

Model Operational Guidelines for Disease Exposure Control¹

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A Draft Prepared by:

*The Center for Strategic & International Studies
Homeland Security Program*

This document is a draft of Model Operational Guidelines for Disease Exposure Control. It is intended to provide states, cities and counties with guidelines to slow or stop the spread of contagious disease when vaccines or other medical countermeasures are unavailable. The guidelines seek to do so by: (1) describing the tools available to public officials for controlling the spread of disease; (2) discussing key policy issues that should be considered; and (3) suggesting protocols to consider for developing specific plans.

Over the next three months, CSIS will collaborate with the various stakeholders in reviewing and refining this document to ensure that it reflects the best technical, public health, and emergency operations thinking to plan for an outbreak.

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Introduction

What is the need for this document?

In the post September 11th world, it is incumbent on our public leaders and communities to develop practical strategies designed to mitigate the severity of bioterrorism and dampen the impact of such attacks if and when they occur. The spectrum of biological agents available to terrorists is significant. Even without the threat of terrorism, newly emerging contagious diseases like Severe Acute Respiratory Syndrome (SARS) and pandemic flu provide a clear impetus for new, and an invigoration of older strategies for disease control in an increasingly interconnected world. In a time that has witnessed almost twenty new diseases in two decades, and the deliberate release of *Bacillus anthracis* through the mail, policies and strategies to protect Americans and avert a public health crisis must support the promise of new biotechnology and medical countermeasures of the future, while also embracing disease control strategies of the past.

Over the last four decades of the twentieth century, science gave birth to vaccines that could prevent diseases, and antibiotics and other medical and pharmacological interventions that would reduce the potentially lethal affects of disease. In becoming the preferred tools of public health policy, vaccines and antibiotics replaced, if not eliminated, the need to cohort the sick from the well. As a consequence, the concept of and reliance on the historic use of quarantine for disease control has faded, becoming unfamiliar to children and young adults, and residing only in the memories of seniors who can recall notices on households signed by public health officials indicating the presence of “old” diseases like diphtheria and measles.

Today, however, novel pathogens, both deliberate and newly emerging, may not be amenable to existing modern medical countermeasures, and may require strategies that limit contacts between potential carriers of contagious disease and other healthy individuals in order to limit their epidemic affects. In cases where medical interventions do not exist, are unavailable, or are merely insufficient to halt a fast-spreading disease, the only recourse may be to employ restrictive measures, including quarantines, that limit contact between exposed and unexposed individuals, and as a result, control the spread of disease by disrupting person-to-person transmission.

What we must recognize is that in the midst of a crisis where social interactions must be limited, political and other public leaders will be expected to decide—and explain—how to best implement restrictive measures, to include possibly a large-scale quarantine. Without operational guidance, however, critical decisions and their implementation will be rushed or careless, with potentially devastating consequences. In the United States, no large-scale quarantine has been employed in the last eight decades, and few if any strategies currently exist to guide such a response. Steps to operationalize large-scale quarantine procedures on a national level have not yet been taken. Most communities—small and large—currently lack the resources to develop the necessary operational plans.

In many situations, isolation and quarantine measures may not be necessary. Diseases that are not contagious, for example, such as anthrax or tularemia, require aggressive prophylaxis and treatment, but would not require extensive disease control measures. In these cases, customary

decontamination will suffice in preventing exposed persons from spreading biological agents remaining on their body or clothing to others.² In situations where limiting social contacts would be needed, however, public officials, service organizations and private citizens will be expected to act swiftly and decisively to protect the public health of their communities.

The purpose of this report is to suggest a framework and methodology by which fast moving, contagious, infectious, and potentially deadly diseases—including those of uncertain origin or pathology—may be controlled in the absence or unavailability of effective prevention, treatment, or other medical intervention.

What are the goals of this document?

The primary goal of this document is to discuss the methods and means by which society can *prevent or minimize exposure to contagious diseases and disrupt disease transmission within a population when medical countermeasures are unavailable*. Potential scenarios for a large-scale contagious disease outbreak are innumerable, and no “playbook” can comprehensively address all of them. It is not the objective of this document to provide rigid guidelines or procedures for a full response and indeed no response can or would be expected to be taken line-by-line from its content. The focus of this document—**disease exposure controls (DEC)**—is in fact only one component of a hierarchy of outbreak response plans. Therefore, these guidelines should be integrated into overall outbreak and disaster response plans. In particular, this document is intended to meet a number of important specific objectives:

- 1) Provide state, local, and federal agencies and officials with a comprehensive understanding of the tools available to contain large-scale contagious disease outbreaks when medical countermeasures are unavailable or insufficient.
- 2) Serve as a resource for state, local, and federal agencies and officials as they develop operational procedures and plans for responding to naturally occurring, accidental, or deliberate contagious disease outbreaks.
- 3) Provide a concept of operations during a public health crisis for communities that may lack appropriate plans to implement quarantines or other restrictive measures
- 4) Promote and help establish the concept of separating potentially exposed (but still healthy) and unexposed individuals as a normative and appropriate—indeed, critical—public health measure to contain large-scale contagious disease outbreaks.
- 5) Help proactively educate public leaders, media officials and the general public on possible disease control measures in order to improve understanding, mitigate panic, and speed and enhance public response in the event of a crisis.

² It should be stressed that contagion and infection are two different but partially overlapping concepts. Infectiousness is the ability of a biological agent to cause disease once introduced into or onto a person's body. Contagiousness is the ability of a disease to be transmitted from an infected person to another person by physical contact or aerosol. Nearly all contagious diseases are infectious.

Who is the intended audience of this document?

These guidelines are intended to be read by individuals in three key groups:

- 1) Senior staff in state, local and federal agencies, including—but not limited to—public health and hospitals, law enforcement, fire and EMS, homeland security, emergency management, human services, and support agencies such as sanitation, energy, housing authority, schools, and transportation.
- 2) Decision-makers in private business and organizations, including nongovernmental organizations, private hospitals, and health care providers, food, shelter, transportation, security, funerary and other private service providers.
- 3) Public leaders, members of the media, and private citizens interested in becoming informed on how to better protect their communities and respond to contagious outbreaks.

An effective and comprehensive response to a fast-moving, contagious and potentially deadly disease with limited possibilities for prevention, treatment, or other medical intervention will require the unprecedented coordination and collaboration of a wide range of governmental and non-governmental actors. Government officials can provide leadership and resources, but they cannot provide all of the services required to contain a disease and support an affected community. Similarly, while response to a public health crisis will and must rely heavily on public health, medical, and scientific experts, it will also require support from law enforcement personnel, mental health providers, transportation authorities, emergency management directors, and other key service providers who may know little about disease transmission or control measures.

Finally, it should be noted that three groups in particular – public leaders, private citizens and journalists – would benefit greatly from examining this document. Public action in response to a large-scale outbreak is central to effectively implementing any disease control regime, even when medical countermeasures or public health strategies are available. The role that private citizens play in supporting crisis response and recovery activities will largely be influenced by the information and messages they receive from their community leaders. These messages are shaped by the media and, in the absence of government information, sometimes created by the media. Understanding how and why certain protective measures may be implemented following a bioterrorist attack or other outbreak can help to mitigate panic, speed public response, and enhance overall compliance to potentially difficult—though necessary—procedures in the time of crisis.

How can this document help me?

The document contains six sections and an appendix.

Section 1: The section on *Rethinking Quarantines* provides a brief history of the use of quarantines in disease control, a summary of recent successful experiences using quarantines for containing SARS, and a discussion on why we may wish to reconsider the use of quarantines as *one* of our tools in protecting public health.

Section 2: The section on *Principles of Disease Control* summarizes the key concepts involved in developing disease control programs, and how some traditional ways of approaching health crises may need to be revised.

Sections 3-5: The sections on *Toolkits for Disease Exposure Control*, *Toolkits for Compliance*, and *Meeting Essential Needs* introduce the instruments by which public health may be protected during an outbreak in the absence of vaccines or other medicines. These sections are organized to help provide: (1) an introduction to the tools available for control programs; (2) key policy issues that must be considered to ensure effective implementation; and (3) suggestions for protocols to consider for development of specific operational guidelines. At the end of each section are additional references for those who are developing guidelines and seek more detailed information.

Section 6: The section on *Decision-making for Disease Exposure Control* introduces the concept of scalable DEC levels as a means for a more generalized approach to outbreak control. It includes levels from Inter-outbreak Period (DEC Level 1) to Outbreak Watch (DEC-2), Outbreak Risk (DEC-3), to Outbreak Alert (DEC-4), and ultimately to Outbreak (DEC-5), and a discussion on how one might consider raising the level, and what type of response actions might be contemplated at each level.

The appendix includes material on what resources may be available for disease exposure control programs.

How were the guidelines developed?

Preliminary research focused on a **literature review and historical analysis** of primary and secondary sources, including State Health department manuals for quarantine implementation, guidelines for quarantine of aircraft or ships, WHO's Infectious Disease outbreak reports, reports of zoonotic quarantine measures during foot and mouth epidemic, WHO/CDC outbreak response guidelines, state quarantine legislation, city Emergency Management Plans, and historical articles on the use of quarantine (See Appendix for complete bibliographic information).

Critical to the development and refinement of these guidelines has been a series of **interviews and consultations** with the experts and public and private officials from a number of cities in the United States who would be responsible for implementing disease control measures, should they be required (See Appendix). These officials ranged primarily across municipal agencies including public health, law enforcement, fire and EMS, emergency management, energy, human services, transportation, sanitation, public schools, and housing. Also interviewed were hospital officials and physicians, as well as infectious disease and infection control specialists. Also included were a number of leading policy-makers and managers currently or formerly in the U.S. federal government, including from the Federal Emergency Management Agency, the White House Homeland Security Council, the Department of Health and Human Services, the Centers for Disease Control and Prevention (CDC), and the U.S. Army Corps of Engineers. From nongovernmental organizations and the private sector, interviews were conducted with key individuals from hotels associations, funeral directors associations, the American Red Cross, and the American Civil Liberties Union.

Two **workshops/conferences** were held to explore and advance new concepts of particular importance, and to gather experts and officials on the issue of quarantines. Specific to the important issue of the role of law enforcement in implementing quarantines and other restrictive

measures, a workshop was held in Charlotte, NC in conjunction with the Police Executive Research Forum and the Charlotte-Mecklenburg Police. This workshop addressed critical law enforcement issues. Secondly, a two-day conference was organized to review best practices and lessons learned from quarantines implemented during the 2003 SARS epidemic in Toronto, Singapore, Hong Kong, and Taiwan. This conference assembled top health and public safety officials from these four countries along with CDC officials, U.S. city officials, public health experts, and U.S. federal government representatives.

Finally, this document has undergone **expert vetting**. Persons consulted during the research phase provided review and analysis of those sections applying to their specific agency or expertise.

What are potential limitations of this document?

This document assumes that the necessary legal authorities are in place to operationalize a response; it does not comprehensively assess emergency health powers or public health legislation. Readers cannot presume that the legal authorities needed to implement every tool presented in this document are necessarily available in his or her state or community. While these guidelines may help legislators and public health attorneys to identify—and potentially act to rectify—gaps in emergency public health powers, every state and locality must examine these model operational guidelines through its own unique legal filter.

A second limitation of this document is inherent in its very need: the United States has not implemented a large-scale quarantine in the past 80 years, and thus there is little to no foundation from which to assess U.S. best practices or lessons learned. While the contents have been informed by a variety of resources and knowledgeable sources, and the lessons learned from other countries' use of quarantine during the SARS epidemic provided valuable insight, these cannot replace hands-on experience within the context of the U.S. public health, law enforcement, and legal systems at federal, state and local levels. Similarly, the clear cultural differences between the United States, with a longstanding history and emphasis on individual freedoms, and the more community-focused countries like Vietnam and Taiwan where SARS lessons have been derived, may mean that some lessons are not necessarily readily transferable to the United States.

SECTION 1.

Rethinking Quarantine

I. History of Quarantine

The connection between the movement of sick persons and the spread of disease has been apparent since the early ages. In biblical times, the isolation of lepers was used as a common practice to prevent lepers from interacting with others, and to control the spread of leprosy.³ During the Byzantine Empire, circa 549 AD, and in the wake of one history's most devastating epidemics of bubonic plague, Emperor Justinian I enacted laws to detain and isolate people arriving from plague-infested regions.⁴

Before quarantines were formally labeled and developed, European and Asian countries enforced cordons with armed guards surrounding perimeters of infected areas, and threatened execution of escapees.⁵ This type of land quarantine, or *cordon sanitaire*, became common practice to protect against outbreaks in the years and centuries to follow.⁶

The first recorded quarantines, as a formal institution, emerged in the early fourteenth century in response to plague. During the fourteenth century, nearly one-third of Europe's population was wiped out from bubonic plague or "Black Death." The disease first struck southern Europe in 1347 and quickly spread across trade routes from England to Russia, over a three-year period.⁷ In 1348, recognizing that plague was introduced by merchant ships coming to port, Venice enacted policy forcing ships, cargo, and individuals to remain in the harbor for 40 days before docking to prevent further introduction of the disease to Venetian shores. The word "quarantine" is derived from the Italian word "*quaranta*," meaning 40.⁸ In 1403, the world's first maritime quarantine station, or *lazaretto*, was established on Santa Maria di Nazareth Island off the coast of Venice.⁹

Plague struck again in the seventeenth century. Armed with knowledge of quarantine tactics from outbreaks 300 years earlier, European cities passed a number of quarantine-related laws. Some ports required 40-day detainment and inspection of all incoming ships to their harbors. Moscow officials organized quarantines and prohibited entry into the city under threat of death. Frankfurt issued a decree "prohibiting people living in plague-infected houses from visiting churches or markets, and from removing and selling the clothing of plague victims without first fumigating, washing, and airing the

³ Hugh S. Cumming M.D., "The United States Quarantine System During the Past 50 Years," *A Half Century of Public Health*. (New York, NY: American Public Health Association, 1921) 118-132.

⁴ NOVA, "History of Quarantine," August 2004, <http://www.pbs.org/wgbh/nova/typhoid/quarantine.html>.

⁵ *Ibid.*

⁶ John B. Hamilton, "Cyclopaedia of Political Science, Political Economy, and the Political History of the United States by the Best American and European Writers: Quarantine," *The Library of Economics and Liberty*, (New York: Maynard, Merrill, and Co., 1899) <http://www.econlib.org/library/YPDBooks/Lalor/II/Cy884.html>.

⁷ Paul S. Sehdev, "The Origin of Quarantine," *ARCANUM* 35 (November 1, 2002): 1071-2.

⁸ Cumming, "The United States Quarantine System," 118-119.

⁹ NOVA, "History of Quarantine," 2004.

garments.”¹⁰ Even small villages made efforts to isolate themselves to prevent the plague. One such village in England adopted a voluntary quarantine policy in response to a plague outbreak. Although the quarantine was strictly observed for the last five months of the epidemic, 80 percent of the village died, most likely because the population had isolated themselves alongside plague-infested rats.¹¹

In the early 1700s, following a plague epidemic around the Baltic Sea, England instituted one of the strictest quarantine acts—a mandatory 40-day waiting period for ships arriving in harbor, whereby violators would be subject to the death penalty.¹² Under this act, in 1721, English sanitary authorities burned two ships in the English harbor out of fear that the ships, coming from Cyprus where plague was widespread, may spread the disease to England if they docked. By the early nineteenth century, England relaxed its quarantine restrictions, allowing all vessels to dock except in cases where disease was either present on arrival or had occurred during the voyage.¹³

Quarantine in the United States

In colonial America, containment and prevention activities to stem the spread of infectious disease were ad hoc and handled by local jurisdictions. With epidemics of smallpox, yellow fever, and plague threatening the colonies throughout the 18th century, cities from Philadelphia to New York and Boston passed a number of laws: to prevent people coming from infected regions from entering cities; to force ships to wait in harbor until proven disease-free; to establish new quarantine stations in ports of entry; and to isolate sick people in separate houses. Most of these laws reflected and incorporated European quarantine practices.¹⁴

When the U.S. Constitution was written, public health power was left to the states. As a consequence, the role of the state to protect public health grew at the turn of the 19th century. In 1797, the Commonwealth of Massachusetts passed the first state public health law in the U.S. authorizing the establishment of local boards of health, and empowering them to implement quarantines.¹⁵ Two federal statutes, one in 1796, and another in 1799, authorized the federal government to assist in state quarantines.¹⁶ But in 1824, the U.S. Supreme Court affirmed states as the primary authority for protecting public health, and empowered them to enact quarantine laws.

In the landmark case *Gibbons v. Ogden*, the Court held that “the completely internal commerce of a State... may be considered as reserved for the State itself.” Chief Justice John Marshall wrote for the Court that under the Constitution, “states are [therefore] able to pass inspection laws, quarantine laws, health laws of every description, as well as laws

¹⁰ Ibid.

¹¹ Michel P. Coleman, “A Plague Epidemic in Voluntary Quarantine,” *International Journal of Epidemiology* 15, no. 3 (Great Britain: International Epidemiological Association, 1986): 379-385.

¹² NOVA, “History of Quarantine,” 2004.

¹³ Cumming, “The United States Quarantine System,” 119.

¹⁴ In 1799, after the 1793 yellow fever epidemic in Philadelphia, which was then the capital of the United States, the city built a large quarantine station 10 miles south of the city along the Delaware River. The station was called Lazaretto after the Italian word for maritime quarantine stations of the coast of Venice established in 1493. The 10-acre property and building still exist.

NOVA, “History of Quarantine,” 2004.

¹⁵ D. Hopkins, “Princes and Peasants: Smallpox in History,” (Chicago, Illinois: University of Chicago Press, 1983); and Chapin C. State, “Municipal control of disease,” *A Half Century of Public Health*, (New York, NY: American Public Health Association: 1921): 133-160.

¹⁶ See Act of May 27, 1796, ch 31, 1 Stat 474. This Act was repealed in 1799 and replaced by Act of February 25, 1799, ch 12, 1 Stat 619.

for regulating the internal commerce of a state.”¹⁷ By the mid-nineteenth century most states had enacted statutes delegating the power to quarantine to state health officials.¹⁸

In 1858, a large yellow fever outbreak in New Orleans killed 4,858 people. Yellow fever broke out again in New York and South Carolina in 1870 and 1876-7, respectively. In 1878, another yellow fever outbreak spread across the Mississippi Valley, infecting over 100,000 people, and leaving 20,000 dead.¹⁹ At the time of these scourges, local health administration had only taken root in thirty-seven local health departments across the entire United States.²⁰

In the wake of yellow fever, U.S. Surgeon General, John Maynard Woodworth, sought and acquired greater federal quarantine authority. In 1878, Congress passed the National Quarantine Act, which gave the Surgeon General of the Marine Hospital Service (MHS) the responsibility to draft rules and regulations for the quarantine of ships entering and exiting American ports. This was the first U.S. legislation to allow quarantine laws to be implemented at the federal level. In Texas in 1882, this new federal authority allowed the MHS to support imposition of a sanitary cordon around Brownsville, Texas to help stop the spread of yellow fever.²¹

A series of subsequent acts strengthened federal quarantine authority. In 1883, the MHS established the first two national quarantine stations, *Gulf Quarantine* and *South Atlantic Quarantine*. Legislation passed in 1888 further bolstered the 1878 Act by creating penalties for violators of quarantine laws.²² In 1890, Congress passed a quarantine law that allowed the Surgeon General to develop rules and regulations to prevent the interstate spread of cholera, yellow fever, smallpox, and plague. And in March 1891, congress authorized the Surgeon General to incorporate medical inspection of immigrants as part of the Marine Hospital Service’s duties.²³

The two largest waves of U.S. immigration occurred in the 1880s and the 1890s. The rise in immigration coincided closely with one of the worst cholera pandemics in history. Beginning in India in 1881, Cholera spread through the Far East, the Middle East, Russia, Germany, Africa, and into the Americas over a fifteen year period, killing hundreds of thousands of people.

The combination of massive immigration along side a fear of a cholera pandemic, led to the use of quarantines both as tool to prevent the spread of new diseases into the United States, and as a way for anti-immigrant factions to restrict immigration. In 1892, for example, a French steamship carrying 1,200 Russian Jewish immigrants was detained off the coast of New York and its passengers quarantined after 200 cases of typhus were discovered on board. The discovery of the disease and the fact that the boat was carrying immigrants, caused the chairman of the U.S. Senate Committee on Immigration to

¹⁷ *Gibbons v. Ogden*, 22 U.S. 1 (1824).

¹⁸ Teri Flowers, “Quarantining the Noncompliant TB Patient: Catching the ‘Red Snapper,’” *Journal of Health and Hospital Law* 28, no. 2 (1994): 95-105.

¹⁹ Dr Jari Vainio and Dr Felicity Cutts, “Yellow Fever,” WHO/EPI/GEN/98.11, (Geneva, Switzerland: September, 1998): 63, <http://www.who.ch/gpv-documents/>

²⁰ James A. Tobey, *Public Health Law (3rd Edition)*, (The Commonwealth Fund, New York: 1947): 11. <http://biotech.law.lsu.edu/cphl/history/books/tobey/tobey.htm>.

²¹ Cumming, “The United States Quarantine System,” *A Half Century*, 121-2.

²² *Ibid.*

²³ United States Department of Health and Human Services, “John B. Hamilton (1879-1891),” April 23, 2004, <http://www.surgeongeneral.gov/library/history/biohamilton.htm>.

propose legislation that would reduce the number of immigrants to America to reduce the risk of immigrants bringing disease to America.²⁴

The port of New York, in 1892, similarly imposed new restrictions largely targeting immigrants. Under the new rules, New York required a 20-day quarantine on all passengers traveling to America in steerage. Cabin class passengers, by contrast, were not subject to the quarantine. Since most ships could not afford to pay the \$5,000 per day port fee for quarantine, the measure, in the end, greatly reduced the number of immigrants coming to New York.²⁵

The Rayner-Harris National Quarantine Act, passed in 1893, attempted to reconcile some of the political and practical concerns regarding immigration and spread of disease. The Act required that a bill of health be presented upon a ship's arrival to an American port. The bill would include a detailed sanitary history of the ship, cargo, crew and passengers on board. Under the provisions of the Act, a consul—or medical officer assigned to the consul—must sign and verify that the bill is accurate, and that all necessary sanitary requirements had been provided for on the ship. Any vessel arriving from a foreign port and failing to comply with the Act's provision would be fined. The Act also established procedures for the medical inspection of immigrants and allowed the president to suspend immigration, if necessary, due to sanitary conditions.²⁶

With the fear of smallpox, and an understanding that vaccination could help exterminate the disease, the city of Cambridge, Massachusetts, in 1902, adopted legislation that would require vaccination or revaccination of all inhabitants of the city, and for all persons not protected by vaccination to be vaccinated.²⁷ Laws that authorized compulsory vaccination, however, were controversial. Those who were forced to be vaccinated questioned the government's authority to, in effect, encroach upon their personal liberty.

In 1905, the balance between personal liberty and the interests of public health came to a head. In *Jacobsen v. Massachusetts*, the Supreme Court upheld the Cambridge statute. In its ruling, the Court carved out a central tenet of public health (and of quarantines), namely that government may infringe on individual rights in order to protect a community from a serious disease. Writing for the majority, Justice Harlan wrote that “the Liberty secured by the Constitution of the United States to every person within its jurisdiction does not import an absolute right in each person to be, at all times and in all circumstances, wholly freed from restraint. There are manifold restraints to which every person is necessarily subject for the common good.”²⁸

The use of quarantines was expanded during World War I, and with this expansion, a greater stigma. From 1917 to 1919, more than 383,000 soldiers were diagnosed with venereal diseases (VD), acquired in large part from prostitutes. The widespread disease cost the U.S. Army greatly in terms of treatment of soldiers, and days lost of soldiers on active duty.²⁹ Legislation passed in many states, including Kansas, Ohio, and New York, forced prostitutes with VD into involuntary hospitalization and quarantine. Involuntary

²⁴ Digital History: using new technologies to enhance teaching and research, “The Huddled Masses: Migration and Disease, Period: 1880-1920,” October 20, 2005, http://www.digitalhistory.uh.edu/database/article_display.cfm?HHID=422.

²⁵ *Ibid.*

²⁶ Cumming, “The United States Quarantine System,” *A Half Century*, 122-3.

²⁷ *Jacobsen v. Massachusetts*, 197 U.S. 11, 26 (1905).

²⁸ *Ibid.*

²⁹ Nearly seven million days of active duty were lost. See Allan M. Brandt, *No Magic Bullet: a Social History of Venereal Disease in the United States since 1880*. (New York: Oxford UP, 1987).

quarantines were often upheld by criminal courts, which meant that vagrants with VD were imprisoned.³⁰ In 1917, the Kansas state legislature passed a law authorizing the quarantine of men and women with VD. As a result, many women with VD were imprisoned alongside common (female) criminals. Far fewer men ended up being incarcerated largely because VD was viewed primarily as a female affliction.³¹ In his book, *No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880*, historian Allan Brandt criticized the detainment as, “the most concerted attack on civil liberties in the name of public health in American history.”³² Yet, the law remained in effect in Kansas until 1956.³³

The Influenza Pandemic of 1918-1919 proved to be one of the worst pandemics in history. Now known to be a strain of avian influenza (H1N1),³⁴ the ‘Spanish flu’ infected a fifth of the world’s population, killing an estimated 675,000 Americans and somewhere between 20 and 40 million people worldwide.³⁵ The public health response to this pandemic was based upon a new understanding of the cause of disease—that the pathogen was transmitted through the air. Public health departments issued flu posters to educate communities on the value of hand-washing before eating and general hygiene. Gauze masks, disinfection, and sterilization methods were all used for prevention.

