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Assessment of the community healthcare providers' ability and willingness to respond to a bioterrorist attack in Florida

Jeffrey S. Crane
University of South Florida

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Assessment of the Community Healthcare Providers' Ability and Willingness to Respond to a Bioterrorist Attack in Florida

By

Jeffrey S. Crane, M.B.A., M.P.A.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy
Department of Environmental and Occupational Health
College of Public Health
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Jay Wolfson, Dr.Ph., J.D.
M. Rony Francois, M.D. Ph.D.
Wayne Westhoff, Ph.D.

Date of Approval:
April 15, 2005

Keywords: core competencies, emergency preparedness planning, public health preparedness, terrorism, Strategic National Stockpile

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Dedication

I would like to dedicate this dissertation to my Mother and Father for their selfless support over the years. I send all my Love.
Acknowledgements

I would like to thank Penkarn Kanjanarat for being a special person in my life. I would not have graduated without your support. I would like to acknowledge my brother Brett Crane and his kids, Justin and Taylor. I would like to thank Nonna Klimchenkova for your help over the years.

I owe tremendous gratitude to Dr. Raymond Harbison, Dr. Jay Wolfson, Dr. M. Rony Francois, and Dr. Wayne Westhoff who selflessly gave me their insights and time over the years.
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ASSESSMENT OF THE COMMUNITY HEALTHCARE PROVIDERS’ ABILITY AND WILLINGNESS TO RESPOND TO A BIOTERRORIST ATTACK IN FLORIDA

Jeffrey S. Crane

ABSTRACT

Previous findings have demonstrated that the preparedness and infrastructure of the public health system are inadequately developed for a biological and/or chemical terrorism attack. (1-4) Chen et al. reported that those primary care providers that would have to respond to such an attack do not feel prepared to diagnose and manage such an event.(5)

This research was an observational study using e-mail/web based survey to assess the levels of preparedness (PL) and willingness to respond (WTR) to a bioterrorism attack, and identify factors that predict PL and WTR of Florida community healthcare providers. The conceptual framework and questionnaire was designed based on empirical studies and the use of an expert panel to assess the providers’ administrative and clinical competencies, WTR, and PL. The questionnaire was pilot-tested in 30 subjects. Reliability was high (Cronbach’s alpha =.82). The emailed invitation letters were sent to 22,800 healthcare providers in Florida. The questionnaire was posted for 7 days on the website during December, 2004.

There were 2,279 respondents of 9,124 who received the e-mails. Response rate was 28%, with 86% completed questionnaires. The subjects included physicians (n=604), nurses (n=1,152), and pharmacists (n=486). The results demonstrated that only
32% of the Florida providers were competent and willing to respond to a bioterrorism attack. 82.7% of providers were willing to respond in their local community and 53.6% within the State. The subjects were more competent in administrative skills than clinical knowledge (62.8% vs. 45%). The most competent areas were the initiation of the treatment and recognition of their clinical and administrative roles. The least competent areas were identifying the cases and communicate risk to the others. About 55% of the subjects had previous bioterrorism training and 31.5% had emergency drills. Gender, race, previous training and drills, perceived threats of bioterrorism attack, and perceived benefits of training and drills and “feeling” prepared were the predictors of overall preparedness.

The findings suggest that only one-third of Florida community healthcare providers were prepared for a bioterrorism attack. To effectively plan for a bioterrorism attack it is important to target the interventions to improve clinical knowledge in every healthcare profession.
“…you asked me what keeps me awake at night, and that bothers me…

this biological issue…”

President Bill Clinton, 1991
CHAPTER 1

INTRODUCTION

Over the past century, weapons of mass destruction (WMD) have been introduced by nation states at an increasing rate. Thirteen nation states are currently suspected in either possessing weaponized biological agents and/or having an offensive production program (6). These include the seven U.S. designated terrorist nation states (state sponsored terrorism - Cuba, Iran, Iraq, Libya, North Korea, Syria, and Sudan)(7). The ability to produce biological and chemical agents by localized terrorist groups has also been proven with incidences such as the 1994 Matsumoto sarin attack (7 dead, 600 injured), the 1995 sarin attack in the Tokyo subway system (5 dead, 565 hospitalized)(8), and the 1998 Wakayama arsenic incident (4 dead, 67 injured)(9).

Prior to the September 11, 2001 attacks, the average American citizen had not been directly affected by a terrorist attack. These attacks were the first highly lethal confrontation by a foreign force on the U.S. mainland since the War of 1812. Before this, most of the acts of terrorism were targeted abroad to the U.S. military personnel and U.S. Foreign Service government employees (see Table 1-1 for complete listing of attacks). In total, 18 known fatal terrorist attacks against the United States (abroad) were perpetrated by foreign radical Islamists since 1983. The Oklahoma City bombing and the 1993 World Trade Center bombing being the exceptions, even then the responsible individuals were apprehended. These facts allowed average Americans to apply the “Out-of Sight”, “Out
of Mind” way of thinking and not view the attacks as a direct threat to them and to their way of life.

However, the September 11th attacks that killed thousands of innocent people (Flight 93, Pentagon and World Trade Center) and was replayed on national television around the clock, did demonstrate to U.S. government officials, and to the average citizen, that foreign terrorists had the resolution and capability to plan, organize, and execute attacks that can produce mass casualties to Americans on the U.S. mainland (10). These terrorist attacks brought a dramatic change to the way Americans live their lives and view terrorism. Americans were immediately on high alert and the preparedness activities to prevent another such “airliner” attack had begun.

In the months following the September 11th attacks, the dispersal of anthrax spores via the U.S. Postal Service further raised questions concerning the United States’ ability to prevent and respond to not only “traditional” terrorism attacks such as bombings and shootings, but also to biological and chemical events. While the history of global warfare has demonstrated the effective use of microbial agents by government entities as weapons of war, biological terrorism was previously deemed an unlikely event in the U.S. by most terrorism experts. And when used in the past, targets of biological warfare were normally deemed as a military objective. (11)

The military use of biological agents has been banned since the 1974 Biological Weapons Convention Signing (12) and its military use was normally for genocide (e.g. Smallpox contaminated blankets given to Indians). Now, it is the unsuspecting civilian populations that are the most likely targets by terrorists because even a small number of deaths, as experienced with the 2001 anthrax attacks (total of 5 deaths), produced great
terror in the U.S. population, thus causing critical parts of the nation’s infrastructure to virtually shut down (U.S. Postal System and the U.S. Senate). This potential to cause terror with the threat of a biological agent is why the term “bioterrorism” was coined. As demonstrated by the 2004 National Elections in Spain, an act of terror (train bombing) could be used to advance the ideologies of the terrorist groups by influencing a regime change when correctly applied (Madrid, Spain, 199 dead, 1450 wounded).  

