2009

# Disease in the desert: Las Vegas as a case study of how first responders and emergency managers understand novel threats to human health and plan to respond during biological emergencies

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# DISEASE IN THE DESERT: LAS VEGAS AS A CASE STUDY OF HOW FIRST RESPONDERS AND EMERGENCY MANAGERS UNDERSTAND NOVEL THREATS TO HUMAN HEALTH AND PLAN TO RESPOND DURING BIOLOGICAL EMERGENCIES

by

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Bachelor of Arts, Political Science
University of Nevada, Las Vegas
2006

A thesis submitted in partial fulfillment of
the requirements for the

**Master of Arts Degree in Political Science**
**Department of Political Science**
**College of Liberal Arts**

**Graduate College**
**University of Nevada, Las Vegas**
**December 2009**

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

THE GRADUATE COLLEGE

We recommend that the thesis prepared under our supervision by

**Monique Williamson**

entitled

**Disease in the Desert: Las Vegas as a Case Study of How First Responders and Emergency Managers Understand Novel Threats to Human Health and Plan to Respond During Biological Emergencies**

be accepted in partial fulfillment of the requirements for the degree of

**Master of Arts**
Political Science

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**December 2009**

ABSTRACT

**Federalist Response to Widespread Pathogenic Invasion**

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Over recent years it has become clear that technological advancements, globalization, and ecological change, combined with the onset of increased terrorist incidents, are all currently working to create an extremely hazardous environment in terms of pathogenic invasion. Realizing that infectious diseases are both newly emerging and re-emerging in many parts of the world, the question of how prepared an expansive United States will be in the face of an oncoming global pandemic is easily raised. Using Las Vegas as an example of just how unequipped a largely visited U.S. city may be in the face of such a situation, this thesis analyzes biological emergency preparedness methods amongst local emergency response agencies. No matter what the origin, during any large-scale emergency it is extremely important for response to be quick and effective, with decision making responsibilities retained within agencies that posses strong understandings of local capabilities, rather than shifted towards federal agencies that do not often take into account unique local needs. For this reason, the following thesis will test the relationship that exists between emergency managers across different levels of disaster response in order to reveal the true effectiveness of a federalist-dominated disaster mitigation system.

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# CHAPTER 1

## INTRODUCTION

In August 2000, the largest emergency-preparedness drill to date was conducted, named “Operation Top-Off, ” for Top Officials. Its purpose was to test the ability of a large scale American city to respond to a localized epidemic. After only a couple of hours of role-playing, “administration officials pretending to be state and local emergency responders were overwhelmed by the demands of thousands of hypothetically sick and dying people” (Miller et al, 2002, p.233). Local medical offices rapidly exhausted their stocks of antibiotics and vaccines, federal quarantine laws turned out to be too antiquated, and no state had adequate plans to take care of the people it had isolated, let alone any idea where to bury the still-contaminated dead. “Discovering huge gaps in logistics, legal authority, and medical care, officials began quarreling among themselves and with Washington over how to stem the epidemic,” and no one seemed to be in charge of the overall procedures (Miller et al, 2002, p.271).

It has become apparent over recent years that many regions of the United States remain unprepared to deal with an infiltrating pathogenic threat. While the above scenario is just one example of how federal government intervention has only served to undermine and confuse, rather than guide and strengthen state response efforts, a larger problem exists. Thus far, policymakers at the local level have chosen to ignore the possibility of a large-scale disease epidemic taking hold on U.S. soil. This has not only allowed the country to remain unprepared for the threat, but has also removed from public discussion the likelihood of a mass pandemic destroying many regions of the country.

In today's global environment it is no wonder that the country must prepare itself to deal with novel biological threats. Many diseases are currently re-emerging due to demographic changes such as urbanization as well as technological advancemans in travel that have allowed people to invade areas that were once isolated and remote. "Human encroachment of wildlife habitat has in fact broadened the interface between nature and humans, increasing opportunities for both the emergence of novel infectious diseases and their transmission to people" (Patz et al, 2004, p.1095). Throughout the coming chapters, multiple threats to human health stemming from a variety of different sources will be analyzed. Each source of threat requires a choreographed response by both emergency management teams and government agencies.

"Hazards, disasters, and the multitude of dangers that exist in modern society are the reasons we have government," yet government does not always respond and protect citizens as it should (Waugh, 2000, p.1). Specifically in the realm of emergency management, it appears that the country's federal system often confuses effective response measures. Typically during a severe emergency, "federal, state, and local governments, operating with different mandates, levels of resources and staff backgrounds and capacities" scramble together to respond (Kettl, 2009, p.20). Such a system creates unnecessary overlap and competition, rather than coordination and cooperation between response agencies.

Based on the hypothesis that technological advancements, ecological change, and the onset of increased terrorist incidents are all currently working to create an extremely hazardous environment in terms of pathogenic invasion, this thesis raises the issue of how prepared certain U.S. localities would be in the face an oncoming biological crisis. Using

the city of Las Vegas as an example, this thesis specifically poses the question of how prepared local emergency response agencies are to deal with a fast-spreading disease epidemic. In order to answer this question, local Las Vegas emergency managers were interviewed. From these interviews a second hypothesis became apparent; that in order for response to a human health crisis to be effective at the local level, the federal government must allocate resources responsibly and ensure that federalist, polycentric ideals regarding emergency response measures are preserved, rather than thwarted.

## Natural Threats to Human Health

Looking at the most influential and calamitous events in human history, it appears as though many have been beyond human command. Oftentimes, the fate of humanity has rested not on its own doing, but on the natural world surrounding it. Thus by ignoring impacts of the natural world and overemphasizing humanity's control over its own fate, many scholars have overlooked the power that the surrounding environment has upon all species (Hobhouse, 1990, p.128).

Ecological factors have in fact led to cycles of human development and degeneration throughout recorded time. For most of human history the fates of scattered clans and tribes were largely determined not by war or politics, but by local constraints of nature, primarily the availability of food, water, and other resources, as well as by local encounters with pests, predators, and pathogens (Pirages, 2007). Since the success of a society is determined by how equipped and capable it is to adapt and respond to the often severe consequences of varying environmental factors, it is important to determine what potential scenarios may arise out of today's changing global environment.

Currently, natural forces are shifting to alter the prospects of human societies in the form of much more resilient human diseases. Climatologists have stated that the current temperature of the globe is increasing rapidly, and since many outbreaks of disease are known to follow specific weather patterns such as extreme heat, disease epidemics are consequently on the rise. Furthermore, the vectors that carry many types of diseases thrive best in warmer climates, so as vector numbers increase, so do the numbers of disease epidemics that follow (Hunter, 2003, p.43).

Ecological changes and corresponding shifts in rainfall in North America have thus far allowed mosquito populations to carry diseases like West Nile Virus to nearly every U.S. state. Similarly, wild birds following changing climatic migratory patterns can easily spread disease to new locations. Influenza viruses especially are known to be spread by birds. A key factor to influenza's deadliness is that it is "among nature's simplest and most mutation-prone RNA viruses," allowing it to spread and survive easily between different types of species (Kellman, 2007, p.28). Recently, the world has seen the reemergence of both H5N1 Avian Influenza Virus and H1N1, also known as the "Swine Flu" due to this phenomenon.

While Avian Influenza did not become a worldwide pandemic, the Swine Flu has become just such a disease, being passed and spread between humans on nearly every major continent. Originating in Mexico in late March 2009, within three months the World Health Organization (WHO) had reported seventy-four countries as being infiltrated by the flu, resulting in at least 28,780 cases worldwide. The U.S. alone reported more than 13,000 cases by early June 2009 and at least twenty-seven deaths. Despite its relatively miniscule mortality rate, it is the rapidity in which the flu has

spread, and the vast number of countries it has reached, that officially makes it a pandemic.

Besides the influenza viruses described above, the recent emergence of Severe Acute Respiratory Syndrome (SARS) has also shown leaders throughout the world just how fast an infectious disease in today's time can cross borders and ruin global trade and travel. In just six months SARS was reported in over twenty-nine countries in Asia, costing the region almost 100 billion dollars in economic growth. One can thus easily see the damage that any infectious disease outbreak can have on a local region, not only in terms of health costs and losses of life, but in terms of economic sustainability and prosperity.

## Man-Made Threats to Human Health

### Threats to Human Health due to Advances in Transportation

With this new age of social complexity, fast paced transportation and global interaction has left the contemporary world system perhaps more fragile than its predecessors in terms of susceptibility to infectious disease. Evidence of this is the fact that "in the year 2000, the World Health Organization officially announced that infectious diseases worldwide now represent a deadlier threat than war" (Cooper, 2006, p.115). Besides transporting humans and their diseases, technological innovations in travel have facilitated the growing global trade of agricultural products.

Being able to transport exotic plants, animals, etc. around the world, has increasingly brought humans, animals, and plant life into greater contact with foreign diseases (Brower, 2003, p.15). Any physical contact occurring amongst previously separated biological specimens often facilitates the spread of disease, as a specimen is

more susceptible to novel microorganisms that it has had no previous interaction with. Many of the zoonotic diseases found in the United States, including Mad Cow Disease, in fact originated from imported animals.

Over recent years, the policy of world trade has come to represent open borders and few barriers between nations, inevitably driving invasion by foreign species (Bright, 1999, p.52). In the search for profit, recent international policies have encouraged the transfer of goods across borders, without taking into account the damage such interactions can cause to local populations. Besides the obvious spread of dangerous pathogens, newly integrated plants and animals can easily disrupt and destroy local ecosystems (Kawachi & Wamala, 2007, p.21). Such outsiders suppress native species by consuming resources that they would have used instead, thus altering the basic checks and balances of the region (Bright, 1999, p.58).

This fact is significant to human health as “active ingredients from at least a third of all prescription drugs are derived from wild plants and fungi” (Pirages, 2007, p.4). As biodiversity is lost then, humans consequently become even more vulnerable to pathogenic threats. “In tropical forests alone, it was estimated by biologists that three species are being eliminated every hour by the habitat destruction caused by invasive species” (Gilpin, 2000, p.209). Ironically then, while bacterial invaders may be working to weaken humans through direct illness, they may also be working to indirectly promote illness by attacking naturally occurring medicines.

Threats to Human Health due to Advances in the Biosciences

Looking at past pandemic trends it is obvious that disease has always been a function of high populations, with humans only beginning to suffer significantly from

disease when populations reach a certain density (Hobhouse, 1990). While in the past there was a triangle of forces at play in which population growth affected the available food supply, resulting in famines that easily led to disease, mankind has since become capable of increasing its supply of food and defeating many diseases, thus allowing populations to grow unchecked (Hobhouse, 1990). Such growth has ironically allowed for more of the consumption, waste, and pollution that often produce new and much more deadly diseases. In today's densely populated world then, humans will not be able to easily escape the onslaught of a mass pandemic, strengthening the potential lethality of any emerging disease.

Besides suffering the consequences of increases in travel and extreme population growth, modern societies have also been exposed to biotechnological advancements in medicines that have allowed for acceleration in the emergence of counter resistance. According to the CDC, nearly all bacteria of concern have developed some resistance due to antibiotics over recent years (Brower, 2003, p.69). Many diseases have similar symptoms at onset leading to misdiagnoses and hence mistreatments that cause patients to be prescribed unnecessary antibiotics.

Consistent misuse of antimicrobial drugs has resulted in the emergence of drug-resistant strains of parasites, bacteria, and viruses. Thus "while scientific progress has certainly helped to mitigate the effects of certain infectious ailments, overuse and misuse of antibiotics both in humans and the agricultural produce they consume, has generated ever more resilient, resistant, and powerful disease" (Brower, 2003, p.17). So while pre-pandemic vaccines and post-exposure drugs used to be the government's answer to

epidemics, they are now believed to have caused healthy people to gain a tolerance and become immune over time.

Additionally problematic with antibiotic use is that fact that there is now overconfidence in existing drugs. This has created a disincentive to develop new antibiotics for emerging diseases, leading to a dangerous lag (Hamburg et al, 2008, p.18). Within the Unites States, there are still not enough domestic stockpiles of many antiviral drugs. According to the CDC, the country has fifty million treatment courses of the main antiviral drugs Tamiflu and Relenza in the Strategic National Stockpile. Seven million courses of Tamiflu are strategically positioned and promised to the U.S. Department of Defense and twenty-five percent of the forty-three million courses left are to be shared by all the fifty states. Clearly, those states that first become infected will be prioritized, leaving others weak and vulnerable.

Threats to Human Health Stemming from Biological Terrorism

One of the main reasons biological agents are likely to become a weapon of choice by hostile groups is the fact that outbreaks of disease are often attributable to natural occurrences. Disease outbreaks have long been known to be used to bring down empires. “In Rome, there were at least eleven major disease outbreaks that undoubtedly originated in the Empire's periphery, and proved to be a significant limitation on the empire’s ambitions” (Pirages, 2007, p.11). Once the dominant society becomes weakened by disease, it easily falls prey to groups waiting to attack.

Unleashing a biological agent is perhaps a better method of impairing large numbers than any other form of hostile attack. It “does not announce itself with a large explosion…one cannot smell, taste, or see biological agents…[and] the attack is not

known until sick patients begin arriving in hospitals and doctor's offices sometimes days after initial exposure" (Frist, 2002, p. 1). Such elements make detecting a disease prior to its mass dissemination amongst the public nearly impossible.

## Think Globally, Act Locally: Las Vegas as a Case Study

Realizing that infectious diseases are currently both newly emerging and re-emerging in many parts of the world, the question arises of how prepared the many separate regions of an expansive United States will be in the face of a devastating global pandemic. Using Las Vegas as an example of just how unprepared a largely visited U.S. city may be in the face of a fast-spreading infectious disease, local preparedness measures will be assessed. Las Vegas is a key city for observation, not only because it has been identified as a city likely to be attacked by terrorists by the Department of Homeland Security, but also because the city has over the years proven weak in its ability to provide medical care for its population, as well as maintain adequate numbers of medical staff. If an attack or pandemic of any sort were to therefore transpire, Las Vegas would be left particularly vulnerable to catastrophe in terms of mortality rates, etc.

Within the city of Las Vegas, tourists from all regions of the world come to visit and can bring with them a variety of pathogens. According to the "Las Vegas City Guide," approximately 30 million people visit Las Vegas each year. The city also has a unique immigration rate. According to the Nevada census, about thirty percent of the city's population is composed of immigrants, many illegal. This is significant regarding the heath of Las Vegas because illegal immigrants are not screened medically like legal immigrants upon arrival, and thus may enter the city with any number of preexisting diseases (Brower & Chalk, 2003, p.64).

Regarding the health of Las Vegas' non-transient population, the state of Nevada ranked forty-two in the 2008 *America's Health Rank* (Pope, 2009 p.2). Additionally, poverty and homelessness are other major factors that contribute to poor health. In Las Vegas, the number of households facing foreclosure continues to double, causing it to be referred to as the "epicenter of the nation's housing crisis" (Urevich, 2008). With loss of home and employment, the loss of health insurance often follows, and those struggling financially will find it difficult to receive appropriate preventative care, nutrition, etc., allowing them to become easily susceptible to many diseases.

When discussing the protection of citizens from disease, the basic level of defense lies with local physicians who have the knowledge and hopefully expertise to identify and treat the problem. Another problem within Las Vegas then, is the fact that it has a health care system characterized by declining reimbursement for physicians' services resulting in many physicians relocating out of the city to counter severe pay cuts (Debas, 2003, p.978). Rising malpractice rates throughout the entire state of Nevada have also been blamed for further discouraging many physicians from remaining in practice within the state.

Whether a biological pandemic stems from natural or man-made causes, any city under microbial attack would be forced to deal with either situation in an identical manner. First responders will be crucial, as they are the primary step in properly subduing the results of a catastrophe. Typically, first responders on the scene of an emergency are defined as: local law enforcement, members of the fire department, and those with sufficient medical expertise to properly treat victims. Unique to a disease epidemic, the first responders at the scene of any disease attack would also include experts from the

local health department, attempting to ascertain the origin and extent of any outbreak. First responders are the main sources of information for researchers attempting to obtain knowledge regarding preparedness in a state of biological emergency. As such, it is important to first discover how they understand the problem at hand.

Interviewing heads of first responder teams is essential because the interaction that occurs between emergency managers and the federal government is key when speaking of ameliorating any sort of biological threat. While the federal government has many more resources to combat the effects of an emergency, local emergency mangers are best able to create appropriate response measures to a localized epidemic. They are aware of local population concentrations, the number and location of care facilities, and the approximate cost of an outbreak in terms of damage caused to local businesses and public infrastructure. In order to best defend local citizens from pathogenic health threats then, local emergency mangers will need to realize their capabilities in terms of technical feasibility, economic constraints, and maintaining sufficient staff numbers, so that the federal government is continually informed on how to best support local response functions.

## Conclusion

In order to justify government emphasis on the potential consequences of biological threats, it is important to prove that such threats indeed present just as great a risk to society as conventional problems. This thesis poses just that; that with changing ecologies and capabilities of scientists around the world, the threat of a newly emerging disease epidemic reaching the United States is becoming more and more likely. Even if terrorists do not resort to acts of biological warfare, and the environment does not

immediately begin to unleash a barrage of pathogenic disasters, it is still generally essential to maintain or strengthen current public health measures and the abilities of local first responders (Menne & Ebi, 2006, p.59). Becoming better equipped, trained and prepared to deal with basic threats to human health can only be of benefit because the same comprehensive agenda for preventing emerging infectious diseases through research, surveillance, diagnostics, treatments, etc., can be attributed to any source of localized health problem (Hamburg et al, 2008, p.2).

Overall, the goal is not to attempt to control nature or the adverse actions of others, but rather to enhance responsive capabilities in order to reduce human suffering in the face of any massive disease infiltration. Local capabilities must thus be strengthened first and foremost. In order for there to be an effective response, the federal government must work to empower local responders through sufficient funding and resources prior to an emergency, rather than dominate relief efforts at the last minute. Local emergency mangers must remain in constant communication with federal and state agencies in order to ensure that necessary resources are properly allocated in the realm of responding to emerging biological threats (Hamburg et al, 2008, p.23).

# CHAPTER 2

## ECOLOGICAL THREATS TO HUMAN HEALTH

"From a long-range historical perspective, the world's current ecology would be characterized as a period of unusually benevolent climatic stability and relative resource abundance" (Pirages, 2007, p.1). For the past 10,000 years, this has allowed humanity to flourish and create great civilizations, but this pleasant ecological period may quickly be reaching its end. It has been predicted that "over the next fifty years, global ecological transformations and resulting changes in species occurrences will have enormous impacts on biodiversity, ecosystem function, and human health" (Cumming & VanVuuren, 2006, p.487).

Much of this global ecological change can be attributed to a change in the way humans now interact with their environment; through man-made technologies and infrastructures. Alongside great technological advancements has stemmed a need for energy and power. "For one hundred years, a major source of power was derived from coal, then for the next hundred years, oil" (Gilpin, 2000, p.265). These two sources of energy together produced many of the ecological problems seen today.

Scientists predict that increasing carbon dioxide emissions from both coal and oil over time have induced long-term progressive changes in the world's ecology, primarily global climate. Emitted during fossil fuel combustion and forest clearance, as well as from irrigated agriculture, animal husbandry, and oil extraction, anthropogenic greenhouse gases have been gradually initiating climatic warming for the last century (Watson & McMichael, 2001, p.68). Much of this can be attributed to the fact that, as gas

emissions prevent heat from escaping the Earth into space this trapped heat additionally melts global ice sheets that cool the Earth by reflecting rays from the sun.