Additionally, many public institutions were closed or restricted to limit people within communities from passing the disease from one to another. The Committee of the American Public Health Association suggested that venues where people assembled for pleasure—such as saloons and cinemas—should be closed. Churches, however, were permitted to stay open if they held brief services and minimized patron interaction. School closure was the subject of fierce debate, as critics claimed that the educational and economic costs outweighed the benefits. Many of those suffering from the Spanish flu were subjected to quarantine and isolation. Those with the worst cases were sent to hospitals, while others were told to stay home. At asylums, colleges, and military training camps where influenza spread especially quickly, quarantines were implemented at a higher rate.³⁶

During this period, new quarantine facilities were built across the country to manage flu cases, and existing local quarantine stations were gradually turned over to federal control. By 1921, all quarantine stations were transferred to the federal government. In 1944, the U.S. Congress passed the Public Health Services Act, consolidating quarantine functions and services the under federal government.³⁷

³⁰ Referenced in Mark A. Rothstein, J.D., M. Gabriela Alcalde, MPH, et al, “Quarantine and Isolation: Lessons Learned from SARS,” *A Report by the Institute for Bioethics, Health Policy and Law, University of Louisville School of Medicine for the Centers for Disease Control and Prevention*, November 2003: 23-25.

³¹ Kansas State Historical Society, “Online Exhibits, Sinners and Saints: Prostitution,” 2005. <http://www.kshs.org/exhibits/vice/vice6.htm>.

³² NOVA, “History of Quarantine,” 2004.

³³ Kansas State, “Online Exhibits,” 2005.

³⁴ Centers for Disease Control and Prevention, “Information About Influenza Pandemics,” October 17, 2005. <http://www.cdc.gov/flu/avian/gen-info/pandemics.htm>.

³⁵ Stanford University, “The Influenza Pandemic of 1918,” February 2005, <http://stanford.edu/group/virus/uda/>.

³⁶ Stanford University, “The Public Health Response,” February 2005,

<http://www.stanford.edu/group/virus/uda/fluresponse.html>.

³⁷ NOVA, “History of Quarantine,” 2004.

Modern Quarantines

The history of quarantines can be seen as a gradual expansion of the role of government to protect public health, first at a local level, then state, and finally at the Federal level. Under the U.S. Constitution, public health authority is split between the states under the Tenth Amendment which reserves to the states all powers not explicitly granted to the Federal government, and to the Federal government under the Commerce Clause to regulate interstate commerce.

The use of quarantines, of mandatory vaccinations, and of detainment have been supported by the courts over the years under the government's interest to care for those who can not care for themselves, and more, to protect the public from individuals who may cause them harm. The Constitution seeks a balance however between compelling individuals in the interest of public health and protecting the rights of individuals to due process under the constitution when their liberty may be denied.

One of the most prominent examples of the tension between balancing the rights of individuals to be left alone and the rights of individuals to be protected from harm, is with the use of isolation and quarantine to protect against TB.

TB was once the leading cause of death in the United States. It is caused by a bacterial infection, spread by casual contact, is highly contagious and, if not treated properly, can be fatal. Globally, in 2003, an estimated 8.8 million people were infected and 1.75 million deaths occurred due to all forms of the disease. Treatment of TB requires a minimum regimen of six months of daily drugs. If treatment is completed, the likelihood of a patient's recovery is good.

For a number of reasons, however, a patient may not complete the full treatment prescribed: patients may begin to feel better and stop taking their medication; health care professionals may prescribe the wrong treatment regimen; or drugs to treat TB may not be readily available to the patient. Like other bacterial infections, multi-drug resistant tuberculosis (MDR-TB) can develop if patients fail to complete prescribed antibiotic treatment. In cases when a patient fails to complete the full treatment, the patient is considered "noncompliant" and at greater risk both of developing MDR-TB and of spreading the disease.³⁸

In 1992, the U.S. Centers for Disease Control (CDC) found that 25 percent of all TB patients were noncompliant. Because of the increased risk of noncompliant patients infecting others and of developing the more lethal drug-resistant strain of TB, the CDC recommended the use of quarantines to ensure treatment.³⁹ Under these guidelines, New York City officials in the 1990s detained noninfectious TB patients in the Goldwater Hospital until they were cured. While median length of confinement was 168 days, one patient detained for an unprecedented 654 days. Patients in other hospitals were only held on average for half that time.⁴⁰

³⁸ World Health Organization, "Fact Sheet No. 104: Tuberculosis," April 2005, <http://www.who.int/mediacentre/factsheets/fs104/en>.

³⁹ Flowers, "Quarantining the Noncompliant," *Journal of Health and Hospital Law*, 95-105.

⁴⁰ BH Lerner, "Catching Patients: Tuberculosis and Detention in the 1990s," *American College of Chest Physicians* 115 (1999): 236-241.

In 1993, in an attempt to balance competing rights of due process and public health, New York City revised its TB control procedures to include the right of individuals to counsel, the appointment of counsel to those who could not afford it, and to timely judicial review of cases.

Quarantines Post 9/11

Despite the history of federalization of quarantine authority, in the absence of pressing threats, public health enforcement, including quarantine, has largely remained with the states. However, most U.S. states are ill prepared to undertake a large-scale quarantine. A literature review conducted by Barbera et al. revealed that no large-scale quarantine has been implemented within U.S. borders in modern day. The wide divergence between and within states in terms of plans and preparedness has led to a wide variety of legislation providing for the use and implementation of quarantine. In the event of an outbreak, quarantines would probably be handled primarily at the local or state level. Should there be a risk that an infectious disease could cross state lines, the federal government has clear quarantine authority. Such a decision must be an executive decision by the president, after which the Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) are authorized to take quarantine actions. The federal government may also exert authority over intrastate quarantine if a state requests assistance, or if it is believed that a state's actions are inadequate.⁴¹

Following September 11, 2001, it became apparent to all manner of U.S. emergency responders that new plans for public safety responses were needed. Accordingly, health officials, at the CDC's request, drafted the Model State Emergency Health Powers Act (MSEHPA). The purpose of the MSEHPA was to provide a resource for state, local and tribal governments to use in revising or updating public health statutes and administrative rules to ensure appropriate authority for implementing quarantine in the event of an emergency. States were encouraged to review their own laws, and make changes where necessary.

The draft MSEHPA itself is controversial; critics believe that some of new powers proscribed in the legislation trample on the basic rights of citizens in times of emergency.⁴² Moreover, most of these states failed to review existing legislation and create a new cohesive package. Instead, they grafted on pieces of the Act, in many cases, enlarging the differences between states' abilities to declare and enforce emergency public health measures. Furthermore, even for states that have provided for the authority to *invoke* quarantines, most—if not all—states today lack operational plans to *implement* them.

II. SARS: A Modern Case Study

SARS emerged in the fall of 2002 in the Guangdong Province of China, with the first known case occurring on 16 November 2002. It was not until February 2003, however,

⁴¹ Joseph Barbera, MD, et. al., "Large-Scale Quarantine Following Biological Terrorism in the United States: Scientific Examination, Logistic and Legal Limits, and Possible Consequences," *JAMA* 286 no. 21 (2001): 2111-7.

⁴² Sue Blevins. "Heritage Lecture #748, The Model State Emergency Health Powers Act: An Assault on Civil Liberties in the Name of Homeland Security," The Heritage Foundation, June 10, 2002. <http://www.heritage.org/Research/HealthCare/HL748.cfm>.

that SARS spread beyond Guangdong Province: an infected medical doctor from traveling to Hong Kong infected at least 12 other hotel guests, who were ultimately the sources of outbreaks in Hong Kong, Viet Nam, Singapore, and Toronto.

By mid-March, the outbreaks were swiftly growing, particularly among hospital staff. Epidemiological research suggested that SARS was spreading along international travel routes. Declaring SARS a “worldwide health threat,” the WHO issued emergency travel recommendations. The WHO increased precautionary measures in early April, when it began issuing travel advisories recommending the postponement of all but essential travel to highly affected regions.

From the beginning of the epidemic, scientists across the world cooperated with unprecedented openness to identify the virus causing the deadly respiratory infection. With exceptional speed, research groups confirmed that a strain of coronavirus—also responsible for the common cold—was the pathogen responsible for SARS.^{43,44}

By May, the epidemic (excepting a growing outbreak in Taiwan) seemed to show signs of peaking. Viet Nam had stopped local transmission of SARS altogether. Although Toronto reported no cases after late April, it developed a second wave of SARS cases approximately one month later. However, this outbreak was limited to health care workers and was not of the same magnitude as the first outbreak.

Although the WHO considered all SARS outbreaks to have been contained by 5 July, a number of post-epidemic cases arose in scientists who had been infected while researching the virus in Singapore and Taiwan. In winter and spring 2004, several cases of SARS were identified in China. While all of these cases were identified, isolated, and their contacts quarantined, the exact cause of the outbreak remains unknown.

The Response to SARS: Quarantine

What makes the response to—and lessons learned from—SARS so unique is the important precedent that has been set for modern quarantines. Lacking known antivirals, vaccines, or other countermeasures for the disease, officials resorted to what public health officials term ‘old medicine:’ the separation of healthy populations from the potential spreaders of disease.

Officials in affected countries did this in a variety of ways. They isolated the sick; they quarantined the asymptomatic contacts of the sick; they required facemasks, cancelled public events, and restricted mass transportation. Though it is impossible to determine exactly which measures were most effective in stemming the spread of the disease, it is nonetheless quite clear that, taken together, they were responsible for limiting spread of the disease and helping to eventually bring the outbreak to an end.

Of the measures taken, quarantine was perhaps the most controversial.

⁴³ TG Ksiazek, D Erdman, CS Goldsmith, SR Zaki, T Peret, S Emery, et al, “A novel coronavirus associated with severe acute respiratory syndrome,” *New England Journal of Medicine* 348 (2003): 1953–66.

⁴⁴ C Drosten, S Gunther, W Preiser, S van der Werf, HR Brodt, S Becker, et al, “Identification of a novel coronavirus in patients with severe acute respiratory syndrome,” *New England Journal of Medicine* 348 (2003): 1967–76

Singapore instituted one of the first with its announcement of home quarantine on March 24, 2003. Singapore issued 7,863 home quarantine orders to individuals in 5,072 households.⁴⁵ Over the course of the epidemic, Hong Kong placed 1,262 persons from 493 different households in home quarantine. In Toronto, the number was as high as 23,000;⁴⁶ Taiwan issued home quarantine orders to over 150,000.⁴⁷ Overall, almost 200,000 persons were quarantined, a number that becomes considerably higher when including the unknown large population quarantined in mainland China.

During the SARS outbreaks, public health departments were required to work closely with law enforcement personnel to ensure compliance with quarantine measures. Methods of enforcement—and the success of the chosen tactics—varied widely. In Toronto, the public was cooperative with home quarantine orders.⁴⁸ In other cases, quarantines caused public protest and even violence.⁴⁹

Quarantines during SARS posed new challenges to the role of law enforcement in the outbreak response. Officers were called upon to complete unfamiliar tasks yet maintain their daily roles. Police and public health officials enforced home quarantines through phone calls, house visits, electronic picture monitoring, and electronic tagging of noncompliant detainees. All of these efforts required close partnerships and coordination between the public health and law enforcement communities.

In all countries, the SARS outbreaks strained medical and response capabilities and resources, and maintaining adequate personnel was a particularly difficult task. In Hong Kong, over 22% of those hospitalized for SARS were medical workers; in areas of Taiwan the number reached 33%; and in Toronto, 46%.⁵⁰ Although many of the affected regions enacted ‘work quarantines,’ allowing exposed health workers to continue to staff the response under strict regulations for protective equipment use, almost all response teams were severely overburdened and understaffed.

Through a combination of vigilance and pure luck, the United States was able to elude a large-scale SARS outbreak. Nonetheless, SARS was a disconcerting example of the lack of preparedness that exists to contain a large-scale contagious disease outbreak in the United States. The SARS epidemic highlighted the need for new planning and new procedures to contain the spread of a contagious disease with no known (or available) countermeasures.

While the lessons learned from the quarantines implemented during the SARS outbreaks months have ushered along planning processes within public health departments in the United States, there remain wide gaps and uncertainties in quarantine planning. Considering the likelihood of newly emerging diseases in the future, it is critical to

⁴⁵ Remarks of Dr. Balaji Sadasivan, Minister of State, Singapore Ministry of Health, September 17-18, 2004, CSIS.

⁴⁶ Remarks of Dr. Bonnie Henry, Associate Medical Officer, Toronto Public Health, September 17-18, 2004, CSIS.

⁴⁷ Remarks of Dr. Ou Chin-der, Deputy Mayor, Taipei City Government, September 17-18, 2004, CSIS.

⁴⁸ In June 2003, the Harvard School of Public Health and Health Canada published a survey that, in part, assessed the willingness of Toronto and U.S. citizens to submit to home quarantine. Results indicated that 96% of citizens recognized the necessity of quarantine to prevent the spread of SARS, and that 97% would be willing to stay in home quarantine for 10 days if exposed to a SARS patient. Approximately 25% of those in quarantine or who knew someone in quarantine identified major problems (primarily emotional difficulties and missing work), but 75% reported no major problems. Survey located at <http://www.hsph.harvard.edu/press/releases/press06162003.html>.

⁴⁹ For example, villagers in at least two areas of China rioted to protest the use of a local government building as a facility for centralized quarantines (New York Times, *SARS is the Spark for a Riot in China*, April 28, 2003).

⁵⁰ Conference Remarks, “Rethinking Quarantines: New Considerations for ‘Old Medicine’” September 17-18, 2004, CSIS.

develop comprehensive strategies to strengthen our ability to contain outbreaks of fast-moving contagious diseases.

III. Rethinking “Quarantine”

The successful use of quarantine during the SARS outbreaks played an important role in stemming the spread of the disease; officials from the CDC and WHO supported its use and praised it as an effective public health tool for disease control.⁵¹ Yet in the United States, the feeling among some officials and public citizens is that quarantine simply is not an option. So despite the success and critical importance of quarantine in response to SARS, sentiment for an *effective public health tool* remains unfavorable. Why is this? And what can be done to change it?

Why Update ‘Quarantine’?

Most people associate the notion of ‘quarantine’ with disease containment, and understand that it is a method of preventing disease spread between people. Despite the familiarity with the term, however, ‘quarantine’ is often misused by the public and government alike, and fails to represent the nuances of disease control measures within a comprehensive, modern framework for controlling the spread of infectious disease. It is true that the term itself needs clarification—not abandonment or alteration—but what is more important is that the public recognize that quarantine is a useful tool, and just one of a many that work together to control disease spread.

First, *the term ‘quarantine’ fails to convey that a variety disease containment measures will be required to stop the spread of disease during a large-scale contagious outbreak.* During the SARS outbreaks, an enormous diversity of quarantine measures was employed. In Hong Kong, for example, officials implemented “home confinement” as a form of quarantine.⁵² In Toronto, many people presumably exposed to SARS were placed under ‘work quarantine,’ which allowed them to leave their homes to go to work, but required the use of proper protective equipment.⁵³ In Singapore, many of the potentially exposed persons were moved to “holiday resorts” that had been converted to quarantine camps.⁵⁴ And in Taiwan, an entire hospital was quarantined to prevent the spread of SARS to the rest of the community.⁵⁵

In order to stop the spread of SARS, furthermore, different degrees of enforcement measures were required. In most cases ‘voluntary quarantine’ was sufficient to ensure that exposed persons remained at home for the required 10 days. In other cases, however, compliance monitoring was necessary, and in more extreme instances, law enforcement personnel guarded quarantined facilities or issued home quarantine orders. Thus quarantine was sometimes voluntary and other times compulsory; sometimes monitored

⁵¹ Dr. Julie Gerberding, director of the Centers for Disease Control (CDC), reported on quarantine measures in Asia, “Tens of thousands of people are in quarantine and that is a very important step to protecting everyone from exposure to SARS.” Upon removing a travel advisory to China, the WHO said, “containment of an outbreak of such dimensions is a tribute to the effectiveness of centuries-old control measures, including isolation, contact tracing, and quarantine...” In a further show of support for quarantine measures, Dr. David Heymann, Chief of Communicable Diseases at the WHO, said that Vietnam’s aggressive hospital quarantines were the key factor in stopping the spread of the virus in that country.

⁵² Statement from officials at a CSIS Conference, “Rethinking Quarantines.” September 17-18, 2003.

⁵³ *Ibid.*

⁵⁴ *Ibid.*

⁵⁵ *Ibid.*

by phone calls and other times by electronic surveillance; sometimes enforced by fines and other times by physical force.

As observed from the wide range of quarantine-like measures implemented during the SARS outbreaks, different measures may apply under different circumstances. In the past, quarantine has been described in its simplest terms: “the isolation of an individual who is thought to be exposed to contagious diseases.”⁵⁶ This notion of ‘quarantine,’ however, is clearly outdated and fails to reflect the high level of adaptability and creativity that will be required for a situational response.

A second difficulty is that *the definition of ‘quarantine’ has become blurred over time, and means different things to different audiences.* Although the experience with SARS has returned the idea of quarantine to the public eye, the wide range of its application—to describe isolation, home quarantine, work quarantine, quarantining in camps, even limitations on social gatherings or restriction of public transportation, not to mention its applications to food or animals⁵⁷—has left confusion about what the term really means. And while several groups have defined the term more specifically,^{58, 59, 60} even these definitions are not consistent with one another. The confusion therefore has remained, and likely will remain, within the general populace.

Finally, *the notion of quarantine often elicits wariness or even hostility, and is sometimes regarded as totalitarian oppression of over-reaching bureaucrats and government officials.* Much of this feeling comes from historical failures and botched attempts that left the public mistrustful of government and public health officials.^{61, 62} Efforts to enforce quarantines have at times also sparked rioting and violence.⁶³ Even when quarantines were implemented successfully and peacefully, the manner by which they

⁵⁶ Flowers, “Quarantining the Noncompliant,” *Journal of Health and Hospital Law*, 95.

⁵⁷ The use of isolation and quarantine is not limited to human populations. Animals carrying infectious disease are also subject to movement restrictions. One large-scale example of animal quarantine was the 2001 foot-and-mouth outbreak in the United Kingdom. Foot-and-mouth is a highly infectious animal disease causing lameness and lesions on hooves and in or around the mouth. Three days after the first case of foot-and-mouth was discovered, movement restrictions were put in place on all livestock. Some experts speculate that if the order was put into place three days earlier the outbreak may have been one half to one third what it actually was. Epidemiologists have estimated that approximately 19 additional farms were infected in the seven hours between the order having been signed and it coming into effect. (Source: Dr. Ian Anderson CBE, Foot and Mouth Disease 2001: Lessons to be Learned Inquiry Report, (London: The Stationary Office, July 22, 2002), 60.) Other common animal epidemics controlled by isolation, quarantines, culling, or other prevention/movement restriction methods include mad cow disease, avian influenza, swine fever, Newcastle disease in poultry, post-weaning multi-systemic wasting syndrome (PMWS) or pork disease, rinderpest in cattle, West Nile virus, etc.

⁵⁸ Barbera et. al in December 2001 defined quarantine as “compulsory physical separation, including restriction of movement, of populations or groups of healthy people who have been potentially exposed to a contagious disease, or to segregate these persons within specified geographic areas.” -*JAMA* 286(21): 2711.

⁵⁹ According to the CDC, Quarantine is the separation and restriction of movement of persons who have been exposed to a contagious illness and may be infected but are not yet ill.

⁶⁰ According to the authors of the Model State Emergency Health Powers Act, Quarantine is the physical separation and confinement of an individual or groups of individuals, who are or may have been exposed to a contagious or possibly contagious disease and who do not show signs or symptoms of a contagious disease, from non-quarantined individuals, to prevent or limit the transmission of the disease to non-quarantined individuals.

⁶¹ During the polio epidemic in Oyster Bay New York in 1916, “attempts at quarantine practices the past summer were so incomplete...so lacking in uniformity, so changeable and erratic, that the public lost confidence in them. Hence the public cooperation was lost (Risse 1992 – see below). During the epidemic, a citizen’s group formed its own alliance and took over the response to the polio outbreak.

⁶² Guenter B. Risse, “Revolt Against Quarantine: Community Responses to the 1916 Polio Epidemic Oyster Bay, New York.” *Transactions and Studies of the College of Physicians of Philadelphia* 14, no. 1 (1992): 23-50.

⁶³ In 1893, during a smallpox outbreak in the town of Muncie, Illinois, entire neighborhoods were locked-down in a police-enforced quarantine. The resulting revolt led to the shootings of a number of public health officials.

were imposed frequently reflected or exacerbated prejudices against urban minorities.^{64,65} Finally, public perception of quarantines as oppressive emanates out of the undeniable fact that by prioritizing the public health of the *community*, quarantines appear to wrest freedom from *individuals* to independently assess a situation and respond in a manner that maximizes his or her own personal safety.

Much of the hostility toward quarantine measures has been reflected in criticism against The Model State Emergency Health Powers Act, which was a model piece of legislation designed by the Center for Law and the Public's Health at Georgetown and Johns Hopkins Universities.⁶⁶ The act, which gives states greater power during a health emergency, including special powers to isolate and quarantine, has been criticized by civil liberties organizations for infringing on citizen's rights. According to the ACLU, for example, although strong health powers are needed, the act "fails to provide modern due process procedures for quarantine."⁶⁷ Even medical groups such as the Association of American Physicians and Surgeons have called the act a "prescription for tyranny."⁶⁸

To address these concerns and to account for the multiple tools available and required to contain a contagious outbreak, CSIS has developed a new concept that utilizes a graded approach to separating sick persons, exposed persons, and persons who may be at risk of exposure. This concept is termed **Disease Exposure Control (DEC)** and will be described in depth in the following chapters.

⁶⁴ In the 1907-1908 bubonic plague outbreaks in San Francisco, authorities implemented a quarantine on all of Chinatown after a Chinese laborer was found dead from the disease. Such an unprecedented and drastic measure "reflected not only fear of an impending epidemic but also a long-standing animosity toward the Chinese in San Francisco (see Risse, 1992 below)

⁶⁵ Risse, Guenter B. "A Long Pull, A Strong Pull, and All Together": San Francisco and Bubonic Plague, 1907-1908. *Bull Hist Med.* 1992;66:260.

⁶⁶ The text of the Model State Emergency Health Powers Act can be found at <http://www.publichealthlaw.net/>.

⁶⁷ American Civil Liberties Union. "Q&A on the MSEHPA."

http://archive.aclu.org/issues/privacy/Model_health_feature.html.

⁶⁸ AAPS ANALYSIS January 9, 2002. <http://www.aaponline.org/testimony/emerpowers2.htm>.

SECTION 2:

Principles of Disease Exposure Control

Disease Exposure Control (DEC) is *the process by which the spread of disease is minimized by limiting contact between uninfected individuals and other individuals who are potential spreaders⁶⁹ of a contagious disease*. DEC programs are needed when confronting possible large-scale outbreaks of contagious diseases, and, in particular, when effective medical or public health prevention or treatment interventions—vaccines or antivirals, for example—do not exist, are unavailable, or are insufficient to halt a fast-spreading disease. It is assumed that for determining if DEC programs are appropriate for any given situation that the disease in question is spread from person-to-person and that interaction among people in their daily lives is the primary mode of disease transmission.

There are five principles that underpin DEC programs. They are:

- 1. Broaden the scope of crisis response**
- 2. Limit social interactions**
- 3. Use a toolkit of exposure control measures**
- 4. Employ least restrictive measures necessary**
- 5. Engage the public as a partner**

These five principles are described below.

Principle 1 – Broaden the Scope of Crisis Response

Principle 1

Government officials should broaden the scope of response to health crises beyond attention to the sick or exposed, and include plans for those who were not exposed, and plans for the provision of services beyond health care.

Managing a large-scale contagious disease outbreak—in contrast to most public emergencies and catastrophes—requires a fundamental shift in our nation’s approach to emergency response. For the last half-century or more, emergency response plans have primarily focused on providing clinical treatment services and support to those directly and immediately affected by a particular localized disaster—the sick or exposed, the injured, and the displaced. In those cases, medical intervention and social services are made available almost exclusively to the individuals and families of those specifically uprooted by fire, floods or earthquakes, of those afflicted by disease, injured by accident or harmed by deliberate attack.

⁶⁹ The term “potential spreaders” refers to individuals who either may have been exposed, are incubating, subclinically affected, or are a carrier of a disease. It also includes individuals with active disease.

Large-scale contagious outbreaks, however, are different from all other emergencies, including biological attacks with non-contagious agents. First, a contagious outbreak may not be limited to a single event in a single geographic space. Unlike natural disasters or other types of terrorist attacks, which can be considered isolated events, large-scale contagious outbreaks can have a mushrooming effect whereby the spread of disease continues to perpetuate the initial event over time and geography, as if new and/ or multiple events are occurring. As such, the attack or outbreak may not be limited to the first ‘incident’ or first detected cases.

Second, the origin of a biological attack or outbreak may initially be unknown, making it difficult or impossible to immediately identify disease carriers and determine the scope of the spread of disease. Moreover, because of the potential delay between disease exposure and the onset of symptoms, a contagious outbreak can spread covertly and unwittingly from infected to healthy individuals as a consequence of normal social interactions. For all of these reasons, a large-scale contagious outbreak is different from all other emergencies that affect the public health, and, consequently, must be managed differently.

Central to a new management approach is the notion that healthy individuals cannot always identify when they are at risk of exposure to disease, and, seemingly healthy individuals may not know that they have been exposed and are incubating a disease and thus pose a risk to others. As a consequence, plans for control of large-scale contagious disease outbreaks must account not just for **sick/symptomatic** individuals, but also for three groups of individuals not typically factored into emergency response planning. They are: **potential spreaders**, asymptomatic individuals who may have been exposed and infected but appear healthy; the **unexposed sick**, symptomatic individuals who have not been exposed but who believe they have been infected (and may present unrelated symptoms that they fear may be caused by the outbreak disease); and **at risk communities**, groups of people who are not sick or exposed but who may have an increased risk of exposure due to interactions with potential spreaders who they may come in contact with where they reside, work or travel. Public action on the part of these populations can either speed control of or enhance the undetected spread of disease from person-to-person.