The technological advances in production and the desire, have made weaponized biological agents as capable as a nuclear weapon to produce mass terror and causalities, but at a fraction of the cost. (13) The previous terrorist successes, such as in the Madrid example and September 11th, and the advances in production, motivates terrorist groups to obtain known weaponized biological and chemical agents or search out other agents commonly available. So each year, more chemical and biological agents have to be added to the list of possible weapons that could be used against civilian populations.  

With the introduction of each new potential agent, Florida’s community healthcare providers are faced with making a correct diagnosis in their medical setting, reporting it to the correct authority, and the possibility of responding as an agent of the Florida Department of Health. While medical practice has always been considered the science of probability and the art of uncertainty, it is recognized that uncertainty is prevalent in health care practices and that uncertainty is a crucial factor in decision-making. However, literature on how physicians, pharmacists and nurses make judgments under uncertain conditions is full of controversy. (14) Clearly, formal and informal education and training has advanced healthcare providers’ ability to correctly improve patients’ health status and quality of life over the last 100 years during normal
circumstances, but with the added factors attributed to weaponized biological and chemical agents released in a civilian population, it is uncertain whether Florida providers are able and willing to make crucial decisions without having basic competencies in bioterrorism identification and management, and the willingness to care for infected patients.

The introduction of awareness level bioterrorism trainings and seminars for healthcare providers since the 2001 anthrax attacks should have improved the bioterrorism competency levels of community providers and their willingness to respond. Without access to a prepared workforce of community healthcare providers during a bioterrorism attack within Florida, the biological incident life cycle would result in chaos of Florida’s population (see Figure 1-1). This will provide for an increase in morbidity and mortality rates in Florida’s population and the spread of the disease across the U.S., and the World.

Figure 1-1. Biological Incident Life Cycle without Preparedness. Source: Adapted from Federal Emergency Management Agency (FEMA) information.
Problem Statement

Previous findings have demonstrated that the preparedness and infrastructure of the public health system are inadequately developed for a biological and/or chemical terrorism attack (1;2;4;15). Additionally, it was found that those primary care providers that would have to respond to such an attack do not “feel” prepared to diagnose and manage such an event. (5)

Since these studies were originally published in 2002, the State of Florida with the support of federal government agencies became recognized as one of the national leaders of Public Health Preparedness. (16) Even so, the inherent shortfalls of the bioterrorism planning process within the State of Florida and its contractors led to the questionable ability to effectively activate the bioterrorism plans during an actual response to a large-scale biological event without the support of the local community healthcare providers (physicians, nurses and pharmacists).

<table>
<thead>
<tr>
<th>Event</th>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983 U.S. Embassy bombing</td>
<td>Beirut, Lebanon</td>
<td>63 dead</td>
</tr>
<tr>
<td>1983 U.S. Embassy bombing</td>
<td>Kuwait</td>
<td>6 dead</td>
</tr>
<tr>
<td>1984 U.S. Marine barracks bombing</td>
<td>Beirut, Lebanon</td>
<td>241 dead</td>
</tr>
<tr>
<td>1985 U.S. Embassy bombing</td>
<td>Beirut, Lebanon</td>
<td>24 dead</td>
</tr>
<tr>
<td>1985 U.S. Military base bombing</td>
<td>Frankfurt, Germany</td>
<td>3 dead</td>
</tr>
<tr>
<td>1996 Khobar Towers</td>
<td>Saudi Arabia</td>
<td>19 dead, 515 wounded</td>
</tr>
<tr>
<td>1998 U.S. Embassy bombings</td>
<td>Nairobi, Kenya</td>
<td>301 dead, over 5000 injured</td>
</tr>
<tr>
<td>1998 U.S. Embassy bombings</td>
<td>Dar-es-Salaam, Tanzania</td>
<td>301 dead, over 5000 injured</td>
</tr>
<tr>
<td>2000 USS Cole</td>
<td>Aden, Yemen</td>
<td>17 dead, 39 injured</td>
</tr>
</tbody>
</table>

Using the recommended planning methodology advocated by the Florida Department of Health and its contractors, the average local county emergency management plans’ (CEMP) strategic national stockpile and mass casualty attachments,
normally located in the Emergency Support Function (ESF) 8, Health and Medical annex, as written would require on average over 97% of the licensed healthcare providers to come from the local community and/or outside the affected county to fully activate (17-21). As an example, the Dade County Health Department serves a population of 2.25 million and has 864 employees with approximately 23% core licensed medical professionals (physicians, nurses and pharmacists). Using the State template, in a large-scale biological event, Dade County Health Department's plan would require 15,589 persons with 10,048 being core licensed medical personnel to administer smallpox vaccinations to its population. This is a planning shortfall of 14,725 total personnel with 9,849 in core medical personnel. The whole population of the State of Florida would require 117,846 total persons and 75,968 core medical personnel (see Table 1-2 for a complete list of Florida staffing calculations). Thus, theoretically, when the counties developed these response plans, it must have been assumed that the community health care providers have the basic competencies to identify and manage a biological terrorism attack, and are willing to respond to a bioterrorism event.

This study was motivated by the recognized threat of weaponized biological agents, such as Smallpox, being released upon Florida’s population and the uncertainty that the planning efforts by the State of Florida since 2001 could become operative during a biological terrorism attack. Specifically, this study took an empirically-driven approach in the assessment of Florida’s community healthcare providers’ current preparedness levels, the factors that influenced these levels, and the willingness of the provider to respond to a bioterrorist attack within the State of Florida. The study’s findings may be used for policy assessment and planning purposes.
Table 1-2. Staffing Calculations for a Florida Bioterrorism Response using the Weill/Cornell Bioterrorism and Epidemic Response Model (BERM). (Based on Smallpox, 5 day response, 16 hrs per day with 15% downtime.)