With these factors combined, scientists have claimed that the atmosphere will within the next few decades have heat trapping abilities never before seen by man (Linden, 2006, p.118). According to the UN Intergovernmental Panel on Climate Change, in just the last fifty years, "the global average surface temperature has increased by $0.6^{o}C$; the sea level has risen on average by 10-20 cm, and the temperature of the oceans has also increased" (Patz & Kovats, 2002, p.1094). Each of these events has grave consequences for humanity and must be looked at as threats to the security of present-day societies.

## Impacts of Increased Temperatures on Human Health

With increases in extreme events like rises in temperature, excess rainfall, drought, etc. there are enormous consequences for human health. Thus far, there has been a limited sense that global ecological changes and public health are linked, yet it appears as though their connection resides in the manifestation of disease. This chapter will focus on current global changes and the specific impact they may have upon disease, whether brought on by temperature fluctuations themselves, or by their consequential affect on disease carriers.

### Increased Temperature and Corresponding Precipitation

"As temperatures warm the atmosphere can hold more water vapor, leading to increasing precipitation" (Menne & Ebi, 2006, p.103). When increased temperature and increased rainfall occur simultaneously, especially in an area predisposed to just one of

these factors, human biological security can easily become at risk. Many of the risks associated with higher rates of precipitation originate from increased flooding.

Flooding allows disease to proliferate in four major ways. First, rising waters force vertebrate hosts of disease, such as mice or rats, into closer contact with humans. Second, areas of stagnant water are created, where insect disease carriers such as mosquitoes can easily proliferate (Hunter, 2003). Unique to mosquitoes, their eggs remain viable and infected in dry areas until the next heavy rainfall produces flooding of their habitats, releasing infected mosquito larvae (Lemon et al, 2008, p.20). Third, higher rates of humidity and consistent dampness work to increase microbes' survival rates. Recent medical advances have shown that, besides leading to infection, some strains of microbes and bacteria play major roles in inducing forms of human cancer, with up to eighty-four percent of some cancers being attributable to bacteria (Price-Smith, 2002, p.37).

Finally, rushing flood water has the unique ability to destroy everything in its path, from man-made facilities needed for sanitation, hospitals, etc., to nearly all vegetation. Environmental damage caused by flooding can thus lead to the depletion of a number of particular resources that combat disease, including rare plants needed to produce many anti-microbial medicines, as well as the laboratories and hospitals needed to create and distribute them (Inouye, 2005, p.211). Additionally, damage to certain facilities disrupts sanitation methods, particularly sewers containing human waste, further advancing disease spread.

With sea levels rising due to melting snow and increased precipitation run-off, increased rainfall may also have direct consequences on cities located far from flooded

regions. Currently, thirteen of the world's twenty mega cities are situated at sea level, and with increasing ocean volumes, many of the millions of residents within these cities may soon need to seek out places of higher elevation, farther away from shorefronts (Patz et al, 2004, p.1095). Not only will inland cities thus be inundated with immigrants, but if they lack adequate health infrastructure, they will not be equipped to handle the corresponding influx of disease-ridden refugees fleeing from contaminated areas.

Increased Temperature and Corresponding Dryness

While the consequences upon disease from flooding are apparent, extreme dryness also has negative impacts on the health of humans. Current statistics of global warming have shown that “the mean number of days exceeding the health-based ozone standard will increase by sixty percent within the next forty years” (Lemon et al, 2008, p.93). Such an increase in temperature weakens victims, as it diminishes immune systems and thus amplifies susceptibility to bacterial invasions over time.

Breathing and lung health often deteriorate in drier areas because temperature and the formation of ozone at ground level are related. Higher temperatures, combined with dryness, tend to produce an increased amount of certain air pollutants, aeroallergens spores, and molds (Patz & Kovats, 2002, p.1096). Extreme heat and dryness may thus become a serious concern for anyone afflicted with underlying health conditions such as obesity, alcoholism, etc., as people who suffer from these chronic conditions often endure dehydration, exhaustion, and lung deterioration much more easily.

Additionally, increased temperatures and subsequent drought have severe impacts on areas like the Western portion of the United States, where “even modest decreases in rainfall over time could reduce available water for the area by half within forty years”

(Linden, 2006, p.253). Millions of people dependent on the region's source of hydroelectric power would consequently experience quite a dilemma. Not only would electrical grids fail, but continually diminishing levels of water could make the region uninhabitable for the large population it currently sustains.

Consistent drought further affects the number of Cyanobacterial algae in local bodies of water. These blooms occur due to a combination of compacted nutrient concentrations, due to a decrease in precipitation, and increased water temperature. As surface water warms, bacteria that feeds upon the nutrients experiences rapid growth (Hunter, 2003, p.38). Symptoms of being infested with the bacteria include potentially fatal bouts of: dermatitis, hepatitis, respiratory symptoms, etc. (Hunter, 2003, p.37). Due to increased dryness and decreased water levels in much of the Southern portion of the United States, "for the period 1991 to 1998 alone there were 230 general waterborne outbreaks reported, affecting an estimated 443,000 people" (Hunter, 2003, p.39).

As bacterial microorganisms are known to grow with escalating temperature, heat waves also lead to increases in food-born infections (Hunter, 2003, 41). Such food illnesses can be extremely expensive for many families in terms of both emergency treatment costs and time off from work. While "in the United States it is estimated that seventy-six million people suffer from some sort of food born illness each year," this number could easily increase with increasing temperatures (Brower, 2003, p.66).

Whether producing drought or heavy rainfall, increased temperatures in general have always had a negative impact upon the health of humans. Generally, higher temperatures are positively correlated with higher mortality rates. To this day, in the United States, heat waves are more deadly than hurricanes, floods, and tornadoes

combined (Lemon et al, 2008, p.90). Many of these deaths result not only from decreases in heart and lung function, but also from overall increases in the natural pathogens that flourish during periods of increased heat.

## Impacts of Ecological Shifts on Vector Populations

Climatic shifts are essential to the propagation of both vectors and their diseases. Recent studies have shown that "temperature and humidity are the two most important climatic factors for vectors' survival, development, and biting activity" (Menne & Ebi, 2006, p.139). As temperatures have shifted over the last few decades, "the distribution ranges of both vectors and the pathogens they carry have extended northwards and into higher altitudes," brining many new diseases once confined to tropical regions, into the United States (Menne & Ebi, 2006, p.141). Regarding changes in human health therefore, perhaps the first effects of ecological change will be manifested through changes in vector distributions.

Vectors are defined as "the transmitters of disease-causing organisms; that is, they carry pathogens from one host to another" (Lemon et al, 2008, p.1). Vectors thus come in the form of mosquitoes, ticks, fleas, etc., all specimens that use the blood of another host or their own saliva to transfer agents. "Nearly half of the world's population is currently infected with at least one type of vector-born pathogen, with Malaria accounting for the most deaths by far of any human vector-born disease" (Lemon et al, 2008, p.4).

Transmitted by mosquitoes, Malaria may continue to spread. It has been proven that "increasing temperature only four degrees, could increase the number of adult mosquitoes by forty-five percent" the world over (Lemon et al, 2008, p.142). Dangerously, in the United Sates, after decades of decline in mosquito-born diseases,

many training programs within the realm of vector biology and entomology were dismantled. Similarly, funding was cut for programs within academic institutions that produce experts in these fields. As such, “no new public health insecticides for adult mosquitoes have been developed in the United States for more than thirty years” (Lemon et al, 2008, p.158). Without sufficient research and development in the field, the United States has thus become quite vulnerable to epidemics carried by ever-increasing mosquito populations.

West Nile Virus in the United States

West Nile Virus (WNV) is a principal disease carried by mosquitoes. Within the United States, WNV has been moving rapidly westward from the East coast for the last three years. Much of this shift can be attributed to the fact that, as of late, even the dry portion of the country has been transformed into an area filled with golf courses, swimming pools, reservoirs, etc. These areas were all created for human comfort and enjoyment, yet they have also allowed for an artificial humidity that has been ideal for disease vectors like mosquitoes to propagate.

WNV has long lasting effects often resulting in hospitalization with symptoms that can last months. Symptoms of the virus include persistent, disabling neurological tremors and movement disorders, as well as difficulty with memory and concentration. In 2002, “it caused the largest epidemic of Meningoencephalitis in U.S. history, with nearly 3,000 cases of neurological disease and 284 deaths” (Lemon et al, 2008, pp. 49,169). Since many symptoms do not immediately reveal themselves, costly screening procedures through blood tests has become necessary, further making WNV an extremely expensive disease for the U.S. to control.

## Hantavirus Pulmonary Syndrome in the Western United States

Changes in temperature also have direct impacts on plant ecologies that determine which types of animals and potential disease hosts exist in which areas. As previously stated, in recent years climate changes have specifically produced periods of drought in the Southern portion of the United States. These droughts have led to a decline in vegetation that consequently has suppressed populations of larger animals that feed upon smaller species.

In the case of the Four Corners region of the United States, where the borders of Utah, Colorado, New Mexico, and Arizona meet, decreases in numbers of predator animals have in the past led to an explosion of rodent populations. In 1993, an outbreak of Hantavirus Pulmonary Syndrome was able to transpire due to a combination of: decreases in vegetation and larger animals, corresponding increases in small rodent populations, and unusually heavy El Nino rains. These heavy rains forced a migration of local rodents into covered areas containing houses, buildings, etc. inadvertently bringing them into closer contact with humans.

Originating in the local rodents' feces, Hantavirus entered through the respiratory tract causing death as a result of uremia, shock, and pulmonary edema. During the 1993 outbreak, the mortality rate reached over forty percent within the United States, the highest mortality rate ever reported for Hantavirus (Menne & Ebi, 2006, pp.244-245). Clearly, much of this occurred due to changes in local ecologies

## Ticks as Vectors of Disease in the United States

Changing ecologies have also affected populations of white-tailed deer in the United States by facilitating ideal breeding climates for their ticks. At very broad scales,

rainfall and temperature are the primary determinants of tick species ranges (Cumming & VanVuuren, 2006, p.490). Problematic for humans, ticks are vectors of a wide range of human and livestock diseases including Lyme disease, tick-born encephalitis, and Q fever. Within the United States, cases of Lyme disease are now reported between 15,000 and 20,000 times each year (Menne & Ebi, 2006, p.157). Out of fear of obtaining certain tick diseases, people have restricted their use of many revenue-generating activities such as camping and hunting. Fiscally, tick pathogens have thus had severe impacts on certain recreational industries, as well as the beef, poultry and milk industries due to animal husbandry contamination (Cumming & VanVuuren, 2006, p.493).

## Impacts of Ecological Changes on Governments

Today's civilizations are much more vulnerable to ecological shocks than those of the past. Through practices of free trade and a greatly increased reliance on imports and exports, nations have become interdependent, allowing most industrialized societies to suffer from food shortages even if their own countries are not directly impacted. Current civilizations have also built strong roots in many countries, becoming fixed to their locales in the form of large infrastructures, electrical grids, extensive piping, etc. This makes them much more vulnerable to unpredictable environmental shifts than their predecessors, who could easily relocate with weather fluctuations (Linden, 2006, p.40).

In terms of adaptation, "climate does not typically shift from consistently warm to consistently cold, but transitions are typified by flickering, when climate rapidly shifts back and forth before settling into a new state" (Linden, 2006, p.76). It is these shifts that can confuse and undermine governments by making efficient responses difficult to both predict and carry out. With such rapid ecological changes, societies become

overwhelmed by the simultaneous release of microbes, withering of crops, and devastating changes in weather.

Adaptation in fact becomes impossible for all biological specimens when stretches of extreme warmth or cold are suddenly punctuated by bouts of the opposite. "When precipitation patterns and temperatures change, creatures in the affected ecosystem must adapt. Typically, the organisms that adapt the fastest are those that have short generations and many offspring," however, particularly microbes, not humans (Linden, 2006, p.61).

## Conclusion

On this planet all ecosystems are connected. In fact, a mere five components interact to produce the climate of a location: atmosphere, bodies of water, the amount of snow and ice, the extent of land surface, and the size of flora and fauna (Menne & Ebi, 2006, p.9). So as increasing temperatures decrease snow and ice packs, which further facilitates warming, they also affect vegetative cover, soil concentrations, oxygen levels, rainfall, river flow, species occurrence, etc.

Despite the fact that large ecological shifts have occurred on Earth before, the recent rise in temperature has occurred at a much quicker pace than it has for at least the previous thousand years. Past studies of the Earth have proven that the planet often reaches thresholds. Once we cross an ecological threshold our ecosystem will reach a state where its resilience has been greatly reduced and a final small push can send the environment into a rapid transition towards a new equilibrium (Homer-Dixon, 1999, p.38).

While it is impossible to know exactly what consequences this new equilibrium will have upon humanity, one must only look at past ecological swings to see their potential impact. Over the past one hundred years, the weather event known as El Nino has led to the deaths of three times as many people as the Black Death. Many of these deaths occurred due to great human catastrophes such as the Dust Bowl in the United States, and the Great Potato Famine of Ireland. From 1997 to 1998 alone El Nino further inflicted about $100 billion in damage (Linden, 2006, pp. 50,182). While these costs have been severe, future ecological catastrophes may occur on a much larger scale and continue for extended periods of time, making the success of many human societies nearly unimaginable.

Drastic environmental shifts have already begun. Hurricanes have doubled in intensity due to changes in ocean temperatures, and overall storm patterns have begun to alter. On December 7, 2004, Tropical Storm Odette hit the Dominican Republic, the first recorded tropical storm to hit the Caribbean in December. That same day a monster snowstorm paralyzed the Northeastern region of the United States. Prior to this, two storms with hurricane-force winds, one cold and one warm, pummeling contiguous regions on the same day had been unheard of. The same year was also recorded as having the earliest and latest tropical storm activity on record (Linden, 2006, p.249).

Overall, 1,500 people die each hour from infectious ailments, and by one estimate "there are at least 5,000 types of viruses and more than 300,000 species of bacteria that challenge human beings today" (Brower, 2003, p.13). Dangerously, many of these species are able to replicate and evolve billions of times in a human generation. In order to lessen the potential health disaster awaiting many societies it is thus important for

preemptive policies to be enacted. As Drs. Menne and Ebi state in the World Health Organization's 2006 report entitled *Climate Change and Adaptation Strategies for Human Health*, "outcomes regarding health in this changing world will depend on social systems; the characteristics of the population as well as the prevention measures and actions in place to reduce the burden" (p.2).

Perhaps the best governmental defense is ensuring that the country has sufficient emergency response capabilities. Quality and availability of trained first responders is crucial, and adaptations to the health hazard posed by global climate change will need to be both proactive and reactive (Watson and McMichael, 2001, p.71). Broad policy approaches and responses regarding ecological changes and human health must become part of general government discourse, and will thus become a primary topic discussed in later chapters.

# CHAPTER 3

# MAN-MADE THREATS TO HUMAN HEALTH

Along with advancements in modern society, an essential problem has appeared. "Material progress has advanced rapidly while the social and political background has remained beset by religious hatred, economic inequalities, and fearing one's neighbors" (Gilpin, 2000, p.89). This social and political lag has created great dangers for contemporary societies because in a climate of terror and hate, any technology used for good could equally be used to harm.

## Globalization as a Man-Made Threat to Human Health

With modern advancements in transportation organisms now have the potential of traveling around the world in a matter of days, easily facilitating the movement of genetic material from one region to another. While this genetic material may take numerous forms, any transferred material that is nonnative to an ecosystem, "whose introduction causes or is likely to cause economic or environmental harm or harm to human health" is referred to as an invasive species (Howard et al, 2006, p.43).

Currently, invasive species have taken root in nearly every corner of the globe and their impact is apparent. Introduced species of many types cost industries and public facilities thousands of dollars each day. They alter things like food production, the provision of water, the rate and nature of regeneration of woodlands, and the developing and maintaining of infrastructures. In the United States alone, control of invasive species costs over $138 billion per year due to these circumstances (Cumming & VanVuuren, 2006, pp. 487, 492).

Invasive Species and the U.S. Agricultural Market

For the entire human race, “a mere seven species – corn, rice, wheat, barley, cassava, potato, and sweet potato – provide three-quarters of all nutrition, and almost all protein from domesticated animals comes from just nine groups” (Tobin, 1990, p.13). Such an extraordinary reliance on so few species creates a high vulnerability to the effects of infiltrating pests and crop disease. Specifically due to trade and modern crop specialization, if agriculture is harmed on any region of the Earth, many others will also be affected. As an example, any invasive species that negatively impacted the Great Plains region of the United States would be analogous to a major global disaster because the U.S. exports the greater part of the world’s grain (Patz & Kovats, 2002, p.1097).

Although it may not seem so, agriculture is just as essential to the United States as it is to less industrialized nations. Even though less than three percent of the population works on a farm, one in eight people in the U.S. work in an occupation that is directly supported by food production (Chalk, 2004, p.1). Allied industries include: suppliers, transporters, distributors, restaurants, etc., so that the fiscal downstream affect of a major act of disruption upon the food industry would be extremely financially detrimental. “In 2002 food production constituted thirteen percent of the U.S. gross domestic product, generating cash receipts in excess of $991 billion. With agriculture’s share of produce sold overseas more than doubling that of other U.S. industries, the agricultural sector is also a major component in the U.S. balance of trade” (Chalk, 2004, p.4).

Goods may now become infested with foreign pathogens during the many steps of global trade; “through harvesting, storage, processing, and transport,” yet there remains a lack of resources for quickly identifying, containing, and eradicating pathogenic

infiltrations in the United States (Kawachi & Wamala, 2007, p.21). Even with the threat of invading genetic material, “most homeland defense planning and funding is focused around the protection of urban populations and infrastructure, while the safeguarding of agricultural areas does not receive much consideration” (Armstrong, 2002, p.5). In fact in 2002, the U.S. National Research Council concluded that the country has inadequate plans for dealing with any invasion upon the agricultural sector (Madden & Wheelis, 2003, p.155).

According to Robert Robinson, managing director of Natural Resources and the Environment at the U.S. General Accounting Office, “biological security and surveillance at many U.S. food processing and rendering plants generally remain inadequate, formal state and federal inspections of these sites are rudimentary, and current oversight of production is inconsistent” (Chalk, 2004, p.34). According to the Committee on International Science, Engineering, and Technology, “only about one percent of goods entering the United States are screened at their point of disembarkation,” and notification requirements as described by the Public Health Service Act and Foreign Quarantine Regulations do not cover animals, insects, or any specimen arriving by automobile (Brower, 2003, p.65). Through each of these examples, it seems apparent that agriculture in the United States remains extremely vulnerable to pathogenic invasion.

Furthermore, since agriculture is typically grown in rural areas, any invasive pathogen could easily spread without notice. Besides the fact that isolated areas are less easily accessed by federal intervention, most rural facilities also lack the use of e-mail or other types of technology needed to quickly inform both the CDC and neighboring counties of an outbreak. Even if a destructive invasive species was caught in a timely

manner, “many small-scale agricultural operations do not keep accurate records of their distribution network,” making it nearly impossible to trace any contaminated items back to their original source of production (Chalk, 2004, p.11).

Intentional Attacks against U.S. Agriculture

“The United States has the largest amount of arable land per capita of any country in the world, with 1.73 acres versus 0.99 for other developed countries, and only 0.49 in the developing world” (Armstrong, 2002, p.2). The country thus possesses an enormous expanse of land that it must protect from outside threats. Besides being wary of the unintentional infiltration of biological specimens through trade and travel, over recent years it has become likely that certain groups may benefit from intentionally infecting agriculture within the United States, as any contaminated food can either directly sicken the public, or lead to sick and dying animals and crops (Howard et al, 2006, p.206).