The new concept that crisis managers must consider with outbreaks of contagious diseases is that asymptomatic people are as important a target of response efforts as sick or directly affected people. For example, during a large outbreak involving extensive community transmission, response officials may recommend that healthy, unexposed individuals remain at home to limit their interaction with others and thus reduce their potential for exposure. At the same time, to reduce the risk of transmission, potentially exposed individuals, who may otherwise appear healthy, must be monitored for symptoms and perhaps remain at home (or elsewhere) for a period of time to protect against the further spread of disease.

Response strategies to provide for groups that are not sick as a direct result of the outbreak—potential spreaders, the unexposed sick, and at risk communities—will require support beyond health care. A number of essential needs—food, utilities, psychological support, transportation, and others—may be needed to enable asymptomatic individuals, whether exposed or unexposed, to remain temporarily separated at home or elsewhere from others. As a consequence, key organizations not traditionally involved in health emergency response efforts, such as law enforcement and social services, will be required to play a much more prominent role.

Principle 2 – Limit Social Interactions

Principle 2

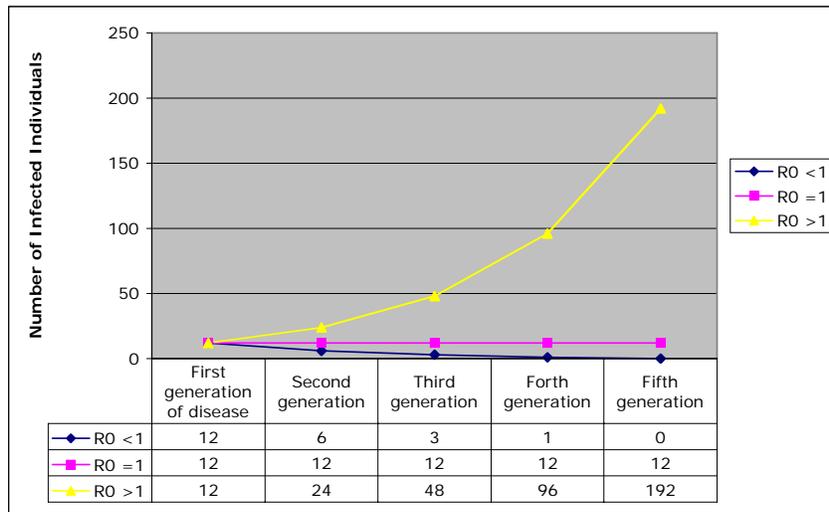
Healthy individuals can limit their own exposure to disease, and potential spreaders can reduce exposing others to disease, by limiting their interactions with others.

Understanding some basic principles of disease transmission is essential for planning for and responding to infectious disease outbreaks. During an outbreak, infectious material may be transferred from person-to-person either (1) through **direct contact** (e.g., through touching, kissing, or sexual activity); (2) through **indirect contact** with contaminated objects (e.g., by touching the mucous membranes of one’s eye, nose or mouth *after* having touched objects—clothes, washroom surfaces, doorknobs, or toys, for example—that have been contaminated by infectious bodily fluids, including droplets of secretions ejected by normal respiratory-based activities such as coughing, spitting, sneezing, singing or talking; or (3) through **small, airborne particles** that can remain floating in the air and continue to pose a risk of being inhaled by others (e.g. from the tiniest of particles produced also from coughing, spitting, sneezing, singing or talking). *A core element of disease exposure control is understanding first that disease is transferred from person-to-person as a consequence of normal day-to-day physiological, personal or social activities; and thus, second, that controlling the spread of disease will require limiting social interactions.*

Health officials track the average number of new cases caused when an infected person transmits a disease to one or more individuals. This concept is known as *transmissibility* and is referred to as “ R_0 ” by epidemiologists and infectious disease experts. If a group of children acquires chicken pox, for example, and each child on average infects two other children, the transmissibility factor or R_0 is 2. If the infected children on average infect four or five other people, R_0 is 4 or 5, and without intervention, the disease will continue to spread. By contrast, if each infected person infects *less* than one additional person ($R_0 < 1$) on average, then the disease outbreak will eventually disappear. Consequently, a goal for officials trying to control an outbreak would be to reduce the average number of new cases caused by individuals infecting others (i.e., to bring R_0 to <1). This can be accomplished through prevention strategies, medical treatment programs, and/ or limiting social interactions.

Figure 1 below diagrams how the logic of reducing transmission works in practice. If on average each infected person spreads the disease to more than one other person ($R_0 > 1$), we see that the disease will spread at an increasing rate throughout a population (see the yellow curve on the chart below). If on average each infected person passes the disease to exactly one other person ($R=1$), then we see that the disease will continue to spread at a constant rate throughout the community (see the purple curve), but will not abate. If, however, on average each infected person passes the disease to less than one other person ($R_0 < 1$), then each subsequent generation of ill people will have fewer infected individuals and the spread of the disease will eventually be halted (see the blue curve).

FIGURE 1 – Example Transmissibility and Number of Infected Individuals Over Time



It is important to note that the principal public health goal of controlling the spread of contagious disease is reducing the spread from generation to generation. While it would be ideal to stop the spread in one step by *breaking the transmission from the first generation to the second generation, this may be neither feasible nor ultimately necessary for successful disease control.* Controlling the spread of an infectious disease, in the absence of other medical interventions, is possible by reducing exposure to the disease through a program that limits social interactions and thus curtails transmissions within a community (bringing R_0 to < 1).

Principle 3 – Use a Toolkit of Exposure Control Measures

Principle 3

Disease exposure control programs should employ a range of tools—infection control, isolation, quarantine, community restrictions, and sheltering—to reduce person-to-person exposure to infectious agents.

A variety of treatment and prevention measures can be employed to control the spread of a disease. Medical and public health countermeasures such as vaccines, antibiotics, and other preventive and therapeutic interventions all work to preserve the health of the infected individual or prevent infection altogether. By enhancing immune response, speeding recovery, and helping to eliminate the pathogen from the body, vaccines, therapeutics and other technical interventions act to maintain or re-establish health despite exposure or infection.

While technical countermeasures can be integral weapons to fighting disease, in some cases, these types of countermeasures may be inadequate or unavailable. In such instances, additional measures to prevent healthy individuals from being exposed to infectious material or to the potential spreaders of the disease must be utilized. There are five primary tools to stem the spread of disease in DEC programs. They are: infection control, isolation, quarantine, community restrictions, and sheltering.

- ***Infection control*** entails the use of hygienic measures such as frequent hand-washing and covering the mouth when sneezing, or through the adoption of personal protective equipment such as wearing gloves, gowns, or particulate masks to prevent healthy individuals from coming into contact with contagious people or other infectious material or objects.
- ***Isolation*** refers to the identification of and separation of sick individuals from healthy people and limitation of their movement so that they are less likely to expose others in the wider community.
- ***Quarantine*** refers to the identification of and separation and restriction of movement of people who are asymptomatic, but who may have been exposed to an infectious agent and are therefore potentially infectious.
- ***Community Restrictions*** refers to curtailing activities on a community-wide basis (such as canceling public events or limiting mass transit) to minimize social interactions that could bring together contagious individuals with unexposed individuals.
- ***Sheltering*** is a tool whereby unexposed individuals limit their own social interactions, e.g., by staying at home, to avoid being exposed to infectious pathogens or the source of disease transmission including, in particular, already infected and contagious individuals.

Principle 4 – Employ Least Restrictive Measures

Principle 4

Disease exposure control programs should be designed using the least restrictive means necessary to control the spread of disease, based on the characteristics of the disease, the extent of its spread, and the physical and social characteristics of the community at risk.

The occurrences of outbreaks are highly variable and often unpredictable. They can originate from a diversity of pathogens; they can be naturally occurring or deliberate; they can crop up in cities of any size; and they can occur among peoples with wide-ranging customs, social habits and lifestyles. Each of these factors affects how a disease spreads, and thus, to the extent possible, must also figure into strategies to halt the transmission of a disease.

No single strategy for limiting the spread of contagious disease, however, is possible for all scenarios, or appropriate for all types of disease outbreaks. Because each outbreak will be situational, specific strategies will need to be flexible and made on a “case-by-case” decision-making basis, adapted to the unique circumstances in which the outbreak occurs and characteristics of the disease⁷⁰. And because limiting social interactions, which is at the heart of DEC programs, can be highly disruptive to the health of an economy as well as to individual lives, DEC programs will need to be designed to achieve maximum effectiveness with minimum disruption. To be clear, economic disruption can be expected, but to minimize disruption while

⁷⁰ When considering what means to employ to stem the spread of disease, situational factors (e.g., city size, population density, public transportation volume, social customs, population susceptibility, etc.) and disease characteristics (incubation period, infectiousness, mode of transmission, transmissibility, etc.) will be the primary inputs for determining the appropriate level of disease exposure control. For a discussion on determining level of disease exposure controls to employ, see Chapter 6, Decision-Making.

also aggressively protecting public health, *decision-makers should employ the least restrictive means necessary to limit exposure in a community and/ or disrupt the transmission of the disease.*

As an example, in the early days of SARS, decision-makers had no knowledge of the disease’s infectiousness prior to symptom presentation, and no knowledge of its means of transmission. In situations like this, the least restrictive means may include broad measures with wider more pervasive restrictions than if detailed knowledge of the means of transmission were known. Similarly, in cases where population susceptibility is high, “least restrictive measures” may also include broader and wider restrictions than with populations with lower susceptibility.⁷¹

In each case, to employ the least restrictive measures necessary, decision-makers will have at their disposal a range of disease exposure control tools—infection control, isolation, quarantine, community-based restrictions, and sheltering—that can be employed narrowly, broadly, or anywhere in between, but that can be tailored to the epidemiological and clinical characteristics of the disease, the nature of the outbreak, and the specific physical and social characteristics of the community at risk⁷².

Employing DEC Tools

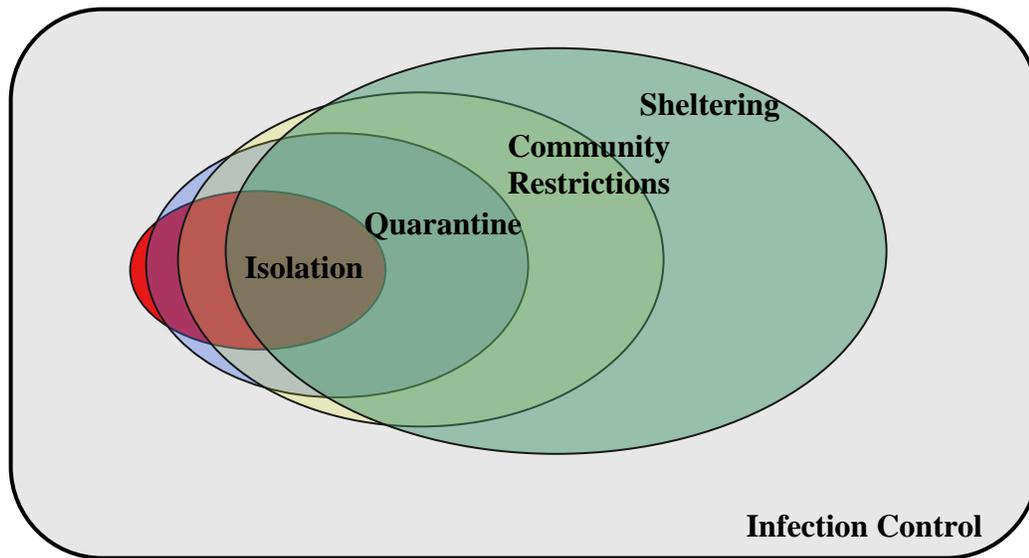
In the context of disease exposure control, an approach that employs *the least restrictive measures* means that there are multiple levels of control that can be employed. We refer to these as ‘DEC levels.’ Each DEC level represents a set of exposure control tools that could be employed in a community to stem the spread of disease. When the DEC level must be raised—that is, as disease continues to spread between individuals—social interactions would be increasingly limited, thereby reducing exposure to and transmission of disease. When the DEC level is lowered—that is, as an outbreak comes under control—social interactions would be encouraged to gradually return to normal, and restrictions would be reduced.

To conceptualize how a “least restrictive” DEC strategy might be employed in practice, one could think of controlling disease exposure in a community as analogous to controlling light exposure in photography. In photography, the amount of light allowed into the camera is controlled by the aperture in the lens, a diaphragm with a circular hole that increases or decreases in size according to how the lens is set. The size of the aperture is called the “f-stop.” As the f-stop is *raised* from 1 to 2 to 4 or 8, the size of the aperture *decreases*, and the amount of light let into the camera—and consequently the amount of light the film is exposed to—is reduced. When the f-stop is *lowered*, the size of the aperture *increases*, more light can flow into the camera, and thus the film is exposed to more light.

Disease exposure control works by similar logic to f-stops in photography. In DEC, the number of people interacting with each other is like light flowing through a lens. The more interactions there are, the greater the possibility of exposure to disease there may be in a community. Like light, if we want to reduce the level of exposure, we must limit or reduce the level of social interactions in a community. This is done through use of the available exposure control tools—infection control, isolation, quarantine, community-based measures, and sheltering—which, if used incrementally, can act as an aperture, expanding and contracting the level of social interactions in a community and thus the level of exposure to disease (see figure 2 below).

⁷¹ Population susceptibility can vary widely between geographic regions and across age-diverse subpopulations.

⁷² For further discussion, see Chapter 3, Tools for Disease Exposure Control.

FIGURE 2 – Toolkit of Measures for Exposure Control

Principle 5 – Engage the Public as a Partner

Principle 5

The public should be engaged as a partner in responding to a large-scale infectious disease outbreak through an appropriate balance of inducements, enforcements and an effective public communication strategy.

Public action in anticipation of and in response to a health crisis can help mitigate casualties and speed recovery, or it can cause panic and hasten the spread of disease. Gaining and maintaining public support during an outbreak is therefore critical for successful disease control. This can be accomplished through policies that *engage the public as a partner in controlling an outbreak*.

To spur public action, governments must provide individuals with credible information, as well as appropriate motivation to support and bolster outbreak response efforts. Specifically, government programs can engage the public by 1) implementing effective education and communication strategies; and 2) encouraging voluntary compliance to government plans when possible and enforcing mandatory compliance when necessary.

Public education and communication strategies are vital to mounting an effective response. The role that private citizens play in supporting crisis response and recovery activities will largely be influenced by the information and messages they receive from their community leaders. These messages are shaped by the media and, in the absence of government information, sometimes created by the media. Given accurate, candid, timely, and trusted information, however, citizens can better appreciate how their self-interest generally aligns with the public interest—protecting public health—and thus how their actions in concert with government strategies can help control the spread of disease.

SECTION 3.

Toolkit for Disease Exposure Control

This chapter will present and discuss the tools that are available to decision-makers to control the spread of disease in the absence of medical countermeasures. Knowing what tools are available for disease exposure control is the first step; making a choice of how to employ them is a more difficult task discussed later in this guide (See “Decision-making for Disease Exposure Control”).

It is common during an outbreak of a contagious disease to employ medical countermeasures such as vaccines, antibiotics, or other therapeutic treatments to preserve the health of an infected individual. By enhancing immune response, speeding recovery, and helping to eliminate the pathogen from the body, various medical countermeasures can act to maintain or re-establish health after exposure to or infection from a disease pathogen.

While medical countermeasures can be an integral element of disease control strategies, they may not always be available due to insufficient supply or even lack of available treatment altogether (e.g., as in the case of new or poorly understood diseases). In these instances, officials can stem the spread of disease by curtailing its transmission from person to person.

Transmission of infection requires three elements: a *source* of infecting microorganisms, a susceptible *host* (e.g., *person*), and a *means of transmission* for the microorganism to move to or be acquired by a susceptible host (e.g., a contagious individual coughing or sneezing near a susceptible host). Preventing transmission can be accomplished by protecting the susceptible host from coming in contact with the source of infection. This can be accomplished either by eliminating the source of infection (*infection control*), and by curtailing the means by which a disease moves from one host to another (*limiting contacts*). The full set of activities related to infection control and limiting contacts are referred to as *disease exposure controls*.

The following five disease exposure control measures can be used separately or in combination to limit the spread of disease in the absence of medical countermeasures. Together, they form the core components of a Disease Exposure Control toolkit.

Infection Control refers to physical measures taken to protect individuals against coming in direct contact with infectious material or agents (whether through the air or by touching people, biological material, or physical surfaces) and includes such things as proper hand hygiene and use of personal protective equipment (masks or respirators, gloves, gowns, and eye protection).

Isolation refers to the identification, separation and restriction of movement or activities of ill/infected or suspected (based upon signs, symptoms or laboratory findings) persons who have a contagious disease, for the purpose of preventing transmission to others and for enhancing delivery of specialized health care to them.⁷⁴

Quarantine refers to the identification, separation and restriction of movement or activities of persons who are *not* ill but may have been exposed to a contagious disease and at risk of

⁷⁴ Centers for Disease Control (SARS Guide) and Barbera et al., (2001)

becoming infected, for the purpose of monitoring their health and preventing transmission of disease to others.⁷⁵

Community Restrictions refers to the reduction of community-wide interactions through restriction or limitation of public events, large public gatherings, interactions or other activities.

Sheltering refers to measures individuals may take to limit their own social interactions such as by staying at home, to avoid being exposed to infected, potentially contagious individuals.

When employing any of these tools, officials may also need to consider how to ensure access to or provision of essential needs (such as food and water) and essential services (e.g., utilities, sanitation, communications) to those subject to these measures. Furthermore, authorities must pay close attention to the special needs of vulnerable populations (e.g., medication for those with other illnesses, baby supplies for families with newborns, independent shelter for the homeless, psychological support for families separated from each other). Special needs groups (e.g., foreign nationals, elderly, prisoners) must also receive special consideration. These issues are addressed in depth in following chapters (see “Meeting Essential Needs”).

I. Infection Control

In an outbreak of a contagious disease—even one in which there are countermeasures available—infection control will be the foundation of containment. Proactive hygiene practices, decontamination procedures and proper use of personal protective equipment (PPE) can play a significant role in limiting the spread of an infectious disease.

Public health officials describe four basic sets of infection control precautions, each of which depends on the mode through which the disease is transmitted.⁷⁶ ***Standard precautions*** are used on all patients to prevent contact with blood, body fluids, or open wounds. Depending upon the extent of contact anticipated, gloves, gown, surgical mask and/ or eye protection may be used. ***Contact precautions*** are taken for diseases that spread through direct or indirect contact (i.e., through touching the patient or items that the patient has touched). Gowns and gloves are worn when entering the room to prevent coming in contact with the patient or potentially contaminated items in the environment. ***Droplet precautions*** (requiring gloves, gown, surgical mask, and a face shield or eye protection when sprays are likely) are taken for diseases that spread through large droplets that travel only short distances. Finally, ***airborne precautions*** are taken for diseases that spread through small droplets and can be transmitted across extended distances and without close contact. Airborne precautions require a room with special air handling (airborne infection isolation room) and may require use of a fit-tested N95 particulate respirator.

Infection control guidelines should include detailed procedures in accordance with a person’s responsibilities, expected contact with suspected cases, and the known pathology of the disease. In cases of unknown or poorly understood agents, information about the pathology of disease transmission may be poorly understood and thus, determining appropriate level of infection control may be difficult. In these cases,

⁷⁵ Ibid.

⁷⁶ Reviewed by Grow, Robert and Rubinson, Lewis. “The Challenge of Hospital Infection Control During a Response to Bioterrorist Attacks.” *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 1, No. 3 (2003): 215-220.

medical and public health officials may choose to recommend the highest level of precaution to ensure safety as the pathology becomes clearer, and update and re-issue guidance as necessary.

Key Considerations

There are three key communities of individuals where specific infection controls may be advised: *responders and hospital workers* who are the first to engage suspected cases; *primary care physicians, pharmacists, and clinicians* who may be the first sought out by infected individuals; and the *general public*. Special consideration also needs to be made regarding the management of resources and oversight of infection control procedures.

Responders and Hospital Workers.

During an outbreak of a contagious disease, infection control for responders (fire, EMS, police) and hospital workers (including administrative, sanitation, and engineering staff) will likely be equally or more important than any other protective measure. As the first to come in contact with suspected cases, these populations are at greatest risk of exposure to the disease; at the same time they are also most critical to the response. Therefore, distribution of protective gear, training on use, and guidance on appropriate level of infection control must be a priority consideration.

As a matter of fact, the vast majority of transmission occurs prior to identifying a patient with a suspected illness. This means hospitals and responders may also need to consider new ways to think about triage (i.e., patients' accessibility to treatment and evaluation of incoming patients). Responders and workers may consider wearing masks and gloves as a standard procedure. They may also consider making it common practice to maintain two entrances to emergency rooms—one for respiratory symptoms and another for all else. Patients with respiratory symptoms would be required to take a mask at the door. To enforce the two-entrance system, hospital officials would need to install clear, visible signs (in multiple languages) that direct patients with coughs, wheezing, difficulty breathing or other respiratory symptoms to one entrance and all others to the other entrance.

Primary Care Physicians, Pharmacists, and Clinicians.

Since many serious diseases exhibit similar symptoms as upper respiratory infections, and because a disease may manifest symptoms that are bothersome but not debilitating enough to warrant hospitalization—individuals may seek medical care from their primary care physician, clinic, or local pharmacist. As a result, specific infection control guidance and perhaps equipment should be considered for physicians, pharmacists, and clinicians. New procedures, similar to those for responders and hospital workers (regularly wearing masks and gloves; providing masks to patients with respiratory symptoms), should be considered at doctors' offices and clinics.

The Public.

During an outbreak, enhanced use of infection control by the public can help reduce disease transmission, especially from direct contact transmission. Infection control can also help raise awareness about how a disease may be transmitted. In certain circumstances, it may be advisable to consider asking citizens to wear some protective gear such as masks. In these cases, decision-makers must weigh the effectiveness of public infection control measures against a number of other considerations, including:

- a) What psychological impact would be created by the visual image of people in public wearing masks and other protective gear?
- b) What impact would community-wide infection control have on resources required for responders and hospital workers (e.g., availability of masks)?
- c) How effective would masks be for kids, men with facial hair, elderly (the work of breathing with an N-95 is considerably increased)?
- d) Even if impractical or unnecessary, would community infection control requirements have a reassuring effect on the community, or would they inspire greater fear?

Officials should be prepared to offer appropriate guidance on the utility and need for protective gear in any event, as a nervous public may demand PPE during an outbreak, regardless of its true benefit.

If PPE is advised, distribution to citizens may require the assistance of law enforcement working with other government agencies to ensure safe delivery of resources to points of distribution (PODs), protect against a possibly aggressive public, and maintain order throughout the process of dissemination. Many states and counties have already developed plans for distribution of antibiotics and other countermeasures following, for example, an anthrax attack. These plans should inform but not replace those developed for outbreaks of a contagious disease; such plans must be modified to protect against disease transmission and manage a potentially more panicked public. Alternate delivery mechanisms should be developed for symptomatic individuals so that PODs do not become modes of community transmission.

Efficiency of distribution should be maximized by maintaining a real-time inventory of supplies to promote timely replacement, implementing creative procedures to maximize traffic flow and reduce cross-contacts (e.g., using mail delivery where possible, or using drive-thru banking or perhaps fast-food proprietors to disseminate materiel), and avoiding long lines by distributing equipment and materiel in well-defined and well-communicated shifts.

Communicating with the public and public education will be a critical element of any plan, particularly when oversight is logistically difficult or impossible. Posting of signs in public places and community gathering spots (e.g., billboards, on major thoroughfares, in newspapers, in grocery stores, in offices buildings, community centers, places of worship, and throughout public transportation systems) can reinforce public messages. Written handouts or other instructions should be distributed with protective gear as well as by postal mail so that citizens can utilize their gear correctly and immediately. Pre-announced briefings on radio and television can supplement written material. Web-based information hubs should be established and their Internet address (URL) broadcast to the community. The media can and should be enlisted to help provide information in this effort.

Resources.

Maintaining an adequate supply of PPE—as well as an efficient and fair system for resource management and distribution—will be vital to protect public health and reduce public anxiety. Careful and controlled distribution of protective gear must be ensured to maintain order, track supplies, and guarantee fair allocation. The plan for distribution must be designed in such a way that delivery minimizes the risk of disease transmission. Distribution must also be adequately controlled so that those with access to resources don't stockpile protective gear—thereby causing supply problems—and feel assured that they do not need to do so.

Many of the mechanisms discussed here for communication, public education, distribution, and resource management can be developed in advance of a crisis. These systems, when implemented, will not vary much for different infectious diseases, and can be adjusted to adapt to the unique characteristics of specific diseases, as the situation warrants.

Oversight.

It is insufficient to issue infection control guidance without also putting in place some means for oversight to ensure that responders and health care workers or others are not only wearing PPE, but are wearing the *proper* PPE.⁷⁷ Peer observation programs where co-workers support each other by closely watching for inappropriate or ineffective use of protective gear should be considered, with penalties imposed as necessary.

Protocols for Consideration

Personal Protective Equipment

- Wear appropriate protective clothing (e.g., gloves, face mask, goggles, and gowns), if there is a risk of contact with bodily fluids, secretions or potentially contaminated surfaces
- Change gloves and gowns after each patient encounter and perform hand hygiene
- Establish stockpile of PPE prior to events; have contracts in place for rapid replenishment, if needed

Hygiene

- Decontaminate hands before and after touching a patient, his/ her environment, or coming in contact with bodily fluids, secretions or potentially contaminated surfaces, whether or not gloves are worn
- Clean and disinfect equipment and surfaces
- Initiate respiratory hygiene/ cough etiquette programs (post signs, provide masks, promote hand hygiene, encourage appropriate distance between persons)

Waste Management

- Collect, handle, store and manage waste and all potentially contaminated material in a manner that will prevent direct contact.
- Collect, handle and dispose of contaminated needles or other sharp instruments used on sick or potentially sick individuals as one would handle bio-hazardous material.