<table>
<thead>
<tr>
<th>County</th>
<th>Population Seasonal</th>
<th>Total Pop</th>
<th>Core Staff Support Staff Total Staff</th>
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<td>Alachua</td>
<td>217,955</td>
<td>36,359</td>
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</tr>
<tr>
<td>Baker</td>
<td>22,259</td>
<td>3,773</td>
<td>26,032</td>
</tr>
<tr>
<td>Bay</td>
<td>148,217</td>
<td>21,222</td>
<td>169,440</td>
</tr>
<tr>
<td>Bradford</td>
<td>26,088</td>
<td>3,573</td>
<td>29,661</td>
</tr>
<tr>
<td>Brevard</td>
<td>476,236</td>
<td>77,252</td>
<td>553,482</td>
</tr>
<tr>
<td>Broward</td>
<td>1,923,018</td>
<td>307,536</td>
<td>1,230,554</td>
</tr>
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<td>13,017</td>
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<td>15,023</td>
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<tr>
<td>Charlotte</td>
<td>141,627</td>
<td>30,652</td>
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</tr>
<tr>
<td>Citrus</td>
<td>118,085</td>
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<td>Clay</td>
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**FLORIDA**

15,982,378 3,044,452 19,026,830 75,968 41,878 117,846
Specific Aims

This study was designed to serve three major purposes: 1) to give insight into Florida’s community healthcare providers’ clinical and administrative competencies to manage a bioterrorism attack, 2) to give insight into their willingness to respond to a biological terrorism attack within the State of Florida, and 3) to assess the current level of preparedness of Florida’s community health care providers (physicians, pharmacists and nurses) to identify and manage a biological terrorism attack.

Research Questions

1. Are Florida’s community healthcare providers (physicians, pharmacists and nurses) prepared to identify and manage a bioterrorism attack?

2. Are the levels of preparedness to respond to a bioterrorism attack different among physicians, pharmacists, and nurses?

   $H_1$: Florida’s physicians, pharmacists and nurses are not equally prepared to identify and manage a biological terrorism attack.

3. Do Florida’s healthcare providers (physicians, pharmacists and nurses) “Feel” prepared to identify and manage a bioterrorism attack?

4. Do previous emergency preparedness trainings and drills predict the overall level of preparedness of the healthcare providers?

   $H_1$: Previous emergency preparedness trainings and drills predict the overall level of preparedness of the healthcare providers.

5. Do previous emergency preparedness trainings and drills predict the Florida’s healthcare providers’ willingness to respond to a biological terrorism attack within the State of Florida?
H1: Previous emergency preparedness trainings and drills predict the willingness of the community healthcare providers to respond to a biological terrorism attack within the State of Florida.

6. Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks within their local community?

7. Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks outside their local community (statewide)?

8. Do demographic factors of Florida’s community healthcare providers (physicians, pharmacists and nurses) predict a biological terrorism overall level of preparedness?

H1: Demographic factors of Florida’s community healthcare providers (physicians, pharmacists and nurses) predict a biological terrorism overall level of preparedness.

9. Does the perceived benefit of bioterrorism preparedness training predict the overall level of preparedness of the healthcare providers?

H1: The perceived benefit of bioterrorism preparedness training predicts the overall level of preparedness of the healthcare provider.

10. Does the perceived threat that a provider's community is at real risk of a bioterrorism attack predict the overall level of preparedness of the healthcare providers?
$H_1$: The perceived threat that a provider's community is at real risk of a bioterrorism attack predicts the overall level of preparedness of the healthcare provider.

11. Do the demographics, perceived threat of bioterrorism attack, perceived benefits of bioterrorism training, previous trainings, and previous drills predict the level of preparedness of the healthcare providers?

$H_1$: The demographics, perceived threat of bioterrorism attack, perceived benefits of bioterrorism training, previous trainings, and previous drills predict the level of preparedness of the healthcare provider.

Implications of this Study

The findings of this study will allow for the future development of training, mobilization and management models for healthcare personnel to adequately respond to a public health crisis. It will also set the baseline value to evaluate future public health preparedness activities in the State of Florida and could be used as a benchmark for public health preparedness levels for across the nation. This study directly assesses the current levels of preparedness of Florida’s community health care providers’ core bioterrorism competency levels and their willingness to respond to biological terrorism attack. This will help identify possible weaknesses in current “planned” public health responses to a biological terrorism attack within the State of Florida, and across the nation.

Based on the results of the survey, tools and models can also be developed to help increase the health care system’s readiness for a bioterrorism event and other public health crisis (e.g. SARS) in Florida. Training models based on the study’s findings can
be used to enable educational facilities (universities and continuing education programs) the ability to efficiently and successfully integrate public health emergency readiness competencies within established training programs of healthcare personnel.

The questionnaire that was developed for this study and tested for its validity and reliability can be used to assess the level of preparedness to respond to a bioterrorism attack in other states, in a certain type of healthcare providers, or a certain situation (e.g., anthrax event). This questionnaire also can be used for a healthcare institution which would want to assess the preparedness of its providers and develop its own training.

The methodology to identify administrative and clinical competencies, willingness to respond, and overall preparedness can be utilized as a model to target for training of healthcare providers, and for future research.

**Organization of the Dissertation**

Chapter 1, Introduction, examined the history of terrorism and problems that are faced by Florida’s healthcare providers. It stated the specific aims that the study will focus upon, and listed the research questions and implications for this study. The remainder of this chapter will define the key terms used in this dissertation and by individuals in the fields of public health preparedness and emergency management. It will also list the assumptions made and the known limitations of this study.

Chapter 2, Literature Review, will discuss the development of the conceptual framework for this study and the use of the Public Health Workers’ Emergency Preparedness Core Competencies for Emergency Response and Bioterrorism and the Clinician Competencies in Initial Assessment and Management (22). It also will examine
all the relevant literature and studies on provider preparedness levels, public health preparedness, bioterrorism preparedness and the administration of online surveys.

Chapter 3, Research Methodology, will address the methods used in this study. This includes the determination of the sampling frame and survey sample size, the methods for collecting the data, including the letters of invitation and the design of the questionnaire. This chapter also looks at the measurements used to determine the competency levels of the providers and their willingness to respond and discusses how the data will be analyzed.

Chapter 4, Results, will describe the distribution of the questionnaire, and the descriptions of the study subjects and their workplace. It will also detail the assessment of the healthcare providers’ competency levels and willingness to respond which determined the overall preparedness level of Florida healthcare providers. Finally, it will present the findings of the predictive modeling of an individual’s overall preparedness level.