Agriculture is in fact an extremely attractive target for a multitude of reasons. First, crops are grown over large areas and thus cannot be protected in a military sense. Second, as previously stated, they are often poorly monitored. Third, the majority of plant diseases have not been eradicated, so it is relatively easy for groups to obtain diseased plants to culture and release amongst healthy yields. Fourth, the database of genetic fingerprints for plant pathogens is not very extensive, so determining the origin of an introduced pathogen would be a slow process when attempting to seize a perpetrator (Madden & Wheelis, 2003, p.157, 165).

Besides thwarting trade and perhaps affecting jobs, any attack that would cripple an agricultural industry could additionally result in a heightened demand and an associated price increase for specific products. “An astute perpetrator could take

advantage of these market dynamics by investing in certain stocks before carrying out an assault" (Chalk, 2004, p.27). This fact alone may provide further incentive for some to intentionally introduce invasive species, thus categorizing an assault on crops as both biological and economic warfare.

Politically, for those groups looking to negotiate some sort of deal with the United States, destroying crops en masse seems a rational solution. Rather than eliciting the aggressive retaliation that would occur if civilians were murdered, attacking agriculture could sufficiently scare U.S. leaders into bargaining. Historical evidence reveals that "countries serious about developing a military capability to wage biological warfare usually include an anti-crop capability as part of their program" perhaps for this very reason (Madden & Wheelis, 2003, p.162).

Table 1 in Appendix C reveals that anti-crop pathogens have long been utilized by state-sponsored militaries. Iraq in fact invested a great deal of effort on a fungal strain with crop destroying potential known as wheat cover smut (Lederberg, 1999, p.139). Al-Qaeda has also repeatedly stated its intention to conduct economic warfare against the United States through its ability to export to the rest of the world. Taking all this into account, there is thus a great likelihood that U.S. agriculture could be attacked in the near future.

## Threat of Biological Weapons

Whenever discussing the possibility of biological terrorism, it is first important to define the parts that compose a biological attack. First, a biological agent must be used. A biological agent is defined as any "microorganism, virus, or infectious substance capable of causing deleterious changes in the environment; damaging food or water supplies; or

causing diseases in humans, animals, plants, or other living organisms" (Lederberg, 1999, p.85). Second is the use of the actual biological weapon. According to the Department of Defense's criteria, a biological weapon is composed of a biological agent, a container that keeps the agent intact and virulent during transmission, a method of delivery, and a device to disperse the agent onto the target population.

As of now the casualties from biological warfare are immensely disturbing to imagine, leading many United States officials to rely on the hope that such weapons will never be utilized. Unfortunately, biological weapons have been used to incite acts of terror and mass casualties for hundreds of years. "More than two millennia ago archers dipped arrowheads in manure and rotting corpses to increase the deadliness of their weapons and plague-ridden bodies were hurled over the walls of enemy cities" (Miller et al, 2002, p.37). More recently, during the colonization of the United States, smallpox was inadvertently utilized as a biological weapon to thin the Native American population.

Veterinary pathogens have also been used as biological weapons, as many diseases that infect animals are unrecognizable to human cells and are thus unable to infect the humans who handle them. As just one example, during the Second World War, Germany developed a biological weapons program that infected the livestock of Allied Forces with anthrax (Lederberg, 1999, p.19). This proved beneficial as it often went unnoticed, and as stated earlier, any attack upon animal or agricultural yields often has direct impacts upon a country's economy.

Another main reason biological agents often become the weapon of choice against enemies is the fact that outbreaks of disease are often attributable to natural occurrences. Biological warfare against humans is perhaps more menacing than any other form of

hostile attack as it "does not announce itself with a large explosion…one cannot smell, taste, or see biological agents…[and] the attack is not known until sick patients begin arriving in hospitals and doctor's offices sometimes days after initial exposure" (Frist, 2002, p.1). These facts make such an attack extremely difficult to both monitor and mitigate. Infectious disease agents in general often possess long incubation periods that further permit the operatives responsible to evacuate a region before a case is even diagnosed (Miller et al, 2002, p.60).

Overall, the use of pathogens and disease to incite terror is clearly not a low-probability occurrence. The tendency for terrorists to move into new areas of violence when current ones no longer achieve the same amount of publicity and chaos makes biological weapons extremely susceptible to use, especially now that the pattern of many terrorist groups has been to murder large numbers of civilians indiscriminately (Lederberg, 1999, p.236). Much of this can be attributed to the apocalyptic nature of many religiously-based terrorist groups. As of now, it is unlikely that any determined perpetrator will be deterred by legal restraints, and many biological agents have remained uncontrolled and extremely accessible to those interested.

## Who is Likely to Resort to the use of Biological Weapons?

While biological warfare can be utilized by individual nations, it is much more probable that independent groups will resort to such methods. As these groups do not have the means to engage in conventional war, they are much more likely to try alternative, asymmetrical techniques (Lederberg, 1999, p.112). Small groups of terrorists are also likely to resort to biological weapons use because the cost of disseminating a biological agent is much less than that associated with the development of nuclear or

chemical weapons, yet lethality can be just as high (Lederberg, 1999, p.110). In fact, by combining a biological attack with a standard explosive attack of any sort, the blend of mass casualties and panic could cause an extraordinary amount of injuries and death, especially in an unprepared region.

According to numerous security policy analysts, groups capable of resorting to biological weapons are comprised of: those individuals with the motivation and lack of moral constraints, those with the technical expertise, and those with a charismatic leader able to carry out initiatives with order and passion. Table 2 in Appendix C reveals exactly how many non-state actors in the Twentieth Century have reverted to the use of biological terrorism. A vast majority of these cases took place post 1970.

Non-State Actors

According to Gordon Oehler, former director of the U.S. intelligence community's Nonproliferation Center, "non-state actors worldwide are increasingly learning how to manufacture chemical and biological agents," and it is not at all difficult to do so (Lederberg, 1999, p.284). As an example, it has been stated that an individual could mount a germ attack using a blender, cheesecloth, a garden sprayer, and some widely available hospital supplies (Miller et al, 2002, p.163). Once a certain strain of bacteria is obtained, the mixture could be blended, filtered through the cloth, and then sprayed through the air intakes of any large building. Table 3 in Appendix C reveals just how often such unconventional methods of pathogen spread have been utilized. In terms of non-state terrorism, there are often two types of terrorist groups that dominate discussion: political and religious.

Religiously Motivated Actors

Often believing that attacks enacted by them are divinely sanctioned, the use of naturally occurring disease pathogens is easily justified by religious terrorist groups. It has in fact been predicted that religious terrorists are much more prone to biological warfare because they are often: less interested in public opinion, less deterred by threats of punishment, and are not concerned with alienating outsiders. This makes them more likely to employ weapons and attack targets that most people would consider unthinkable.

In today's time, religiously motivated terrorists are seeking to wipe out their enemy, and hence, often see little problem with resorting to weapons of mass destruction. Furthermore, many of these groups are apocalyptic in nature and dangerously suicidal, believing that they will be rewarded for their actions in the next life. While there is no abundance of such religious terrorist groups, they are growing in numbers. "In 1968, none of the eleven international terrorist groups could be characterized as religious in nature, yet by 1995, forty-two percent of the fifty-eight known groups were, and they were responsible for over half of the fatalities regarding terrorist incidents" (Lederberg, 1999, p.294).

One example of an extremist religious group is Aum Shinrikyo, residing in Japan. In the mid nineties this group unleashed an attack with Sarin nerve gas upon civilians in a Tokyo subway. A dozen people were killed and thousands injured by the onslaught (Miller et al, 2002, p.152). Although this was a chemical attack, reports later revealed that the Aum Shinrikyo sect had originally planned to develop biological weapons.

In 1992, the group sent a team to the former Zaire to assist in the treatment of Ebola victims as a cover for their real goal, to find a sample of Ebola virus to take back to Japan for culturing (Lederberg, 1999, p.119). Japanese intelligence also discovered a 1989 arrangement between members of the religious cult and Iraqi secret service members regarding trading information about biological warfare (Lederberg, 1999, p.305). Frighteningly, the United States had no information about this group prior to the attack, even though the cult had published a direct statement threatening then president Clinton.

More recently, another religiously motivated act of unconventional terrorism took place on U.S. soil. In late 2001, numerous anthrax laced letters were mailed to U.S. Senators Tom Daschle and Patrick Leahy, the Governor of New York, as well as a number of media leaders. Ending in the phrase, "Allah is great," each of these letters was apparently religiously tied.

Despite the fact that only a few people were targeted, the anthrax attacks soon became a regional disaster. Much of this can be attributed to the rarity of the pathogen. At the time of the anthrax attacks, the CDC "lacked a thorough compilation of relevant scientific literature and of outside experts who could be consulted about the agent" (Johnstone, 2008, p.95). The CDC also experienced a variety of problems processing the large amounts of information arriving from multiple sources regarding the incidents. Treated at first as natural occurrences, the federal government was not properly alerted to the cases, and as a result "mail handlers inadvertently exposed to the agent were identified only after it was too late for effective treatment" (Brower, 2003, p.95).

Once CDC experts finally became well versed on the particular effects of anthrax, state and local health authorities reported difficulties in providing proper diagnosis and treatment information to regional healthcare providers due to a wide variety of communication capabilities (Johnstone, 2008, p.103). State and local public health officials later reported that their resources were seriously strained by the anthrax attacks and they might not have been able to manage had the crisis lasted longer (Johnstone, 2008, p.103). Eventually, "twenty-two individuals were diagnosed with either confirmed or suspected anthrax infections, evenly split between the coetaneous and inhalation forms" (Johnstone, 2008, p.17). Clearly, if the spores had been even more haphazardly distributed, perhaps aerosolized through a vent in a large building, then many more people would have been affected.

Religiously motivated acts of terrorism are particularly difficult to respond to. Dispersed throughout the globe there is no longer a unified face of terrorist actors, nor a unified approach to weaponization. For example, besides residing in the Middle East, Islamic terrorist groups can now be found in Europe, Southeast Asia, and the Philippines (Howard et al, 2006, p.8). Regarding biological attacks by Islamic groups in particular, the eleventh volume of Al Qaeda's *Encyclopedia of Jihad* is devoted to both chemical and biological weapons (Kellman, 2007, p.1). Documents and computer hard drives seized by the FBI have further solidified that the acquisition, production, and use of biological weapons by Al Qaeda is legitimately being discussed.

Politically Motivated Actors

Unlike religious terrorists, political terrorist groups do not typically seek to inflict mass casualties (Lederberg, 1999, p.289). Instead, they have often resorted to hostage

taking, hijacking, small-scale bombs, and assassinations, primarily for media coverage. Their goal is often to weaken public confidence in government by making citizens feel insecure in their own countries. Within the United States this has not been the case, however. In 1984 a cult by the name of Rajneeshee was able to obtain dangerous pathogens from an American germ bank which they then unleashed upon a small Oregon town.

By placing salmonella in restaurant coffee creamers, blue-cheese dressing, and sometimes even over fruits and vegetables in salad bars, the Rajneeshee group hoped to make local residents too sick to vote in elections in order to gain political clout. Seven hundred and fifty-one people, ranging in age from newborn to eighty-seven years became ill in two separate waves. Their symptoms included: diarrhea, fever, chills, headache, nausea, vomiting, and other basic food poisoning ailments.

Local physicians and medical authorities had to determine quickly if this was a natural outbreak or deliberate contamination. They were able to decipher that: since there was no single provider or distributor to any of the restaurants impacted, all facilities appeared to maintain proper sanitation practices, and plasmid analysis identified a single outbreak strain, that in fact the town was not experiencing the remote possibility of independent, simultaneous outbreaks (Lederberg, 1999, p.181).This attack became “the first large-scale use of germs on American soil,” and the ease in which the pathogens were ordered is perhaps most frightening (Miller et al, 2002, p.32).

Rajneeshee members were able to obtain the S. Typhimurium pathogen from a commercial supplier of biologic products. Due to the small size of the group’s clandestine lab, and the lab’s status as a medical corporation, they were able to purchase germs

legally without having to register with the state. When public health officials realized how easily the Rajneeshees had spread the disease, it became apparent that America was not prepared to deal with a domestic biological attack.

It has since been learned that the public is best protected from an epidemic when health care professionals and laboratories cooperate early with local and state health departments regarding suspicious and unusual disease clusters (Lederberg, 1999, p.184). Congress has also since passed a law that imposes tougher rules regarding the domestic transfer of pathogens (Miller et al, 2002, p.197). Now, U.S. laboratories that maintain germ collections have to register and submit to federal inspections. This way, vials of hazardous bacteria can no longer be purchased without government surveillance.

Another example of a domestic biological terrorist incident occurred in 1998, when an individual associated with right wing extremist activities attempted to procure and produce a biological weapon. A man by the name of Larry Wayne Harris, linked to the Aryan Nations, was arrested in Las Vegas, Nevada for possession and plotting to use vials of Pasteurella pestis while spewing anti-government remarks. Pasteurella pestis is the biological agent also known as the plague. While the plague pathogen often attacks lymphatic glands, potentially causing septicemia, it can and has often mutated into a violent and contagious lung infection. In fact “pneumonic plague” is a death sentence to anyone within a range of an infected individual’s coughing or breathing range, with a one hundred percent expectation of death within two days (Lederberg, 1999, p.14).

Las Vegas has long been on the “top ten list” of likely U.S. cities to be targeted by a terrorist attack. Besides right wing extremists, hijackers from the 9/11 event were said to have used Las Vegas as a meeting ground for plotting their strategy. In the case of

Harris, a mass pandemic could have easily ensued from his possession of the plague virus, but potential disaster was averted primarily due to the alert recognition and intervention of local Las Vegas authorities.

Overall, non-state actors have proven to be a much more difficult threat to combat than threats from militarized nations. As former CIA Director James Woolsey states, "we have slain a large dragon, but are now finding ourselves living in a jungle with a bewildering number of poisonous snakes. In many ways, the dragon was easier to keep track of" (Brower, 2003, p.2).

Non-State Actors and Advancements in Biological Technologies

There are certain points of view that have remained prevalent among policy circles serving to dismiss biological terrorism as nothing more than theoretical. Some scholars in the political community have thus far believed that the science of producing enough organisms and dispersing them is so difficult, that it is out of reach for any uneducated actor (Rizzo, 1989, p.498). Contrary to popular belief, however, criminals against the state often do not come from the ranks of the poor and many are university graduates, fully conscious of their actions and capable of using pathogens to their advantage (Howard et al, 2006, p.61). Table 4 in Appendix C exemplifies this fact.

Biological terrorism has in fact become a plausible act of warfare recently, especially with the advent of the internet. Political terrorists especially have often stated that individuals should have parity with large, powerful nations, and the internet has provided them with just such methods of power and control. Dissemination of information regarding how to create and disperse certain weapons has become prolific on the internet, as well as those who utilize such mass communication for social

manipulation. In today's world, "global communications provide a ready and effective means of dissemination models of marginalization and violent ideas of cultural resistance" (Nolutshungu, 1996, p.299).

Through the expansion of the internet, it has become apparent that knowledge regarding bacteria, viruses, chemicals, etc. has become inexhaustible. From a security perspective, if someone with expertise in the area were looking to remain undetected while he or she seeks to obtain specific pathogens for the purpose of causing harm, the "sequence information that defines the genomes encoding many pathogens is readily available online" (Gostin, 1997, p.687). While manipulation of genetic material by these methods is labor intensive, as well as extremely hazardous, such work can be done in medium-sized laboratories.

This extended reach of members within certain hostile groups can have large impacts on any society, especially within the United States where many diverse groups reside. Nations like the United States may find it difficult to monitor and remain responsive to all sections of their population (Nolutshungu, 1996, p.2). For this reason, the U.S. must remain alert to the fact that there will reside marginal populations who suffer particular problems of insecurity within the country. These marginal people may turn to the internet, searching for groups that advocate acts of terror and violence.

Marginal Populations

Marginal populations can be defined as "distinguishable minorities within states whose integration into society is markedly incomplete, so that their participation is partial, intermittent, or subject to special qualifications" (Nolutshungu, 1996, p.17). Particularly problematic for ethnically diverse countries such as the United States is the

fact that preserving national security often includes looking at marginal groups with more scrutiny (Nolutshungu, 1996, p.13). Such an act can produce a cyclical effect; as governments become openly suspicious of marginal groups during periods of fear or crises, they in fact continue to marginalize these groups, forcing them to turn inward.

Currently, the United States is finding itself in an economic crisis that can easily lead marginal groups to become ostracized. As competition for scarce monetary resources in the form of employment increases, marginal groups may become more harshly scrutinized and prevented from gaining access to standard methods of upward social mobility (Nolutshungu, 1996, p.60). Since marginal populations tend to possess less power and money, they usually suffer graver consequences during hard times (Homer-Dixon, 1999, p.15).

Regarding biological terrorism it is important to mention marginal populations because persistent feelings of segregation from society may reinforce marginal group ties. Many will thus turn to strong group leaders in order to gain a sense of security. Unfortunately, this typically only creates greater insecurity, as it makes them a target of suspicion, especially if a few members of the larger group seek out violent means to gain representation.

Violence often arises when government legitimacy is undermined out of an inability to respond to both fiscal and environmental stresses. Those who reside in societies like the United States where they have been led to believe that they have a right to success and wealth may be even more prone to violence. This is especially true as groups begin to feel relative deprivation, “where they perceive a widening gap between

the level of satisfaction they have achieved and what they believe they deserve" (Homer-Dixon, 1999, p.136).

State-Sponsored Actors

While the above scenario raises the potential for terrorism that stems from domestic sources, there has recently been a resurgence of state sponsorship of terrorism, with foreign governments providing things like training, safe haven, and financial and scientific assistance to terrorist groups (Lederberg, 1999, p.236). Legitimate use of biological weapons by state actors has been an issue for decades. During World War II, "Japan alone is said to have caused nearly a quarter of a million casualties using plague, cholera, and epidemic hemorrhagic fever as biological weapons in China" (Kellman, 2007, p.57). More recently, in the late 1980s, several medium-sized nations including regional aggressors such as North Korea, Libya, Syria, Iraq, and Iran pursued major weapons programs that incorporated biological arms (Lederberg, 1999, p.83).

Iraq's Biological Weapons Program

Regarding Iraq, "it would take the United Nations team nearly four years and countless trips to piece together what the CIA had figured out by the fall of 1991," that Salman Pak, just south of Baghdad was just one of many Iraqi centers for biological warfare research and development (Miller et al, 2002, p.131). By the mid-1990s, Iraq admitted to having produced "19,000L of concentrated botulinum toxin, of which 10,000L were loaded into military weapons. This constitutes approximately three times the amount needed to kill the entire current human population by inhalation" (Arnon et al, 2001, p.1059). In 1990, Iraq deployed specially designed missiles with a 600-km

range; thirteen of these were filled with botulinum toxin, ten with aflatoxin, and two with anthrax spores" (Arnon et al, 2001, p.1060).

Botulinum toxin, which is a primary agent for weaponization, is the most toxic compound known. With an estimated toxic dose of only 0.001 pg/kg of body weight, botulinum is 100,000 times more toxic than Sarin nerve gas (Lederberg, 1999, p.72). Exposure to botulinum toxin often results in paralysis, leading those exposed to appear comatose within twelve to seventy-two hours of exposure. Victims experience difficulty speaking and swallowing, with death often occurring from a lack of protective gag reflex functioning, resulting in airway obstruction. It is an ideal biological weapon as it is "easily produced and transported, colorless, odorless, and tasteless, and prolonged care is needed following contamination" (Arnon et al, 2001, p.1064). Placing a large burden on the health care system, as well as employers of those infected, recovery from the toxin can take months as the brain attempts to repair itself.