⁷⁷ During the SARS outbreaks, some public health officials found that two groups—children and, surprisingly, health care workers—were the least likely to comply with infection control guidelines.

Laundry and Dishes

- Collect, clean and disinfect laundry (e.g., bedding, towels and clothing). Laundry should be handled in a manner that limits aerosolizing infectious particles
- Clean and disinfect dishes and other eating utensils. Dishes and eating utensils should not be shared.

Decontamination

- Decontaminate rooms after sick or suspected cases have vacated (e.g., hospital rooms, bedrooms, funeral homes, morgues)
- Decontaminate transport vehicles (e.g., emergency vehicles, funerary vehicles, personal cars taking patients to hospitals)
- Decontaminate gurneys and emergency rooms following exposure

Movement of persons

- Transportation within hospitals (i.e. from triage to isolation) should be initiated in a manner that minimizes contact with others and limits aerosolizing infectious particles or depositing infectious fluids or materials en route
- Transportation of symptomatic persons from quarantine to isolation should be initiated in a manner that minimizes contact with others and limits aerosolizing infectious particles or depositing infectious fluids or materials en route
- Movement of dead bodies should be initiated in a manner that minimizes contact with others and limits aerosolizing infectious particles or depositing infectious fluids or materials en route

Operations

- Post appropriate signs to communicate warnings and procedures
- Maintain one way work flows from clean areas to dirty zones
- Develop and distribute education and training material for using protective gear, performing proper hygiene, and decontaminating materials and surfaces
- Set-up auxiliary patient triage areas outside of and separate from main waiting areas

II. Isolation

Isolation is the separation and restriction of movement or activities of ill/ infected or suspected (based upon signs, symptoms or laboratory findings) persons who have a contagious disease, for the purpose of preventing transmission to others and for enhancing delivery of specialized health care to them.⁷⁸

Patient isolation is a common part of public health practice, and is regularly used within hospitals to control the spread of a number of infectious diseases. Separating sick or suspected sick individuals from those uninfected, and limiting their physical contact with others, reduces the possibility of transmission of disease from them to others and thus is a critical tool for Disease Exposure Control.

⁷⁸ Based on Centers for Disease Control (SARS Guide) and Barbera et al., (2001)

Three types of isolation could be employed in DEC regimes: Airborne Infection Isolation Rooms (*AIIR isolation*)⁷⁹ within a hospital, if there are a limited number of sick or suspected cases; or in the face of a large-scale potentially catastrophic outbreak, if there are insufficient AIIR isolation units available; *home isolation*, useful when limited health care is required or available for treating patients; and *facility isolation*—establishing isolation wards in sections of or in entire hospitals, or in other facilities (e.g., clinics, nursing homes, schools, convention centers, cruise ships, etc.)—when specialized health care may be required.

In all types of isolation, every effort should be made to allow family members to visit, with appropriate exposure controls observed. If necessary, visitors can be limited to one at a time. Reasonable effort should also be made to provide counseling and/ or religious services to the seriously ill.

Key Considerations

Legal/ Political.

In many cities and states, a health commissioner may order someone into isolation or quarantine only when that individual *is* endangering the health of others, or if a state of emergency has been declared. This authority may be inadequate. Unless public health authorities are permitted to issue quarantine orders to someone who *may* endanger others, it will be difficult or impossible to sufficiently protect the public from *suspected* cases (i.e., those where individuals may have been exposed, but have not developed symptoms). This means that small situations may well degenerate into a state of emergency. Legal authority must be established for health commissioners to order removal and detention of someone who is or *may be* endangering the health of others. Laws must also ensure that detention can occur in locations other than hospitals.

AIIR Isolation.

During AIIR isolation, an individual is confined to an Airborne Infection Isolation Room (AIIR) within a hospital. The Centers for Disease Control describe AIIRs as specialized, typically private rooms in which environmental factors—ventilation, air pressure, and air filtration—are controlled to minimize transmission of infectious agents spread from person to person by droplet nuclei associated with coughing or aerosolization of contaminated fluids.⁸⁰ Because these are specialized rooms, there may be relatively few available within communities.

In many communities, in fact, a majority of hospitals may have no established AIIR isolation capacity. Consequently, it is essential that officials, in advance of an outbreak, perform a community-wide inventory of hospitals and determine the total number of isolation beds available, as well as the feasibility of alternative sites should additional isolation capacity be needed. Knowledge of isolation capacity (and locations) will help officials assess the need for and use of home isolation, or establishment of alternative isolations sites in other facilities.

⁷⁹ The Centers for Disease Control describe AIIRs as specialized, typically private rooms in which environmental factors—ventilation, air pressure, and air filtration—are controlled to minimize transmission of infectious agents spread from person to person by droplet nuclei associated with coughing or aerosolization of contaminated fluids.

⁸⁰ For detailed guidance, please see Garner JS, “Hospital Infection Control Practices Advisory Committee: Guideline for isolation precautions in hospitals.” *Infect Control Hosp Epidemiol* 17 (1996): 53-80, and *Am J Infect Control* 24 (1996): 24-52. Description of AIIRs found in Centers for Disease Control (SARS Guide).

Home Isolation.

Home isolation may be required when a community's hospital isolation capacity is overwhelmed and/or when a patient's treatment options (e.g., maintaining hydration) are limited. During home isolation, a sick person is confined within the home, separate from household members, for the duration of the illness.

Isolation at home offers a number of advantages, including reduced stress on an overloaded hospital system; ability of a sick person to remain in the comfort of his/her home; enhanced opportunity for family members to provide personal and immediate care; and the mental health benefit of proximity of loved ones. On the other hand, the disadvantages of home isolation include an increased risk of transmission to family members and the reduced availability of professional medical care.

If home isolation is deemed necessary and appropriate to confront an outbreak, officials will need to ensure that the special needs of vulnerable populations (i.e., elderly, homeless, disabled, or chronically ill individuals) are addressed (for further discussion, see *Meeting Essential Needs*, below).

Ultimately, the effectiveness of home isolation will depend on how much professional health care support is required, and on whether an individual can be effectively isolated within a home. If a sick person cannot access sufficient care and basic needs—or poses a transmission risk to family members—home isolation may not be an option. Factors such as the ability to handle waste; ability to ventilate the designated isolation room; and ability to safely handle materials (bedding, clothes, utensils, etc) must be considered.

Facility Isolation.

Facility isolation—the establishment of alternative isolation facilities—may be required when AIIR capacity has been overwhelmed, or when home isolation does not sufficiently support patients or places household members at risk. Under these circumstances, it may become necessary to block off hospital wards or designate hospitals for isolation. Because of the availability of medical infrastructure and potential for makeshift negative pressure zones, a hospital is the best option for facility isolation. However, other facilities (e.g., hotels, schools, gyms, religious establishments, nursing homes, convention centers, portable tents, trailers, meeting halls, cruise ships, or government buildings) should be considered when a hospital is unavailable or impractical.

When looking to identify alternative isolation facilities, the following characteristics/capabilities should be considered:⁸¹

- Availability of Airborne Infection Isolation Rooms
- Potential for makeshift negative pressure zones
- Availability of on-site laundry services
- Availability of autoclave
- Availability of essential utilities (heating, cooling, plumbing, electrical)
- Ability to isolate facility airflow to keep aerosolized infectious material from flowing out of isolation areas

⁸¹ A number of the items on this list were derived from, *Rocky Mountain Regional Care Model for Bioterrorist Events: Locate Alternate Care Sites During an Emergency* (www.ahrq.gov/research/altsites/altsite6.htm)

- Ability to provide basic needs (food, water, sanitation)
- Ability to support designated level of care for ill patients (e.g., suction, oxygen, etc., if deemed necessary)
- Ability to provide communications services
- Ability to handle bio-hazardous waste
- Ease of transporting patients into and within the facility (doors wide enough for gurneys?)
- Ease of decontaminating rooms
- Ease of securing the building
- Ease of allowing family to visit the very seriously ill
- Proximity to residential areas
- Proximity to auxiliary space for staff, family members, clergy, counselors, equipment, supplies, food prep, laboratory, decontamination, and mortuary
- Willingness of facility owner to allow structure to be used as an isolation facility—this may include reimbursement for costs associated with returning the facility to its previous use and a predefined plan to accomplish this.

Ending Isolation.

Recovered patients may continue to shed virus (e.g., from the respiratory tract or from feces) after overt clinical symptoms have stopped. How long patients should remain in isolation depends on whether, and to what extent, they continue to shed virus, which may or may not be evident. To avoid transmission after release from isolation/ hospital, patients should remain in quarantine (home or other appropriate facility) for the length of the incubation period of the disease. Recovered patients may or may not have developed immunity and may or may not still be shedding virus and thus must be educated about their health risks, the risks they present to their community, and the possibility that they may become re-infected if further exposed to the virus.

Protocols for Consideration

AIIR Isolation

- Ensure proper use of gowning, masking, eye protection, gloves, and hand hygiene for all those in contact with patient.
- Establish ‘cohorting’ procedures where possible (i.e., staff that is treating sick or suspected cases should not treat others).
- Dedicate the use of non-critical patient-care equipment (e.g., stethoscope, sphygmomanometer, bedside commode, electronic rectal thermometer) to a single patient. If use of common equipment or items is unavoidable, clean and disinfect equipment prior to use on other patients.
- Maintain close surveillance of all staff and patients in hospital; enable capacity for rapid alert to all workers of potential outbreak in facility.
- Employ work quarantines for those in contact with sick or suspected cases (see Work Quarantine below).
- Establish clear lines of communication for crisis decision-making. (Hospitals may be private, federal, state, or city-owned. A number of different groups may have oversight.)

Home Isolation:

- Confine isolated person to a room that is furthest from high-traffic areas, and with the least opportunity for disease spread. This room requires a closeable door and an in-room bathroom.
- Ensure isolated person has access to a separate bathroom that would not be used by others during the period of isolation.
- Cut-off room ventilation from central A/C unit to prevent spread of germs through air conditioning system.
- Air out room often to the outside of the building.
- Restrict pets from transiting the room.
- Provide protective mask for isolated person to wear whenever another person is in the room.
- Instruct isolated person to always cover mouth with a tissue when coughing, sneezing, or laughing and to put the tissue in a closed bag for disposal.

Household Primary Caregiver

- Designate one household member as the primary caregiver. Only he/ she may have close contact with a person in home isolation. All other household members, if possible, should be relocated out of the residence.
- Ensure that primary caregiver *remains in quarantine* for a time deemed appropriate per the recommendation of public health department.
- Provide protective equipment for primary caregiver to wear when in contact with the isolated person. Provide guidance and/ or training on proper use of the equipment.
- Ensure primary caregiver observes appropriate infection control procedures (i.e., for handling laundry, dishes, waste management, decontamination, and hygiene) and receives necessary guidance on providing care for the isolated person.

Household Members

- Relocate household members (except for the primary caregiver) during period of home isolation. If this is not possible, household members should have minimal contact with the isolated person.
- Ensure that household members remain in quarantine, if deemed appropriate by public health authorities.
- Provide household members with personal protective equipment to wear if and when they are in contact with the isolated person. Provide guidance and/ or training on proper use of the equipment.
- Discourage close-contact and conjugal visits.
- Assist primary caregiver (who must remain in quarantine) with provision of essential goods such as food, cleaning and medical supplies.

Public Health must provide detailed information, guidance, and/ or training regarding

- Therapeutic or other home treatments for patient
- Proper use of PPE for all users
- Hygiene/ Infection control for household members and primary caregiver
- Handling and disposal of human bodily fluids and waste
- Handling and disposal of other waste (tissues, masks, etc)
- Decontamination of beddings, clothes, dishes, utensils, and isolation rooms
- Symptoms for which to be vigilant
- How long patients should remain in isolation
- Quarantine guidelines post-release from isolation
- Availability of additional (or continuously updated) information

Public Health must also

- Establish case definition and provide education on disease to patients, family members, care providers, and other emergency responders.
- Provide access to mental health counseling, as needed.
- Establish controlled access at all entrances to facilities to allow screening of all persons entering facility.
- Develop a community-wide inventory of hospitals and determine the total number of isolation services available.
- Assess the feasibility of, identify, and establish (as necessary) alternative isolation sites.
- Establish a case log and summary of activities to track and contain the outbreak
- Notify local, state, and federal public health agencies of reportable illnesses and outbreaks as required by law.
- Monitor health of sick, primary caregivers and others in contact with isolated patients.
- Restrict movement of patients and visitors from one ward to another when such restrictions are medically necessary.
- Develop Home Isolation Toolkits (i.e., what items are needed for home isolation—masks, gloves, disinfectants, waste disposal bags, rubbing alcohol, tissues, etc.). Distribute information for developing kits, or if available, distribute items as a kit through PODs.
- Develop and disseminate protocols to sanitation workers for collection and safe handling of waste (i.e., appropriate level of infection control).
- Develop and disseminate protocols to EMS, funerary, and mortuary services for transport and handling of sick and deceased (i.e., appropriate level of infection control).
- Modify EMS call types based on information provided by the caller. For example, identify whether patient has a rash or a fever, which may indicate higher-risk for infectious disease like smallpox, or if he/ she has respiratory symptoms, which may indicate higher need for masks or other infection controls.
- Launch media campaign to triage before going to care provider.

III. Quarantine

Quarantine is the separation and restriction of movement or activities of persons who are not ill but who are suspected to have been exposed to infection, for the purpose of monitoring their health and preventing transmission of disease.⁸²

The use of quarantines in disease exposure control regimes should not be viewed as a means to immediately stop the spread of disease, but rather as one of many tools to reduce the likelihood that new cases will arise from individuals who are unaware that they are infected. Over time, as the incidence of new cases declines, the number of infected individuals will eventually drop to zero.

Public officials may choose to employ a number of different types of quarantines, based on the nature and scale of the outbreak, characteristics of the public at risk, resource availability, and legal authorities in place. The four principal types of quarantine are

⁸²Based on Centers for Disease Control (SARS Guide)

home quarantine (exposed or potentially exposed persons remain at home during the incubation period of the infectious agent), **facility quarantine** (officials designate a facility to better control the implementation of a quarantine, or to provide a location for those unwilling or unable to quarantine at home), **work quarantine** (individuals remain at work, or limit travel and contact with others between work and home, for the duration of the incubation period), and **community quarantine** (officials designate neighborhoods or geographic regions where a combination of home, work, and/or facility quarantines may be implemented). Each type of quarantine may be implemented on either a voluntary or mandatory basis.

Key Considerations

Home Quarantine

During home quarantine, exposed or potentially exposed persons remain at home for the incubation period of the infectious agent. Home quarantines can be implemented on a person-by-person or home-by-home basis, or for entire buildings. Entire buildings would be quarantined only if it appears likely that most people in the building had been exposed. If a person in quarantine develops symptoms of the disease, he/ she must go into isolation; if no symptoms develop by the end of the quarantine, the person may return to normal activities.

Home quarantines offer a number of advantages, including: ease and comfort of a familiar location; availability of relatives, friends, or household members to provide support; and relatively few contacts with others, compared to work or facility quarantines. Disadvantages of home quarantines include the increased risk of exposure for family members, greater difficulty monitoring patients and enforcing limitations on social interactions, increased likelihood of missing a diagnosis, increased delay time for transportation of sick persons to isolation facilities, and unavailability of immediate medical care.

If home quarantine is deemed necessary and appropriate, officials must also ensure that the special needs of vulnerable populations (i.e., elderly, infants and children, homeless, disabled, or chronically ill individuals), to include the provision of food, medical, and sanitation supplies, are also addressed (see *Meeting Essential Needs*, below).

Facility Quarantine

For those unwilling or unable to maintain home quarantines,⁸³ officials may establish facility quarantines: entire buildings or facilities set-up to house and support quarantined individuals. These facilities would be selected from places within a community that could comfortably house individuals, such as hotels, schools, recreation centers, religious establishments, nursing homes, convention centers, aircraft hangars, meeting halls, military barracks, or government buildings. During facility quarantine, the movement of exposed or potentially exposed persons would be restricted to the facility for the duration of the quarantine.

⁸³ A person may be unable to maintain a home quarantine if he or she does not have adequate resources at home; is homeless; is a tourist or other type of transient; or requires special support or health care. Inmates who cannot be adequately quarantined in prison may also require separate facility quarantine. Further, persons who are unwilling to maintain home quarantine would be candidate for facility quarantine. Such persons may be unwilling for a number of reasons including, they may: fear infecting household members, prefer facility accommodations, wish to have more immediate access to medical care and observation, or simply not wish to comply with home quarantine orders.

The advantages of facility quarantines are that they centralize and consolidate response efforts, and provide options for those who are unable or unwilling to maintain home quarantine or who wish to minimize risk to their household members. However, the prospect of being placed in close proximity to potentially infected persons—or simply being away from home or family—may cause psychological distress and pose a challenge to officials seeking to encourage voluntary compliance.

As in home quarantines, officials must attend to the special needs of vulnerable populations. Transportation may also be required to bring people to quarantine facilities and take symptomatic individuals safely from quarantine to isolation

Work Quarantines

Work quarantines may be implemented where outbreak control requires employee continuity, such as with health care workers and other emergency response personnel. Health care workers and emergency response personnel are perhaps most likely to be exposed to infected individuals, but given their essential role in containing an outbreak, placing them in quarantine at home or in another facility would be problematic. In work quarantines, however, quarantined individuals are permitted to continue working, but are required to use personal protective equipment as prescribed by health officials. When not working, they must remain in home or facility quarantine. Authorities would need to arrange for safe transportation to limit contacts with others, and would need to enforce strict and frequent monitoring for symptoms.

Community Quarantines

In community quarantine, all persons in a specific area or region, where a high community-wide case count has been identified or where there is potential for widespread exposure, are quarantined. Movement of persons within the community is limited to the area of quarantine—a number of houses, a building complex, a neighborhood, or groups of buildings and/ or neighborhoods. Community quarantine is implemented by arranging a perimeter—a controlled access area—around the region of concern.

In outbreaks where health officials have a good understanding of the pathology of the disease and nature of the outbreak, authorities and the public may be more confident that they have delineated the correct boundaries for community quarantine. More likely, however, there will be considerable uncertainty involved in the determination of the precise geographic area to quarantine, which consequently may present greater challenges to public officials trying to reassure an anxious and potentially confused public, who may already be skeptical about the government's ability to manage the crisis and protect them from further harm. Lastly, because community quarantines are the most sweeping form of quarantine, they will likely be the most difficult to implement and enforce.

Legal/ Political

Quarantine is one of the more politically sensitive tools that can be employed for disease exposure control. The decision to separate and restrict movement of persons who, for all intents and purposes, are well (by definition they are not ill, but may have been exposed to someone or something that could infect them) raises a number of legal, ethical and ultimately political questions that must be weighed carefully.

To the extent possible quarantines should be voluntary. Governments should take steps to induce voluntary compliance by providing adequate care and support so as to help those in quarantine not feel abandoned, psychologically isolated, or unduly burdened. This may require provision of food, health care, the capacity to communicate with friends and family outside of the quarantine, and perhaps even entertainment. It may also require provision of some financial incentives, such as reimbursement for income lost during quarantine (for more discussion on inducing voluntary compliance, see chapter on *Toolkit for Compliance*).

For various reasons, individuals who should be quarantined may not wish to be quarantined. Such individuals may resist quarantine because, for example, they believe they are not sick (or likely to become sick), because they cannot afford to be unpaid for a short period of time, or leave their family unattended; or because they fear being confined in proximity to people who they believe may infect them.

In these cases, to protect the public from infection by a possible carrier of disease, officials will need to legally order and enforce the quarantine of individuals. Involuntary quarantine, however, may be viewed as a violation of personal liberty and equivalent to criminal detention. The greatest challenge to officials, then, is balancing the interest of the public being protected from disease, with their interest in preserving individual liberty.

In general, public interest can supersede individual rights in order to achieve a common good; but actions to do so must be ethical, even-handed, transparent for all stakeholders, provided for and carried out in accordance with the law, and strictly necessary to achieve the objective. Furthermore, there can be no less intrusive and restrictive means available to reach the same objective.⁸⁴

Under these circumstances, a social compact forms the basis of action: public health officials have an obligation to restrict certain individual rights to protect the health and well-being of the community; and citizens have a civic duty to comply with them in order to protect their family, friends and the broader health of the community⁸⁵. When quarantines are required, public officials should inform the public of the threat to their health, communicate the known risks, provide full information about the need for public action, and describe how the government will support individuals whose movement has been restricted. They will also need to ensure that proper legal authorities and procedures are in place to remove and detain suspected or confirmed cases, contacts, or carriers who are or *may* be endangering public health. Laws that establish the legal basis for government action in these cases must also provide that quarantines can be applied almost anywhere, and not restricted just to hospitals.

Who to Quarantine?

Anyone who has been exposed or potentially exposed to the infectious agent causing an outbreak should be quarantined.

⁸⁴ The basic type of circumstances that justify overriding individual rights for the public good are established in international law and known as the *Siracusa Principles*. For a brief discussion, see 25 Questions and Answers on Health and Human Rights. Geneva: WHO, July 2002, p20.

⁸⁵ The idea of a social compact and the language to describe it was derived from "Ethics and SARS: Learning Lessons from the Toronto Experience," a report by a working group of The University of Toronto Joint Centre for Bioethics Toronto, Canada. Revised 13 August 2003.

Identifying individuals who may have been exposed may not be easy or even possible. When possible, health officials will need to do the hard work of tracing contacts—tracking down all those who have been in close contact with someone who is known to be sick or infected, and/ or tracking down all those who were in the vicinity where exposure may have occurred (either from the release of a pathogen, or from interaction with known sick or suspected cases)—and quarantining them.

When the source of possible infection is known, contact tracing is straightforward, though potentially resource-intensive. Individuals or groups who were exposed or potentially exposed may be asked to stay at home (*home quarantine*), or to quarantine at a designated facility (*facility quarantine*). The larger challenge will be quarantining when the source of infection is unknown or there is widespread community transmission. Under these circumstances, it may be difficult or impossible to trace exposures, and larger-scale *community quarantine* should be contemplated.

There is much debate and little agreement about the feasibility and utility of large-scale quarantines. For the most part, this is because in large, heavily-trafficked urban areas with international transportation hubs, people come and go so rapidly that it is virtually impossible to identify who was in a certain location at a certain time at the moment of exposure.

That being said, all cities are different; all disease outbreaks unique. The question of large-scale quarantine feasibility will need to be assessed on a case-by-base basis, with consideration of a range of factors related to the degree and speed by which a disease may spread. Such factors include: disease pathology; type of outbreak (deliberate or naturally occurring; if deliberate, single or multiple releases); city size; city density, public transportation volume; level, frequency, and access to transportation (air, land, and sea); scale and frequency of public gatherings; and social customs (e.g., shaking hands, cheek-kissing, wakes at funerals). While few tools exist, it is possible to model these factors from city to city and provide some data for decision-makers to assess the possible spread of an outbreak, and inform decisions on the size and shape of large-scale community quarantines.⁸⁶ Walden and Kaplan have developed an approach for real-time estimation of the size and time of a bioterror attack,⁸⁷ from case report data, that is simple enough to implement in a spreadsheet. Their model can help estimate the spread of disease during the first generation of cases for a single-source attack.

In cases where the likelihood of disease spread is high or uncertain, or resources to implement large-scale quarantines simply unavailable, more aggressive tools should be contemplated, including initiating restrictions on community activities, and asking the public to shelter-in-place until the scale of the outbreak is determined (see Community Restrictions and Sheltering below).

⁸⁶ Los Alamos National Laboratory has developed a tool called TRANSIMS that could serve as a starting point for such modeling. TRANSIMS is an agent level model that simulates the volume and traffic of all transportation modalities in a city over various time considerations. The model is tailored to and implemented on a city-by-city basis. Additional elements could be added including: variation in disease pathology (e.g., transmissibility, transmission rates, incubation period, mortality rates); variation in outbreak mechanics (e.g., delivery mechanism, size of initial exposure, number and locations of exposure sites); variation in urban settings (e.g., air, land and water transportation options, geography and topography of release site, evacuation); variation in resources available (e.g., number and locations of hospitals, number of those available for patient care, tracking, and monitoring, availability of prophylaxis or treatment, availability of personal protective equipment).

⁸⁷ Walden J, Kaplan EH. "Estimating time and size of bioterror attack." *Emerg Infect Dis* [serial on the Internet]. 2004 Jul [date cited]. Available from: <http://www.cdc.gov/ncidod/EID/vol10no7/03-0632.htm>

Non-Residents, Homeless, and Dislocated

A number of individuals may be exposed to an infectious agent who do not regularly reside in the community or are otherwise separated from their families. They include: homeless persons, business travelers, transients, foreigner visitors, tourists, or persons visiting the community for other social reasons. Individuals from each of these categories may need to be quarantined in a facility, as they would not otherwise be able to go home. Special needs of particular groups of individuals will also need to be attended to, including in particular, parents and children separated from each other (e.g., arranging care for children and communications to each other), and foreigners who may not speak the local language (see *Meeting Essential Needs* below). In some cases, where the incubation period and time from exposure is known, and time permits, officials may wish to consider allowing individuals to return home, with sufficient monitoring to prevent non-compliance, and appropriate notification of ‘home’ community.

How Long to Quarantine?

Individuals should be quarantined for a sufficient period of time—typically at least the length of the pathogen’s incubation period—to ensure they did not contract the disease. The incubation period is the time interval between infection (i.e., introduction of the infectious agent into the susceptible host) and the onset of the first symptom of illness known to be caused by the infectious agent. If a person does not develop symptoms during this period, he or she can be assumed uninfected and return to normal activities.