Chapter 5, Discussion, will discuss Florida’s community healthcare providers’ clinical and administrative competencies to manage a bioterrorism attack, the providers willingness to respond to a biological terrorism attack within the State of Florida, and their current level of overall preparedness to identify and manage a biological terrorism attack. This chapter also provides discussions on the study results, methodology, and its limitations.
Definition of the Key Terms

- Bioterrorism- The act of terrorism using biological agents (see Terrorism below).

- Public Health Core Competency- It is an area of expertise that is a basic and necessary component to public health workers. An example of a bioterrorism response core competency for public health worker is the ability to use a fax machine. It is not nuclear response training for all workers in the public health system.

- Smallpox- Smallpox is a highly contagious, virulent, and often fatal disease caused by variola virus, a large orthopoxvirus of the family Poxviridae, subfamily Chordopoxvirinae. (23)

- Strategic National Stockpile (SNS) - “The SNS is a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. The SNS is designed to supplement and re-supply state and local public health agencies in the event of a national emergency anywhere and at anytime within the U.S. or its territories.” (24)

- Terrorism- “Acts dangerous to human life that are a violation of the criminal laws of the United States or any state and appear to be intended to intimidate or coerce a civilian population, influence the government by intimidation or coercion, or to affect the conduct of a government by mass destruction,
assassination, or kidnapping, occurring primarily within the territorial jurisdiction of the United States.” (18 United States Code 802)

- Terrorist Nation States – These are Nations that fund terrorism.

- War of 1812- A war (1812-1814) between the United States and England which was trying to interfere with American trade with France, and it is the war that inspired the National Anthem (The Star Spangle Banner).

List of Assumptions

1. Staffing Calculations for a Florida Bioterrorism Response using the Weill/Cornell Bioterrorism and Epidemic Response Model (BERM) were based on the 2000 U.S. Census. It is assumed that Florida counties that were not examined also took the recommendation of the Florida Department of Health and its contractors, and used the BERM to calculate personnel needs. The BERM seems to be the standard method of calculation; it is used by Texas and other states (25).

2. In a large scale event, the first responders and emergency room workers will become infected as undiagnosed patients are transported to hospitals, thus they should not have a major role in the plans. These workers will be essentially the warning “Canaries” that alert the health care system of a major problem.

3. Healthcare providers who are employed by hospitals should not be used or be relied upon to respond to a large scale crisis. These facilities are already short
in personnel and are needed to keep the hospital functioning. In most cases, the hospital systems rely upon each other. If one hospital fails, all other hospitals will have a problem keeping the doors open.

4. Large numbers of healthcare providers will refuse to work because of the fear of becoming ill and/or placing their own family at harm by working. (26)

5. The “worried well” will overwhelm the healthcare system.
“But the most troubling threat, in my judgment, is biological weapons. They may be quite small, and the raw material for some of the most fearsome ones - such as anthrax - is readily available, unlike fissionable material.”

Testimony of R. James Woolsey
U.S. House of Representatives
Committee on National Security
22 February 12, 1998
CHAPTER 2
LITERATURE REVIEW

To better understand current US preparedness activities and the need to have a prepared volunteer workforce of community healthcare providers to respond to biological terrorism events, this chapter will first discuss the risks of bioterrorism in the United States, the State of Florida and its local communities, types of biological agents that could be used for bioterrorism attacks and the possible damage from such attacks. Second, a discussion on the current planning activities within the State of Florida and the methods that will keep the population protected and/or treated will be discussed. Third, the researcher will provide literature review on current preparedness levels of healthcare providers within the United States and their willingness to respond. Forth, core competencies that have been used for assessment of preparedness and willingness to respond to bioterrorism attacks will be discussed. Fifth, the researcher will exam the psychosocial theory, Theory of Planned Behavior, that is used in the theoretical framework as factors related to preparedness and willingness of healthcare providers. Sixth, the conceptual framework for this study will be discussed. Finally, the use of an mixed model (email/web) survey verses a traditional mail survey will be examined.
History of Bioterrorism

The use of disease as a weapon of war is as old as war itself. Water supplies have been contaminated with animal and human corpses as early as the 1346 Tartar siege of the seaport of Kaffa. It was stated that plague victims were catapulted over the walls of the besieged city. (27) To devastate the opposing forces during the French and Indian War of 1763, British soldiers presented smallpox infested blankets and handkerchiefs to Native Americans (28), killing large portions of the indigenous population. During World War II, the Japanese used flea-borne plague to attack cities in China. Their infamous Unit 731 used soldiers and civilians alike to conduct its experiments with biological weapons. (29)

By the 1950s, several countries including the Soviet Union and the United States had extensive biological weapons programs. These programs were weaponizing bacteria, biotoxins and viruses to be dispersed in aerosols, bombs and missiles. (30) The Soviet program had over 50,000 scientists and technicians dedicated to biological weapons productions (six research labs and five production plants). (31) The total production capacity of all of the facilities involved was many hundreds of tons of various agents annually.

On April 10, 1972, the Biological Weapons Convention, after much debate, was signed. Under the terms of the Convention, no parties thereto would undertake the development, production, stockpiling, or acquire biological agents, toxins or the means of its delivery. This agreement also stated that all such materials would be destroyed within nine months once the Convention entered into force. The United States announced its compliance to the Convention on December 26, 1975. (32) Then, in 1979, an accidental release of weaponized anthrax from a Soviet production plant killed 70 people in
Sverdlovsk and injured countless others. (33) This event illustrated the deadly effectiveness of biological warfare in the modern age and the ineffectiveness of the Biological Weapons Convention.

In the 1980s, it was demonstrated that terrorist groups had the desire and capability of weaponizing and use of biological weapons. These groups were smaller in size and independent of a Nation State. The Rajneeshee Cult (1984) used Salmonella to contaminate salad bars in an attempt to influence a local election in Oregon. It did succeed in infecting 751 residents of that community, but the fact that it was a biological attack went undiscovered for six months before one of the group’s members confessed. (34)

This demonstrated the difficulties in the detection of a small bioweapon attack. In 1995, another attack involved the Aum Shinrikyo Doomsday Cult in Japan. Its attack of the Japanese subway system using sarin gas not only demonstrated the successful aerial dispersal of nerve agent by a small terrorist group, but the inability of healthcare providers to effectively respond to such attack. Many of the first responders and hospital personnel were affected by the gas due to the lack of or improper decontamination of the presenting patients. After further investigation into the Shinrikyo Cult, it was revealed that it also attempted to release anthrax from the rooftop of a Tokyo building in 1993. No casualties were reported because the cult did not understand air flow dynamics in a city. If the cult had a better understanding and released the spores at a different time during the day, it may have resulted in a quite different outcome.