Anthrax, meanwhile is an ideal candidate for biological weaponization as it can enter the human body through multiple pathways, attacking the lungs when inhaled, burrowing into the digestive tract of those who eat contaminated meat, or seeping into the skin through sores or cuts. "Anthrax bacteria can also be induced to form microscopic spores that have a tough outer coat, rendering them resistant to environmental stresses such as heat, drying, and sunlight" (Lederberg, 1999, p.286). "Anthrax, if left untreated, kills nearly every infected person – a very high rate of mortality, even compared with plague and most other pathogens" (Miller et al, 2002, p.42).

The Soviet Biological Weapons Program

It is now known that "the Soviet program for germ warfare began in the 1920s, and grew steadily into one of the largest of the modern era" (Davis, 1999, p.49). Suspicions were first raised when an explosion at a secret military base sent a cloud of deadly microbes wafting over a nearby village (Davis, 1999, p.76). This cloud was eventually proven to be anthrax and "at least seventy-seven cases and sixty-six deaths resulted, constituting the largest epidemic of inhalation anthrax in history" (Lederberg, 1999, p.31).

In 1992, after reporting for years that epidemics in the region were due to ingestion of contaminated meat, Boris Yeltsin finally admitted that the military facility in the town of Sverdlovsk was in fact part of an offensive biological weapons program. Unfortunately, the extent of activities being conducted at the compound was never discovered, nor what caused the accidental release of anthrax over the village. Perhaps the most dangerous result of the Soviet biological weapons program, however, was the defection of biological weapons scientists from the facility.

U.S. officials have long feared that the deteriorating state of the former Soviet germ warfare centers would allow their secrets and scientists to fall into dangerous hands (Davis, 1999, p.140). "Never before had the collapse of an empire left behind tens of thousands of nuclear, chemical, and biological weapons, and the scientists who knew how to make them," open to exploitation (Miller et al, 2002, p.191). As of now, it appears that many of the defectors fled to the Middle and Far Eastern portions of the globe. Disturbingly, since the Biological Weapons Convention to prohibit the development, stockpiling, and production of such weapons went into force in 1975, "the number of

countries known to have or suspected of having biological weapons capability has doubled worldwide" (Lederberg, 1999, 95).

State-Sponsored Actors and Advancements in Biological Technologies

Germs are all around us, with those found in nature being deadly enough, but now through the use of biotechnologies, governments are creating biological weapons that have the potential of being much more destructive. Biotechnology refers to "any technological application used to make or modify products for explicit human use" and in the last forty years or so it has become one of the world's fastest growing commercial sectors and an international endeavor (Atlas, 2002, p.753).

"Since 1992, the number of government funded biotechnology companies has tripled," allowing for both positive and negative end results (Carafano & Gudgel, 2007, p.634). Many of the advancements in biotechnology are dual-use, meaning that while certain advances may provide faster-acting, more effective drugs or allow for increasingly productive crops, the same advancements could also be used to create lethal biological weapons. "In the future, germs might be designed not only to kill, but to manipulate all the life processes – cognition, development, reproduction, etc." (Miller et al, 2002, p.314).

Technological innovations have already allowed for the creation of novel viruses that have "undergone critical genetic changes, making them: more easily transmittable from person to person, able to survive in the environment longer, and more virulent" (Osterholm, 2007, p.8). As a result, several U.S. states have recently experienced a surge of stronger measles outbreaks as well as stronger forms of both Tuberculosis and Malaria (Hamburg et al, 2008, p.4). With modern advances, besides making existing strains of

diseases more powerful, entirely new diseases can be created. DNA replication or Gene Synthesis is the process of replicating an artificially designed gene to create new strains of viruses, bacteria, etc. (Woodward, 2006, p.3). Using these advances, even an ethnic-specific bio-weapon, targeting certain genetic markers, could be created in the future (Kellman, 2007, p.51).

## Conclusion

Man-made threats to human health are perhaps more prolific now than ever. With advancements in technology, groups seeking to do harm can easily find pathways on the internet and use modern communications to their benefit. Arriving through "friendly travel and trade," a biological attack can also be enacted unintentionally through the facilitation of invasive species. Due to the ease in which people now travel, it has become apparent that "the health of U.S. citizens is inextricably linked to the health and actions of people in other parts of the world," and infectious diseases may soon become a serious intrusion on U.S. soil (Hamburg et al, 2008, p.1).

Regarding the chance of U.S. agriculture being attacked, as vast numbers of organisms, including various molds, viruses, etc., are easily being grown in laboratories at no threat to humans, they can be transported without detection and unleashed without health hazard to the releaser. Due to the fact that agriculture itself often acts as the primary vector for pathogen spread, costly methods for disbursing a virus or bacteria also do not need to be purchased. There is no need for elaborate containment procedures, personal protective equipment, or antibiotics to prepare, reducing many technical difficulties which are frequently cited as the most significant barriers preventing terrorist use of biological agents. Unleashing a biological assault upon agriculture would thus

utilize cheap and unsophisticated means, yet would still be able to undermine a government's economic base, providing any terrorist group with an attractive cost-benefit payoff (Chalk, 2004, p.28).

Also occurring throughout the world, countries are beginning to enhance their biological facilities. While many of these facilities are dual-use, this has only made them easier to hide, raising deep concerns regarding how many facilities in the world are being used for negative weapons creation. In 2007, the United States intelligence community's National Intelligence Estimate published that "the U.S. Homeland will face a persistent and evolving terrorist threat over the coming years from numerous state-sponsored groups and cells" (Gerber, 2007, p.1).

Overall, to prepare for any potential biological threat to national security, vigilance and response measures must not be left in the hands of an already overly expanded federal government. In order to interrupt a terrorist group's goal of disrupting society, policies must be strengthened within each U.S. city and state. Citizens must become just as prepared as trained specialists, for even the talk of biological attack can serve to create great fear and turmoil. Hopefully, this preparation in and of itself will serve to diminish a terrorist's ability to undermine the government's role as protector of the people and will strengthen local response capabilities and the ability of the country to recover quickly from a major epidemic as a whole.

# CHAPTER 4

# LAS VEGAS AS A CASE STUDY

With rapidly evolving global interactions and ecologies, it has thus far been suggested that current societies are soon to be faced with significant health risks. As such, it is important to determine what strategies, policies and measures are available to reduce the impacts, as well as which infrastructures and agencies need to be strengthened or reformed. As the best knowledge and expertise regarding conditions of any region is generally found at the local level, local authorities are the preeminent source of information regarding preparedness mechanisms for coping and recovering from the impact of any biological emergency (Graeger, 1996, p.114).

Vindicating federalist ideals, response procedures are always initiated at the local level, yet mitigation measures can only be successful with sufficient resources from the federal government. Conscious of this fact, local emergency mangers must be aware of the hierarchy involved in obtaining additional assistance, primarily the interaction that occurs between local, state, and federal emergency response agencies when local capabilities are insufficient. Cooperation and communication amongst different levels of government response is thus essential. As federalist ideals work best when local first responders are able to avoid the chaos of competing organizations, the following chapter seeks to better understand the progression from local to federal control during disasters.

## Las Vegas: A Unique City

Within the United States, looking specifically at the state of Nevada, the region presents a unique situation demographically. While the city of Las Vegas, situated in the southern portion of Nevada, is a large and booming urban metropolis, the center and

northern regions of the state are rural, with isolated towns scattered throughout. Within the state it has been presumed that a biological threat to security is most likely to occur in the city of Las Vegas, where many tourists from all regions of the world come to visit and can bring with them a variety of pathogens.

People visiting the city of Las Vegas often stay for only a short period of time, typically no longer than a weekend getaway. In terms of a health threat, visitors are thus able to spread an infectious disease, particularly one with a longer incubation period, asymptomatically. Evidence of this fact transpired as recently as the 2009 H1N1, Swine Flu pandemic. According to the Southern Nevada Health District, the first reported flu-related death in Las Vegas occurred in a tourist. On June 12, 2009 an apparently healthy seventy year old woman visiting the city from New York died in a local Las Vegas hospital. While the elderly woman's visit to the city and hospital may have infected many others, she perished quickly due to underlying conditions, and was thus un-influential.

Tourism presents a unique situation because visitors can easily turn a localized epidemic into a pandemic quite quickly. During the SARS pandemic, just one infected person staying in a Hong Kong hotel resulted in the transmission of the disease to a dozen or so guests. A chain reaction then allowed those dozen guests to eventually infect up to 8,000 more in two dozen countries. In total, "774 people eventually died from an epidemic that had rippled out from just a single case" (Kettl, 2009, p.121).

While tourism can be considered a hazard to the city of Las Vegas due to infiltrating disease, it is also essential to its economic survival. According to the Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas, tourism in the city accounts for a large part of the state's revenues. Nevada has no state

income tax and thus relies heavily on revenues generated from outside sources. Additionally, CBER estimates that approximately 230,000 Nevada jobs depend on tourism for their survival in some way. Again looking to the SARS pandemic as an example, in just six months the disease cost the Asian region almost 100 billion dollars in economic growth due at least in part to greatly reduced tourism. If this were to occur on a smaller scale within the city of Las Vegas, it is easy to conclude that the occurrence would be economically catastrophic.

## A City in Crisis

Keeping a population safe and managing health effectively requires taking into account the social and cultural determinants of health, as well as local behaviors and practices (Menne & Ebi, 2006, p.406). Vulnerability to a biological catastrophe includes issues of economic and political disparities between groups and disparities in other assets like knowledge and information (Gerber, 2007, p.229). As such, it is important to first define current social problems within the city of Las Vegas.

Currently, Nevada's population consists of approximately 2.7 million people. The vast majority of that number resides in Clark County, which includes the city of Las Vegas. Regarding the health of its population, the state ranked forty-two in the 2008 *America's Health Rank*, with Nevada dropping to among the ten unhealthiest states in the country due to certain state trends such as low graduation and high crime rates (Pope, 2009, p.1). In a repeat of 2008, in 2009 Nevada remained the lowest-ranking graduation state in the nation with a commencement rate of just 47.3 percent. According to Education Week's annual Diplomas Count study, "Clark County's graduation rate is even

lower at 46.8 percent, placing it at 43 among the nation's 50 largest school districts"(Haug, 2009, p.1).

Coinciding with low graduation rates are poor education levels in general, and education has often proven to be a vital contributor to health. According to the CDC, there is a clear direct link between education and a healthy life. The less schooling one achieves, the higher their levels of risky health behaviors such as smoking, being overweight, not being active, etc. (Pope, 2009, p.1). Regarding the spread of a disease epidemic, just several leading risk factors; smoking, alcoholism, high blood pressure, high cholesterol, and low physical activity are mainly responsible for differences in the burden of disease, and Nevada residents suffer from all of these ailments (Menne & Ebi, 2006, p.395).

Further affecting the health of Las Vegas residents is the fact that homelessness in the city is entering a new high. The city has recently been referred to as the epicenter of the nation's housing crisis. Nevada's Governor Jim Gibbons in fact stated that "one in every forty-three households in the city received a foreclosure filing during 2008," and it has been predicted that one in eleven homes may be entering foreclosure by 2010 (Urevich, 2008, p.1). This has forced many in the city to postpone obtaining appropriate preventative health care, thus allowing them to become the perfect vectors for any potentially devastating infectious disease (Elphinstone, 2008, p.1).

Local Immigration and its Effect on Health

Further escalating any localized epidemic, Nevada has recently been identified as a state with low health insurance coverage and immunization rates amongst its population (Pope, 2009). Much of this can be attributed to the state's unique transient rate, as well as

foreign immigration rates. According to the Nevada census, about thirty percent of the state's population is composed of immigrants, primarily from Mexico and the Philippines. Unfortunately, many of these immigrants are un-naturalized. Based upon data obtained during the 2000 census, Nevada's naturalization rate of 36.9 percent is much lower than the national average of 40.1 percent. This is threatening to the health of local residents because un-naturalized immigrants are not screened medically like legal immigrants, and thus may arrive to the state with any number of preexisting conditions and diseases (Brower & Chalk, 2003, p.64).

Local Ecological Changes and their Effect on Health

Within the city of Las Vegas water is in limited supply. The Colorado River System that supplies water to Las Vegas not only has the arduous task of growing much of "America's domestic production of fresh winter vegetables, but it has more people, more industry, and a more significant economy dependent on it than any comparable river in the world" (Tobin, 1990, p.189). The Colorado River system was the first drainage basin in which the concept of multiple uses was put into practice: it is used for power, irrigation, flood control, recreation, etc. providing water to over twenty five million people in seven states (Gilpin, 2000, p.168). Essential to biological survival, water is perhaps the only resource that cannot be substituted for anything else, and in the Southwestern portion of the United States, it is quickly depleting. Regarding the progression of disease, a simple shortage in water has proven to be responsible for a major portion of acute and chronic infections the world over (Homer-Dixon, 1999, p.91).

One major reason the water supply is dwindling throughout Las Vegas is due to excessive heat and drought. According to the Washington Post, in 2007 Nevada ranked as

a state with the most dramatic increase in average temperatures over the last thirty years. University of Nevada, Las Vegas Professor of Geology, Stephen M. Rowland states that, since the turn of the century, "Las Vegas' average summer temperature has been 3.6 degrees above its 30-year average." Again applying these statistics to the health of local residents, in people who are already obese or suffering from underlying chronic conditions, death can occur much more easily with such drastic increases in heat.

Local Population Distribution and its Effect on Health

With much of Nevada being rural, isolated towns are scattered throughout the middle and northern portions of the state. If any sort of epidemic were to initiate in one of these more remote locations, it would be much more difficult to provide treatment in a timely manner. Isolated areas are less easily accessed, leaving them susceptible to an infectious disease that could easily spread to urban locales. Small counties suddenly infiltrated by a fast-spreading disease may rapidly begin to "lose important government figures and social servants who can help promote prevention, as well as medical professionals and employees" (Lamptey et al, 2006, p.19). Without key figures working to respond to an outbreak in an isolated area, any larger city nearby would not be able to preempt its own infestation.

Adding to the problem is the fact that most rural health care facilities do not possess many types of technology needed to quickly inform both the CDC and neighboring counties or cities. Recently, Nevada surveyed its local health agencies to assess readiness in terms of a pandemic. It was reported in the Las Vegas Review Journal that: 50 percent lacked high-speed internet access, 94 percent lacked adequate emergency preparedness training (with 77 percent lacking an emergency response plan directly

addressing a bioterrorist attack), and 46 percent did not have broadcast facsimile capabilities for emergency notifications (Chereb, 2008, p.1). In 2008, the Trust for America's Health Foundation gave Nevada six out of ten possible points for emergency preparedness, the same score it has received since 2005. It cited additional weaknesses including: "failure to have an intrastate courier system for 24-hour lab analysis, not having an Internet-based disease surveillance system compatible with the National Centers for Disease Control and Prevention, and not having a state medical reserve corps coordinator" (Chereb, 2008 p.1).

Oftentimes, physicians also choose to stay away from practicing in remote locations. This is true primarily in the realm of emergency care, as emergency procedures are deemed too risky to undergo in remote locations where backup is not immediately available (Babula, 2002, p.1). According to a recent study, the shortage of physicians in rural areas is a longstanding and serious problem that state policymakers continue to face (Rabinowitz et al, 1999, p.256). Furthermore, since most physicians seek to practice in areas where they can comfortably turn the most profit, rural areas are often left by the wayside in exchange for practicing in larger, urban metropolises.

Local Physician Shortage

It is obvious that if a region already suffers from inadequate health care services, then any additional threats to human health will only exacerbate the problem. In order to best determine how prepared a city will be in the face of a biological crisis then, it is first important to observe any weaknesses in the region's current health care infrastructures. One major area of weakness within Las Vegas' health care system lies with a shortage of medical physicians.

According to the University of Nevada, School of Medicine, Nevada ranks among the lowest in the nation regarding its physician to population ratio. Much of this can be attributed to rising malpractice premiums throughout the state which are discouraging many physicians from staying in practice and forcing others to relocate (Debas, 2003, p.979). Issues of malpractice have become prominent throughout the country. Lawsuits are said to be on the rise because while in the past a patient in need of a hazardous surgery would never contemplate suing as he or she was almost certainly going to die, in the last sixty years or so the public's expectations of both physicians and the technological advancemans they rely upon have risen drastically (Hoffman, 2005, p.1).

In Nevada, "a computer-assisted analysis of national malpractice data shows that higher average malpractice settlements are paid for physicians here than in neighboring states" (Sloan, 2004, p.1). In fact, Nevada's average settlement for medical doctors is thirty-three percent higher than other Western states. Using the public-use version of the National Practitioners Data Bank, it has been verified that "the average payment per malpractice settlement in Nevada over the past fourteen years was $209,652…more than twice California's average" (Sloan, 2004, p.1).

Further forcing many physicians to leave the city of Las Vegas is the fact that "in 2002 a 5.4% payment cut was passed that totaled about $12.2 million, or about $4,263 per physician" (Rizzo, 1989, p.483). This cut has primarily affected Medicare reimbursements, resulting in an American Medical Association survey finding that "one in four physicians either has restricted or plans to restrict the number or type of Medicare patients treated" (Rizzo, 1989, p.490). With lower Medicare reimbursements to physicians, vulnerable, elderly patients in Las Vegas have had an increasingly difficult

time gaining access to the medical community. If an epidemic were to transpire, a large portion of the population would thus be immediately at risk, leaving the door open for a pathogen to spread easily to other sectors of the public.

Overall, physician numbers are dwindling. Besides through payment cuts, cuts to Medicare funds additionally affect the supply of physicians through reductions in medical residencies, which all medical students must undergo. By reducing such funding, Congress has saved money, but has also caused a decrease in physicians for the future.

As of now, there are less students training to be primary care physicians than retiring from the profession, and "physicians older than fifty-five years of age work about 15% less than younger doctors" (Cauchon, 2005, p.1). Frighteningly, there is currently about "one physician per 350 patients," but it is suggested that "in the year 2020, when Americans are older and there are new medical procedures keeping patients alive longer, the population will require approximately one physician for every 275 persons" (Weiner, 2004, p.2). With reductions in physician numbers occurring for multiple reasons, there will clearly be consequences for local health care facilities attempting to respond to future threats to biological security.

Negligent Physicians

In reaction to soaring malpractice costs and payment cuts, many Southern Nevada physicians are claiming that in order to stay in practice they must now double their patient loads (Debas, 2003, p.981). Ironically, by doubling patient loads, physicians are also doubling their chances of making a mistake, leaving the door open to either misdiagnoses or a complete oversight of a problem. A recent example of such negligent malpractice within Southern Nevada occurred in a Las Vegas endoscopy clinic. In 2008,

this endoscopy clinic was found to have re-used syringes, eventually causing forty thousand people to become potentially exposed to HIV and Hepatitis C infections.

In an attempt to further cut costs and ensure avoiding potential lawsuits, many physicians are increasingly relying on the use of defensive medicine. Defensive medicine can be described as a physician reducing his or her exposure to lawsuits by "performing redundant and unnecessary diagnostic tests" (Barr, 2003, p.1). Besides raising medical costs, defensive medicine dangerously prevents physicians from offering certain types of more beneficial, but perhaps risky advice. This not only leads to an overall decrease in medical services, but if a biological invasion of some sort were to occur, physicians afraid to treat atypical ailments may dangerously transfer an infectious patient from physician to physician. Furthermore, by simply going through the motions, many doctors would miss many tell tale signs of a coming epidemic.

To discover exactly "how often physicians alter their clinical behavior because of the threat of malpractice liability," in 2005 a survey was mailed out by researchers to physicians within six high-risk specialties (Studdert et al, 2005, p.2610). These specialties: emergency medicine, general surgery, orthopedic surgery, neurosurgery, obstetrics/gynecology, and radiology, generally experience high levels of malpractice suits. "A total of 824 physicians (65%) completed the survey and nearly all (93%) reported practicing defensive medicine" (Studdert et al, 2005, p.2615). These physicians admitted to avoiding patients they deemed highly litigious and admitted to limiting procedures prone to complications, resulting in poorer medical care.