In some cases, the pathology of the infectious agent may be unknown. In those instances, officials will want to implement longer quarantines at first, and then gradually reduce the time for quarantine as the incubation period becomes better known. The challenge, however, is that with longer quarantines, the rate of compliance tends to decline. A balance must be made: longer quarantine periods may provide greater confidence that disease has not spread, but people are more likely to comply with shorter quarantines.

Where to Quarantine?

Facility quarantine—the establishment of alternative quarantine facilities—may be required to support the needs of homeless persons, business travelers, transients, foreigner visitors, tourists, shoppers or others visiting the community for entertainment, or other social reasons. Facility quarantine may also be required to support the needs of individuals who may be unable to quarantine at home (e.g., elderly, disabled, chronically ill, or families who wish to protect other members from being exposed). To support the needs of these groups, and to better monitor the health of potentially exposed individuals, alternative facilities will need to be established for quarantine (e.g., in hotels, schools, gyms, churches/ synagogues/ mosques, nursing homes, convention centers, portable tents, trailers, meeting halls, military barracks, school dormitories, cruise ships, or government buildings, etc.).

When looking to identify alternative quarantine facilities, the following characteristics/ capabilities should be considered:

- Availability of separate rooms for each person or family
- Availability of on-site laundry services
- Availability of essential utilities (heating, cooling, plumbing, electrical)
- Ability to provide basic needs (food, water)
- Ability to provide communications services

- Ease of transporting patients within and out of the facility (doors wide enough for gurneys?)
- Ease of decontaminating rooms
- Ease of securing the building
- Ease of allowing family to visit
- Proximity to residential areas
- Proximity to isolation facilities
- Willingness of facility owner to allow structure to be used as a quarantine facility—this may include reimbursement for costs associated with returning the facility to its previous use and a predefined plan to accomplish this.

Access Control and Credentialing

Two groups of individuals will need to enter a quarantine facility or area: those who have been quarantined and those who may need to temporarily enter for the purposes of medical care and provision of goods, services or other special needs. Health officials have a clear interest in limiting contacts between these two groups to minimize the risk of further exposures.

To keep quarantined individuals in—and healthy individuals out—officials should establish controlled access into and out of quarantined areas. Well-controlled access will diminish the likelihood of additional exposures and allow resources to be devoted to other aspects of the response. It also affords temporary access for health care workers and response personnel as needed.

In some cases, access control may be limited to just a single building. When several buildings are implicated or when community quarantines are warranted, access control may be best accomplished by establishing a secured perimeter with one (or at most a few) entrances/ exits. While such restrictions are difficult to imagine, and may well be difficult to implement, it is useful to note that the use of perimeters to restrict movement of the public is not at all uncommon in urban settings. During parades, demonstrations, fires, crime scenes, or for protection of special visitors, law enforcement personnel routinely restrict movement into and out of sensitive areas. Access control for large-scale quarantines would naturally build on those procedures.

It is important to note, however, that while parades, crime scenes or special events (e.g., the G-8 conference) may last a few hours or at best several days, quarantines could last weeks, requiring personnel resources that may exceed local law enforcement capacity. An ability to scale up capacity to provide controlled access to quarantines may require bringing in additional law enforcement resources first from neighboring cities, counties, or even from other states, then from state law enforcement or federal law enforcement agencies, and finally from state national guard or perhaps even from national guards from other states. If needed, and as a last resort, the use of active military may be contemplated, but would require serious review of *posse comitatus* laws that prohibit use of military for law enforcement purposes, as well as reviewing the implications of such use to other national security interests.

Government officials in charge of controlling access to quarantines must issue appropriate credentials for entry and exit, and strictly enforce the perimeter for anyone who lacks proper credentials. To guard against fraud, credentials should be linked to biometrics and possibly re-formatted on a daily basis. The credentialing process would likely be administered by a central agency—preferably the lead agency responsible for

managing the crisis (e.g., office of emergency management). This agency would need to manage the creation and dissemination of access passes, and establish protocols to handle daily exceptions and special requests. It would also need to coordinate with law enforcement or other officials responsible for maintaining the perimeter. Since persons who prematurely leave quarantine also pose a risk transmission to the community, passes are needed to allow those who have completed quarantine to leave the quarantine facility or area.

Monitoring, Surveillance and Enforcement

One of the key functions of quarantines is to properly monitor individuals for symptoms of disease, and—in a timely fashion—identify those who require medical attention and isolation. Plans for monitoring and observation should include a means to screen for health (e.g., periodic phone calls, video-conferencing, in-person visits, or internet-based interviews with health officials), ensure the person is following procedures for quarantine, confirm that the person is aware of what to do if he/ she develops symptoms, confirm the person has essential needs being met, and direct the person to information hotlines and other education resources.

While voluntary adherence to quarantine orders is preferred, there are many reasons people may not wish to comply. In order to protect the public health, officials will need to legally order—and enforce—the detention of such individuals into quarantine.

Protocols will be needed for enforcement officers on how to deliver quarantine orders and control access to and from a quarantine facility or area (e.g., stand so many feet away; wear specific protective gear, etc.). Enforcement officers may also need to be prepared to answer a number of key questions:

- What conditions dictate who should be quarantined? For how long?
- What are the rights of families separated by quarantine?
- What punishment will be meted out to escapees?
- Can there be court appeals of quarantined status? How will they work?
- Can there be voluntary quarantine entry?
- What are the rights of foreign nationals?
- Can you hold public health officials liable?
- What are the rights of families regarding burial/ cremation?

To better provide health information to those receiving quarantine orders, health officials may also join enforcement officers to deliver the orders. For a discussion on enforcement and maintaining quarantines, see *Toolkit for Compliance*, below.

In addition to monitoring the health of individuals in quarantine, communities should also consider assessing the risk of infected individuals returning to or transiting the community during an outbreak. The spread of SARS, for example, occurred largely because travelers staying at a single hotel in Hong Kong returned to their home countries and unknowingly infected others. Surveillance of air, rail, and sea lines (as well as ferries and ports of entry at border crossings) for high-risk individuals may help prevent infected individuals from entering a community and spreading the disease to others. This can be accomplished by checking at large public conveyances if passengers: [1] are traveling from regions of known or suspected cases; [2] and/ or are feverish (e.g., by taking temperature or using thermal imaging) or symptomatic in some other way. High-risk travelers returning to a community should, on their own, remain vigilant for symptoms for the duration of a quarantine period. If suspected cases are identified, officials should

have the capacity to isolate them, and rapidly track down and quarantine the case contacts.

Symptoms and Sickness

Persons who become symptomatic may present themselves in a number of venues as they attempt to seek help: during emergency calls, to private physicians, in clinics, to pharmacists, at hospitals, at border crossings, at community check-stations, through audits of incoming air or cruise lines, or through normal monitoring of quarantines. To limit the transmission of disease, plans must be in place for the safe removal of symptomatic or sick persons from the community and into the appropriate isolation situation as soon as they are identified. These plans should include identifying and designating isolation facilities, identifying and establishing transport capability to isolation facilities, procedures for arrival and safe triage at isolation facility, decontamination procedures for facility where symptoms first presented, and for transport vehicles. Health officials will also need to commence contact tracing and initiate infection control (and prophylaxis, if any) for immediate contacts.

Transportation

Transportation will need to be provided to move symptomatic individuals from quarantine to isolation. In some cases—such as for disabled, elderly, or special needs populations—transportation to facility quarantine may also be necessary.

Transport resources (public and private ambulances, ambulate services, vans, and/ or buses) and willing/protected drivers will need to be identified, assigned, and acquired. Transport needs should be centrally managed for appropriate prioritization of effort. Transport teams (drivers, emergency responders, health officials, and in some cases law enforcement officers) should be provided guidance on appropriate protective equipment, infection control, and decontamination protocols. Similar requirements and protocols are needed for transport of the deceased.

Decontamination

Decontamination will be required for (1) homes or facilities housing individuals who became sick; (2) vehicles that carried suspected cases, known cases, or the deceased; and (3) quarantine facilities after quarantines are ended.

Key Requirements for Quarantine

Regardless of the location or type of quarantine, every effort must be made to provide those in quarantine with a minimum set of basic capabilities. First, they must have access to public health and healthcare personnel. Whether this is in the form of an email, telephone hotlines, two-way radio, Internet chat rooms, or personal care, there must be some form of interaction consistent with the level of health care required.

Second, any person in quarantine must have access to public information and educational resources, so that they can make informed decisions and take educated actions to protect their own health and the health of their families. This may also be in the form of emails, websites set up specifically to meet this need, hotlines, two-way radio, public access TV, or mailings.

Third, communication with relatives and friends must be made available through telephone, email, two-way radio, or videoconferencing capability, if in-person visits are not advised. Fourth, those in quarantine must be monitored for symptoms, whether by a public health or response professional, by family members, or by themselves. Monitoring must be efficient and effective enough to identify the key symptoms immediately. Fifth, enforcement guidelines must be established, disseminated, and maintained.

Finally, upon identification, authorities must provide immediate transportation of those who show symptoms to isolation facilities. While such transportation capabilities are important for ensuring the greatest possible medical care of the symptomatic, they are also critical for minimizing potential exposure of non-symptomatic persons in quarantine.

Protocols for Consideration

General

Legal Authorities needed prior to a Declared Biological Emergency:

1. Establish authority to remove and detain suspected or confirmed cases/ contacts/ carriers who are or *may be* endangering public health.
2. Ensure that laws for quarantines are not limited only to hospitals, but can be applied almost anywhere.

In general, quarantines may be considered for the following:

1. For persons who have been **exposed to the contagious pathogen**; or,
2. For persons who have **likely been exposed to the contagious pathogen**; or,
3. For persons who are **arriving from a high-risk area**.

When patient transport is necessary from quarantine to isolation...

1. Inform emergency responders/ transport support/ those involved in the move of infection risk and provide appropriate infection control guidance.
2. Educate *patients* on infection control and inform them how to reduce transmission to others.
3. Ensure appropriate physical barriers (e.g., masks, impervious dressings) are worn or used by the patient to reduce transmission to other household members, patients, or emergency responders
4. Notify personnel in the area to which the patient is to be taken of the impending arrival of the patient and of necessary precautions to undertake.
5. Move patient in a manner that limits contact with others, and minimizes transmission of infectious agents spread from person to person by droplet nuclei associated with coughing or aerosolization or dispersal of contaminated fluids.
6. Decontaminate gurney, vehicle, and all equipment used.

Home Quarantine

Of those who may be quarantined, home quarantines may be considered for persons:

1. who are **able to care for themselves** at home, and
2. who **can monitor themselves** for symptoms, and
3. whose **home is nearby** (i.e., close enough to return to before infection, if acquired, could be transmitted to others), and
4. who **can minimize close contacts** and contacts with immuno-compromised individuals within a household, and
5. who are **willing to remain in quarantine** for the full duration required.

Persons in home quarantine should:

1. Follow instructions of doctors and other public health officials.
2. Stay home at all times.
3. Avoid close contacts with others.
4. Practice good hygiene and cleanliness to avoid spreading germs.
5. Conduct temperature checks or other measures of self-observation to be on the lookout for symptoms per instructions of public health.
6. Be available for daily public health monitoring (for more details, please refer to section on “Monitoring and Observation” in *Toolkit for Compliance*, below)
7. Immediately inform public health authorities if symptoms appear.
8. Move to home isolation or other isolation environment as soon as symptoms appear.

In cases where disease is contagious after symptoms develop, household members should:

1. Be unrestricted to come and go as they please
2. Assist in acquiring household needs such as food, medical, sanitation, and other supplies.
3. Assist in monitoring those in quarantine for symptoms associated with the disease.

In cases where disease is contagious before symptoms develop or it is unclear how disease is transmitted, household members should:

1. Observe appropriate recommended infection control protocols and avoid close contact with quarantined individual.
2. Abide by guidance from health officials on restrictions (and/ or additional infection control guidelines) for movement into and out of quarantine.
3. When possible, assist in acquiring household needs such as food, medical, sanitation, and other supplies.
4. Assist in monitoring those in quarantine for symptoms associated with the disease.

If the person in quarantine develops symptoms or becomes known to be infected:

1. Remain at home unless they require hospitalization.
2. Contact public health authorities immediately.
3. Based on advice of public health authorities, establish and *safely* move quarantined individual into home isolation, or arrange safe transport to other isolation environment.

4. Disinfect/ decontaminate home environment.

Facility Quarantine

Of those who may be quarantined, facility quarantines may be considered for persons:

- who are **unable to care for themselves** at home, or
- who are **unable to monitor themselves** for symptoms, or
- who are **non-residents**—homeless, transients, foreigner visitors, tourists, business travelers, or persons otherwise dislocated from their homes, or
- who **cannot minimize close contacts** within a household, or
- who **live with immuno-compromised** individuals at home, or
- who are **unwilling to remain in quarantine** for the full duration required.

Entire facilities may be considered for quarantine if:

- they have experienced a **high potential for exposure**, or
- they have a particularly **high case count**.

When establishing Quarantine Facilities:

1. Quarantined persons should be cohorted (when necessary) with family, friends, or persons exposed under similar circumstances. *Suspected cases* should be moved to isolation and not cohorted.
2. Efforts should be made to create makeshift negative pressure rooms or corridors when possible.
3. Facility layout should be arranged to facilitate immediate removal of quarantined persons to isolation upon development of symptoms.
4. Facility layout should be arranged to facilitate efficient monitoring, observation, and care.
5. Temporary facilities (e.g. for food and laundry services) should be erected to meet needs otherwise unavailable.
6. Generators should be used to provide energy/heating/cooling where otherwise unavailable.
7. Special arrangements and procedures for *work quarantine* should be implemented for first responders and medical personnel.
8. Access control in and out of facility may be required.
9. Provide clear guidance on risks to health, means for protection, ways to engage the public, and ways in which their families will be supported during the crisis, to law enforcement, public health and other officials responsible for maintaining the quarantine.

Persons in facility quarantines should:

1. Follow instructions of doctors and other public health officials.
2. Stay in facility at all times.
3. Avoid close contacts with others.
4. Practice good hygiene and cleanliness to avoid spreading germs.
5. Conduct temperature checks or other measures of self-observation to be on the lookout for symptoms per instructions of public health.

6. Be available for daily public health monitoring (for more details, please refer to section on “Monitoring and Observation” in *Toolkit for Compliance*, below)
7. Immediately inform public health authorities if symptoms appear.
8. Move to home isolation or other isolation environment per instruction of health official, as soon as symptoms appear.

Work Quarantines

Of those who may be quarantined, work quarantines may be considered for persons:

- who **may have been exposed**, and
- who are **emergency responders or health care workers** or other essential staff managing the outbreak.
- who are **providing essential services** such as supporting utility infrastructure.

Persons in work quarantine should:

1. Follow instructions of doctors and other public health officials.
2. Stay home at all times when not working, or stay at work if home or alternative quarantine facilities are unavailable.
3. Utilize safe transport when moving between home/ facility quarantine and work, to limit contacts with others.
4. Maintain highest appropriate infection control regimes as determined by public health officials.
5. Maintain accurate list of contacts.
6. Conduct temperature checks or other measures of self-observation to be on the lookout for symptoms per instructions of public health.
7. Submit to regular public health screening/ monitoring.
8. Immediately inform public health authorities, if symptoms appear.
9. Move to home isolation or other appropriate isolation environment, as soon as symptoms appear.

Public health officials should:

1. Provide education and regular updates on outbreak disease to patients, family members and other care providers.
2. Provide access to mental health counseling, as needed.

Community Quarantine

Of those who may be quarantined, community quarantines may be considered for communities:

- that have experienced a **potential for widespread exposure**, or
- that have a particularly **high community-wide case count**.

When setting up community quarantine...

1. Determine the size of quarantine/ perimeters that limit where the quarantine begins and ends.

2. Provide clear guidance (public communications, signs, hotlines, etc.) to the public explaining the danger of the disease, public health risks, government, and public actions needed to protect the community.
3. Establish and maintain quarantine facilities for nonresidents, homeless, and dislocated persons within the quarantine.
4. Provide essential services to those in quarantine.
5. Make available mental health counseling, as needed.

When establishing perimeters...

1. Security/ Law enforcement officials should establish access controls into and out of quarantined area. In some instances this may include setting-up buffer or warm zones between the quarantine (hot zone) and non-quarantine regions, as a way of limiting contacts and facilitating delivery of essential needs.
2. Provide special access to those requiring temporary entrance into quarantine (e.g., work quarantines, service providers, law enforcement, family members/ friends, critical service providers, emergency responders, and business continuity staff).
3. Identify and acquire buses, vans and/ or other vehicles to provide transportation to quarantines, as needed.
4. Establish transport call-center to track and coordinate transport to and from quarantines, in coordination with EMS, public health and local law enforcement.
5. Provide clear guidance on risks to health, means for protection, ways to engage the public, and ways in which their families will be supported during the crisis, to law enforcement, public health and other officials responsible for maintaining the quarantine.

Prior to a health crisis, and as part of normal disaster planning...

1. Businesses should develop business continuity plans, to include options to work from home or at alternative sites.⁸⁸ The plans should identify essential personnel that require access and must operate inside the quarantine, and address procedures for maintaining appropriate infection control for these individuals. For businesses that may need to close as a result of quarantine, or are significantly affected by closed-businesses, government officials may consider some level of financial re-imbursement similar to relief provided as a result of floods, earthquakes or other natural disasters.
2. Families and individuals should develop business continuity plans, to include: preparing a multi-day supply kit of food, water, toiletries, essential medicines, radio, and batteries; and developing a family communications plan.⁸⁹

⁸⁸ Business continuity plans should consider ways to stay in business in times of crisis. Plans should include: identifying operations critical to survival and recovery; developing procedures for succession of management; establishing contingency plans if building, plant or store is not accessible; disseminating emergency communications to employees; and identifying those who may require special access. For a full discussion, see Department of Homeland Security guidance at: <http://www.ready.gov/business/index.html>.

⁸⁹ Family/ individual emergency plans should consider ways to stay safe in times of crisis. Plans should include having stockpiled enough food, water and other supplies to take care of oneself for a number of days, if for some reason government officials are unable to provide immediate support. For a full discussion on how to prepare, see Department of Homeland Security guidance at: <http://www.ready.gov/index.html>.

Persons in community quarantine should...

1. Follow instructions of doctors and other public health officials.
2. Stay in home or quarantine facility at all times.
3. Avoid close contacts with others.
4. Practice good hygiene and cleanliness to avoid spreading germs.
5. Conduct temperature checks or other measures of self-observation to be on the lookout for symptoms per instructions of public health.
6. Be available for daily public health monitoring (for more details, please refer to section on “Monitoring and Observation” in *Toolkit for Compliance*, below)
7. Immediately inform public health authorities if symptoms appear.
8. Move to home isolation or other isolation environment per instruction of health official, as soon as symptoms appear.

Public Health must provide detailed information, guidance, and/ or training regarding...

1. Hygiene/ Infection control for household members and primary caregiver.
2. Hygiene/ Infection control for those requiring temporary access to quarantines (e.g., work quarantines, service providers, law enforcement, family members/ friends, critical service providers, emergency responders, and business continuity staff).
3. Proper use of PPE for all users, if needed.
4. Decontamination of beddings, clothes, dishes, utensils, and household rooms, for households or facilities where individuals become symptomatic or sick.
5. Decontamination of transport vehicles.
6. Symptoms for which to be vigilant.
7. Availability of additional (or continuously updated) information.

Public Health must also...

1. Assess the feasibility of, identify, and establish (as necessary) alternative quarantine facility sites.
2. Develop local model for estimating spread of communicable diseases.
3. Develop Home Quarantine Toolkits (i.e., what items are needed for home quarantine—masks, gloves, thermometers, brochures on “what symptoms to look for”, cell phones, etc.). Distribute information for developing kits, or if available, distribute items as a kit through PODs.
4. Monitor health of quarantined persons.
5. Track down and quarantine contacts of persons becoming symptomatic or sick
6. Develop and disseminate protocols to EMS and other ambulatory services for transport and handling of sick or suspected cases (i.e., appropriate level of infection control).
7. Modify EMS call types based on information provided by the caller. For example, identify whether patient has a rash or a fever, which may indicate higher-risk for infectious disease like smallpox, or if he/ she has respiratory symptoms, which may indicate higher need for masks or other infection controls.
8. Launch media campaign for public to triage before going to care provider.

IV. Community Restrictions

Community Restrictions refers to reducing community-wide interactions through restriction or limitation of public events, large public gatherings, interactions or other activities.

While community restrictions will likely be applied concurrently with quarantine and isolation, community restrictions are a very different approach to disease exposure control. Community restrictions are not directed at individuals or specific groups, nor do they necessarily apply only to people who are ill, exposed, or potentially exposed. Community restrictions limit social interactions across an entire community, as a means of lessening the likelihood that unwitting carriers of disease will come in contact with healthy individuals and infect them.

Measures for reducing community-wide interactions should be considered when:

- The spread of the disease is no longer limited to known chains of transmission, but instead has evolved into “community transmission” where not all contacts can be traced.
- There are not enough personnel available to perform contact tracing.
- Mass gatherings pose a risk of furthering the spread of the disease.
- Transportation poses a risk for spread of the disease within and between communities.

There are five categories of community restrictions that policy-makers can draw from and implement:

1. Encourage community-wide infection controls
2. Restrict public travel
3. Cancel public gatherings
4. Close public facilities
5. Enhance screening efforts.

A summary of potential restrictions/measures in each of these categories can be found in Table 1.

Key Considerations

Encourage Community-wide Infection Controls

Infection Control is one of the primary tools of disease exposure control, and includes hygiene measures as well as protective gear use. While there are specific needs for stringent infection control in hospitals, for isolation wards, and for emergency responders, broader application of infection controls may help limit the spread of disease in a community, if observed on a community-wide basis.

In general, during a public health outbreak, the public should be encouraged to practice good hygiene and cleanliness to avoid spreading germs (i.e., cover your mouth when you cough, sneeze into a tissue, wash your hands frequently, don't spit in public). Authorities

may also consider establishing public hand-washing stations, or promoting/requiring the public to use protective masks while on public transportation or at public gatherings.

If protective gear is encouraged, officials will need to make sure that there are adequate resources. If needed, officials may wish to establish points of distribution (PODs) and implement plans to distribute gear, in order to reduce the likelihood of runs on stores, panic or other breakdown in public order. These PODs would need to be organized so as not to further expose individuals to potential spreaders (using food or bank drive-thrus, for example).

Social customs that may facilitate the spread of disease should be identified and temporarily suspended to reduce transmission. As an example, business traditions like shaking hands, or religious customs like drinking from a common communion cup or kissing the Torah would be discontinued during the outbreak.

Of central importance is a program to notify, inform, and educate the public about community restrictions. Communications may include: public signage (e.g., on billboards, along major thoroughfares, in grocery stores, offices buildings, restrooms, and throughout public transportation systems); written handouts or flyers distributed by postal mail, at public gatherings, or together with protective gear; and public service announcements in print media as well as on radio, television, and the internet.

Restrict Public Travel

Travel restrictions have been shown to reduce geographic spread, as well as total and local incidence during a disease outbreak. Restrictions may be placed on some or all modes of transportation—air, rail, ferry, cruise ship, subway, and bus—and may include a range of increasingly stringent limitations, from issuing travel warnings to closing high-risk stops, limiting schedules, or canceling travel routes altogether. The effectiveness of such measures will depend on many factors, most notably by total travel intensity of a community, behavior of travelers, and disease pathology.

Although individual car travel naturally poses lower risk for community transmission, it could potentially facilitate the spread of disease to other locations. Thus traffic restrictions may be considered to reduce flow between communities, perhaps in extreme cases even limiting passage to trucking, response and emergency vehicles, and other essential transportation.

Law enforcement responsible for enforcing restrictions will need to receive education on the disease, guidance and training on appropriate protective gear, and rules of engagement should someone seek to violate the restrictions. It is important to note, as rules of engagement are contemplated, that containment measures such as these can be effective even if compliance is not 100%. In fact, the benefit of these types of restrictions maxes out at a compliance rate of about 90%.⁹⁰ So while the control measures are important, enforcement does not need to be at the 100% level.

Cancel Public Gatherings

Public gatherings can provide a target-rich environment for transmission. Large gatherings (sporting events, parades, concerts, political rallies, holiday celebrations,

⁹⁰ Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS), Version 2 (CDC). January 8, 2004.

festivals) as well as smaller social activities (weddings, funerals, or religious services) may need to be curtailed, postponed, or cancelled altogether. By placing such limitations, officials can reduce social interactions and, therefore, transmission of disease.

The great challenge for this kind of restriction is that humans are inherently social beings. By depriving them certain social interactions in the midst of a public health crisis in which they may feel isolated and afraid, officials may aggravate an already stressful situation. To promote mental health, compliance with the restrictive measures, and as much ‘normalcy’ as possible, every effort should be made to arrange for alternative means of entertainment, social, religious or political gatherings. These might include use of radio/ public TV broadcasts, streaming video web casts, internet-based ‘community square’ chat rooms, and teleconferences to provide alternative means for groups to congregate, to experience ‘live’ entertainment, or participate in religious services. These ‘quality of life’ activities should be supplemented with access to mental health counselors, spiritual advisors, or other support, as needed.

Close Public Facilities

Closing public facilities or facilities where large groups congregate can also reduce opportunities for disease transmission through social interactions. Clear authority exists for government officials to close public (but not private) facilities. Consequently, public facilities—schools, government offices, transportation hubs, museums, libraries, convention centers—would be the first ones considered for closing. Private facilities—shopping malls, concert halls, skating rinks, gyms, restaurants, bars, theaters, and grocery stores—may be closed under general emergency powers or special powers granted during times of public health emergencies.⁹¹

Public and parental concerns about child safety may prompt school closures early on during an outbreak with community transmission. If these closures force hospital and response workers to stay home to care for their children, officials may need to provide alternative childcare. Children whose parents have just entered into work or facility quarantine prior to school closures may also need outside care.