During 1998 and early 1999, a large number of letters containing white power were received by businesses, targeted individuals and governmental offices in the United States. These letters were accompanied by phone calls threatening an anthrax attack. (28)
Even though these letters turned out to be hoaxes with benign powers ranging from cornstarch to baby power, it was a precursor to the 2001 attacks. Events during the Clinton Administration, which included these 1998 white power letters, the fall of the U.S.S.R. and the unemployed weapons scientists, Iraq and high profile terrorist attacks in the United States and abroad, galvanized the U.S. Congress to refocus on the civilian biodefense program in 1999. Congress allocated $121 million to be used by the CDC to improve its bioterrorism detection and response capabilities and to help establish a national pharmaceutical stockpile (later renamed to the Strategic National Stockpile). (3)

Shortly after the September 11th, 2001 terrorist attacks, letters laced with weaponized anthrax began arriving to members of the media and high ranking government officials via the U.S. Postal System. The letters resulted in 22 identified cases of anthrax between October and November of 2001. Of these cases, eleven were inhalational anthrax resulting in five deaths. (35) The cases occurred on the eastern coast (Connecticut, District of Columbia, Florida, New Jersey and New York City) and produced massive anxiety throughout the United States. It disrupted critical services to the United States, such as mail delivery and the U.S. Senate. This attack confirmed that even a small bioterrorism attack (5 deaths) upon the citizens of the United States has the ability to cause mass terror in the population. It also demonstrated the inability of the public health system to effectively identify and respond to biological agents.

Bioterrorism is a recognized threat to the population of Florida and the United States. Massive funding for the planning and response to a biological weapon has taken place since theses attacks. The Florida Department of Health (FDOH) has received $111 million alone for bioterrorism during fiscal years 2003 and 2004. (16)
Bioterrorism Agents

Since there are numerous agents capable of being used as a potential biological weapon, the CDC developed a list that categorizes agents in the order of the seriousness of concern they present. The agents are reviewed annually and are either placed in Category A, B, or C. Agents in Category A are considered the most dangerous because they are easily disseminated, highly contagious and can be weaponized. They have the ability to cause mass causalities and are hard to manage without a sophisticated public health system response. (36) These agents include anthrax (Bacillus anthraces), botulism (Clostridium botulinum), plague (Yersinia pestia), smallpox (Variola major), tularemia (Francisella tularensis), and viral hemorrhagic fevers (Filoviruses and Arenaviruses). (37)

The Category B agents are moderately easy to disseminate, produce moderate morbidity and low mortality, and are normally delivered in contaminated water and food sources. These agents include, but not limited to brucellosis (Brucella species), cholera (Vibrio cholerae), ricin toxin (Ricinus communis), salmonella, and viral encephalitis. (37) These agents also require enhancements to disease surveillance and diagnostics systems to detect.

The Category C agents are emerging pathogens that have the potential to be weaponized for mass dissemination. (36) The agents are included in this category because of their availability, ease of production and its potential to cause high morbidity and mortality. These agents include emerging infectious diseases such as the Nipah virus and hantavirus. (37)
Smallpox

Smallpox is contagious and sometimes fatal infectious disease, which has no specific treatment. The only prevention for the smallpox disease is vaccination. The name smallpox means “spotted” in Latin. It refers to the raised bumps that appear on an infected person. It was once a global disease, but was declared eradicated in 1980 by the World Health Organization (WHO) after a successful worldwide vaccination program (38). In the United States, the last case of smallpox was in 1949, and the last naturally occurring case in the world was in 1977. This was accomplished by the general vaccination program that ended in the 1970s in the United States and 1982 worldwide. Since the anthrax attacks in 2001 and the potential of smallpox being used as a bioweapon, the vaccination of the U.S. population began again. In Florida, the Operation Vaccinate Florida I & II (OVF) has been in operation since 2002. It focuses on the vaccination of the first responders such as paramedics, firefighters and police. The promotion was only partially successful because of the highly publicized adverse effects and deaths attributed of the vaccine.

Two forms of smallpox exist: Variola major, which is the most severe and common form of smallpox and carries a 30% case-fatal rate in an unvaccinated population, and Variola minor, which historically carries a case-fatality rate of 1% or less. (38) It is less common and a much less severe disease. Smallpox is considered to be at the top of the list of Categories A diseases because of its high mortality and morbidity rates and its ease of transmission from human-to-human. For this reason, only Smallpox will be examined (Category A) for this study. If we are prepared against a smallpox attack, we should be able to respond to all other known bioweapons (“the all-hazards approach”).
The smallpox (Variola Major) is acquired through the respiratory track and spread throughout the body via the lymph nodes. There is a 7 to 17 days latent-incubation phase (average 12-14 days) and then a prodromal phase that normally lasts for 2 to 3 days. (39) During the prodromal phase, the subject normally presents flu-like symptoms such as severe headache, backache and high fever (40c +). Once this phase is complete, the lesions start to appear. The transmission from person to person is the greatest during the first 7 to 10 days of these lesions. (38) After 8 to 9 days, the lesions begin to scab over. Unlike chickenpox, which is commonly confused with smallpox by the general public, the pox lesions are normally at the same stage of development and are present mainly on the face, hands and extremities. (39) Death normally results from toxemia and super-infections. Patients that survive are severely scarred with pitted lesion and/or pox marks.

**Bioterrorism Preparedness Activities**

The very concept of public preparedness (also know as domestic preparedness) came into effect during the early years of the cold war when the Soviet Union successfully detonated its first atomic bomb. This resulted in the development of the Civil Defense Program and the signing of the Civil Defense Act of 1950. The Civil Defense Act of 1950 had the policy and intent of the U.S. Congress to provide a civil defense system for the protection of life and property of the United States from all attacks, including ones from natural disasters. This Act effectively made the protection of the civilian population a joint federal-state charge with the primary responsibility for civil defense residing in the state and local government structures. Most of the basic principles of civil defense were developed during this timeframe and are still relevant to our current U.S. preparedness programs.
Like the former civil defense programs, public health preparedness starts at the state and local levels. This concept is based on the fact that the initial recognition and response to a biological attack will be at the local level with support from the State. Local emergency managers and public health officials have a unique perspective of their communities. They understand the hazards and risks of a bioterrorism attack to the community and the resources it has available to respond. Like all emergencies, once the local community needs exceed the local resources, they will contact the State, and if the State exceeds its resources, the Governor will make a formal request to the President. The President has the option to declare a federal emergency or just provide federal support. This process could take hours or days dependant upon the urgency of the situation. The local emergency manager will continue to manage the incident within his/her community, even when it becomes a federally declared emergency and support from the state and federal government has arrived the scene.