Treating victims during a mass infiltration of an infectious disease would require many hospital beds, isolation rooms, and if the disease calls for long term care, definitely

sufficient numbers of qualified staff. While much of this relies on transforming malpractice policies and sustaining physician pay rates in Nevada, policies must also incorporate proper training in the realm of large-sale pathogen invasion. If an emergency is large enough, multiple local agencies may further become involved in the response effort, potentially creating a bureaucratic nightmare if local medical staff are unprepared.

## Case Study

Both ecological change and the results of an intentional biological attack will present local citizens with unique challenges as new health risks are introduced into previously unaffected areas. In order to best determine how prepared the city of Las Vegas in particular is to respond to a localized disease epidemic, there are two areas of focus that must be assessed. First responder agencies must be interviewed in order to determine how they are prepared to respond to a biological emergency, and local policies must be reviewed in order to observe the steps laid out for first responders to follow.

Utilizing methodological triangulation, involving the convergence of data from multiple data collection sources, the hope is to compare informal interviews with formal response plans to observe the actual amount of coordination and cooperation occurring between those who create emergency plans, and those who actually act on them. Using post-positivist and interpretive research paradigms, the methodology utilized in this research will thus be both direct interviews and document analysis.

### Why Interview First Responders?

In order to receive first-hand accounts of any localized emergency, emergency mangers and governments have to rely on the reports of local first responders who deal directly with victims. Local first responders and disaster mitigation departments serve as

the catalyst for having a smooth recovery process. With regard to localized emergencies, "the first hours of disaster response often determine the success or failure of overall mitigation efforts" (Waugh, 2000, p.43).

First responders are defined as: local law enforcement, members of the fire department, and those with sufficient medical expertise to properly treat victims. "Fire and police departments, as well as emergency medical teams, are assumed to know the likely natural hazards specific to their area, prepare and train for them, and can be on the scene within minutes" (Schneck, 2009, p.6). Unique to germ terrorism, the first responders at the scene of any disease attack would also include experts from the local health department, attempting to ascertain the origin and extent of an epidemic. Overall, it is important to first discover how first responders understand and have prepared for biological threats to human security, in order to then ascertain exactly how proficient the city is to responding to such hazards.

Document Analysis

Documents can often be useful when attempting to understand the philosophy of an agency. In the state of Nevada, the *Nevada Division of Emergency Management: Disaster Response and Recovery Guide for Local Government* became the first attempt to consolidate, in a single reference, the steps and criteria required to declare a local emergency. By completing the process for each progressive step, emergency managers are hopefully able to seek additional assistance in an orderly manner.

According to the guide, once an emergency occurs, the initial response procedure is to notify public officials and first responders to deploy as indicated in the local emergency operations plan. The next step is to lessen the spread of harm by alerting

citizens of potential hazards and any known safety measures through public information systems. In reference to an epidemic, disease spread can be reduced in several ways: through improved medical access and preventative information; through the reduction of population exposure by quarantine; or through the reduction of population sensitivity through vaccines distributed en masse (Menne & Ebi, 2006, p.48).

Whether procedures like evacuation measures are necessary is then analyzed through a rapid assessment of the situation, conducted by the local government. Assessments include analyzing, identifying, and confirming that an emergency has in fact occurred, identifying the nature, severity and potential impact of the emergency, and then drafting a local declaration of disaster in order to formally declare the extent of damage and harm to local inhabitants. If the assessment concludes that the emergency has escalated to a situation beyond local resource capabilities, that situation can be declared a major or catastrophic disaster. The Nevada Division of Emergency Management defines a catastrophic disaster as an event that: results in large numbers of deaths, causes extensive damage to facilities that provide and sustain human needs, produces an overwhelming demand on state and local response resources, causes a severe long-term effect on general economic activity, and severely affects capabilities to sustain response activities.

As of now, the steps for requesting further assistance are as follows. When local resources are insufficient, the state intervenes. Resources in this case are defined as any and all equipment, materials, personnel and finances that would be employed to respond to an emergency, including things like vaccines and medications. If the state is incapable, then federal support can be requested. A State Disaster Declaration, made by the state

Governor, is submitted through the State Division of Emergency Management for review. Within this declaration must be a dollar estimate of damage along with cost estimates obtained through the damage assessment survey. All of this formulates quite a lengthy process.

It is clear from the guide that local governments are on their own for all small to moderate-scale biological invasions. As the Emergency Plan only allows for federal assistance to be called upon after local and state resources have become completely depleted, "the actual mobilization of federal resources in response to an outbreak is necessarily contingent on local and state capabilities to detect their own limitations" (Brower & Chalk, 2003, p.76). When local capabilities are determined to be completely overwhelmed, then state governments can call on the Federal Emergency Management Agency (FEMA), an under funded government agency for assistance. While the chance of disease having a great impact on society depends upon many things such as access to health care, demographics, social behaviors, etc., it seems apparent that "a network based emergency management plan of preparedness, response, and recovery has the greatest potential to reduce health impacts following a biological disaster" (Menne & Ebi, 2006, p.117).

First Responder Interviews

Since attempting to determine exact numerical values is not possible when speaking of preparedness levels for an event that has not yet occurred, quantitative research must be substituted for research that focuses more on the opinions and experiences of individuals; qualitative research is thus to be used. Using inductive rather than deductive reasoning, the objective is to obtain greater knowledge of how local first

responders have been affected by recent climatic and terrorism events. This research hopes to better understand the opinions, attitudes, developments, behaviors, etc., of those in charge of emergency response.

To sufficiently answer questions of how heads of emergency response understand and are prepared to deal with a local biological crisis, individual interviews were conducted involving a series of open-ended questions. Using a semi-structured interview format, there were many opportunities for interviewees to discuss certain topics in greater detail and elaborate on responses where necessary. Through direct encounters with heads of first responder teams, as well as those in the local health department, data obtained was then used to develop theories regarding local preparedness measures and plans. The exact interview questionnaires are located in Appendix A.

## Results

While certain events may occur that individuals cannot control in the realm of disease infestation, regions can still prepare for the recovery process. In order to discover whether influential members of Las Vegas emergency management systems are taking the threat of pathogen invasion seriously and properly preparing for disease events, interviews were thus conducted. Nicole Hart, Emergency Preparedness Manager for the Las Vegas Metropolitan Police Department (LVMPD) was interviewed, along with: Major David M. Sellen, Commander of the 92nd Civil Support Team in charge of Weapons of Mass Destruction, Alan Osborne, Clark County's Senior Deputy Fire Chief, Richard Brenner, Head of Clark County Fire Department's Hazardous Response Team, and both Jennifer Sizemore and Jane Shunney, of the Southern Nevada Health District. Results of the questionnaires are listed in Appendix B.

After conducting interviews across different fields and agencies, one thing became clear; emergency preparedness in the realm of pandemics has not been ranked especially high within Southern Nevada until the last few years. According to both Nicole Hart and Major Sellen, only since the recent publicity of H1N1 flu has pandemic planning become a top priority within their agencies. Senior Deputy Fire Chief Alan Osborne similarly summarized that "until events such as the H1N1 virus raise public awareness," local resources are often not allocated to prepare for them (personal communication, October 16, 2009).

Locally, the Southern Nevada Health District (SNHD) is lead on the issue of planning for any disease event. As publicity regarding the H1N1 virus spread, however, SNHD was not able to immediately gain access to a sufficient amount of resources needed to track and mitigate the disease, particularly sufficient amounts of H1N1 vaccine. Vaccine insufficiencies have taken place despite the fact that it has been concluded by the health community that the best protection against disease spread is prevention, as well as the fact that H1N1 influenza vaccine has recently taken both public and fiscal priority.

Due to vaccine shortages the CDC has recommended certain priority groups deemed most at-risk for severe illness or complications from H1N1 influenza to receive the vaccine first. Vaccine priority groups include: pregnant women, caregivers for children younger than 6 months of age because infants cannot be vaccinated, those between the ages of six months and twenty-four years because they are in close contact with each other increasing the likelihood of disease spread, those under the age of sixty-four who have health conditions associated with higher risk of medical complications

from influenza, and healthcare and emergency medical services personnel who have direct contact with those infected.

According to the SNHD website, as of mid-October 2009 the local health district received approximately 48,000 doses of H1N1 influenza vaccine, with the initial delivery consisting primarily of an inhaled vaccine mist. This inhaled form is a live, attenuated influenza vaccine, meaning that it is only approved for healthy people between the ages of two and forty-nine, and not for pregnant women or children and adults who have underlying medical conditions. In terms of priority groups, only three groups can therefore receive the mist; those with infants, school-age children, and medical personnel. As such, it is apparent that many Las Vegas residents have been left unvaccinated.

Preparing for Disease Epidemics

In order to gauge levels of preparedness in the realm of emergency management regarding threats to human health, managers were asked to rate their preparations for both intentional and natural threats. Representing one side of the spectrum, Major Sellen responded by stating that "preparations for diseases due to intentional causes [were] prioritized" within his civil support team over those that stemmed from natural sources (electronic communication, July 1, 2009). On the other side of the spectrum, the Clark County Fire Department ranked itself as most prepared to deal with diseases stemming from natural sources, as the department is trained to deal with such emergencies on a daily basis.

While the Clark County Fire Department (CCFD) responded to the questionnaire comprehensively, admitting that its existing emergency plans do not "identify specific areas and populations within the valley that are more susceptible to certain types of

biological threats," both Nicole hart of the LVMPD and Major Sellen responded broadly (Alan Osborne and Richard Brenner, personal communication, October 16, 2009). Both concluded that they would be a support agency for hazardous situations stemming from either intentional or natural sources, utilizing an "all hazards approach" to emergency management (Nicole Hart, personal communication, October 7, 2009). This means that all victims, despite the source of their injuries, are rushed to medical care in the same manner. "Response is focused on patient stabilization so that they may be transported to hospitals where they can receive definitive advanced care, quickly" (personal communication, October 16, 2009).

Even though each agency did respond positively to being able to mobilize during either a terrorist incident or natural catastrophe, no agency had a specific plan in place to deal with a widespread disease epidemic. In fact, regarding the spread of a highly infectious disease, implementing a "shelter-in-place" is the only option that the CCFD has even discussed (Alan Osborne and Richard Brenner, personal communication, October 16, 2009). Much of this is due to a heavy reliance on the SNHD to dictate response procedures during such an occurrence. Assisted by the Southern Nevada Public Health Laboratory (SNPHL) which collects recent mortality rates, doctor reports, recent hospital admissions, and emergency room consultations from health care facilities, the SNHD has the responsibility of properly surveying the local community and gauging disease spread. Actual response plans and procedures for disease infestations, however, are addressed at the city and county level.

With most response agencies lacking any preparedness plan specific to dealing with a large-scale biological epidemic, the SNHD must ensure that it is capable of

properly communicating advice and information to emergency managers in an efficient manner. To meet any public health challenges, the health district must also keep its local health care providers informed of recent disease occurrences. As of now, the main SNHD website does provide an outlet for the health care community to both report diseases in a timely manner and receive bulletins and informational links regarding emerging infectious diseases.

It seems as though all information regarding the Southern Nevada Health District's preparedness plans is currently located on their website. Both Jane Shunney and Jennifer Sizemore, who happens to be the public information officer for SNHD, refused to answer the majority of the interview questions. Instead, Jane Shunney stated that all the information that the department can share with the public at any given time is available online. For this reason, interview responses by the SNHD are the only ones not found in the Appendix. On the website, one can find statistics and rates of disease occurrence within southern Nevada by month, as well as the tracking information for antimicrobial cases.

Organization and Coordination

The Clark County Office of Emergency Management is responsible for disaster preparedness plans as well as coordinating mobilization and response during emergencies. Document analysis of the emergency response plan was conducted in a previous section. In agreement with the emergency response plan, interviewees stated that for any agency, the first step is to immediately utilize local and state resources. Once these resources are exhausted, only then may federal resources be requested.

With regard to local agency resources, the CCFD budget is "minimal," with most funding for equipment stemming from the County General Fund. Additionally, there is some grant money that is specifically designated to hazardous materials training and response, but typically it is carefully parceled out and shared amongst each of the response agencies within Clark County (Alan Osborne and Richard Brenner, personal communication, October 16, 2009). As for the LVMPD, during any large-scale catastrophe, its own minimal fund is supplemented with modestly parceled federal grants.

Throughout the interviews, each emergency manager did specify that he or she had consistent contact with local, state, regional, and national emergency responders and governments, but emphasized that there are many complicated stages to disaster relief. Comparing the described progression of obtaining federal relief by the interviewees, with the progression described earlier in the emergency response plan, both are very similar revealing an accepted mode of requesting federal assistance. According to emergency mangers in CCFD, any local jurisdiction within Clark County would first contact the Clark County Office of Emergency Management. After contacting the County, if the disaster is still beyond local capabilities, the request goes on to the Nevada State Office of Emergency Management. If beyond the State's capability, only then is the request forwarded to the national level (Alan Osborne and Richard Brenner, personal communication, October 16, 2009).

Once creating a declaration for federal assistance, the hope is that federal emergency response agencies will provide local agencies with additional resources in a quick and synchronized manner. Unfortunately, judging by the interview responses, it seems as though much of this assistance often arrives in an uncoordinated manner and in

a delayed fashion. As such, the dynamic between local and federal agencies must be assessed further, and will be assessed in greater detail in the next chapter.

All in all, it seems as though federal assistance is most valued by local agencies when it appears in the form of additional resources and funding. Problematically, quite a bit of time is lost when attempting to obtain any federal government assistance at all. By the time additional resources do arrive, it is often too late to do much good. If federalist ideals are to effectively work within the realm of emergency response then, local regions need to be properly prepared. In this sense, a major theme arose out of the conversations conducted with emergency responders. It revolved around being able to preemptively obtain additional resources before any major disaster takes place.

## Conclusion

For the past ten years or so "Las Vegas has been facing one of the worst medical emergencies in the nation" leaving the city particularly vulnerable to increases in incidences of both naturally occurring and intentional outbreaks of infectious diseases (Babula, 2002, p.2). Overall from the interviews conducted, it appears that in terms of possessing a comprehensive training plan for biological emergencies the CCFD is the most organized of all the other agencies. The CCFD plan is concise, naming the hazardous materials team as being in charge of response.

In fact, first responders in other departments depend on the hazardous materials team for mitigation of incidents that require specialized training and/or personal protective equipment. Hazardous materials teams and technicians beneath the sphere of the fire department "receive the most comprehensive training of all members of first response" (Alan Osborne and Richard Brenner, personal communication, October 16,

2009). While first responders in other departments are trained only to the operations level, these teams must attain re-certifications in a number of different fields at on-going intervals.

Problematically, both local police and fire departments do not have in place any formal next-in-line programs ensuring a pipeline of successors for critical posts. This means that if command staffs become incapacitated during an epidemic, there are no immediate experts to fill their positions. Additionally, Nicole Hart concluded the Las Vegas has its own unique problems in terms of being able to mitigate the effects of a fast-spreading infectious disease.

In order to coordinate transportation issues, multiple agencies including: the "Nevada Highway Patrol, LVMPD, the Nevada Department of Transportation, Public Works, etc. would all have to be involved" (Nicole Hart, personal communication, October 7, 2009). Furthermore in terms of tourism, responsibilities would be dispersed across "the Las Vegas Security Chiefs Association, as well as each individual hotel" (Nicole Hart, personal communication, October 7, 2009). Within the city of Las Vegas, because tourism is a primary industry, the hotels have a great deal of power. As such, each would have the freedom to determine for itself whether to temporarily refuse guests or remain open during an epidemic.

With numerous and diverse actors involved, Major Sellen easily states that any large-scale epidemic occurring within the city of Las Vegas "would not be a pleasant situation" (electronic communication, July 1, 2009). Simply keeping track of the millions of visitors that temporarily reside in Las Vegas at any given time is an enormous task, making it difficult to monitor and thwart disease spread. While loss of life would be

tragic during a large-scale epidemic, damage to the local economy as the result of such an event would be devastating and extremely difficult to recover from.

To conclude, emergency mangers are not required to participate in research and have little motivation to do so on an issue which involves a great deal of secrecy. As such, many of the interview questions were either not answered at all, or were answered in an over simplified manner. In order to obtain a more comprehensive view of how prepared local agencies are in the face of a large-scale emergency then, additional research must be conducted. The next chapter will utilize a historical comparative approach to analyze response measures initiated by local regions during emergencies of the past. By applying this research method, the goal is to perceive the true effectiveness and benefit of carrying out a polycentric government plan regarding hazard mitigation, in comparison with a federal-centered approach.

# CHAPTER 5

## LESSONS LEARNED FROM THE PAST

As a primary goal, the government of any country should seek to protect its citizens from harm. While the word harm can be defined in many ways, on the largest scale it is often described in terms of a disaster, or "the interdependent cascade of failures triggered by an extreme event" (Comfort, 2002, p.338). Once a disaster does occur, it then becomes the government's responsibility to ensure that the emergency is not exacerbated by inadequate coordination and ill-informed organizational response. Perhaps the best way to ensure that organizational and structural mistakes of the past in the realm of emergency preparedness are not repeated in the future is to look at previous domestic disasters.

Clearly, the two most recent catastrophic disasters to hit the United States were the events of September 11th and the aftermath of Hurricane Katrina. Following the attacks of September 11th, the federal government immediately began focusing on preventing the same type of emergency from occurring again. Plans and policies to prevent terrorists from hijacking planes were enacted, while a multitude of other threats cropping up to challenge the U.S. emergency management infrastructure were ignored. Due to this fact, a catastrophe on the scale of September 11th did transpire again, this time in the form of Hurricane Katrina.

Just four years after the events of September 11th, in August 2005, Hurricane Katrina revealed that policymakers remained unprepared to deal with an array of disastrous threats geared towards the United States in the 21st century. Failing to anticipate the unexpected, the Southeastern region of the country was ill-equipped to

properly ameliorate a disaster that originated outside the realm of previous historical experience; a New Orleans levee breach. Hurricane Katrina was of course not a man-made emergency, and thus represented a shift in the types of crises governments needed to prepare for.

While each of these events stemmed from different sources, both required a significant amount of local-level resources and coordination to combat resulting damage. Analyzing the response conducted by local and federal agencies in regard to these events, one can easily see that emergency mangers in both situations were more reliant on effective, polycentric response than federal government presence. For this reason, the following chapter applies lessons learned from polycentric mitigation measures of the past, to the way in which emergency management agencies should be organized, strengthened and operated to respond to crises of the future.

## All Disasters are Local

While the federal government is often in charge of mitigating the effects of any large disaster, most emergency and disaster management begins as a local government function. Within the United States, " a degree of sovereignty is assumed at state and local levels of government resulting in local governments having most of the discretion and responsibility for emergency management functions like preparedness, response, and recovery" (Schneck, 2009, p.5). This came about because many natural emergencies tend to reoccur within specific areas and local authorities, familiar with their precise types of problems, are better able to mitigate or put in place certain practices that minimize the adverse effects of such disasters (Gerber, 2007, p.235). When an emergency is not

routine, however, chaos can ensue as “the locus of control and coordination shifts from local and state, to federal control” (Schneck, 2009, p.10).

While the federalist system promotes localized initial response, with any large-scale catastrophe federal intervention is imminent. Federal assistance often comes into play as the scale of a hazard event quickly increases (Gerber, 2007, p.228). Possessing many more funds and resources than state and local governments, federal response departments are thus relied upon to assist shattered and drained local agencies.