Enhance Screening

Depending on the symptoms of the disease, active screening for sick individuals in public places may help detect and separate infected persons. Such screenings may take place passively or as a requirement for access into public or private buildings, businesses, or public events. Checkpoints and screenings may also be set up in key transportation hubs such as airports, seaports, trains and bus stations, or at land crossings or tollbooths.

⁹¹ For example, see Article V, Sections 501 and 502 in Draft Model State Emergency Health Powers Act that would allow officials in times of public health crisis “to close, compel and direct the evacuation of...any facilities where there is reasonable cause to believe that it may endanger the public health.” (Gostin, L., December 21, 2001).

Table 1: Options to Consider for Community Restrictions

	Potential Scenario	Options to Consider
Public Transportation, Mass Transit, and Travel	Public Transportation/ Mass Transit Restrictions	<ul style="list-style-type: none"> Restrict/close mass transit Require infection control on public transportation.
	Air Travel	<ul style="list-style-type: none"> Scale back or cancel domestic and/or international flights Limit flights to regions designated as safe Screen arriving or departing passengers Require infection control during air travel
	Regional Travel	<ul style="list-style-type: none"> Limit rail, ferry, other boat, or private bus travel
	Car Travel	<ul style="list-style-type: none"> Restrict taxi use Restrict travel within cities, regions, or states Restrict travel between cities, regions, or states
Infection Control	Recommendations or Requirements	<ul style="list-style-type: none"> Universal infection control Infection control during public transportation Infection control during domestic or international travel Infection control at public gatherings Recommendations/Requirements for hand-washing Hand-washing stations
	PPE Distribution	<ul style="list-style-type: none"> Distribute masks, thermometers, etc. Provide PPE training/fit-testing
Public Gatherings	Religious Gatherings	<ul style="list-style-type: none"> Limit or prohibit religious gatherings Provide alternatives such as radio/public TV broadcasts of religious services or teleconferences with religious leaders
	Funerals / Weddings	<ul style="list-style-type: none"> Restrict or prohibit funerals and weddings Restrict attendance to family only
	Public Celebrations/ Holidays	<ul style="list-style-type: none"> Postpone or cancel public festivals, celebrations, or holidays Require infection control measures during public celebrations
	Public recreation spaces	<ul style="list-style-type: none"> Close movie theaters, sporting arenas, museums, concert halls, etc.
	Businesses and Places of Work	<ul style="list-style-type: none"> Close public facilities (schools, government, military) Close businesses Arrange for business continuity steps from home Implement work quarantines when appropriate
Screening Procedures	Building Access	<ul style="list-style-type: none"> Require symptom screening for entrance into public or private buildings, businesses, or government offices
	Transportation	<ul style="list-style-type: none"> Hold checkpoints and screening at airports, train and bus stations, along highways, or at toll booths
	Public Spaces	<ul style="list-style-type: none"> Establish random checkpoints in public spaces or at public gatherings

V. Sheltering

Sheltering is when individuals, acting out of self-interest, limit their own social interactions for the purpose of protecting their health.

In some cases, it may become necessary to limit social interactions on a very widespread scale. To do this, one of the tools for Disease Exposure Control is voluntary *sheltering* (sometimes referred to as a “sheltering-in-place”). Typically, this will be manifested by large numbers of people remaining within their homes for a period of time recommended by public health authorities.

Sheltering is different from isolation and quarantine in that those who are sheltering may never have been exposed to a pathogen. In contrast to many community restrictions, furthermore, sheltering is characterized by the fact that there will be no attempt made at enforcement. However, the community would voluntarily restrict movement to avoid potential exposure.

Sheltering might be recommended under the following circumstances:

- Community transmission has become so widespread that tracing contacts is no longer possible, and social interactions may pose a high risk for infection.
- Isolation, quarantine, and community restrictions may not be adequate for stemming the spread of the disease.
- The pathogen is so deadly, contagious and/ or virulent that the most aggressive steps are merited despite perhaps only limited spread of the disease.
- Individuals who have been infected become contagious before they are symptomatic, so the extent of disease spread is not well-known and infectious individuals cannot be readily identified.

The positive aspect of sheltering is that it is a purely voluntary act. It provides the individual with a choice: while it is in his/her self-interest to remain at home, it is permissible to leave shelter at their own discretion. This therefore decreases potential for exposure, but allows persons the flexibility to act according to individual special needs. Sheltering may also have a positive psychological effect by empowering the citizen to act in a way that will stop the spread of the disease. Another advantage is that it will encourage citizens to stay in one place rather than fleeing—and spreading the disease across the nation as they go.

How an affected population responds to an outbreak will be a key factor in the outcome of the incident. The fear of disease, lack of specific medical treatments, and what may seem like random patterns of sickness, can make a community in the midst of an outbreak panicky and more likely to act out in their own defense. When isolation and quarantines are imposed, they may, depending on how they are implemented, enhance the psychological stress to an already anxious population, particularly with the prospects of being separated from family members.

By advising citizens to shelter-in-place, government officials provide individuals with a choice and an opportunity to take matters in their own hand: while it may well be in a person’s self-interest to remain at home, it is permissible to leave shelter at one’s own discretion. With this tool, individuals are provided a means to protect themselves, but are

also afforded the flexibility to act according to their own needs. Sheltering may also have a positive psychological effect by empowering citizens to act in a way that will stop the spread of the disease. Lastly, an advantage of sheltering is that it may help encourage citizens to stay in one place rather than fleeing—and spreading the disease to other communities as they go.

Even if implemented only for a limited time period, sheltering may be accompanied by challenging logistical issues, particularly in terms of making sure that everyone has all of their basic needs and vital supplies available at home. Furthermore, sheltering would likely have widespread effects on businesses ability to stay open and would have severe economic impact.

Prior to a health crisis, and as part of normal disaster planning

1. Businesses should:

- Develop business continuity plans, to include options to work from home or at alternative sites outside of the city if people can't get to work.⁹²
- Identify essential personnel of businesses that require access and must operate inside the quarantine. If access is granted, appropriate infection control procedures should be maintained.
- For businesses that may need to close as a result of quarantine, government officials may consider some level of financial reimbursement.

2. Families and individuals should:

- Develop business continuity plans, to include: preparing a multi-day supply kit of food, water, toiletries, essential medicines, radio, and batteries; and developing a family communications plan.⁹³

VI. Additional Resources

In developing operations guidelines for disease exposure control, the following resources may serve as useful references:

Hospital Preparedness

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement C: Preparedness and Response in Healthcare Facilities. Centers for Disease Control. January 8, 2004.
<http://origin.cdc.gov/ncidod/sars/guidance/C/pdf/c.pdf>

Emergency System for Advance Registration of Volunteer Health Care Personnel (ESAR-VHP), Interim Technical and Policy Guidelines, Standards, and Definitions.

⁹³ Family/ individual emergency plans should consider ways to stay safe in times of crisis. Plans should include having stockpiled enough food, water and other supplies to take care of oneself for a number of days, if for some reason government officials are unable to provide immediate support. For a full discussion on how to prepare, see Department of Homeland Security guidance at: <http://www.ready.gov/index.html>.

United States Department of Health and Human Services, Health Resource and Services Administration. June 2005.

<http://www.hrsa.gov/bioterrorism/esarvhp/index.htm>

Infection Control

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement I: Infection Control in Healthcare, Home, and Community Settings. Centers for Disease Control. January 8, 2004.

<http://origin.cdc.gov/ncidod/sars/guidance/i/pdf/i.pdf>

“New York State Department of Health Environmental Control Measures for Airborne Infection Isolation Surge Capacity Planning in Health Care Facilities for Smallpox, SARS or Other Infections Potentially Transmitted via Airborne Droplet Nuclei.” December 18, 2003.

http://www.health.state.ny.us/nysdoh/sars/preparedness_guidance/pdf/2i_surge_capacity_planning.pdf

“Infection Control Measures Taken by the Hospital Authority in the Management and Prevention of the SARS Incident.” Hong Kong Hospital Authority, June 2003.

http://www.sars-expertcom.gov.hk/textonly/english/reports/submissions/files/infection_control_measures_taken_ha.pdf

Smallpox Response Plan and Guidelines (Version 3.0), Guide C—Infection Control Measures for Healthcare and Community Settings and Quarantine Guidelines Part 1: Infection Control Measures for Healthcare and Community Settings. Centers for Disease Control. November 26, 2002.

<http://www.bt.cdc.gov/agent/smallpox/response-plan/index.asp>

Isolation

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement D: Community Containment Measures, Including Non-Hospital Isolation and Quarantine. Centers for Disease Control. January 8, 2004.

<http://origin.cdc.gov/ncidod/sars/guidance/d/pdf/d.pdf>

New York State Department of Health Environmental Control Measures for Airborne Infection Isolation Surge Capacity Planning in Health Care Facilities for Smallpox, SARS or Other Infections Potentially Transmitted via Airborne Droplet Nuclei. December 18, 2003.

http://www.health.state.ny.us/nysdoh/sars/preparedness_guidance/pdf/2i_surge_capacity_planning.pdf

SARS Infection Control and Isolation Guidelines/Resources (Centers for Disease Control)

<http://www.cdc.gov/ncidod/sars/ic.htm>

“Public Health Management of SARS Cases and Contacts: Interim Guidelines.” Version 7. Health Canada. December 17, 2003
http://www.phac-aspc.gc.ca/sars-sras/pdf/phmanagementofcases12-17_e.pdf

Smallpox Response Plan and Guidelines (Version 3.0), Guide C—Infection Control Measures for Healthcare and Community Settings and Quarantine Guidelines Part 1: Infection Control Measures for Healthcare and Community Settings. Centers for Disease Control. November 26, 2002.
<http://www.bt.cdc.gov/agent/smallpox/response-plan/index.asp>

Quarantine

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement D: Community Containment Measures, Including Non-Hospital Isolation and Quarantine. Centers for Disease Control, January 8, 2004.
<http://origin.cdc.gov/ncidod/sars/guidance/d/pdf/d.pdf>

Smallpox Response Plan and Guidelines (Version 3.0), Guide C—Infection Control Measures for Healthcare and Community Settings and Quarantine Guidelines Part 2: Quarantine Guidelines. Centers for Disease Control. March 20, 2003.
<http://www.bt.cdc.gov/agent/smallpox/response-plan/index.asp>

“Public Health Management of SARS Cases and Contacts: Interim Guidelines.” Version 7. Health Canada. December 17, 2003
http://www.phac-aspc.gc.ca/sars-sras/pdf/phmanagementofcases12-17_e.pdf

Community Restrictions

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement D: Community Containment Measures, Including Non-Hospital Isolation and Quarantine. Centers for Disease Control, January 8, 2004.
<http://origin.cdc.gov/ncidod/sars/guidance/d/pdf/d.pdf>

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement E: Managing International Travel-Related Transmission Risk. Centers for Disease Control, January 8, 2004.
<http://origin.cdc.gov/ncidod/sars/guidance/E/pdf/e.pdf>

“Public Health Management of SARS Cases and Contacts: Interim Guidelines.” Version 7. Health Canada. December 17, 2003
http://www.phac-aspc.gc.ca/sars-sras/pdf/phmanagementofcases12-17_e.pdf

SECTION 4.

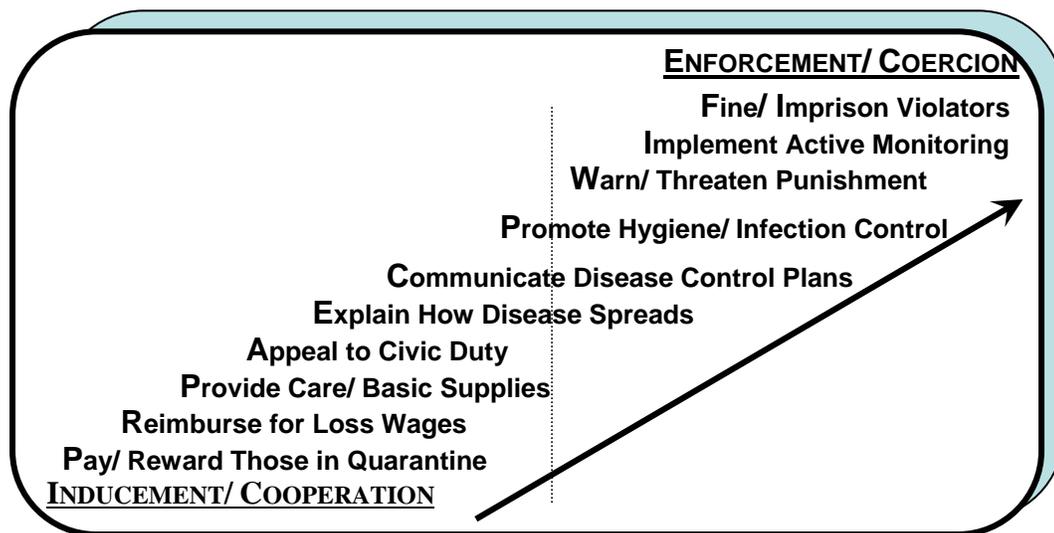
Toolkit for Compliance

Public action in response to an outbreak can help mitigate casualties and speed recovery, or it can cause panic and hasten the spread of disease. Gaining and maintaining public support during an outbreak is therefore a critical element of disease control. This can be accomplished through policies that engage the public as a partner to control the outbreak.

Ideally, public action in the face of an outbreak would uniformly and voluntarily support disease control programs. This is neither likely, nor realistic. For various reasons, individuals may reject government efforts because, for example, they may believe they personally are unaffected (i.e., not sick or likely to become sick), or because they are unable in their mind to stay away from work or separated from family members for a period of time. They may also simply be too afraid to take actions that require them to be confined with other potential carriers. Finally, in some cases, individuals may also fail to comply with recommended public actions, because they are plainly unaware of what they should do.

Thus disease exposure control strategies must, to the maximum extent possible, promote voluntary compliance through education programs, through communications with the public, and by providing the necessary support, and in some cases incentives, for individuals to help stop the spread of disease. These efforts can be categorized as activities that seek to **induce compliance**. But because there will undoubtedly be cases where individuals may be unwilling to support necessary public actions (e.g., quarantines), mechanisms to compel them to do so, must also be available. These mechanisms would aim to **enforce compliance**. The spectrum of government activities, from actions that spur cooperation by inducement to those that compel support through enforcement, represent the *toolkit for compliance* for disease exposure control programs (see Figure 3, Sample Activities in the Toolkit for Compliance, below).

FIGURE 3 – Sample Activities in the Toolkit for Compliance



I. Inducing Compliance

There is very little research on what factors contribute to motivating the public to support large-scale public actions to protect health in a possible outbreak. This is partly because with the exception of SARS, there has really been little need for large-scale public health crisis intervention such as quarantines in nearly fifty years in America. The best indications we have to guide future disease exposure control programs come from the 2003 SARS experience. Even with this case study, it is important to understand that experiences varied from culture to culture, and nation to nation, and the lessons derived from these experiences may reflect more the individual nature and character of the communities that faced SARS than larger general principals.

That being the case, in Canada, the principal motivation for compliance among those who were quarantined, was to protect others (family, friends, or others in the community) from getting sick.⁹⁴ The fear of breaking the law or threat of punishment played little role in their decisions to comply with quarantine orders. People were more likely to comply if the government could help them cope with the many challenges they faced from an extended quarantine—confusion over mixed messages from authorities, need for logistical support, losses of income and productivity, and managing psychological stress.

To help induce compliance, disease exposure control programs must include strong **public communication and education programs**; they must help support the **basic needs** of citizens; provide **financial relief** for affected businesses and individuals; promote **peace of mind**; and if all else fails, offer additional **rewards and incentives** to encourage compliance.

Key Considerations

Public Communication and Education Program

Disease outbreaks are frequently marked by uncertainty, confusion, and a sense of urgency. In the absence of clear, effective communication, government officials can unintentionally perpetuate fear, undermine public trust, and inspire counterproductive actions. A fearful public will be wary that information is possibly being withheld, that mixed messages reflect government incompetence, or that requests for public action represents government's interest in total control and compliance, versus cooperation and partnership. An educated public with trust in its leadership will be more likely to support exposure control efforts and contribute to a more rapid resolution of a crisis.

The primary goal for officials communicating with the public in a crisis is to build, maintain, or restore public trust. This can be accomplished if officials:

- **Communicate early and often.** Early information in a crisis can often be incomplete or even erroneous. Nonetheless, to avoid feelings that information is

⁹⁴ The exception to this in Toronto was from some high school students who complied with quarantine orders more because they feared that their parents would be punished if they failed to comply than out of greater sense of altruism for protecting the health of their wider community. For a full discussion looking at lessons from Toronto's experiences with large-scale quarantine during the 2003 SARS outbreak, see *Factors Influencing Compliance with Quarantine in Toronto During the 2003 SARS Outbreak* (DiGiovanni, Conley, Chiu and Zaborski), in *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, Volume 2, Number 4, 2004. pp. 265-272.

being withheld and to promote a sense of partnership between the government and the public, officials should communicate early and often.

- **Offer guidance and statements that are easily understood.** Technical jargon may offer the most accurate way of explaining a medical situation, but it may also alienate a public unfamiliar with scientific terms or medical terminology. To ensure maximum compliance and understanding, officials should offer guidance and statements that are easily understood.
- **Supply factually correct and comprehensive information.** Uncertainty and confusion are common feelings in a crisis. Misrepresentations of the facts, incomplete information, or withholding information can reduce public confidence and undermine trust. To minimize confusion, bolster confidence and empower the public to take responsibility for their health, officials should provide factually correct and comprehensive information.
- **Provide briefings about government actions with complete candor and transparency.** Given the sense of urgency often associated with an outbreak, an anxious public will want to know that all efforts are being taken to protect their health and the rationale behind those efforts. To counter concerns about secrecy, establish a track record of honesty, and offer a clear view into the decision-making and actions of the government, officials should provide briefings about government actions with complete candor and transparency.
- **Tailor messages to accommodate public beliefs, opinions, and cultural sensitivities.** Public communications in a crisis are more likely to be embraced if communications are offered as a dialogue rather than a command from on high. Understanding the public is therefore a vital component of developing public messages. To reduce possible feelings of being patronized and acknowledge particular fears and concerns, officials should tailor messages to accommodate public beliefs, opinions, and cultural sensitivities.

To be most effective, communication strategies should be developed before they are needed. While specific messages may not be able to be crafted until the crisis, questions about who is in charge, who should deliver the messages, how messages will be delivered, and how they will be shared with stakeholders and coordinated across the government should be considered well in advance of an outbreak.

Public Education is equally important and messages can be developed in advance of a crisis. For example, training videos or guides on how to use protective gear, how to set-up a home isolation room, or documents on hand hygiene, cough etiquette, or other forms of infection control can be developed prior to an outbreak. Plans for delivering education guides (e.g., written handouts or flyers, distributed at public gatherings or at public facilities, with protective gear, and/ or by postal mail; public service announcements and briefings on radio and television; web-based information hubs; and reporting in print media) should also be developed.

Basic Needs

Though meeting essential needs (e.g., providing food, water, and other basic supplies) during a crisis will pose technical and logistical challenges to state and local officials, effective implementation can make or break the disease response. The next chapter, therefore, has been devoted entirely to this topic.

Business Continuity and Financial Relief

Although there will undoubtedly be disruptions to businesses, loss of productivity from employees observing disease exposure controls, and self-employed or wage-workers who cannot work from home and may face financial pressures to circumvent public health restrictions, measures can be taken to minimize losses:

During an outbreak, businesses should strive to enable employees to work from home, where possible. Business continuity measures (e.g., establishing web-based email capability, facilitating access to files and computer drives from home, and updating teleconference and videoconference capabilities) would help disperse the workforce while maintaining many business functions. Ideally, employees should continue to receive regular pay and should not have to take vacation or use sick leave for staying home.

- **Public health officials should ensure that businesses understand their stake in supporting disease exposure controls.** Businesses may be tempted to refuse leave or sick pay to affected personnel. Some may even seek to fire workers who voluntarily quarantine. Strong guidance from political leaders and public health officials can help businesses realize that it is, in fact, advantageous in the long run to prevent new waves of workforce infection by minimizing social interactions in the workplace.
- **State and Federal governments should consider disaster assistance programs for businesses and individuals who sustain losses and incur costs that are not covered by insurance or other assistance programs.** For example, housing assistance could be provided to individuals or families whose residence may have been affected by the outbreak (e.g., to clean up homes in an outbreak area); unemployment assistance could be provided for those out of work or whose livelihood was affected by an outbreak; small business loans could be made available to decontaminate facilities in an outbreak area or assist in helping resume normal operations for firms closed or significantly harmed as a result of the outbreak.

Promoting Peace of Mind

While limiting social interactions may be the key to stemming the spread of a contagious disease, actions that limit social contact can also create significant psychological stress and thus undercut the desire of individuals to comply with DEC programs. Isolation, quarantine, community restrictions, and sheltering can create an environment where individuals experience enhanced feelings of loneliness, isolation, loss of freedom; anxiety of one's own vulnerability and mortality, fear of an impending crisis, worry about one's friends and families, financial stresses, feelings of being out of control, social stigmatization, ridicule or even avoidance, and boredom.

To promote mental health, compliance with restrictive measures, and as much 'normalcy' as possible, every effort should be made to arrange for psycho-social support to include:

- **provision of communications** with family and friends (e.g., telephones, walkie-talkies, two-way radios, blackberries, e-mail, etc...);
- **alternative means of entertainment, social, religious or political gatherings** (e.g., books, radio, television, internet, video, DVD, streaming video web casts, internet-based ‘community square’ chat rooms, and teleconferences to provide alternative means for groups to congregate, to experience ‘live’ entertainment, or participate in religious services); and
- **access to mental health counselors, spiritual advisors, or other psychological support**, as needed.

Support should be tailored to the specific needs and interests of various groups in a community based upon age, gender, level of education, religion, and other local characteristics and/ or interests.

Rewards and Incentives

Public response may vary by community and culture. In some cases, supporting the broader public health interest of a community may be secondary to the individual interests of members living in an outbreak area. Should public appeals fail to induce compliance with recommended disease exposure controls, officials may consider rewarding specific behavior that supports the outbreak response. Examples of this would include provision of monetary payments beyond disaster relief reimbursements, priority access to medical supplies, health care or other resources, tax relief, or other special treatment (e.g., all-expense stays at luxury hotels, resorts, or cruise ships during the outbreak).

II. Enforcing Compliance

When individuals fail to comply with disease exposure control measures—despite public appeals or incentives offered—government officials must consider other more coercive means for enforcing compliance. These can range from **warning would-be violators** with the prospect of punishment, instituting **active monitoring within certain perimeters** of communities for possible offenders, and **punishing noncompliance** with fines and even forcibly detaining and/ or imprisoning violators.

Key Considerations

Law Enforcement

Public safety officers, police, public health officers with police authorities, and other law enforcement officials will have the primary responsibility of enforcing compliance to disease exposure control measures. The National Guard, as long as they are not federalized and thus not bound by *posse comitatus*, may also support efforts to enforce compliance. Four key issues should be considered: who’s in charge, what are the rules of engagement, how do you ensure proper protective measures, and what other enforcement issues must also be addressed.

- **Who's in Charge.** Although public health would likely be the lead agency for managing an outbreak crisis response, law enforcement officials will play a major supporting role in enforcing quarantines and other exposure controls. Specific roles and responsibilities would be determined in collaboration with public health officials but may include: establishing perimeters and maintaining access controls around certain buildings or areas of a city; managing crowds; providing security for medical facilities, health care providers, and shipments of medical supplies; overseeing transportation of affected populations to and from quarantine facilities; and supporting the provision or delivery of medical, food, or other essential services.
- **Rules of Engagement.** One question that surfaces immediately in discussions on enforcing restrictive measures is when and if lethal force should be employed to protect a vulnerable public from potentially infectious individuals fleeing quarantines? The answer is “no.” First, a guiding principle of law enforcement is to use the least force necessary to subdue possible threats. Second, non-lethal force can be equally as effective as lethal force, without risking the tragic consequences of wrongful arrest or undermining public trust. Third, it is important to understand as rules of engagement are contemplated, that exposure control measures can be effective even if compliance is not 100%. In fact, the benefit of quarantines and other similar restrictive measures tend to reach their maximum benefit at a compliance rate of about 90%.⁹⁵ So while public compliance with control measures is vitally important, enforcement does not have to be absolute for programs to be effective.

In all instances in which law enforcement officials may engage the public, they should do so with full knowledge of the risks posed to them by infected individuals, and what measures they can and should take to protect themselves from infection. Protocols will be needed for enforcement officers on how to deliver quarantine orders and control access to and from a quarantine facility or area (e.g., stand so many feet away; wear specific protective gear, etc.). Enforcement officers may also need to be prepared to answer a number of key questions:

- What conditions dictate who should be quarantined? For how long?
- What are the rights of families separated by quarantine?
- What punishment will be meted out to escapees?
- Can there be court appeals of quarantined status? How will they work?
- Can there be voluntary quarantine entry?
- What are the rights of foreign nationals?
- Can you hold public health officials liable?
- What are the rights of families regarding burial/ cremation?

⁹⁵ Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS), Version 2 (CDC). January 8, 2004.

To better provide health information to those receiving quarantine orders, health officials may also join enforcement officers to deliver orders.

- **Protective Measures.** Law enforcement responsible for enforcing restrictions will need to receive education on the disease, on the risks presented by engaging those infected, guidance and training on appropriate protective gear, and will need to recognize that if they engage potentially infected individuals, they too will have to be quarantined, perhaps away from their family.
- **Other Enforcement Issues.**

Responding to opportunistic crime. While supporting the activities of managing the response to a large-scale infectious disease outbreak, law enforcement officials will still need to respond to common criminal activity, including the possibility of an increase in opportunistic crime—thefts, looting, and other criminal acts that seek to exploit the health emergency.