In addition, during a large scale event such as a hurricane or smallpox release, numerous communities may be competing for the same state and federal resources (e.g. personnel and equipment). Since state and federal resources may not be immediately available to the local community, the local community (e.g. government agencies, hospitals, and utilities) must have an emergency operations plan (EOP) and a county mass casualty plan that can be activated with resources located within it boarders. In the case of a bioterrorism attack, the local community must have the ability to respond in a timely manner, since only a short window exists to provide vaccinations, prophylaxis and/or implement other counter measures. (40), (41) These communities should drill and exercise these plans to identify shortfalls and to familiarize the personnel.
Public health preparedness is crucial and should be performed at all levels of the public health care system. To enhance the capabilities of the federal, state and local bioterrorism preparedness levels, the CDC as part of its strategic plan implemented the Bioterrorism Preparedness and Response Program. This program has five focus areas. They are 1) preparedness and prevention; 2) detection and surveillance; 3) laboratory; 4) response; and 5) communication. All five focus areas have training and research at its core. (42) These areas have been incorporated into the core public health workers bioterrorism competencies and are within the Florida Department of Health preparedness structure.

The State of Florida, according to a report released in December 2003, made great improvements within its public health system since 2001. It was tied with California, Maryland and Tennessee as the most prepared states within the nation, achieving 7 out of 10 preparedness indicators. (16) These indicators were based off the five focus areas set forth by the CDC (see above). Of these 10 indicators, this research will focus on indicator 4, “Sufficient Workers to Distribute the National Stockpile Supplies.” While Florida received credit for successful completion of this indicator (16) because it has a strategic national stockpile plan for most counties, it is questionable whether the state has “sufficient” workers to distribute the antibiotics and/or administer inoculations during large biological attack (smallpox). The community healthcare providers (“workers”) preparedness levels and willingness to respond during the activation of the Strategic National Stockpile will be the focus of this research.
The Strategic National Stockpile

Congress tasked the Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) with the creation of the National Pharmaceutical Stockpile (NPS) in 1999. (43) The Strategic National Stockpile (SNS), as it is formally known today, is a national repository, the mission of which is to provide a re-supply of large quantities of pharmaceuticals, medical supplies and equipment to be used in an event of national emergency within the United States and its territories. This repository includes antibiotics, antidotes to various chemicals, antitoxins, airway maintained and medical/surgical supplies that can be used to treat thousands of individuals during a crisis event. Its primary purpose is to provide critical medications and medical supplies that would not otherwise be available to the affected community. (44)

The decision to request the SNS assets are based on numerous factors, such as an overt release of a biological agent that cannot be handled by the State health department or outbreak surveillance warning signs of a possible large-scale outbreak. Either way, the governor’s office will need to formally request the SNS to be deployed. The final decision for SNS deployment is made by the Department of Homeland Security (DHS) and the Department of Health and Human Services (HHS). (43)

The SNS deployment is designed to be deployed in two phases. The first phase is called the “12- Hour Push Package”. These secure Plus Packages are strategically located throughout the United States and can be deployed and be on location within 12 hours. (43) These locations are coordinated by each State and can be deployed to a designated hospital, Logistic Staging Areas (LSA) or Point of Distribution (POD) location. These Push Packages have a broad spectrum of items, but are limited in the
amount of each. The Push Package can be limited to the type of response needed. In the 2001 anthrax responses, only antibiotics were deployed.

The second phase is designed for a larger scale event, where additional pharmaceutical and medical supplies are needed. This phase utilizes the Vendor Managed Inventory (VMI) system. The VMI utilizes current pharmaceutical supply changes and private transports such as UPS and Federal Express. The VMI will ship supplies that are tailored to the event type, if known. These VMI shipments will be transported to the State LSA and should arrive within 24 to 36 hours. At the LSA, the supplies will be repacked from bulk pharmaceutical packaging to individualized doses, if necessary. Then they will be deployed to the PODs in the same manner as the Push Package.

The Logistical Staging Areas (LSA) are normally placed around a State to effectively receive either the Push Packages or the VMI shipments. The LSA normally needs to be located near an airport that can handle a large aircraft. The facility should be large enough to accommodate the shipment of supplies. The LSA are kept confidential and are not open to the public. The public will be seen at the Point of Distribution (POD) Locations.

Point of Distribution Centers

The POD is used to triage and provide prophylaxis medications to individuals who were potently exposed and, if necessary, provide large scale immunization of vaccines to the general population. The location and number of PODs during an event are dependant on the size of the population affected. Personnel requirements for the PODs within the State of Florida are calculated using the Weill-Cornell Bioterrorism and Epidemic Outbreak Response Model (BERM).
Florida’s decision to use the Weill-Cornell Bioterrorism and Epidemic Outbreak Response Model (BERM) as the centerpiece to determine the staffing needs to respond to a major disease outbreak and/or biological terrorist event on a specific population within the State may not have been the best choice. It is not suggested that the model is incorrect, but that the model has been recommended by the Florida Department of Health for use in developing county strategic stockpile plans and mass casualty plans without determining the levels of preparedness and willingness to respond by community medical professionals not employed by the State. The Florida Department of Health, as the Essential Support Function #8 (ESF) State Representative for the Office of Emergency Management (OEM), has been tasked as the lead agency in developing these plans by the Governor.

The BERM model has been used by the local health departments, county emergency operation centers (EOC), and state contractors throughout Florida to develop the core bioterrorism response plans even though the staffing levels could not be fulfilled internally within the Florida Department of Health. This was discussed briefly in Chapter 1. Another example of this problem is the Pasco County Health Department that serves a population of 388,908 permanent residents and has 212 employees with approximately 24% licensed medical professionals (physicians, nurses and dentist). According to the BERM estimates, in a large-scale biological event Pasco County Health Department would need 2,360 persons with 1,521 being core licensed medical personnel for five consecutive days. This plan has a recognized shortfall of 2,148 total personnel with 1,469 in the core licensed medical personnel. The CDC is currently under consideration of reducing the
required response time from 5 days to 2 days. If this becomes a requirement of the SNS, the current estimate of personnel needed, will more than double.