Unless a region is completely incapacitated, the federal government cannot assume the reins for command during an emergency. Required to wait until circumstances are so devastating then, that state and local governments become victims themselves, federal response can often be hindered as localities become unable to properly request assistance (Schneck, 2009, p.15). Once federal authorities do arrive on the scene, efficient information sharing and response efforts are then complicated by the multitude of entities involved. “Policies that guide emergency response can vary widely in practice across federal, state, and local governmental entities,” so that measures initiated by local agencies may not even be useful to federal agencies arriving to pick up the pieces (Schneck, 2009, p.1). This can result in “duplication, lack of unity of effort, and diminished accountability” when trying to respond (Johnstone, 2008, p.55).

## The Hurricane Katrina Debacle

“What government does regularly, it tends to do well” and natural catastrophes such as Hurricanes further provide governments with days to prepare (Kettl, 2009, p.33). Unfortunately during Hurricane Katrina, the routine effects of the storm were quickly

exacerbated by sudden levee breaches. This non-routine occurrence led to catastrophe, despite the "best efforts of government employees at all levels" (Kettl, 2009, p.16).

It is the Stafford Act of 1988 that requires the governor to ask for help during a catastrophe in order to initiate federal government assistance (Kettl, 2009, p.24). Such a hierarchical model for requesting support proved detrimental during the response to Hurricane Katrina however. Adhering to the lengthy official process, "state and local officials in Louisiana had trouble defining just what they needed, leaving federal officials waiting for the right requests, submitted in just the right way for days" (Kettl, 2009, p.23). Similarly, while a request to the Pentagon for swift water rescue teams was made by the state, it too did not come to fruition due to an inability to approve the request in a timely manner (Cooper & Block, 2006, p.155). Just after the hurricane hit, the Coast Guard therefore became the most beneficial response mechanism, simply because it did not wait for official approval from either the federal government or the state to initiate life saving activities (Schneck, 2009, p.16).

Further escalating the situation, local officials made grave mistakes in their supposed preparation for the hurricane. Regarding evacuation procedures, "state and local officials considered drafting Amtrak to help, but had never sealed the deal," and in terms of the evacuees sheltered in the Superdome, no supplies were ever purchased to be placed in an extra storage unit that was specifically cleared for the occasion (Cooper & Block, 2006, p.237). Federal assistance also arrived too late because the governor did not believe that the levees, which were built to hold the rising waters back, were breached for quite some time. Governor Blanco of Louisiana later stated that she would not have been so

dismissive regarding evaluating the levees had she been aware that the federal response was hanging on her ability to clarify the breach (Cooper & Block, 2006, p.150).

Despite the fact that the federal government had supplied multiple up-to-date hurricane preparation plans to the region, Katrina revealed that the state of Louisiana's response measures were truly lacking. There was "insufficient communication and coordination amongst first responders, a lack of any central gathering point for information, a lack of understanding by key state officials of their emergency responsibilities, and inadequate interagency planning" (Kettl, 2009, p.104). In part, this may have been due to the fact that each federally supplied plan was "hundreds of pages long, thick with appendixes and crammed with dense, jargon-filled prose" (Cooper & Block, 2006, p.5). Most alarming, each emergency plan was created without any local input whatsoever.

To this day, the National Response Plan, which was created to have a more "consistent program of responding to large-scale disasters and catastrophes across states and localities," does not allow state input or comments (Schneck, 2009, p.6). The national pan also has an obvious slant towards terrorism, so that when Katrina did happen, the section on natural disaster response was still incomplete. Once the Hurricane hit, and the levees were breached, virtually every federal, state, and local agency was thus left unprepared, each conducting an independent operation in response to the disaster (Cooper & Block, 2006, p.181).

Besides confusing local response plans, when the federal government did eventually step in to help the state of Louisiana it was unable to provide much assistance. "Within seventy-two hours of Hurricane Katrina making landfall, the emergency

response network had increased from 58 to 410 actors" (Schneck, 2009, p.19). As the size of the response network increased, the response became more complex, and thus much more difficult to coordinate. All in all, local emergency response teams from Texas provided the most help, revealing an interesting "movement from federal to local control as the emergency escalated, rather than the accepted progression from local to federal control" (Schneck, 2009, p.19).

Looking at the aftereffects of Hurricane Katrina, it appears obvious that relying on federal government intervention is not always the ideal solution. Stifled by bureaucracy and formal request procedures, the state of Louisiana was unable to act quickly, and therefore was forced to stand by as the disaster escalated. It seems as though the local government was hindered by insufficient federal guidance, and federal mitigation efforts were correspondingly hindered by a flawed initial response. Louisiana, like perhaps many other states, may have thus functioned better had it been provided with additional federal resources prior to the disaster, and less physical federal intervention post-disaster.

## Federal Intervention at its Worst

Regarding preserving federalist ideals, the fact that local officials responded remarkably well to the shock of September 11th vindicates values of local and state independence. Local dominance appeared to be essential following the attacks, as first responders in the state of New York remained aware that quick response was vital. Unfortunately, the federal government was unable to follow the same mantra.

Ideally during a localized crisis, vertical communication occurs between federal and state governments, while horizontal coordination takes place across local agencies

(Gerber, 2007, p.228). Table 5 in Appendix C reveals that local agencies possessed higher levels of coordination than federal agencies in nearly every realm during the response to 9/11. Prioritizing regional decision-makers thus provided a more dynamic framework for action than any federal-centered approach (Cooper & Block, 2006, p.301). Bureaucracy is often the main culprit working to slow federal intervention. When requesting federal assistance during an emergency, so much paperwork needs to be processed that "in recent years some state agencies have run training exercises focused solely on how to complete forms for the disaster declaration request" (Waugh, 2000, p.34).

Federal intervention can hinder response in other ways as well. As evidenced by the Katrina debacle, federal officials can have trouble connecting with local agencies and assisting them in an efficient manner. With an increased number of agencies involved in response, all attempting to communicate regularly and exchange information frequently, it is difficult to make sure the right dots are connected properly (Schneck, 2009, p.4).

Table 6 in Appendix C reveals just how many organizations were involved in response to 9/11, exemplifying the fact that federal assistance often arrives in the form of a multitude of different actors. These different actors can perceive the same pieces of information differently, leading to interactions that are limited, and occur primarily between organizations of similar type (Kettl, 2009, p.77). Since federal emergency management agencies are not located near the center of the crisis, they are often the agencies easily left out of communications.

The Department of Homeland Security

Any incident that has the potential for significant impact on the nation's well being is responded to beneath the sphere of the Department of Homeland Security (DHS). Currently, however, DHS has many obstacles hindering its functions. In 2003 DHS was created, integrating twenty-two separate agencies and more than 200,000 employees, to form the third largest agency in government (Gerber, 2007, p.3). With so many agencies and staff members beneath its sphere, DHS has thus far had trouble coordinating and mobilizing resources across the federal government in response to security threats (Gerber, 2007, p. 2).

While the department's main responsibility is to provide overwhelmed cities and states with a more organized response effort, the department's largest concern over recent years has ironically become organizing its own organizations. At present, "the coordinator of homeland security has little real authority over the myriad of departments, agencies and offices that are involved in dealing with threats to biological security" (Waugh & Sylves, 2002, p.147). Due to troubles with bringing its many departments together into one collaborative unit, oftentimes information has flowed into DHS, but not out to those who need it (Cooper & Block, 2006, p.157). Regarding this branch of the federal government then, "the biggest areas needing improvement deal with the very 'connecting the dots' problem that the department was created to solve" (Kettl, 2004, p.7).

Additionally, the DHS reports to multiple congressional oversight committees which have stretched its resources and made it difficult to focus policy enactment and legislation (Gerber, 2007, p.2). Lacking sufficient resources of its own, the department is

unable to carry out its primary function of delivering resources to the sates. Overall, it appears as though the Department of Homeland Security was created more as a symbolic gesture of the federal government's commitment to the security issue, rather than an actual efficient grouping of agencies meant to effectively assist states during a crisis. As such, the Department of Homeland Security has been reasonably unsuccessful, only serving to further emphasize the usefulness of applying federalist principles to localized emergency situations.

## The Federal Emergency Management Agency

While the Department of Homeland Security was created as an umbrella agency, collecting information from multiple sources and reporting directly to the president, this task used to belong to the Federal Emergency Management Agency (FEMA). FEMA was created in 1979 as an agency designed to mitigate local disasters. In the past, it was FEMA that could report directly to the President, making its role much more effective (Cooper & Block, 2006, p.77). Being able to relay information directly to the federal government without a myriad of decision makers adding to the confusion allowed for a much quicker response.

In 2003, FEMA fell beneath the realm of DHS and lost much of its power. Being one of the smallest agencies in the Department of Homeland Security, FEMA felt the squeeze more than others. It was denied as much as $80 million a year and was forced to compete with the Office of Domestic Preparedness (ODP) for any remaining funds (Cooper & Block, 2006, p.84). Within the Department of Homeland Security, FEMA and ODP have overlapping responsibilities in terms of protecting the populace. While FEMA "distributes grants for public health, medical preparedness, and natural disaster response

training, ODP does the same, but specifically for acts of terrorism" (Kettl, 2004, p.19). There was a fear that "if FEMA picked up terrorism as a responsibility, it would consume the time, energy and resources needed to respond to natural disasters" (Cooper & Block, 2006, p.65).

FEMA stated for years that it needed to "run the whole show" during local emergencies in order for states to have a one-stop shop regarding grants (Cooper & Block, 2006, p.85). Whether the source of a disaster stemmed from natural or man-made causes, FEMA believed that emergency response in terms of financial resources would be very similar. Unfortunately, at the end of the day the split between FEMA and ODP has remained, and work between the two organizations is still dangerously uncoordinated. As such, states do not have a unified figure regarding accessing federal government assistance, and it seems as though "many of the most important problems the country faces today simply do not match the federal institutions created to govern them" (Kettl, 2009, p.25).

## Applying Lessons to Issues of Funding

While local government may be the first step in responding to an emergency, federal agencies are intended to provide additional support and resources. When it comes to directing financial resources strategically to state and local governments, however, "promised federal aid has thus far flowed slowly and has been allocated more on the basis of pork than need" (Kettl, 2004, pp.7, 9). Since the beginning of this century there has been little support at the federal level for substantial new investments in local emergency activities (Frist, 2002, p.1). Many state governments, already suffering due to a significant nation-wide budget crisis, have thus struggled to provide sufficient monies

to their local first responders. A recent government report found that “seventy-one percent of law enforcement agencies and over half of fire departments have reported no increases in funding” in years (Kettl, 2004, p.18). If the federalist system is to truly work in the face of a biological attack then, it seems as though local and state governments must be further strengthened with additional funding from the federal government.

Specifically for disease events and environmental hazards, senators in Congress have long refused to sponsor acts that provide state infrastructures with the additional funding necessary to enhance preparedness levels (Bryan & Fields, 1999, p.1). Throughout recent history, the bulk of the United States’ government spending on bio-defense went to the Pentagon for studies and for equipment like detectors, suits, vaccines, and masks, rather than to the actual states. Regarding biological emergencies then, little money has thus far been allocated to strengthening the local health facilities that would actually have to contain an infectious outbreak.

So far only a few calls to action have been made in the realm of federal assistance through funding. In June 2002, President Bush signed into law the Public Health Security and Bioterrorism Preparedness and Response Act which authorized greater funding to the states in the face of biological attack. Then in 2005, he submitted a request for an additional $7.1 Billion (Osterholm, 2007, p.8).

Thus far, it appears as though some states have benefited from this act, but definitely not all, with “evidence indicating that additional assistance is required to meet state and local needs” (Wise & Nader, 2002, p. 48). According to the U.S. General Accounting Office, “poor interagency coordination within the federal government and inadequate top-down federal, state, and local cooperation has [thus far] accompanied any

additional spending activity," making organized financial investments within the states nearly impossible (Kincaid & Cole, 2002, p.183). So while emergency management has become a bottom-up process, regarding resources, federal assistance has not been kind to local governments and has remained a dysfunctional and limited top-down approach (Waugh & Sylves, 2002, p.149).

Why Proper Funding is Essential

Naturally occurring pathogenic invasion is a unique type of threat. To the naked eye pathogens are invisible, making them perhaps more terrifying than standard threats to society. Similarly frightening, authorities would have very little knowledge of exactly who was infected during an outbreak as news spread and even unexposed individuals experience pseudo-symptoms out of paranoia and fear. These individuals "will add complexity and additional patients for triage during the crisis," warranting trained medical personnel who can quickly differentiate between pseudo-patients and those actually infected (Lederberg, 1999, p.254).

Oftentimes with limited local funds, personnel and resources required to prevent disease compete with those created to treat disease, often known as the "crowding out effect" (Lamptey et al, 2006, p.16). In this sense, while a majority of local funds are directed towards treatment methods, procedures such as appropriate containment procedures are often pushed aside. During a biological emergency, however, it is essential that those susceptible to infection but not yet exposed are separated from the contagious quickly and efficiently. As of now, most local public health facilities are not designed to accommodate a large number of highly contagious people, and thus have no proper means of isolating them from an uncontaminated public.

According to many experts, “a modest program of $35 million a year” could train emergency personnel in key cities and create within those cities designated quarantine, treatment, and contaminated areas (Frist, 2002, p.3). There is a question of how key cities are defined and identified, however, and DHS has in the past designated about 120 cities to receive additional funds. Mistakenly, many of these cities were selected based on population, rather than inherent need or actual likelihood of becoming threatened by either natural or intentional biological attack however. Overall, if polycentric methods of disease mitigation are to work, the federal government must become aware of which localities are most vulnerable and most in need of additional fiscal support.

Funding and Disease Detection

Whether stemming from intentional or natural sources, in the face of a biological disaster it is necessary for sates to first have the ability and resources to rapidly identify, investigate, and especially control the consequences of pathogenic invasion (Bryan & Fields, 1999, p.2). To prevent further spread, diseases must be reported in a timely manner and appropriate health responses must be immediately triggered (M’ikanatha et al, 2003, p.1). Funding for greater technologies, training, and telecommunications networks that support disease surveillance, dissemination of health information, and co-ordination of emergency response activities are thus necessary.

In the United States, the Centers for Disease Control (CDC) are typically responsible for tracking the spread of an emerging disease. The CDC classifies biological agents into three categories. Category A consists of the most dangerous, high priority agents including: anthrax, botulism, plague, smallpox, and viral hemorrhagic fevers like Ebola. Category B consists of food safety threats like Salmonella, as well as Ricin toxin,

Typhus fever, etc. Category C "includes emerging pathogens that could be engineered for mass dissemination due to: availability, ease of production and dissemination, and potential for high morbidity and mortality rates" (Hamburg et al, 2008, p. 5).

Once the biological agent at the source of an epidemic is identified and categorized, the CDC, in coordination with the Department of Health and Human Services, is then in charge of communicating health-related information and guidance. In order for the CDC to efficiently monitor and track disease outbreaks, identify new diseases, provide laboratory support, and disseminate expert advice and control measures, states and local health departments must first have the technological ability to rapidly acquire and send out local disease information.

To have the rapid assessment and reporting of data on disease occurrence needed during an emergency, the communications-sharing network will have to be seamless. Local public health departments will need "standardized protocols via a multilevel laboratory response network that links hospital, commercial, veterinary, food and water laboratories together" (Khan et al, 2000, p.2). Universal coding standards are also necessary. Most importantly, there must be qualified personnel available to properly interpret and input results. Automated systems after all are a "complement, [not] a substitute for human involvement in interpreting laboratory findings and screening for errors" (M'ikanatha et al, 2003, p.1).

In this sense, funding must be directed towards acquiring "an adequate number of epidemiologists trained in detection, control, and treatment of biological agents" (Bryan & Fields, 1999, p.2). Epidemiology is commonly known as the study of those factors which affect the health of populations, and it is highly regarded in evidence-based

medicine for identifying risk factors for disease through preventative approaches. Locally, trained epidemiologists, along with updated technological capabilities, can work together to prevent any pathogenic outbreak from worsening.

Despite the fact that threats to human health are ever-present, "the overall system of disease surveillance in the U.S. has not developed into a robust, coordinated capability" (Hamburg et al, 2008, p.16). The Trust for America's Health 2005 Report found that: "over one-fourth of states [in the U.S.] were rated by the CDC as lacking sufficient laboratory response capabilities, nearly half were unable to track disease outbreak information, and almost a third had insufficient capacity to expeditiously consult with infection control experts" (Johnstone, 2008, p.120). Overall it was concluded that laboratory capabilities vary from state to state, with most jurisdictions unable to survey a vast range of diseases. "The U.S. first line of defense against diseases is thus severely impeded; requiring considerable investment in the development of significantly improved surveillance capabilities "(Brower & Chalk, 2003, p.94).

## Applying Lessons to Acts of Biological Terrorism

The National Intelligence Council predicted that a major terrorist attack employing biological agents will likely occur by the year 2020. According to the Council, one goal of such an attack would be to "undermine public confidence in the ability of local government to protect and defend its citizens, thereby creating a climate of fear and intimidation amongst the populace" (Howard et al, 2006, p.63). Terrorists typically look to take advantage of any weaknesses they perceive in a region's ability to detect, prevent, and respond to crises.

In general, measures to combat acts of biological warfare have not been provided proper resources and manpower in the United States. This is dangerous for local regions because, unlike with a natural outbreak, an intentional attack would lead to a near-simultaneous infection of many people, easily overwhelming even the finest health care infrastructure (Lederberg, 1999, p.280). Terrorists could further overwhelm local emergency response teams by "releasing a recombinant virus that would express itself in distinct phases" (Miller et al, 2002, p.232). If such a pathogen was used, first responders who would rush to an affected region to contain and treat an outbreak would themselves become vectors of a secondary epidemic that they would unknowingly carry back to their families.

In order to minimize the effects of such an attack, local authorities must be aware of the threat of biological warfare and have an increased understanding and belief that an attack from such a source can in fact occur. Any intentionally released disease will less catastrophically ruffle a community alert of the multiple types of risk and possible countermeasures (Kellman, 2007, p.160). For this reason, preemptive federal government funding to the states is essential. Ideally, finances should trickle down to hospital-accrediting bodies, as well as local emergency response teams that can encourage both bureaucratic and medical facilities to incorporate biological warfare scenarios into their annual training (Lederberg, 1999, p.231).

Detection and Civil Liberties

In a democratic society, counterterrorism efforts often entail difficult trade offs between civil liberties and public safety. Within the United States, local authorities thus have an additional problem that they must be aware of; how to enhance biological

security without imposing intolerable stresses on personal liberties. Impeded by the regulations and paperwork often surrounding issues of informed consent, definitive response measures can be unduly postponed (Lemon et al, 2008, p.282). In the realm of biological security, this is especially true regarding issues such as quarantine and mandatory examinations.

Issues also arise when certain members of the population do not wish to get vaccinated, or refuse to take drugs that have not yet been thoroughly tested. While this may place other citizens at risk, it would be difficult for the government to justify infringing on citizens' civil liberties beneath these circumstances. In order to enact drastic response measures like forced quarantine or vaccination then, there must be an element of transparency regarding information that is disseminated to the public.

Locally, the issue of transparency separates law enforcement from emergency managers. On one side, law enforcement officials advocate secrecy and tight security as the key to minimizing the trauma of any terrorist attack. On the other side, rescue workers and emergency managers emphasize “collaboration, information sharing, and public awareness to reduce the impact of disasters” (Cooper & Block, 2006, p.81). They claim that “authorities would lose hours or days trying to determine the cause of an outbreak, and could be treating with ineffective antibiotics” if they are not given access to specific information and methods of mitigation in due time (Armstrong, 2002, p.2).