Coordinating a criminal investigation with other agencies. If it becomes apparent that instances of disease may not be the result of natural causes, the FBI must be notified. The FBI, acting on behalf of the Attorney General, has lead responsibility for criminal investigations of terrorist acts. The Department of Homeland Security in coordination with the U.S. Department of Health and Human Services maintains the overall lead in managing the incident response.⁹⁶ Law enforcement and Public Health officials will need to coordinate with one another and hold joint investigations (epidemiological and forensics) in the event of a deliberate outbreak. Even if the outbreak is widely believed to be naturally occurring, law enforcement officials will likely remain vigilant for any signs that it was indeed deliberate.

Perimeters and Active Monitoring

To keep quarantined individuals in—and healthy individuals out—officials will need to establish controlled access into and out of quarantined areas. Well-controlled access will diminish the likelihood of additional exposures and allow resources to be devoted to other aspects of the response. It also affords temporary access for health care workers and response personnel as needed.

In some cases, access control may be limited to just a single building. When several buildings are at risk or when community quarantines are warranted, access control may be best accomplished by establishing a secured perimeter with one (or at most a few) entrances/exits. While such restrictions are difficult to imagine, and may well be difficult to implement, it is useful to note that the use of perimeters to restrict movement of the public is not at all uncommon in urban settings. During parades, demonstrations, fires, crime scenes, or for protection of special visitors, law enforcement personnel routinely restrict movement into and out of sensitive areas. Access control for large-scale quarantines could build on those procedures.

Officials must issue appropriate credentials for entry and exit, and strictly enforce the perimeter for anyone who lacks proper credentials. To guard against fraud, credentials

⁹⁶ See the Biological Incident Annex of the National Response Plan, and the Terrorism Incident Law Enforcement and Investigation Annex (December 2004).

should be linked to biometrics and possibly re-formatted on a daily basis. The credentialing process would likely be administered by a central agency—preferably the lead agency responsible for managing the crisis (e.g., office of emergency management). This agency would need to manage the creation and dissemination of access passes, and establish protocols to handle daily exceptions and special requests. It would also need to coordinate with law enforcement or other officials responsible for maintaining the perimeter. Since persons who prematurely leave quarantine also pose a risk transmission to the community, passes are needed to allow those who have completed quarantine to leave the quarantine facility or area.

Key elements of a perimeter include...

1. *Transmission Zone* within a perimeter
2. Guarded checkpoints/ Monitoring stations/ Access controls
3. Barriers to control flow of traffic
4. Barriers and patrols to enforce flow of pedestrian traffic
5. *Protective Zones* just outside of perimeter as a buffer for delivery of goods to Transmission Zone and decontamination of people/ transport leaving the Transmission Zone
6. Zones just outside of the buffer/ Protective Zone

Key activities inside the Protective Zone ...

1. Credentialing for access to hot zone
2. Monitoring and observation of persons moving between hot and warm zones
3. Supporting the delivery of basic goods and essential services
4. Protecting health care professionals
5. Facilitating sanitation and decontamination activities
6. Maintaining public order
7. Transfer of Goods
8. Decontamination of People
9. Decontamination of Delivery Vehicles, other vehicles
10. Decontamination of Sanitation vehicles
11. Issuance of PPE
12. Possible support of mental health counseling services
13. Ensuring perimeter enforcement
14. Supporting transportation to/ from quarantine facilities

Activities outside the Protective Zone...

1. Gathering goods for delivery
2. Developing information/ guidelines/ public messages and establishing special hotlines/ information dissemination hubs

Movement between Transmission Zone and Protective Zone...

1. Possible transport of symptomatic to isolation
2. Removal of waste
3. Provision of goods
4. Movement of law enforcement/ health care providers/ EMS and service providers

Monitoring of individuals in Transmission Zone...

Officials have a number of technologies available for monitoring and observation. Factors to consider when deciding which technologies to use include the number of personnel required, total expense, overall effectiveness, legal authorities required, and likelihood of public compliance.

A key balance will be between the cost of sophisticated tools and the personnel required for less sophisticated measures. More sophisticated tools may be too costly to implement, but personnel-intensive mechanisms may suffer from a lack of available and trained personnel. Home visits will require much more personnel than remote monitoring and observation techniques. And remote techniques such as epic or electronic tagging will require installation of cameras or other technology that significantly increases labor. Although trained nursing or other medically trained persons will be best qualified to monitor (as well as to deal with the questions posed by a population of people who will likely be quite frightened), monitoring call centers may also be staffed by trained volunteers when personnel runs short. Thus it may be of greater use to concentrate on methods—such as phone calls—that focus on monitoring for symptoms with the goal of quickly identifying and treating those who become sick.

Possible technologies include:

1. Phone calls. Daily (or twice-daily) phone calls are perhaps the most efficient way to monitor quarantined persons for compliance and symptoms. Evasion tactics, however, may include use of “call forwarding,” use of a cell phones, and household members pretending to be the person in question.
2. Home visits. Though resource intensive, in-person visits may be the most effective means of monitoring and observation. Officials performing house calls would confirm identification, check for symptoms, and verify compliance with home quarantine.
3. Web-based monitoring. Although persons can be required to submit information over the web, there is no guarantee that this information will be correct and, in the absence of biometrics, it may be difficult to confirm identity over the web.
4. Video monitoring. Video monitoring (also called Electronic Picture or E-pic) allows visual identification and real-time symptom assessment and ensures that the person being monitored is indeed at home. In cases like SARS where temperature is a reliable indicator of potential infection, health officials can require that those being monitored also take their temperature under observation.⁹⁷
5. Electronic tagging. Usually reserved only for those who have demonstrated noncompliance, electronic tags may be fitted around the wrist or the ankle, and will set off an alarm if the wearer strays too far away or outside of

⁹⁷ Note this is not failsafe. A glass of ice water, for example, before an oral temperature reading can drop an oral temperature to normal or below.

his/her home. The alarm will also be set off should the wearer tamper with the sensing mechanism.

Punishing Noncompliance

Possibly the most severe form of enforcement, punishing noncompliance includes issuing fines, imposing jail time and using physical force to compel compliance. In many cases the *threat* of force will be enough to ensure compliance, and the *use* of force or punishment should be reserved only for those cases when efforts at inducing compliance have failed.

Fines are perhaps the least intrusive means of enforcing compliance, but also may be the least effective. During the SARS outbreaks, fines were issued for breaking quarantine, spitting, and other violations of community-based restrictive measures. Non-lethal force should be considered for cases posing a danger of violence, a breakdown in public order, or a serious risk of danger to health of the community.

The option of jailing would-be violators presents a unique challenge. Prisons or jails do not in general have hospital level infection control measures in place, nor AIIR isolation wards. Officials would not introduce an infected person or even a potentially infected individual into the general prison population. Consequently, secure alternative facilities would need to be established or specific jail facilities would need to be cleared for violators. In the US, where prison capacity is already stretched, finding an existing prison or jail facility or clearing prisoners from one facility for violators would be problematic.

III. Additional Resources

In developing operations guidelines for disease exposure control, the following resources may serve as useful references:

Inducements

“Workplace Laws and SARS – Q&A.” Ontario Ministry of Labour, December 10, 2003. Reflects updated laws to protect workers in isolation and quarantine.
http://www.labour.gov.on.ca/english/hs/sars/sars_faq.html

SARS Assistance and Recovery Strategy Act, 2003. Addresses issues of SARS emergency leave.
http://www.e-laws.gov.on.ca/DBLaws/Source/Statutes/English/2003/S03001_e.htm

Enforcements

Richard, Goodman, and Milligan. “Quarantine and Police Powers: The Role of Law Enforcement in a Biomedical Crisis.” Police Executive Research Forum, January 2004.
<http://ohlhausen.com/quarantine-v9.pdf>

Butler JC, Cohen ML, Friedman CR, Scripp RM, Watz CG. Collaboration between public health and law enforcement: new paradigms and partnerships for bioterrorism planning and response. *Emerging Infectious Disease* [serial online] 2002 Oct [date cited]; 8. Available from: URL: <http://www.cdc.gov/ncidod/EID/vol8no10/02-0400.htm>

“Security During Disasters.” Prepared by the Greater New York Hospital Association (GNYHA). <http://www.gnyha.org/eprc/general/security/SecurityDuringDisasters.pdf>

Surveillance and Contact Tracing

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement B: SARS Surveillance. Centers for Disease Control, January 8, 2004.
<http://origin.cdc.gov/ncidod/sars/guidance/B/pdf/b.pdf>

“Public Health Management of SARS Cases and Contacts: Interim Guidelines.” Version 7. Health Canada. December 17, 2003
http://www.phac-aspc.gc.ca/sars-sras/pdf/phmanagementofcases12-17_e.pdf

Smallpox Response Plan and Guidelines (Version 3.0), Draft Guide A—Smallpox Surveillance and Case Reporting; Contact Identification, Tracing, Vaccination, and Surveillance; and Epidemiologic Investigation. Centers for Disease Control. November 26, 2002.
<http://www.bt.cdc.gov/agent/smallpox/response-plan/index.asp>

SECTION 5.

Meeting Essential Needs

An effective disease exposure control regime must meet the requirements of a population that has a diversity—and abundance—of needs. Addressing these needs is important to induce compliance and requisite to enforce compliance. Particularly in the case of large-scale outbreaks that may require expansive or prolonged disease exposure control measures, authorities must be capable of meeting the needs of those who cannot do so independently.

This chapter describes the variety of essential needs that should be met during disease exposure control. These can range from the very basics—food and water—to more sophisticated needs such as mental health. With any luck, many of these needs will be met without official aid. Unfortunately, it is possible that in a prolonged, large-scale outbreak, the personal resources of those observing DEC will not be sufficient. In such cases, official aid will be required.

Essential needs include *essential goods* (e.g., food; water; medical supplies), *essential services* (e.g., sanitation; energy; communication), *special populations' needs* (e.g., families, foreign nationals, prisoners), *financial needs*, *mental health needs*, and *non-outbreak-related activities*.

I. Essential Goods and Services

Essential Goods are goods that are required to maintain life, health, and general well-being. We categorize essential goods into three tiers: 1) basic life requirements; 2) general health and sanitation needs; and 3) compliance-enhancing goods. Essential services are those that meet daily needs and must be maintained during a crisis—including communications, utilities/heating, and sanitation.

Key Considerations

Basic Life Requirements

Basic life requirements most obviously include food and water (including special needs for special diets such as babies, diabetics, or elderly). Other essentials include medical supplies such as insulin and other life-sustaining prescriptions. The second tier—general health and sanitation needs—includes goods that will help maintain the health of those under disease exposure controls. These include sanitation supplies (soap, toilet paper, laundry detergent, bleach, household disinfectants) and medical supplies (bandages, antiseptics). The third tier of goods, while not essential, increase likelihood for compliance with disease exposure controls. This includes items such as communication devices (e.g., telephones or internet) or entertainment products (e.g., books, games, and newspapers).

Public Communications

Maintaining public communications services during an outbreak is an integral part of maintaining public cooperation and well-being. Some form of communication—whether

email, telephone, or teleconferencing services—must be ensured for those in home quarantine; provided for those in centralized or facility quarantine; provided for contact with families of those in isolation, and maintained for those in sheltering.

Utilities and Public Services

Utilities such as heating, air conditioning, plumbing, and electrical services must be maintained for those observing disease exposure controls. Though a public health crisis will be unlikely to affect most infrastructure such as gas lines and electrical wiring, certain buildings use oil for heat, and will need replacement heating oil during the winter. Ease of providing utilities may play into decisions about which facilities to choose for facility quarantine or isolation.

- **To avoid causing a secondary health hazard, sanitation and trash collection services should be maintained to the greatest degree possible.** Sanitation workers will not enter into a restricted zone unless appropriate safety measures have been taken. Public Health officials must therefore advise the responsible municipal department—as well as private trash collection companies—on special precautions that must be taken with waste produced in quarantined areas, and special precautions to be taken by employees when collecting that waste. It may be necessary for HAZMAT workers to take on additional duties in this area, if private sanitation workers are unwilling or unable to do so. Many cities transport their solid wastes across state lines—how will this be addressed. Additionally, much solid waste (sludge) is incinerated and sold for fertilizer—how will this be addressed?

Transportation of Supplies

Logistically, the transportation and effective distribution of supplies will be a significant challenge, but an important one. Although much of this will depend on the outbreak, key issues include ensuring safety and security of supplies and workers, and efficient mechanisms for delivery.

- **Response officials need to take advantage of abundant private sector transportation resources.** Depending on number of people observing disease exposure control measures, officials may need to utilize private sector resources (trailer trucks, refrigerated trucks, moving or shipping company trucks) to transport food and supplies. Agreements should be established with the private sector to provide such resources during an emergency.
- **Appropriate protective equipment as recommended by public health should be issued to drivers and protocols should be established for deliveries to Protective Zones** so that drivers are not placed at risk or required to quarantine. Any vehicles entering a Protective Zone should be decontaminated before leaving.
- **Key transportation protocols should be developed.** Such protocols include: a) transport of supplies to those in home or facility quarantine; b) transport of supplies to those sheltering; c) transport of supplies to hospitals; d) protection of supplies during transportation.

Distribution of Supplies

- **Health officials should issue guidelines for friends, relatives, or household-members to assist with supply acquisition and delivery to those in quarantine.**
- **Protocols should be developed for door-to-door deliveries, centralized supply pick-up zones, and drive-up supply pickup areas.** Which of these mechanisms for supply delivery will depend on the outbreak itself, but all of them are possibilities. Assigning roles to NGOs, Fire and EMS, or other organizations is important, as is developing protocols to use appropriate message boards and signage.
- **Pre-made “Essential Needs Packs” should be delivered by public health officials when making house-calls for the purposes of monitoring and observation.**
- **Protocol for supply distribution utilizing the warm zones around perimeter areas, to minimize personnel required to enter perimeter-controlled areas.** See discussion in the previous chapter on perimeters.

Resource Management

- **Coordination with the private sector, community leaders, volunteer organizations, and NGOs.**
- **Access regional or federal resource aid.** Mutual aid agreements, developed in advance of an outbreak, may provide additional resources in a time of strain; however it should be noted that in a large-scale outbreak it is unlikely that neighboring communities would have resources available to share. In states of emergency, states can access federal resources (described in greater details in Appendix I) for emergency response.
- **Maintain a real-time inventory of health care supplies, protective gear, and essential needs supplies.** A real-time computerized inventory allows planners to better manage supplies and to warn officials when they need to acquire additional supplies. Furthermore, an inventory that tracks the location of all supplies will enhance delivery and logistical capabilities. It is especially important to manage PPE supplies in hospitals, where stockpiling might occur and lead to shortage problems.
- **Train workers in use of PPE** and fit-test them to ensure effectiveness of equipment.
- **Utilize law enforcement to guard supplies.**
- **Provide educational materials to hospital workers and those observing exposure controls, in order to promote use of supplies.**

II. Special Populations' Needs

Essential goods and services will be largely the same across populations, but certain populations will require additional care and consideration. Some groups—such as families, religious groups, and ethnic groups—will be more likely to proactively cooperate with DEC if their special needs are met. Others—such as prisoners, foreign groups, and the homeless—are simply unable to observe DEC in the same way as the broader population.

Key Considerations

Families.

During the SARS outbreaks, preventing exposure of one's family was one of the greatest incentives for voluntary quarantine. At the same time, however, separation from family was a great source of stress to those in quarantine. Policies looking at family needs, therefore, should seek to maximize safety of family members as well as connectivity and communication between family members who are physically separated.

- **Separated family members should be provided with reasonable options for reunification.** A special case arises when either a parent or a child—but not both—must be quarantined or isolated. Even in cases where home quarantine is an option, exposed parents should, when feasible, be permitted to choose facility quarantine in order to minimize the risk to their children. On the other hand, parents of exposed children (who may normally be placed in facility quarantine/isolation) may wish to care for their children at home and should be allowed to do so if they can provide adequate medical care.

If a perimeter is formed around a facility or geographic area—with one family member in and one family member out—the family member within the perimeter could be released under the condition that he/she observes home quarantine in another location. In some cases, officials may even consider requests from family members to enter a quarantined facility or area in order to be with family members. In extreme circumstances such as imminent death of a person in isolation, family members may be permitted into isolation, provided that they use appropriate protective equipment and enter quarantine following the visit.

- **Childcare should be offered for children of critical hospital and response workers.** During an outbreak, parents—including those who are health care and response workers—may be hesitant to allow their children to attend school, even in cases where the risk of exposure may be low. Public schools, therefore, may be among the first facilities to close, requiring parents to stay home to care for children. Childcare provision for response personnel will help maintain the response workforce.
- **Multiple methods of communication should be made available to family members.** Communication via telephones, walkie-talkies, two-way radios, blackberries, e-mail, web-based chats, or videoconferencing are all potential options for connecting families.

- **Hospitals may consider a centralized database, accessible by hotline or via internetInternet, to identify individuals in quarantine or isolation.**

Special Needs Groups.

Groups that require additional resources due for example to problems with physical mobility or language skills, maybe unable to comply with DEC unless their special needs can be met. During the SARS Epidemic, for example, homeless and shelter populations posed particular difficulties because they had no venue for home quarantine and may have been a risk of transmission in an urban setting.

- **Homeless populations should be provided a venue for facility isolation, facility quarantine, or sheltering.** Homeless populations that may have been exposed need to be identified and transported to facility isolation or quarantine.
- **Special transportation should be arranged for the elderly, disabled, and/or immobile.** These groups may need special vehicles or the assistance of response personnel for transport to quarantine or isolation
- **Blind and deaf populations should have access to alternative forms of information communication.** Among other assistance, the blind will need Braille informational materials, and the deaf may require sign-language translation.
- **Measures should be taken to reduce the risk of spreading infection among prison populations.** Despite a perception that prisoners are isolated from the outside world, officials should remember that in reality they may be quite vulnerable during an infectious disease outbreak. Possible measures include restricting or canceling outside visits, requiring protective gear among prisoners and/or employees, adjusting sentences, shifting prisoner locations, and developing special protocols for prisoner transportation.

Foreign Groups.

In many cases, policies for dealing with foreign groups differ from those dealing with United States citizens.

- **Informational materials, signage, and in-person interactions must be made available in multiple languages.** Special needs hotlines should employ multilingual staff, and some hotlines may be dedicated entirely to calls in other languages. Health monitoring and counseling services, when possible, should be provided by multilingual workers, and quarantine orders and other legal documentation should be prepared in multiple languages prior to an outbreak.
- **When possible, efforts should be made to accommodate the needs of various ethnic groups.** Special care should be taken to ensure that control measures do not reflect any prejudice or bias against ethnic groups. Effort should be made to accommodate special diet and cultural practices when delivering food and supplies. Counseling should be provided, when possible, from those of the same ethnic and linguistic backgrounds.
- **Diplomats and other foreign nationals present unique problem legal and policy problems that deserve advance discussion.** Diplomats, in particular,

have diplomatic immunity and are not liable to “any form of detention.” Foreign nationals and tourists also require special consideration. Can illegal aliens who were exposed be deported? What is the best way to ensure that illegal aliens comply with case investigations without fearing deportation? Foreign tourists, lacking a home, may be unable to maintain home quarantine or sheltering, and may be required to enter facility quarantine or isolation.

Religious Groups.

During an outbreak, religious gatherings may be restricted, and certain religious practices (e.g., burials) prohibited. Maintaining a degree of normalcy in religious practices may bolster compliance with DEC measures. Thus while some religious practices may not be allowable, many problems may have creative solutions that are acceptable to both citizens and public health officials. This may include broadcast or webcast of social or religious events (e.g., worship services) that are not permitted due to community restrictions.

III. Mental Health Needs

A number of resources have been dedicated to meeting mental health needs during emergencies, and more specifically during bioterror attacks—in particular the World Health Organization (WHO).⁹⁸ Although we will not discuss the important post-emergency phase of mental health care, we will instead focus specifically on meeting the mental health needs of those observing disease exposure controls, as well as their families, communities, and associates.

Key Considerations

Family Communication

Ensuring communications for those observing disease exposure controls is critical to promote mental health during an outbreak. Whether by phone, videoconference, or internet/email access, those observing disease exposure controls should be provided with a means of contacting their families and friends. This is particularly important in the case of isolation, when family members are most worried for their sick relatives.

Counseling

When possible, mental health counseling is worth consideration. Professional counselors are most effective, but medical/health professionals can be trained to address—or at least be sensitive to—the mental health needs of those observing disease exposure controls. When appropriate and available, medications may also be provided to those under great stress. Counselors may use Internet chat rooms to talk to those observing disease exposure controls.

Promoting Normalcy

Efforts should be made to promote feelings of normalcy and minimize boredom. This means keeping families, religious groups, and ethnic groups together possible. Maintaining recreational activities, when safe, can also help. Efforts to maintain

⁹⁸ “Mental Health of Populations Exposed to Biological and Chemical Weapons. Van Ommeren, Mark, and Saxena, Shekhar. Prepublication version January 2004. WHO.

schooling through the use of internet and email communications with teachers will promote normalcy and minimize boredom among schoolchildren.

IV. Non-Outbreak-Related Activities

Although overextended hospitals and responders will be focused on outbreak response, they should take care to maintain the capability to perform some of their critical non-outbreak related activities.

Key Considerations

Non-Outbreak Medical Emergencies

Hospitals need to maintain the capability to address non-outbreak medical emergencies such as heart attacks and serious physical injuries. And while medical resources will likely be diverted from elective care procedures, officials should recognize the potentially serious longer-term health consequences of postponing elective procedures.

- **Officials should develop criteria to determine the appropriate location for non-outbreak care.** This included choosing to designate an entire hospital or for designating portions of hospitals for outbreak vs. non-outbreak care. Hospitals should assess whether they are able to separate portions of hospitals for outbreak and non-outbreak care, and develop a protocol for traffic flows and entry/exit within hospitals.
- **Hospitals should develop protocols for choosing medical personnel for non-outbreak emergency care.** Key considerations include staff who are pregnant, caring for immuno-compromised, have contraindications to potential treatments, or the social implications of decisions that may have serious negative impact for child/elder care.

Law Enforcement/ Security functions

Law enforcement personnel or private security will also be required to balance resources between outbreak response and traditional law enforcement functions. This balance will depend on nature of the disease exposure control measures required, but in all cases officials must maintain personnel designated for standard law enforcement functions.

- **Law enforcement officials should work with Public Health to prepare a list of potential roles and responsibilities for law enforcement and/ or other security personnel for exposure control.**
- **Develop a memorandum of understanding with unions regarding crisis roles for law enforcement personnel.**

V. Additional Resources

In developing operations guidelines for disease exposure control, the following resources may serve as useful references:

Risk Communication and Education

“Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS) Version 2.” Supplement G: Communication and Education. Centers for Disease Control, January 8, 2004.

<http://origin.cdc.gov/ncidod/sars/guidance/G/pdf/g.pdf>

Crisis & Emergency Risk Communication (CERC) Training, provided by the Centers for Disease Control.

http://www.cdc.gov/communication/emergency/erc_overview.htm Field Manual for

Mental Health

CDC Mental Health Resources Page

<http://www.bt.cdc.gov/mentalhealth/>

Mental Health and Human Services Workers in Major Disasters. United States Department of Health and Human Services, 2000.

<http://www.mentalhealth.samhsa.gov/publications/allpubs/ADM90-537/Default.asp>

Mental Health of Populations Exposed to Biological and Chemical Weapons.” World Health Organization, 2005.

http://whqlibdoc.who.int/icd/hq/2005/WHO_MSD_MER_05.1.pdf

Businesses

Hong Kong recommendations and guidance for businesses and various special needs groups. (SARS)

http://www.info.gov.hk/info/sars/e_business.htm

Singapore Business Continuity and workforce issues resources (SARS)

<http://www.sars.gov.sg/business.html>

Special Needs Groups

“Handbook on Prevention of SARS in Schools.” Education and Manpower Bureau, The Government of Hong Kong Special Administrative Region.