The BERM estimates and the working floor plans of the Points of Distribution center plans (POD) to dispense medications, even when adjusted, are requiring personnel levels over a one thousand percent (1000%) beyond what the county health departments have available during normal operations. Local hospitals will not be able to lend personnel to the health department because of local surge in demand for its services and the possibility of a dirty hospital scenario. Other government personnel such as teachers and transportation workers, even though not specified within current plans, could be used for non-core medical personnel positions. The only real solution is to use community healthcare providers to fill these planned positions.

**Community Healthcare Providers’ Preparedness**

The question that has been most frequently asked since the terrorist attack of 11 September 2001 is: “Are we ready or not?” Numerous studies have taken place since 2001 on the United States’ ability to prevent and respond to future terrorist attacks. These studies have mostly focused on conventional terrorist methods, such as various styles of bombings. The studies that did focus on biological agents or a bioterrorist attack have researched technology to identify an attack (sampling methods and surveillance) and the methods to decontaminate after an attack (processes and chemicals). There have only been a few studies that have directly focused on the preparedness levels of healthcare providers, and of these, most targeted only physicians.
Roles of the Responding Healthcare Providers

There are several roles of a healthcare provider, depending on the provider's licensing. As the plans and policies are currently written, during a bioterrorism attack only Florida licensed medical personnel can perform direct medical services. Credentialing of medical providers within Florida for such events is still under much debate. One must hope that medical providers licensed in other states and/or retirees, will be allowed to treat patients during a Florida mass causality event. As of 01/2005, this option was not approved.

There are numerous roles for a community physician related to a bioterrorism event. The first and foremost duty of a community physician is the early identification of individuals who have been exposed to a bioterrorism attack. The physician is ultimately responsible for the identification and treatment of a biological weapon exposure. Even so, in a nationwide survey, only 25 percent of family physicians felt prepared to respond to a bioterrorist event in 2001 (5) and again in 2002, only 21 percent of the physicians surveyed by the University of Chicago, felt personally well prepared for a bioterrorism attack. (45) All the studies to date rely on the self evaluation of the physician to determine bioterrorism preparedness levels. Physicians responding to a bioterrorist attack will also provide the medical care to the patients as well as perform duties normally expected from the nurses such as patient triage and administrating smallpox inoculations.

In the United States, there are approximately 900,000 practicing emergency nurses (46), so it has been assumed that the largest percent of licensed community healthcare providers to respond will be the nurses (RN, BSN). Nurses will also play a major role in recognition of potential bioterrorism attacks. Nurses will serve as the triage staff at the...
local Point-of-Distribution (POD) centers and hospitals. They will be also responsible for vaccinating the worried well and the exposed during a terrorism attack. As in the Middle Ages, nurses will be the primary caretakers of the infected. While there have been several studies on the use of nurses volunteers in a bioterrorism event and education standards in nursing programs, there was not a study that directly addresses the perceived preparedness levels of nurses at the time of this study.

Shortly after the 2001 attacks, National Pharmacist Response Teams (NPRTs) were formed. These teams are formed of pharmacists, pharmacy students and pharmacy technicians. They are authorized by Health and Human Services (HHS) to respond during a national emergency, such as a bioterrorism attack. There are currently ten teams nationwide. (47) Most bioterrorism plans, response teams and surveillance systems in the State of Florida, while occasionally monitoring over-the-counter medications for spikes, do not include the pharmacist.

Within this study, the pharmacist is also included. It was felt that a pharmacist could be beneficial to Florida’s bioterrorism preparedness activities (other than the obvious dispensing of medications). Additionally, pharmacist could potentially be the first to encounter an exposed patient in the community setting (drugstore). Persons who have been exposed are more likely to self treat (common cold symptoms and rashes) in the early stages of the disease. This will give the trained pharmacist the ability to identify individuals whom may have been exposed. Pharmacists’ roles in a bioterrorism response range from clinical recognition, disease management, patient education (48), and from administration of the vaccines (PharmD. only) to the dispensing of the medications (R.Ph./PharmD.).
There are other medical personnel that have clearly defined roles or could be tapped into during a response. The emergency medical technicians (EMT) and paramedics are the first responders and will probably be the first to begin to notice the increase in patient loads due to a bioterrorist attack. They will also be the first of the healthcare providers to contract the disease themselves. These responders will unfortunately be similar to a canary in the coal mines. Their exposure is likely to signal a large bioterrorist event. While these types of providers are crucial to a bioterrorism response, they were not included in this study.

Previous Studies

As stated earlier, previous study findings have demonstrated that the preparedness and infrastructure of the public health system are inadequately developed for a biological and/or chemical terrorism attack. (1),(2),(4),(15). It was also found that those primary care providers that would have to respond to such an attack do not “feel” prepared to diagnose and manage such an event. (5) This came as no surprise to public health officials when these studies were first released in 2001. Bioterrorism attacks were not considered as a real threat in most areas prior to 2001. Even as recent as June 2004, local public health Directors in Florida has verbally dismissed the notion of a bioterrorism attack within their particular counties and have considered a large scale bioterrorism preparedness a misuse of the health department resources. (49)

Since these studies were originally published, the Public Health Security and Bioterrorism Act of 2002 was passed. This provided the CDC with $915 million dollars to boost States and major metropolitan areas response capabilities. Then in early 2003, an additional $870 million was provided to the States by the CDC. Other funding came
from various federal agencies, such as Health and Human Services’ HRSA funding.
HRSA funding provided another $622.5 million since 2002. This totals more than 2.4
billion dollars during fiscal years 2002 and 2003. (16) Of the 2.4 billion, Florida was
awarded approximately $111 million dollars from the CDC and HHS for bioterrorism
response. This is not all inclusive for Florida’s bioterrorism funding sources.