If a local government moves toward restraining the flow of information there will further be an inevitable clash with the academic research community. This community is constantly fighting to keep open the “information exchange that could speed up the discovery of vaccines and drugs to treat infectious diseases” (Atlas, 2002, p.754). In

order to remain continuously ahead of the curve, many informed voices must be heard with a variety of choices put forward for consideration, especially in the scientific fields (Woolwine, 2007, p.8). Any governance framework that stymies development [could] retard research and make the challenge of responsibly developing treatments far more difficult in the future (Gostin, 1997, p.689).

## Conclusion

Overall, it is clear that the events of September 11, 2001, and subsequent events like Hurricane Katrina "have underscored the dire need to further transform government processes, systems, and organizational frameworks to better protect the American people" (Forrester, 2005, p. 25). With an almost infinite number of biological threats and targets across the U.S., winning the war against an incoming pathogenic invasion will require a change in the way the battle is being fought (Rothkopf, 2002, p.58). Many political analysts have noted that "improving the capacity of U.S. governments to provide greater homeland security will primarily require changes in the way federal, state, and local governments are organized and coordinate with one another" (Wise & Nader, 2002, p. 44).

Thus far, in the sphere of countering biological threats, the federal government has allowed for "a hodgepodge of programs that are often conceptually dubious, bureaucratically duplicative, poorly coordinated, and disastrously implemented" (Miller et al, 2002, p.276). Particularly, state and local officials often report being confused and unable to identify the entities in charge of resources. As a result, local authorities do not receive sufficient amounts of funding and assistance, and their ability to mitigate the effects of a local disaster are thus hindered.

Locally there are problems as well. In order to acquire sufficient federal assistance, horizontal communication must occur effectively amongst local organizations so that relevant information can be elevated vertically to the federal government when the time comes. At that point, rather than stepping in to replace local first responders, federal agencies must be supportive and cooperative with local authorities, allowing intervention to take place not through symbols and force, but rather through the supply of appropriate resources and funds.

It seems as though in terms of a biological emergency, in the longer run, a positive mobilization based on efficacy rather than federal dominance is necessary if response actions are to be sustained (Graeger, 1996, p.112). Federalist ideals are thus essential to emergency response because within a large country such as the United States, in order for response to be quick, it must be focused locally. Local capabilities must thus be strengthened first and foremost, and the federal government must be willing to empower states and local governments with sufficient resources and response capabilities prior to a disaster.

Thus far, it has been a daunting challenge encouraging federal politicians to begin spending millions of dollars on research and preemptive resources for threats that may not even transpire (Osterholm, 2007, p.5). While it is difficult for humans to plan for low probability, high consequence events, and politicians especially tend to overly discount ambiguous future rewards in exchange for present and certain short-term costs, the threat of a global pandemic is increasing (Gerber, 2007, p.231). When speaking of large-scale threats to human health, billions of people could suffer the world over if preemptive planning is not taken.

# CHAPTER 6

# CONCLUSION

In order to justify government emphasis on the potential consequences of novel biological threats, it has been important to prove that such threats indeed present just as great a risk to society as conventional problems. With changing ecologies and capabilities of scientists around the world, this thesis has posed just that; that the threat of a newly emerging infectious disease epidemic is becoming more and more likely, and that local governments are simultaneously becoming less and less prepared to respond to them.

There are two primary sources specified in previous chapters from which a biological catastrophe seems most likely to originate: through naturally occurring environmental means and intentional acts against society. While naturally occurring viruses and bacteria are ever-present, human encroachment upon every aspect of the Earth, from climate to wildlife, combined with advancements in pharmaceutical drugs, have allowed for the creation of both stronger and a more widespread release of pathogenic agents. In terms of intentional biological attack, biological weapons are the poor man's nuclear bomb. They are not only cheaper and easier to disseminate, but can be even more catastrophic. Overall, the many varied cities throughout the United States must begin to prepare now for a vast range of biological threats that will arrive to challenge human health from an assortment of different sources in the coming years.

## The Concept of Biological Security

"Since 1975, at least thirty-three new pathogens have emerged to compromise the health of the human species" (Price-Smith, 2002, p.3). Despite this fact, within the United States the concept of biological security has been defined quite broadly by the political

community, becoming a catchword for sorted goals, rather than a stable notion of potential disaster. Biological threats stemming from ecological change in particular have thus far been overlooked. Unfortunately, government legitimacy is easily undermined out of an inability to respond to crises, and with ecological change, pathogens and disease are major threats on the rise.

As discussed in Chapter 2, ecological shifts can affect the security of human health in multiple ways. Most importantly, however, these shifts increase the incidence and magnitude of natural disasters such as storms, flooding, etc., which correspondingly affect the proliferation of many carriers of disease. Simultaneously arising to threaten the health of modern societies are the amplified incidences of hostile terrorist acts. It has become apparent that the relative ineffectiveness of past use of biological agents by hostile groups provides little insight into the potential consequences of modern biotechnological advancements (Lederberg, 1999, p.231).

In particular, as vast numbers of organisms, including various molds, viruses, etc., are easily being created and grown in laboratories, they can also now quickly be transported to any corner of the globe. In today's world, "the jet airplane unintentionally provides the ideal mechanism by which pathogens of all types move around the Earth in infected humans, host animals, and vectors" (Lemon et al, 2008, 17). Predicting the next location and source of an intentional biological attack has thus become nearly impossible.

Furthermore, given the inability of the U.S. government to eliminate the importation of large volumes of illegal drugs into the country, interdiction of the tiny amounts of material necessary to carry out a biological attack is evidently hopeless (Madden & Wheelis, 2003, 158). Currently, there is very little control at the borders as

well as no restrictive barriers between most U.S. states. Both people and the materials they carry can thus move freely throughout nation.

## Responding to Contemporary Threats to Human Health

While for the last few decades the world has been rather lucky in terms of the amount of destruction caused by pandemics, recent scares have been good indicators of how countries will respond to the potentially heinous outbreaks of infectious diseases of the future. In April of 2009, the reemergence globally of Swine Flu put the United States to the test. Originating in Mexico, a land-sharing neighbor with the United States, the H1N1 influenza virus quickly penetrated U.S. soil.

While the initial response to H1N1 within the United States was relatively weak, ultimately a public health emergency allowing for scarce resources to be freed up to state and local agencies was declared. Other than this action, very few other actions were taken however. The U.S. Customs and Border Protection decided not to close any borders. Screening at points of arrival was thus reduced to the use of "passive selection," where only visually symptomatic people were isolated and questioned. In addition, a much more prevalent message was put out by U.S. officials that people needed to take responsibility for their own health. Commonsense safety measures were recommended, like covering coughs and sneezes with a disposable tissue, washing hands frequently, avoiding touching the face, and staying home if sick.

Unlike within other countries, no masks became available, and no official public response plan was immediately put in place. Eventually, a nationwide vaccination attempt became the main response effort to stop the flu from spreading. Vaccines are often incorrectly emphasized as a panacea for epidemics however. Not only are they

extremely expensive to create, with an estimated cost of $5.6 billion for sufficient stockpiling of influenza vaccine alone, but a focus on vaccine stockpiling also tends to direct government funds away from shoring up the local health facilities needed to actually distribute them (Cooper, 2006, p.113). In 2006, “ninety percent of the first $3.8 billion that Congress appropriated for biological threats was devoted to vaccine stockpiling, leaving only $350 million for other improvements to the public health infrastructure” (Kellman, 2007, p.175).

Furthermore, it seems that the country has always experienced some difficulty reaching all sectors of the public when it comes to vaccine distribution. In 2003, an attempt was made to vaccinate approximately eleven million U.S. health care workers and emergency response personnel against smallpox across the nation. Despite best efforts, only 40,000 people were actually vaccinated (Hamburg et al, 2008, p.6). A similar occurrence has been taking place regarding the H1N1 virus, perhaps because “only ten vaccine companies produce over eighty percent of the world’s influenza vaccine” (Kellman, 2007, p.180).

By September 2009, prior to the peak of the actual flu season, 393 lab cases of H1N1 were reported within Southern Nevada alone. Dr Ellen M. Fitzpatrick, head of Las Vegas epidemiology, confirmed that this was indicative of proper surveillance of the disease, but poor isolation methods. As of November 2009, approximately eight months after news of the reemergence of H1N1 influenza broke; seventy-seven percent of vaccines promised to the public were yet to be distributed.

While this particular strain of H1N1 influenza virus is one that the world has seen in the past, if a novel infectious disease were to crop up, the country would be unable to

rely on a vaccine as a solution. As of now, “less than 1% of viruses and bacteria have been described,” making it very difficult for anyone in the biological profession to preemptively generate a vaccine (Pirages & DeGeest, 2004, p.8). There is also the new problem of creating a vaccine against a certain disease only to learn that its DNA sequence has been intentionally manipulated by hostile groups. This would not only lead to costly inefficiencies, but vaccines may not be created in the future out of fear of repeating the same mistake.

## Is the City of Las Vegas Prepared?

Unlike with any conventional problem, in order to contain an attack against human health, response measures that are both well coordinated and extremely efficient would be required. Specifically, if the threat arrives in the form of a highly infectious disease, “initial response will not only have to be robust and well rehearsed, but also extremely resourceful, since there is only a short window to implement control measures” (Khan et al, 2000, p.1). Much of this is reliant upon the coordination that occurs horizontally between local government agencies, first responders, and emergency managers. Strengthening local agencies thus necessitates providing enough resources and well trained people who have the right tools and equipment to deal with any sort of threat.

Focusing on the city of Las Vegas, a case study of local preparedness measures and procedures for responding to large-scale disease epidemics was undertaken utilizing three types of methodologies. First, interviews of local emergency mangers were conducted to perceive their individual levels of preparedness. Second, an analysis of the local emergency response plan was undertaken to compare it with interview responses.

Third, a historical comparative approach was utilized to determine the efficacy of the federalist-dominated, polycentric approach to hazard mitigation. By comparing interview responses with both the emergency plan and historical examples of disaster response, the goal was to create a comprehensive picture of levels of coordination that take place when attempting to mitigate the effects of a localized crisis.

Overall, judging by interview responses and past government attempts to respond to large-scale disaster events, it appears that a city the size of Las Vegas would not currently be able to mitigate the effects of a deadly disease epidemic. Interviews revealed that while local emergency responders train constantly throughout their careers and do consistently communicate with the federal government, they are primarily trained to deal with the impacts of natural disasters and intentional acts of terrorism, not specific threats targeting human health. Particularly, very few preparations are being made at the local emergency response level for any threat to human health stemming from sources outside the realm of previous experience. In this sense, methods used to respond to conventional threats are being utilized to respond to disease epidemics.

While this may seem cost-effective, since it has been stated that any "effective strategy to combat threats to human health would include standard approaches of initial prevention techniques and subsequent mitigation techniques," pathogens are a unique type of threat (Lederberg, 1999, p.305). Invisible to the human eye and often carried by human, animal, or plant hosts, pathogens can enter any region of the country quite easily, making prevention techniques extremely difficult. In order to intercept novel diseases and their pathways, it thus becomes important to ensure that significant links in the defense chain are aware of the threat as well as appropriately resourced (Nolutshungu, 1996, p.3).

The provision of sufficient funding and resources is essential during a localized epidemic because such funding is primarily funneled towards containment, treatment, surveillance, and tracking procedures. When a contagious pathogen is unleashed, there is a need to "immediately be able to diagnose the threat, quickly decide on the most effective courses of action, and respond in an integrated fashion within extremely compressed time frames" (Wise & Nader, 2002, p.46). State and local health departments, responsible for disease surveillance, must thus be able to efficiently allocate limited funds amongst differing local response agencies in order to properly monitor and contain any health threat (Hamburg et al, 2008, p.16).

Hospitals will need special wards that seal the contagious off from the rest, and sufficient vaccines, medications, etc. will also need to be provided (Howard et al, 2006, p.440). Additionally, sufficient telecommunications capabilities are necessary to properly emit warnings as well as specific advice on what people can do to protect themselves in order to reduce risk. Each of these measures is quite costly, and with "only six percent of [government] funds allocated to strengthening the public-health infrastructure" any sort of health threat can easily become a crisis (Frist, 2002, p.2).

Thus far, as stated in Chapter 4, many response agencies within the city of Las Vegas have remained without sufficient funding, resources, and technological capabilities. Additionally, in terms of preparations made by response agencies, there are no clearly defined performance standards or self-evaluations to test performance measures locally. While the city of Las Vegas has not prepared itself for specific pathogenic threats, unique to the city is that it is dependent on tourism and the fact that a disease can spread quite quickly, easily, and without much control amongst the visiting

population. For this reason, the city has much more to lose if it does not prepare itself for the potentially hazardous effects of a local disease outbreak.

Even if a city of one million inhabitants had adopted a biological defense infrastructure strong enough to save ninety-five percent of its population, it would still sustain 50,000 casualties (Lederberg, 1999, p.279). Las Vegas has twice this population, and is far from able to save ninety-five percent. For this reason, policymakers in Las Vegas will need to be aware of first responder and health-related infrastructural capabilities. Whatever the source of an epidemic, being able to properly respond and recover has the potential to greatly reduce casualties and hence is an important government goal.

## The Promotion of Federalist Ideals

"Good health is a fundamental resource for social and economic development," and thus its maintenance is a primary objective for any government (Menne & Ebi, 2006, p.395). Within the United States there is still much room for improvement and efficiency in the processes of federal government response methods however. "Officials and the public are quick to forget, and thus have been fated to repeat past policy mistakes" (Waugh, 2000, p.51).

Specifically, mistakes regarding emergency response procedures to Hurricane Katrina have yet to be resolved. During this crisis, the federal government did not honor its commitment to assisting local Louisiana response teams through resources rather than power struggles. As a result, federalist ideals came into action to mitigate effects of the disaster in the form of nearby state emergency agencies. From the aftermath of this hurricane, it has become apparent that local emergency response mangers must fight the

instinct to look back rather than forward, as well as fight an instinct to think vertically rather than horizontally across government levels during a localized emergency.

Another lesson learned from Hurricane Katrina is the fact that, during regional disasters, the federal government tends to focus more on symbols of security than what will best assist incapacitated citizens. In order for response to an emergency to be efficient then, reactionary measures must truly work from the bottom up, so that time is not wasted, procedures duplicated, bureaucracy and paperwork allowed to get in the way, and an overall lack of coordination allowed to ensue. To accomplish this task, the federal government must commit to providing preemptive support functions to local emergency response agencies.

Overall, local government agencies have much to improve on if they plan on being prepared for a vast range of biological emergencies. Policies governing the protection of: domestic agriculture, infrastructures that preserve human health, and methods of vector control, are significant areas that must be strengthened and policymakers must present preparedness for biological threats originating from these areas as an important goal.

Policy processes often feature long periods of incremental change, occasionally punctuated by brief periods of extreme policy alterations. These sudden policy alterations are often due to novel advances in information regarding past beliefs. Following the previous five chapters, the hope is that such extreme change will occur now in the realm of local biological security measures. Local response agencies can utilize the information in this thesis concerning potential disease uprising and spread to begin planning seriously for the threat of emerging epidemics.

This thesis has tested three hypotheses: that the threat of emerging infectious diseases is likely and thus should be taken more seriously by policymakers; that emergency managers within many local regions are not prepared to deal with a large-scale, deadly disease outbreak; and that federal government intervention in response to these problems, when not arriving in the form of greater funding and resources, often only serves to confuse mitigation measures. While conclusions have pointed to the fact that each of these hypotheses are true, unfortunately "the effectiveness of emergency management policies and programs are difficult to measure until after a disaster occurs" (Waugh, 2000, p.52). As such, recommendations can be made regarding ways to better prepare for a large-scale epidemic, but the only way to truly see how prepared local regions are is to wait for the inevitable to occur.

Even if potential epidemics are prepared for but do not immediately materialize, governments must not let planning fatigue take place leading to a loss of interest in the subject (Osterholm, 2007, p.6). Diseases and bacteria are ever present and will remain, as they have always been, a significant area of concern. Looking at past predictions of potential calamity, "the risks of erring on the side of caution tend to be fewer than the costs of dismissing predicted threats" (Linden, 2006, p.2). As the country becomes better equipped, trained and prepared to deal with the effects of biological invasion, that defensive capability will only serve to strengthen the nation as whole.

# APPENDIX A

## INTERVIEW QUESTIONNAIRES

### Questions for the Southern Nevada Health District

- What is your professional title/position?
- What is the type of your highest degree or training?

- From what types of factors has your department anticipated an epidemic to originate?
- Are veterinarians incorporated into prevention, surveillance and mitigation plans?
- Please rank from numbers 1 to 4 how concerned your organization is about the following potential health effects of climate change:
    - deaths and injuries due to increased incidents of floods?
    - illnesses due to increased intensities of heat waves?
    - increased cases of vector-borne diseases?
    - increased cases of illnesses due to bacteria?
- Do you receive routine transmissions of meteorological information?
- Is there a program to monitor population health during natural disasters? Does it include:
    - recent mortality rates?
    - doctor reports and recent hospital admissions throughout the region?
    - emergency room consultations?
- How are marginalized groups looked at and dealt with regarding surveillance, prevention, and mitigation of infectious disease?
- Where is information regarding pandemic preparedness/response located? How can people receive information from your organization during a pandemic?
- How is self care advice provided or advice on how to reduce risk of infection?
- Is the public notified regarding who to contact to obtain such information?
- Regarding the occurrence of a pandemic, have businesses been encouraged to develop plans to ensure they have the information needed to properly plan and enact procedures allowing for the continuation of their business during episodes of staff sickness, etc.?
- How will the health sector address personnel absenteeism?
- Are physicians being trained to handle extra demand when necessary?
- What estimates have been made of the demand for critical care beds in the event of a pandemic?
- What is current bed utilization?
- How much bed capacity could be released and within what amount of time?
- How many primary care facilities have a pandemic emergency plan in place now?
- For which types of diseases are vaccines/ antiviral drugs currently being stocked?
- What does the stockpile look like in terms of ratio to current population?
- How will the vaccine be distributed?
- Will prescriptions be necessary?

- Is there any sort of contract made to ensure the supply of any specific types of vaccines?
- Have provisional immunization priority groups been drawn up regarding administering vaccines/antiviral drugs?
- When are priority groups to be resorted to?
- Have you tested preparedness?
- How are preparedness tests funded?
- Overall, what are the graduated series of public health measures that would be implemented to reduce impact and help control a local epidemic?
- Is there any additional information that you think would help me describe the preventative and response measures of your department?

Questions for Local Clark County Heads of First Response

- What is your professional title/position?
- What is the type of your highest degree or training?
- Where is information regarding pandemic preparedness/response located?
- How can people receive information from your organization during a pandemic?
- Please name the section of or the person responsible for:
    - protecting human health from invading threats
    - disaster preparedness plans
    - mobilization and response during emergencies
- How many first responders are there in your department who specialize in county-wide biological emergency situations?
- What budget is provided to them?
- Is there a next-in-line succession order ensuring a pipeline of successors for critical posts?
- Does your agency have a comprehensive training plan put in place for biological emergencies that specifies:
    - Objectives?
    - Participants?
    - Periodic reviews?
    - Budgets?
    - Back-up resources?
    - Simulation exercises?
- Are pre and post-assessments conducted to measure training comprehension levels and overall effectiveness of training programs?
- When was your emergency plan last revised?

- Does this agency consistently remain in contact with, local, state, regional, and national emergency responders and governments?

- What are the stages for disaster relief at the local level and upwards?
- How would you describe the amount of coordination that occurs between local, state, and federal agencies when preparing for an emergency?

- How concerned are you and your organization about the following health effects of climate change: deaths and injuries due to floods, illnesses due to heat waves, increased cases of vector-borne diseases?
- Do you receive routine transmissions of meteorological information?
- Do your emergency measures include those for: floods, cold spells, extreme heat waves, windstorms, food or water-borne illnesses, vector infestations, or infectious diseases?
- Do your emergency plans involve an assessment of which areas and people are most susceptible within the county to certain types of biological threats?