<http://www.emb.gov.hk/index.aspx?nodeid=643&langno=1>

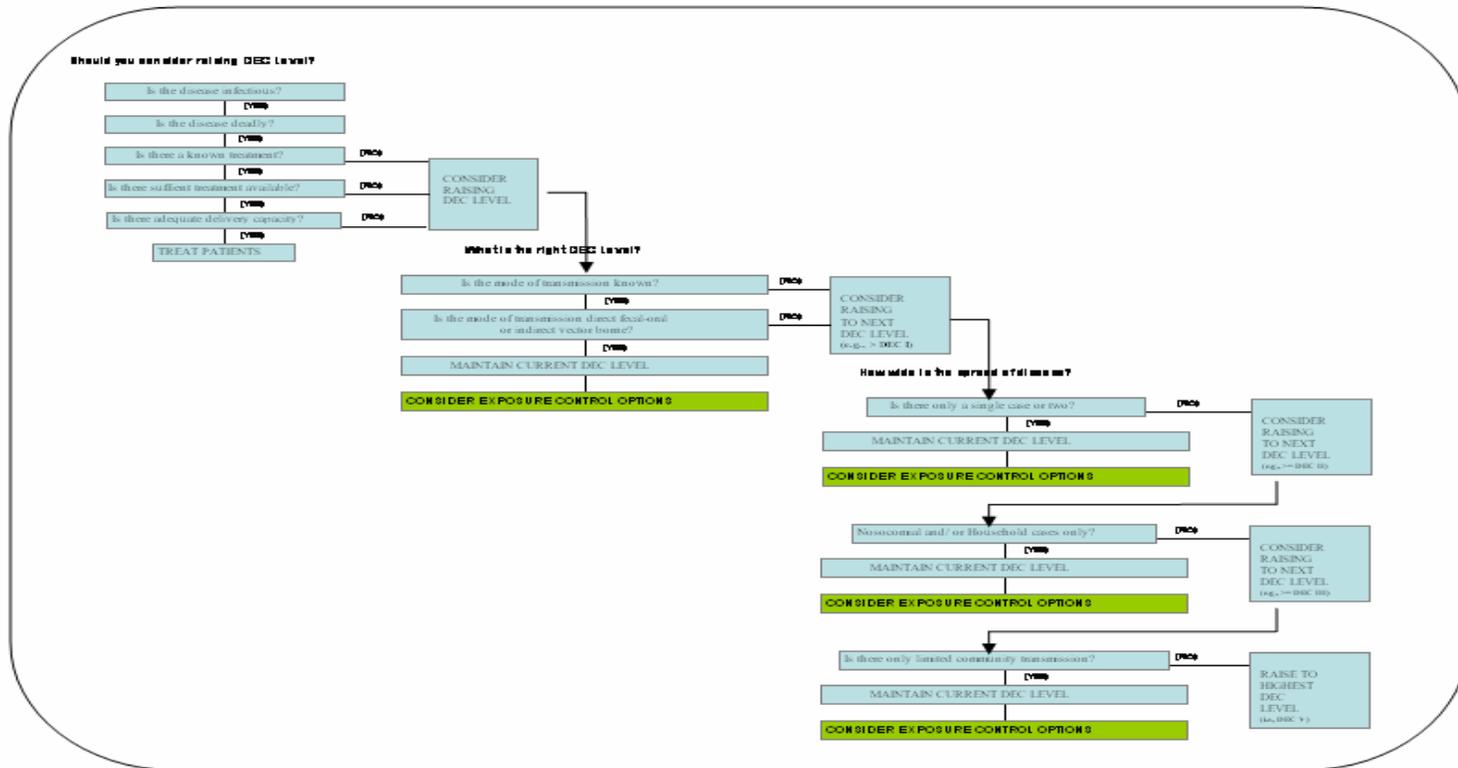
“SWD Review Report on Measures to Prevent the Spread of SARS in Elderly Homes.” Hong Kong Social Welfare Department. July 2003.

http://www.sars-expertcom.gov.hk/english/reports/submissions/files/swd_rrmps_sars_eh.pdf

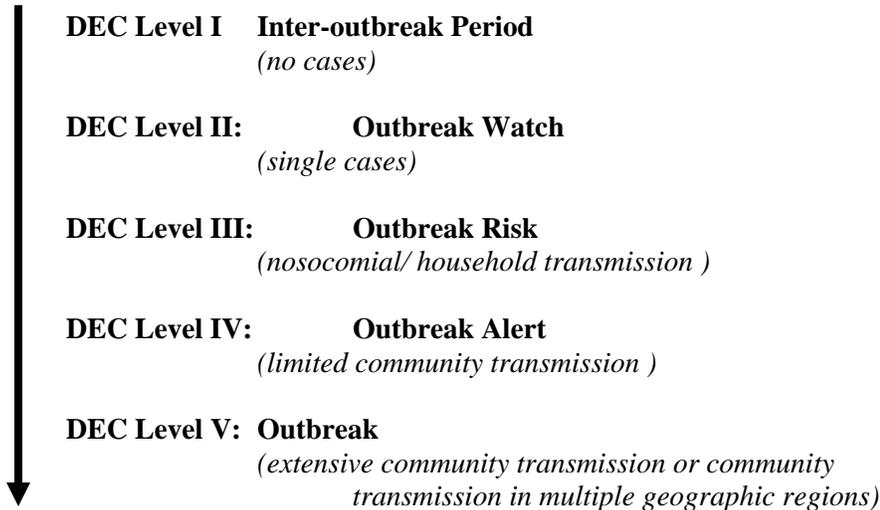
“Social Welfare Department’s Work Relating to the Prevention of the Spread of SARS.” Hong Kong Social Welfare Department. June 2003.

http://www.sars-expertcom.gov.hk/english/reports/submissions/files/swd_wrpsars.pdf

SECTION 6. Decisionmaking



I. DEC Levels



II. Example Response Measures

DEC Level I: Inter-outbreak Period

(no cases)

- a) Consider Legal/Policy Issues
 - Review and update current legal authorities and policies for emergency health response.
 - Coordinate with adjacent jurisdictions
- b) Education
 - Health care and response personnel should receive training in use of infection control, policies for disease exposure control measures, legal authorities, and protocols for large-scale outbreaks.
 - Businesses should review workman’s compensation laws.
 - Families should develop and/ or review individual family protection plans.
- c) Hospital Planning
 - Hospitals identify wards that can be separated for quarantine or isolation
 - Hospitals develop plans for constructing makeshift AIIR rooms
 - Hospitals develop traffic flow plans to minimize potential transmission
 - Consider whether new emergency department and triage protocols might be adjusted in advance of a potential outbreak to minimize potential exposures.
 - Consider whether use of infection control for hospitals and physicians should be expanded during normal times.
 - Develop a real-time inventory system to track hospital supplies.
 - Exercise plans annually and modify as appropriate

- d) Build relationships among responders
 - Public health, hospital, and law enforcement personnel and private responders
 - Public health and private businesses
 - Coordinate plans with Law Enforcement, EMS and Public health
- e). Develop emergency communication plans
 - Designate public relations spokesperson

DEC Level II: Outbreak Watch

(single or few cases)

- a) Establish an incident command structure.
 - Emergency Operations Managers designate incident lead with public health and medical officials support.
 - PH begin to liaise with law enforcement, hospital, response, and political leaders
 - In cases of potential terrorism, notify law enforcement and coordinate a terrorism/criminal investigation
- b) Implement enhanced infection control, isolation and quarantine as necessary.
 - Initiate aggressive contact tracing and case investigations
 - Place all contacts in home quarantine
 - Implement transportation protocols to transport those in quarantine to isolation, if necessary
 - Assess availability of vaccines, antivirals, antibiotics, supplies, and equipment. Take steps to identify sources of additional supplies.
- c) Begin to induce or enforce isolation and quarantine.
 - Enforce isolation of case by hospital guard if necessary
 - Open lines of communications with law enforcement personnel and work with them to issue home quarantine orders.
 - Monitor home quarantine orders by in-person house calls or phone calls
 - Observe quarantined persons closely for symptoms
 - Establish protocols for transportation of quarantined individuals to isolation, if necessary
- d) Establish operational capability to meet needs of those observing DEC.
 - Hold educational and informational sessions for hospital, medical, and response personnel
 - Establish and staff a hotline to manage special needs of those in home quarantine
 - Identify vehicles and personnel to deliver essential goods to those in home quarantine, when necessary.
 - Hospitals begin to inventory, track, and mobilize medical supplies, food and water supplies, infection control supplies.
- e) Issue public statement

DEC Level III: Outbreak Risk*(nosocomial/ household transmission)*

- a) Establish an incident command structure, if not already in place.
 - PH designate incident lead
 - PH liaise regularly with law enforcement, hospital, response, and political leaders
 - Issue frequent public statements

- b) Implement infection control, isolation and quarantine as necessary; consider facility-based action.
 - Isolate cases within hospitals; use alternative facilities or private homes when AIIR's are not available.
 - Initiate aggressive contact tracing and case investigations
 - Place all contacts in home quarantine
 - Provide infection control supplies to at-risk households
 - Consider alternatives to home quarantine (i.e. facility quarantine); identify hospitals or other facilities that might be used for isolation or quarantine
 - Implement transportation protocols to transport those in quarantine to isolation as necessary
 - Continually assess availability of vaccines, antivirals, antibiotics, supplies, and equipment.
 - Healthcare workers and others—laboratory workers, housekeeping, food services, facility engineers, etc.—may need to be placed under work quarantine; travel and housing arrangements should be made as necessary.

- b) Consider implementing community restrictions
 - Issue recommendations for good personal hygiene in the community
 - Consider limiting large public gatherings in high-risk areas

- c) Aggressively induce or enforce isolation and quarantine.
 - Implement protocols for law enforcement personnel to issue home quarantine orders.
 - Monitor home quarantine orders by in-person house calls or phone calls
 - Observe quarantined persons closely for symptoms; consider web-based monitoring
 - Transport quarantined individuals to isolation as necessary

- d) Establish operational capability to meet needs of those observing DEC.
 - Hold educational and informational sessions for hospital, medical, and response personnel and their families.
 - Establish and staff a hotline to manage special needs of those in home quarantine
 - Identify vehicles and personnel to deliver essential goods to those in home quarantine, when necessary.
 - Hospitals begin to inventory, track, and mobilize medical supplies, food and water supplies, infection control supplies.
 - Hold educational and informational sessions for hospital, medical, and response personnel
 - Deliver food or medication to those who are in need
 - Hospitals should track, inventory, and mobilize medical supplies and PPE

- e) Implement communications plan including issuance of press releases and establishing regular media briefings.

DEC Level IV: Outbreak Alert

(limited community transmission)

- a) Broadly implement infection control, isolation, and quarantine.
- Isolate cases within hospitals, alternative facilities, or homes
 - Implement a combination of home, facility, and geographic quarantines
 - Investigate the geographical factors in the outbreak to determine areas of high risk
 - Continually assess availability of vaccines, antivirals, antibiotics, supplies, and equipment.
 - Healthcare workers may need to be placed under work quarantine; travel and housing arrangements should be made as necessary.
- b) Implement community restrictions and consider sheltering.
- Implement a range of community restrictive measures, especially within the most heavily affected areas.
 - Recommend mask-wearing in high-density public spaces
 - Consider closing schools, public offices
 - Limit public gatherings or mass transit
 - Consider recommending sheltering within high risk areas
- c) Aggressively induce or enforce isolation, quarantine, and community restrictions.
- Implement protocols for law enforcement personnel to issue home quarantine orders.
 - Monitor home quarantine orders by in-person house calls or phone calls
 - Observe quarantined persons closely for symptoms; consider web-based monitoring
 - Transport quarantined individuals to isolation as necessary
 - Consider establishing perimeters and warm zones around the affected area
- d) Meeting Needs
- All hospital and medical personnel in affected areas must wear appropriate PPE
 - Establish incentives and reimbursement programs for hospital and response workers, as needed.
 - Establish efficient/safe centralized systems for food/ medication deliveries.
 - Establish warm zones for basing operations within community quarantines.
 - Hospitals inventory/track personnel, equipment, and PPE
- e) Communications
- Issue regular public statements, updates and informational briefings

DEC Level V: Outbreak

(extensive community transmission or community transmission in multiple geographic regions)

- a) Broadly implement infection control, isolation, and quarantine. Broadly utilize facility quarantine and community quarantine.
 - Isolate cases within hospitals, alternative facilities, and/or homes
 - Contact tracing may become difficult or impossible; any tracing done should be prioritized systematically
 - Implement a combination of home, facility, and community quarantines
- b) Broadly implement community restrictions; issue a strong recommendation for sheltering in affected areas.
 - Comprehensive use of community restrictive measures
 - Frequent temperature/symptom screening in public places
 - Consider recommendation or enforcement of universal PPE-wearing in public spaces
 - Strong recommendation for sheltering in certain areas.
- c) Aggressively induce or enforce isolation, quarantine, and community restrictions.
 - Promote financial incentives and reimbursement programs for those compliant with DEC
 - Consider establishing/enforcing perimeters around most crucial areas
- d) Meeting Needs
 - Hold educational/informational sessions for hospital, medical, and response personnel
 - Tap federal, private sector, and community resources when overwhelmed
 - Mutual aid from neighboring jurisdictions will likely be unavailable
 - Establish hotlines for special needs of those in quarantine
 - Establish efficient/safe centralized systems (i.e. warm zones) for food/medication deliveries
- e) Communications
 - Initiate daily press conferences; issue regular media updates and medical reports.

APPENDIX – I RESOURCES FOR DEC

Preparing and responding to biological events will fall principally on the backs of first responders in the local government. This principle holds true for the measures outlined in this report for disease exposure control. Still, local communities have several avenues for acquiring additional resources which, at the margins, could provide essential capacity for the health care system. Resources for DEC fall generally under two categories – those resources necessary to train and prepare local first responders before an event occurs, and external resources that can be brought to bear post-event. These resources can be tapped from a variety of sources, including the federal government, community groups, mutual aid and the private sector.

I. Federal Resources

While the Federal Emergency Management Agency is the main coordinating body for responding to disasters, the Department of Health and Human Services would also play a leading role in a public health crisis, and the Department of Defense would commit resources at the direction and discretion of civilian authorities.

Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency, a division of the Department of Homeland Security, would coordinate the federal resource response to a contagious disease outbreak or epidemic. FEMA and its coordinating agencies, such as the Department of Health and Human Services (and CDC as an operating division) would be designated as the lead federal agency and have the statutory authority to respond to a local or state disaster if an emergency is declared under the provisions of the Stafford Act. While FEMA and HHS are authorized to implement health and safety measures, they have no specific regulatory powers to “implement prevention and control measures outside the national quarantine system, as those powers reside with the states.”⁹⁹

A major FEMA resource for disease treatment and containment would be the National Disaster Medical System (NDMS), a network of hospitals and special teams designed to respond to acute health situations. These teams include:

- Disaster Medical Assistance Teams (DMATs)
- National Medical Response Teams (NMRTs)
- Disaster Mortuary Operational Response Teams (DMORTs)
- Veterinary Medical Assistance Teams (VMATs)
- National Pharmacy Response Teams (NPRTs)
- National Nurse Response Teams (NNRTs)

While NDMS teams would be useful in treating patients, it is unclear what role they would play specifically in disease exposure control measures. There are more than 6,000 personnel in Disaster Medical Assistance Teams (DMAT) nationwide, spread among roughly 80 teams. These teams, deployable within 24 hours and operational within 72 hours, typically provide an indirect role in providing surge capacity to the medical system

⁹⁹ QUARANTINE AND ISOLATION: LESSONS LEARNED FROM SARS A Report to the Centers for Disease Control and Prevention Institute for Bioethics, Health Policy and Law University of Louisville School of Medicine

in a mass casualty event. They have an outpatient throughput (for minor illnesses/injury) of about two hundred patients per day and can operate for up to two weeks. DMAT could treat a small number of isolated patients for a short period of time. If a disease outbreak led to a high number of fatalities, overwhelming local mortuary resources, the NDMS could also deploy Disaster Mortuary Operational Response Teams (DMORTs) to assist in the identification, storage and disposition of human remains. There are 2 portable morgues that could also be deployed. Besides the teams themselves, NDMS hospitals would provide surge capacity, and could tap military and VA hospitals as a last resort.

Department of Health and Human Services (HHS)

HHS has additional resources at its disposal for assisting local communities, principally through its Centers for Disease Control and Prevention (CDC). It also has the statutory authority to assist in a local public health response. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 directs the Secretary to “ensure that the Department of Health and Human Services is able to provide such assistance as may be needed to State and local health agencies to enable such agencies to respond effectively to bioterrorist attacks.” In addition, the CDC states that DHHS has similar responsibility in the event of a communicable disease outbreak, regardless of whether it is of bioterrorist origin. The CDC has limited response capability in terms of administering public health. Its capabilities are mostly in epidemiology and technical expertise. Its Epidemiological Intelligence Service would respond to a contagious disease outbreak or epidemic, and provide technical guidance on responding to an incident. The CDC also oversees the nation’s Laboratory Response Network (LRN), which provides a framework for regional and federal cooperation in identifying bioterrorism events and processing biological specimens. The LRN would be an important support function for local officials, but would not address major resource needs. CDC has a national capability in communications through its Epi-X and Health Alert Network, as well as its Emergency Operations Center.

State and local authorities may be able to tap the Strategic National Stockpile (SNS), operated by the CDC to support home or hospital care of isolated/quarantined individuals with supplies of specialized equipment or perhaps medicine. However, it is unlikely that these supplies would be adequate in a major isolation/quarantine situation.

Department of Defense (DoD)

DoD can assist in a public health emergency, but has no independent authority to impose restrictions on movement for reasons of public health. Under the Posse Comitatus Act, military personnel are prohibited from law enforcement activities aside from those activities specifically allowed in the Constitution or by an Act of Congress. However, the military is permitted by the under the National Response Plan to provide resources under the direction and discretion of civilian authorities in the lead federal agency. This authority would be provided by a Presidential Disaster Declaration or through a request for assistance to the Joint Directorate of Military Support at the Pentagon Joint Staff who then farms it out to Northern Command (NORTHCOM). In this capacity, NORTHCOM provides military assistance to civil authorities in emergency situations.¹⁰⁰ It has set up a Joint Forces Command in Norfolk, VA, which has a Joint Task Force for Civil Support to direct military resources for domestic contingencies. The main forms of assistance

¹⁰⁰ “DOD Helps Local, State, Federal Agencies in Disaster-Response Exercise” *Regulatory Intelligence Data* August 12, 2004

provided by NORTHCOM would be in transport, treatment, personnel logistics, communications, and/ or laboratory assistance (via USAMRIID). *Posse comitatus* restrictions would prohibit the U.S. armed forces from acting to enforce quarantines in a civilian population.

One resource which could be used in a limited capacity for a contagious disease outbreak is the USAMRIID Aeromedical Isolation Teams. The AIT “is a rapid response team with worldwide airlift capability. The AIT is designed to safely evacuate and manage patients with potentially lethal communicable diseases under high-level containment.”¹⁰¹ The capacity of these teams is not adequate to respond to a major incident requiring mass isolation. There are only two teams, and each can only transport two patients.¹⁰²

The Army’s Technical Escort Unit and Chemical Biological Rapid Response Team (CB-RRT) and the Marine Corps’ Chemical and Biological Incident Response Force (CBIRF) may assist in agent identification and removal, decontamination, coordination and technical expertise.

Environmental Protection Agency (EPA)

The EPA’s Environmental Response Team (ERT) is a group of experts specifically trained to deal with human health/environmental impacts of terrorist attacks. These teams—which have assisted with the anthrax cleanups in Washington DC and monitoring of air quality following the World Trade Center collapse—could aid in decontamination efforts help to develop procedures for quarantine.

II. State Resources

National Guard

For enforcement of isolation and quarantine, local communities could request that the Governor dispatch the National Guard, which has roughly 500,000 citizen-soldiers nationwide. Governors have the authority to command the National Guard to conduct state missions under powers granted by the federal government and their own state governments and constitution.¹⁰³ The Guard would play a vital role in enforcing cordon sanitaires and facility quarantines, and could supplement important law enforcement functions, such as hospital and transportation security, during a disease outbreak.

Some states have made efforts to create special National Guard forces devoted toward law enforcement in the event of a terrorist attack.¹⁰⁴ These forces should be trained in infection control and quarantine procedures as part of their anti-terrorism function.

The National Guard’s 44 WMD Civil Support Teams would also play an indirect role in DEC for bioterrorist-induced outbreaks by identifying a biological agent, providing technical assistance on emergency response, communications equipment for interoperability, and as a channel for other federal assistance. These teams are not designed to provide mass medical care or to enforce isolation or quarantine, however.

¹⁰¹ “Treatment of Biological Warfare Agent Casualties: Chapter 1”

¹⁰² “Air Evacuation Under High-Level Biosafety Containment: The Aeromedical Isolation Team” *Emerging Inf Diseases* Vol 5, No 2, April-June 1999 p. 241

¹⁰³ “The Role of the Military in Civilian Emergency Response” Vice Admiral Richard H. Carmona, MD, US Surgeon General July 26, 2003

¹⁰⁴ “National Guard Organizes Anti-Terrorism Force in Virginia” Associated Press November 6, 2004

Community Emergency Response Teams (CERTs)

State governments currently run local initiatives that would be crucial to an emergency response. In the future, Community Emergency Response Teams (CERTs), consisting of local individuals trained in emergency response, might be called upon to assist in an emergency medical response. CERTs train and coordinate with local first responders and typically handle auxiliary functions, although they are also trained to respond autonomously if professional first responders are not on the scene. CERT programs exist in 1,464 communities nationwide.

Unfortunately, these teams do not currently have the requisite skills for assisting in DEC. While these teams train in disaster medical operations, they would need additional training in personal protection to protect themselves and to prevent these teams from becoming inadvertent spreaders of disease. This will require additional funding above current levels. CERTs are currently funded through state government Citizen Corps programs, and through local or charitable funds. FEMA currently supports these local initiatives by providing “Teach the Teachers” training to prepare local first responders to set up CERTs in their communities, but will need to take a larger role if CERTs are to become a part of the DEC infrastructure.

III. Community Resources

Providing essential needs to individuals forcibly isolated or quarantined, or even voluntarily isolated, quarantined and sheltered is often beyond the limited means of local government. Besides federal resources, local communities can call upon the non-profit sector to assist in efforts to distribute basic needs, like food and medicine.

Red Cross

The Red Cross would be an essential service for providing food, shelter and mental health services to isolated, quarantined or sheltering individuals. With the greatest resources within local communities, the Red Cross would serve as the backbone for the human resources response. It currently responds to more than 67,000 disasters annually. Red Cross volunteers, however, will need additional training and preparation for operating in a hot zone.

Other Not-For-Profit Community Groups

Other not-for-profit organizations could provide either broad-based or specific services based on their capabilities. The United Way, for instance, through its Emergency Food and Shelter National Board Program, would be able to assist in Red Cross activities for providing food and shelter to isolated, quarantined or sheltering individuals. On the other hand, organizations with specific missions, like Meals-on-Wheels could assist in one component of the emergency response for these individuals. Like all first responders, these organizations would need education and training in advance.

Local Religious Organizations

Local religious groups, such as churches, synagogues and mosques, are an essential component of most major disaster response systems. They often have the capacity to assist in the supply and distribution of essential needs and provide services to special populations, like the young, homeless and needy, through homeless shelters, soup kitchens, religious schools and houses of worship. They are also important linchpins for

mitigating the psycho-social effects of a medical disaster, by providing religious services for the ill and deceased.

Community Outreach

The essential component of preparing all of these organizations for DEC is by helping them to train. Without personal protection training, their assistance may inadvertently contribute to disease transmission in the community.

IV. Private Sector Resources

Specific industries can also provide essential resources to help local governments respond to quarantines. Some of these industries, such as transportation and communications, often rely on both private and public companies. Essential private and public services will need to remain in operation in a hot or warm zone to assist in and ensure an adequate emergency response.

Private and Public Transportation

With appropriate planning and training, private and public transportation systems can be incorporated into the human resources response to a large-scale quarantine.

Business Development Districts

BDD's serve as important means of pooling private sector resources and enhancing business districts. With appropriate planning and training, they can provide essential services to business districts, including stockpiling infection control supplies and training security to respond to infectious disease outbreaks through appropriate use of PPE's.

Refrigerated Trucks

In the event of a mass casualty outbreak or epidemic, local industry, such as grocery and mass retail stores, could supply refrigerated trucks for temporary storage of human remains. This, however, became an issue during the fall 2001 anthrax attacks in terms of how to decontaminate the vehicles once they are used for storing remains. People were concerned about contaminating food or goods transported after their use as storage vehicles.

Essential Services

As noted in the *Essential Needs* chapter, many industries will need to remain in operation to provide basic services to both the impacted and general populations. Communications to the public, through mass media and also telephone, will be essential to avoid public panic and misperceptions. A wide range of additional private and public services will need to remain in operation to assist the emergency response and provide for essential needs to the impacted and general populations. Local sanitation, heating, air conditioning, plumbing and electrical services will need to be maintained to provide essential services to isolated, quarantined or sheltering individuals. Grocery, fuel and mortuary services will similarly need to be provided. Dialysis centers, nursing homes, prisons, mental health facilities, pharmacies and homeless facilities must remain in operation. All of these services will prove challenging if employees or facilities of these companies are impacted by the disease outbreak or epidemic. It may be necessary to allow essential service workers to continue to operate with PPE in a hot zone, and remain in work quarantine while off duty.

Acronyms

A/C	Air Conditioning
ACLU	American Civil Liberties Union
AIDS	Autoimmune Deficiency Syndrome
AIIR	Airborne Infection Isolation Room
AIT	Aeromedical Isolation Teams
ATEU	Army Technical Escort Unit
BDD	Business Development District
C-BIRF	Marine Corp Chemical and Biological Incident Response Force
CB-RRT	Army Chemical Biological Rapid Response Team
CDC	Centers for Disease Control and Prevention
CERT	Community Emergency Response Team
CSIS	Center for Strategic and International Studies
DEC	Disease Exposure Control
DHS	Department of Homeland Security
DMATs	Disaster Medical Assistance Teams
DMORTs	Disaster Mortuary Operations response Teams
DoD	Department of Defense
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ERT	Environmental Response Team
ESAR-VHP	Emergency System for Advance Registration of Volunteer Health Care Personnel
FBI	Federal Bureau of Investigation
FD	Fire Department
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
GIS	Geographical Information Systems
GPS	Global Positioning System
HAZMAT	Hazardous Materials Team
HCW	Health Care Worker
HDP	Homeland Defense Program
HHS/ DHHS	Department of Health and Human Services
LRN	Laboratory Response Network
MDR-TB	Multi-Drug Resistant Tuberculosis
MHS	Marine Hospital Service
MSEHPA	Model State Emergency Health Powers Act
NDMS	National Disaster Medical System
NEMA	National Emergency Management Association
NGO	Non-Governmental Organization
NMRTs	National Medical Response Teams
NNRTs	National Nurse Response Teams
NORTHCOM	U.S. Northern Command
NPRTs	National Pharmacy Response Teams
ODP	Office of Domestic Preparedness
PH	Public Health

PODs	Points of Distribution
PPE	Personal Protective Equipment
SARS	Severe Acute Respiratory Syndrome
SHSS	State Homeland Security Strategy
SNS	Strategic National Stockpile
TB	Tuberculosis
URL	Uniform Resource Locator
USAMRIID	U.S. Army Medical Research Institute of Infectious Diseases
VD	Venereal Disease
VMATs	Veterinary Medical Assistance Teams
WHO	World Health Organization
WMD	Weapons of Mass Destruction

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