- How high would you rank emergency preparedness in the realm of pandemics?
- What current steps are being taken to preempt local spread of the H1N1 virus?
- During a pandemic:
    - Will people be prevented from traveling?
    - How will the city coordinate transportation issues?
    - How will tourism be dealt with? The hotels?
    - Will there be screening at points of entry in the state? When will this be utilized? How? By Who?
    - Will the borders remain open to people and/or supplies during a pandemic? Are there circumstances under which the border would be closed (e.g., a certain phase of the pandemic)?
- In the event of a health emergency, are you most prepared to deal with temperature stresses, or diseases due to natural or intentional causes?
- How concerned are you and your organization about the potential effects of an intentional biological attack upon the city of Las Vegas?

- Is there any additional information that you think would help me describe the preventative and response measures of your department?

APPENDIX B

QUESTIONNAIRE RESULTS

Electronic Communication with Major David M. Sellen, Commander of the 92nd Civil Support Team in charge of Weapons of Mass Destruction (July 1, 2009).

- What is the type of your highest degree or training?

BA- History, Some Graduate work in Homeland Security/ Disaster and Emergency management.

- Where is information regarding pandemic preparedness/response located?

Pandemic preparedness/response is located in the NV Emergency Operations Plan.

- How can people receive information from your organization during a pandemic?

People can receive information by contacting the Joint Forces Headquarters for the NV National Guard.

- How many first responders are there who specialize in county-wide emergency situations?

Depending on the type of emergency, any where from eight to a few hundred personnel. This also varies depending on whether it is a city/county/state/federal asset that is responding.

- What budget is provided to them?

Most operate on a county budget, supplemented with state grants, and Department of Homeland Security (DHS) funding. In the case of my unit, we are provided a budget from federal funding.

- When was your emergency plan last revised?

2008.

- Does this facility consistently remain in contact with, local, state, regional, and national emergency responders and governments?

Yes.

- What are the stages for disaster relief at the local level and upwards?

Local/State Resources, Local/State Emergency Declarations, Federal Assistance, FEMA (DHS) Assistance.

- How concerned are you and your organization about the following health effects of climate change: deaths and injuries due to floods, illnesses due to heat waves, increased cases of vector-borne diseases?

We are more concerned with effects of vector-borne diseases than any of the other events listed above.

- Do you receive routine transmissions of meteorological information?

Yes.

- Do your emergency measures include those for: earthquakes, chemical spills, floods, cold spells, extreme heat waves, windstorms, food or water-borne illnesses, vector infestations, or infectious diseases?

With regard to responding in order to support civil authorities, yes.

- Do you have a plan to prevent the impacts of climate related floods, drying, or disease infestations?

No. We would fall under the State Emergency Operations Plan which would cover these issues.

- Does it involve: an assessment of which areas and people are most susceptible?

With respect to floods, fires, and earthquakes it does. It is not specific on disease infestations.

- How high would you rank emergency preparedness in the realm of pandemics?

Solely based on the recent response to the H1N1 I would rank emergency preparedness as high.

- In the event of a health emergency, are you most prepared to deal with temperature stresses, or diseases due to natural or intentional causes?

Diseases due to intentional causes.

- During a pandemic:
    - Will people be prevented from traveling?

Unsure.

    - How will the city coordinate transportation issues?

More than likely it will be coordinated between TSA and NDOT.

    - How will tourism be dealt with? The hotels?

I'm sure it won't be a pleasant situation.

    - Will there be screening at points of entry in the state? When will this be utilized? How? By Who?

I'm sure screening points will be established when a serious threat of spread is identified. How this will happen/who will lead, will depend on who the lead state/federal agency is.

    - Will the borders remain open to people and/or supplies during a pandemic? Are there circumstances under which the border would be closed (e.g., a certain phase of the pandemic)?

Not sure.

- Is there any additional information that you think would help me describe the preventative and response measures of your department.

The bottom line is we provide a response unit to the incident commander to identify CBRNE/WMD hazardous substances, Assess, Assist, and Advise the IC.

Personal Communication with Nicole Hart, Emergency Preparedness Manager for the Las Vegas Metropolitan Police Department (LVMPD) (October 7, 2009).

- What is the type of your highest degree or training?

Bachelors in Criminal Justice

- How can people receive information from your organization during a pandemic?

Information would be delivered through a Joint Information Center with all other media representatives from government agencies locally.

- Please name the section of or the person responsible for: protecting human health from environmental threats, disaster preparedness, mobilization and response during emergencies

The lead agency for Environmental Health emergencies is the SNHD. The other items are all addresses at the city and county level. Each has individuals designated to handle the preparedness and planning aspects. At LVMPD the Emergency Management Section in the Homeland Security Bureau is responsible for agency preparedness, coordinating with other local, state and federal partners as well as the public.

- How many first responders are there who specialize in county-wide emergency situations?

All first responders are trained to respond to emergency situations regardless of jurisdiction.

- What budget is provided to them?

They will operate off of their own department budget unless it is a federally declared emergency that is reimbursable

- When was your emergency plan last revised?

Currently being revised right now

- Does this facility consistently remain in contact with, local, state, regional, and national emergency responders and governments?

Yes it is an ongoing effort.

- What are the stages for disaster relief at the local level and upwards?

Every emergency is handled based on the situation needs. We do not have pre-planned stages attached to a response from LVMPD.

- How concerned are you and your organization about the following health effects of climate change: deaths and injuries due to floods, illnesses due to heat waves, increased cases of vector-borne diseases?

Any type of event that can affect the safety of our community is a priority to us.

- Do you receive routine transmissions of meteorological information?

Yes through the weather radios and local updates distributed by the National Weather Service or Clark County Office of Emergency Management

- Do your emergency measures include those for: earthquakes, chemical spills, floods, cold spells, extreme heat waves, windstorms, food or water-borne illnesses, vector infestations, or infectious diseases?

Yes, we use an all hazards approach to emergency planning as directed by the Federal Emergency Management Agency. Certain local hazards are addressed individually in the Clark County Emergency Response Plan and Hazard Mitigation Plan.

- Do you have a plan to prevent the impacts of climate related floods, drying, or disease infestations?

Most of those types of plans are handled by other agencies such as the Regional Flood Control District and SNHD

- How high would you rank emergency preparedness in the realm of pandemics?

Pandemic Planning has been a very important factor in the U.S. over the past few years. It is one of our agencies top priorities

- During a pandemic:
    - Will people be prevented from traveling?

The CDC and SNHD will make those decisions

    - How will the city coordinate transportation issues?

Transportation issues will be coordinated amongst multiple agencies (NHP, LVMPD, NDOT, Public Works, RTC, etc.)

    - How will tourism be dealt with? The hotels?

The situation will help determine what the needs are of the hotels. Coordination will come from the Las Vegas Security Chiefs Association as well as individual hotels if there are certain measures/concerns that are more severe at a specific location

    - Will there be screening at points of entry in the state? When will this be utilized? How? By Who?

It has been discussed at the County level but all points of entry would be handled by the lead agency; Nevada Highway Patrol. I am unaware if there is a plan in place for this or not.

    - Will the borders remain open to people and/or supplies during a pandemic?

Unknown to me

- In the event of a health emergency, are you most prepared to deal with temperature stresses, or diseases due to natural or intentional causes?

As law enforcement we will be a support agency for either situation.

- Is there any additional information that you think would help me describe the preventative and response measures of your department.

As a law enforcement agency we support all activities and emergencies that affect our community.

Combined Personal Communications with Alan Osborne, Clark County's Senior Deputy Fire Chief and Richard Brenner, Head of Clark County Fire Department's Hazardous Response Team (October 16, 2009).

- What is the type of your highest degree or training?

Bachelor Degree in Fire Administration.
Specialized training as a fire officer, hazmat technician, Incident Commander, emergency medical technician, paramedic.

- Where is information regarding pandemic preparedness/response located?

The Center for Disease Control website: cdc.gov
Southern Nevada Health Department website: southernnevadahealthdistrict.org

- How can people receive information from your organization during a pandemic?

Clark County's website: accessclarkcounty.com
Clark County Fire Department Public Information Officer
Public Service announcements

- Please name the section of or the person responsible for:
    - protecting human health from invading threats

Southern Nevada Health District

    - disaster preparedness plans

Clark County Office of Emergency Management

    - mobilization and response during emergencies

Clark County Office of Emergency Management
Clark County Fire Department
Las Vegas Fire & Rescue
Henderson Fire Department
North Las Vegas Fire Department
Las Vegas Metropolitan Police Department
North Las Vegas Police Department
Henderson Police Department
Clark County Public Works
Southern Nevada Health District
Nevada National Guard/ 92 Civil Support Team
Nellis Air Force Base

- How many first responders are there in your department who specialize in county-wide biological emergency situations?

The Clark County Fire Department staffs the Hazardous Materials response team with 30 technicians across a three platoon work schedule. On any given day, we would have between 8 and 10 technicians on duty to respond to an immediate threat. The balance of the technicians would have to be called back if the incident required the full complement of 30 technicians.

- What budget is provided to them?

A designated hazmat budget is minimal, most of the funding for the team and equipment comes from the County General Fund and is simply included in the operating budget of the fire department. Additionally, there is some grant money that is specifically designated to hazardous materials training and response, but typically these grant monies are controlled and distributed by the Local Emergency Planning Committee (LEPC) with the monies being parceled out to each of the response agencies within Clark County.

- Is there a next-in-line succession order ensuring a pipeline of successors for critical posts?

There is no formal program in place supporting succession planning.

- Does your agency have a comprehensive training plan put in place for biological emergencies that specifies: Objectives? Participants? Periodic reviews? Budgets? Back-up resources? Simulation exercises?

The hazardous materials team and technicians receive the most comprehensive training of all the members of the fire department. The remaining first responders are trained to the operations level and depend on the hazardous materials team for mitigation of incidents that would require specialized training and/or person protective equipment.
The Clark County Fire Department does utilize an extensive training program that is recognized by the Nevada State Fire Marshals Office. Additionally, the current collective bargaining agreement that binds labor and management specifies that members of the CCFD hazardous materials team attend specialized training while they are members of the team. Captains(Supervisors) who are members of the team must also attain hazmat instructor certification during their assignment to the team along with hazmat specialist certification.

- Are pre and post-assessments conducted to measure training comprehension levels and overall effectiveness of training programs?

Our emergency responders train constantly throughout their careers. Some of this training has accompanying written post tests, however, the primary testing component of the fire department once one is on the job, centers around promotional exams and emergency medical certification.

- When was your emergency plan last revised?

The Clark County Office of Emergency Management "Emergency Operational Manual," was last revised in January 2004. It may currently be under revision as I am unable to access the manual on the OEM website.

- Does this agency consistently remain in contact with, local, state, regional, and national emergency responders and governments?

Yes.

- What are the stages for disaster relief at the local level and upwards?

Any local jurisdiction within Clark County would first contact the Clark County Office of Emergency Management to request assistance, if the request for assistance was beyond

the capability of the County, the request would go to the Nevada State Office of Emergency Management and if beyond the State's capability, the request would be forwarded to the National level. With this stated, please note that most agencies within Clark County already have existing automatic and mutual aid agreements in place so authorization to grant resource requests at the local level does not necessarily need to be approved by the Clark County Office of Emergency Management, however depending upon the significance of the incident, they do need to be advised of County resource deployments and commitments.

- How would you describe the amount of coordination that occurs between local, state, and federal agencies when preparing for an emergency?

There is always room for improvement. A good test of this very question may be answered in early 2010 when a National Level Exercise is held in the Las Vegas valley. Local, State and National response organizations will all be involved.
To use a local example of the cooperation that exists within the valley for *planned* events, the New Years Eve event involves many agencies and members of the resort industry all working together.

- How concerned are you and your organization about the following health effects of climate change: deaths and injuries due to floods, illnesses due to heat waves, increased cases of vector-borne diseases?

The fire service responds to emergencies as they occur. We also do our best to pre-plan for events. We do address our ability to provide emergency service to the community in the wake of floods and heat waves. Vector borne diseases and climate change are beyond our scope of operations and quite simply we would respond to victims in much the same way that we do now. We have the ability to respond and treat patients who exhibit a variety of symptoms and medical conditions. Our response is focused on emergency medicine and patient stabilization so that they may be transported to hospitals where they may receive definitive advanced medical care.

- Do you receive routine transmissions of meteorological information?

Yes, the local office of the U.S. National Weather Service contacts our Fire Alarm Office with this type of information.

- Do your emergency measures include those for:
    - floods

Yes

    - cold spells

There is no specific Fire Department Operations Plan

    - extreme heat waves

The County does open cooling centers within the valley during extreme heat warnings

    - windstorms

No, other than the warnings from the National Weather Service

    - food or water-borne illnesses

No

    - vector infestations

Only a bee response plan
    - infectious diseases

No

- Do your emergency plans involve an assessment of which areas and people are most susceptible within the county to certain types of biological threats?

The existing emergency plans do not identify specific areas within the valley by geographic location or demographics that are most susceptible to certain types of biological threats. The shelter-in-place option and the decision to implement this action is often the best choice to lessen any exposure to the public.

- How high would you rank emergency preparedness in the realm of pandemics?

The CDC is at the forefront of this issue. Until events such as the H1N1 virus raise public awareness, their work goes unnoticed. Locally, the health care providers play a significant role in the planning for such an event with the Southern Nevada Health Department being the lead on the issue.

- What current steps are being taken to preempt local spread of the H1N1 virus?

The media is actively involved in providing information to the public. Media campaigns are advising the public to practice good hygiene, especially hand washing. The medical community is planning for mass vaccinations and the emergency response community is educating their personnel on personal protective equipment and general protective measures that they need to observe when treating patients.

- During a pandemic: Will people be prevented from traveling? How will the city coordinate transportation issues? How will tourism be dealt with? The hotels? Will there be screening at points of entry in the state? When will this be utilized? How? By Who? Will the borders remain open to people and/or supplies during a pandemic? Are there circumstances under which the border would be closed (e.g., a certain phase of the pandemic)?

Closing down borders, addressing transportation issues, establishing screening points, would certainly require resources that most States would not be able to sustain for any length of time. The States may call upon their National Guard resources if such actions were actually implemented.

- In the event of a health emergency, are you most prepared to deal with temperature stresses, or diseases due to natural or intentional causes?

I would say the Clark County Fire Department is most prepared to deal with diseases that are natural. We deal with these medical emergencies on a daily basis.

- How concerned are you and your organization about the potential effects of an intentional biological attack upon the city of Las Vegas?

Any metropolitan area within the U.S. border could be a potential target. As such, the local community is very aware and concerned of the potential damage that could result.

APPENDIX C

TABLES

Table 1 Biological Agents for Military and Bioterrorist Use

| | **Traditional Warfare Agents** | **Agents Associated with Bioterror** |
|---|---|---|
| **Pathogens** | Bacillus anthracis | Bacillus anthracis |
| | Brucella suis | HIV |
| | Coxiella burnetii | Typhus |
| | Francisella tularensis | Salmonella typhis |
| | Smallpox | Shigella species |
| | Viral encephalitides | Yellow Fever Virus |
| | Viral hemorrhagic fevers | Yersinia pestis |
| | Yersinia pestis | |
| **Toxins** | Botulinum | Botulinum |
| | Ricin | Cholera endotoxin |
| | Staphylococcal enterotoxin B | Diphtheria toxin |
| | | Nicotine |
| | | Ricin<br>Tetrodotoxin |
| | | Snake toxin |
| **Anti-crop** | Rice Blast | |
| | Rye stem rust | |
| | Wheat stem rust | |

SOURCE: Lederberg, Joshua. (1999). *Biological Weapons: Limiting the Threat*. Cambridge, Massachusetts: MIT Press. p. 229.

Table 2 Cases of Illicit Use of Biological Agents

| **Type** | **Terrorist** | **Criminal** | **Other/Uncertain** | **Total Cases** |
|---|---|---|---|---|
| **Acquire and Use** | 5 | 9 | 0 | 14 |
| **Acquire** | 3 | 5 | 2 | 10 |
| **Interest** | 3 | 4 | 0 | 7 |
| **Threat/Hoax** | 1 | 10 | 3 | 14 |
| **Total Cases** | 12 | 28 | 5 | 45 |

SOURCE: Carus, Seth W. (1998, August). *Bioterrorism and Biocrimes: The Illicit Use of biological agents in the 20th Century*. Working Paper, Center for Counter-proliferation Research. National Defense University.

Table 3 Dissemination Techniques

| Type | Terrorist | Criminal | Other/Uncertain | Total Cases |
|---|---|---|---|---|
| **Aerosolized** | 2 | 0 | 0 | 2 |
| **Direct injection/ Topical application** | 3 | 5 | 0 | 8 |
| **Contaminated food** | 1 | 15 | 0 | 16 |
| **Contaminated water** | 3 | 0 | 2 | 5 |
| **Insect/Natural vectors** | 0 | 1 | 1 | 2 |
| **None** | 2 | 0 | 0 | 2 |
| **Unknown** | 4 | 9 | 2 | 15 |

SOURCE: Lederberg, Joshua. (1999). *Biological Weapons: Limiting the Threat*. Cambridge, Massachusetts: MIT Press. p. 222.

Table 4 Perpetrator Expertise

| Type | Terrorist | Criminal | Other/Uncertain | Total Cases |
|---|---|---|---|---|
| **Medical or scientific expertise** | 4 | 12 | 2 | 18 |
| **Agricultural expertise** | 3 | 13 | 1 | 17 |
| **Unknown** | 5 | 3 | 2 | 10 |
| **Total Cases** | 12 | 28 | 5 | 45 |

SOURCE: Lederberg, Joshua. (1999). *Biological Weapons: Limiting the Threat*. Cambridge, Massachusetts: MIT Press. p. 221.

Tables 5 and 6 reveal expert numbers regarding the actual amount of assistance and coordination occurring across government levels.

Table 5 Matrix of Interacting Organizations Involved In Response Operations to September 11, 2001 Attacks

| **Public Organizations** | **Federal Level Interaction** | **State Level Interaction** | **County Level Interaction** | **Nonprofit Interaction** | **Private Sector Interaction** |
|---|---|---|---|---|---|
| Executive Office | 1% | 3.2% | 0.0% | 0.0% | 0.0% |
| Department of Transportation | 3.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| National Communication Services | 1% | 4.8% | 66.7% | 0.0% | 2.6% |
| Department of Defense | 6.6% | 3.2% | 0.0% | 0.0% | 5.1% |
| Department of Agriculture | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| FEMA | 55.1% | 66.1% | 33.3% | 75.9% | 76.9% |
| Department of Health and Human Services | 6.6% | 11.3% | 0.0% | 2.5% | 2.6% |
| EPA | 3% | 3.2% | 0.0% | 0.0% | 0.0% |

SOURCE: Kincaid, John and Richard L. Cole. (2002, September). "Issues of Federalism in Response to Terrorism." *Public Administration Review*. Vol. 62. p. 189.

Table 6 Frequency Distribution and Number of Organizations Involved In Response Operations to September 11, 2001 Attacks

| **Public Organizations** | **Number of Organizations Involved** | **Percent** |
|---|---|---|
| Federal | 73 | 19.3 |
| State | 34 | 9.0 |
| Regional | 9 | 2.4 |
| County | 2 | 0.5 |
| Local | 9 | 2.4 |
| City | 41 | 10.9 |
| Nonprofit | 64 | 16.9 |
| Private | 143 | 37.9 |

SOURCE: Kincaid, John and Richard L. Cole. (2002, September). "Issues of Federalism in Response to Terrorism." *Public Administration Review*. Vol. 62. p. 186.

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