While all of the States received funding, many are still unprepared. A recent study
that examined 10 key indicators found that while most States have made some progress,
most have fundamental structure problems that could threaten the United States’ ability to
respond to a large-scale public health emergency. (16) Majority of the states (70%)
received scores of 50% or below (5 or less indicators), which is indicative of a successful
national comprehensive bioterrorism response within the current public health system.
These indicators include having a statewide bioterrorism plan, provisions that no more
than 3 counties are left without alert capabilities, passing of at least 50% of federal funds
to the local health departments, and sufficient staffing to distribute the Strategic National
Stockpile (SNS). (16) Florida is one of the four states that scored 70% (7 of 10
indicators). It was even suggested that the State had sufficient workers to distribute the
SNS. As explained earlier, the BERM estimates of licensed medical personnel needed
for an SNS response would indicate that Florida does not have the trained and willing
workforce to successfully respond to an actual large-scale bioterrorism incident.
**Bioterrorism Core Competencies**

The incorporation of emergency preparedness activities and their assessment is an expected part for the national public health system, individual public health practitioners and local public health departments. While the use of the Standards of Practice (assessment) has been in place since 1923 for public health services, the use of performance standards in the form of competencies have only gained acceptance in medical and public health professions in recent years. In 1998, the CDC’s Public Health Practice Program Office (PHPPO), in conjunction with the public health practice community, developed performance standards for state and local agencies that are representative of the essential services for public health. With these completed and integrated within the public health agencies, the next step was to focus on particular areas within public health practice. This is when the emergency preparedness standards (2000) were developed, which in turn evolved into the *Emergency Response: Core Competencies for All Public Health Workers*, first released in April 2001. Following the 2001 Anthrax Attacks, these competencies were reexamined and released as the *Bioterrorism and Emergency Readiness: Competencies for all Public Health Workers* in 2003.

**Selection of the Core Competencies for this Study**

The Public Health Workers’ Emergency Preparedness Core Competencies for Emergency Response and Bioterrorism, which were developed by the Columbia University School of Nursing, Center for Health Policy, and the Emergency Response Clinician Competencies in Initial Assessment and Management, developed by the Association of Teachers of Preventive Medicine in collaboration with Center for Health...
Policy, Columbia University School of Nursing and 17 national associations, including the American Medical Association (AMA), were used in the development of the conceptual framework for this study. These projects were supported by the Center for Disease Control (CDC) and/or Prevention/Association of Teachers of Preventive Medicine Cooperative Agreement to insure the readiness of healthcare workers’ ability to perform in emergency and bioterrorism situations. (22)

The researcher chose these competency sets as the base template for the determination of the bioterrorism competency level (BCL) because of its current integration into Florida’s public health care system and because it is the recognized set by the Center of Disease Control (CDC). (22) Additionally, after reviewing numerous strategic national stockpile and mass causality plans for Florida’s county health departments the researcher believes that during an actual bioterrorism response, community health care providers would need to be integrated within Florida’s public health care system. If this is done, community health care providers would be required to work within the constraints of the Florida public health system and would need to have the same levels of competency as the Department of Health employees when responding to the event.

Upon the recommendation of the lead developer of the original competency sets, the individual competencies were used as the guiding template only and were not directly transplanted without adjustments to measure preparedness levels within this given population, and the duplications between the two competency sets were removed. (50) These modifications were developed through direct communications with emergency preparedness designated employees within the Florida Department of Health and
preparedness experts throughout the United States (see Table 2-1). Once this was completed, a method of measuring the competency levels within community healthcare providers also had to be developed for this study. This is discussed in Chapter 3 under Research Instrument: Phases of Development.

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<thead>
<tr>
<th>ADMINISTRATIVE COMPETENCIES (AC)</th>
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<tr>
<td><strong>Administrative Competency 1.</strong> Describe the role of your workplace in an emergency response.</td>
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<tr>
<td><strong>Administrative Competency 2.</strong> Identify the chain of command in emergency response.</td>
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<tr>
<td><strong>Administrative Competency 3.</strong> Identify and locate the agency’s emergency management plan.</td>
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<tr>
<td><strong>Administrative Competency 4.</strong> Describe his/her functional role(s) in emergency response and participate in these role(s) during regular drills.</td>
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<tr>
<td><strong>Administrative Competency 5.</strong> Demonstrate the correct use of communication equipment used for emergency communication. (phone, fax, radio, satellite phone)</td>
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<tr>
<td><strong>Administrative Competency 6.</strong> Ability to locate the communication role(s) in emergency response plan and understand his/her role.</td>
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<tr>
<td><strong>Administrative Competency 7.</strong> Identify limits to own knowledge, skill, and authority, and identify key system resources for referring matters that exceed these limits.</td>
</tr>
<tr>
<td><strong>Administrative Competency 8.</strong> Demonstrate creative problem solving and flexible thinking to unusual challenges within his/her functional responsibilities to respond to a bioterrorism event.</td>
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<tr>
<th>CLINICIAN COMPETENCIES (CC)</th>
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<tr>
<td><strong>Clinical Competency 1.</strong> Describe his/her expected clinical role in bioterrorism response for the specific practice setting as a part of the institution or community response.</td>
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<tr>
<td><strong>Clinical Competency 2.</strong> Respond to an emergency within the emergency management system of his/her practice, institution and community.</td>
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<tr>
<td><strong>Clinical Competency 3.</strong> Recognize an illness or injury as potentially resulting from exposure to a biological, chemical or radiological agent possibly associated with a terrorist event.</td>
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<tr>
<td><strong>Clinical Competency 4.</strong> Ability to report identified cases or events to the public health authorities to facilitate surveillance and investigation using the established institutional or local communication protocol.</td>
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<tr>
<td><strong>Clinical Competency 5.</strong> Initiate patient care within his/her professional scope of practice and arrange for prompt referral appropriate to the identified condition(s).</td>
</tr>
<tr>
<td><strong>Clinical Competency 6.</strong> Communicate risks and actions taken to patients and concerned others clearly and accurately.</td>
</tr>
<tr>
<td><strong>Clinical Competency 7.</strong> Recognize and manage the psychological impact of a Bioterrorism event on victims and health care professionals, as appropriate to the event.</td>
</tr>
<tr>
<td><strong>Clinical Competency 8.</strong> Recognize unusual events that might indicate an emergency and describe appropriate action</td>
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Rationale and Conceptual Framework

The purpose of this study is to identify healthcare providers’ level of preparedness, and to determine factors that predict the community healthcare providers’ clinical and administrative competency to manage a bioterrorism attack and to predict their willingness to response to a biological terrorism attack within the State of Florida. Various recognized sets of core competency sets (see appendix B.) for emergency preparedness were combined to form the Conceptual Framework for this study.

Figure 2-1. Conceptual Framework of the Study.
Conceptual Framework of the Study

The conceptual framework model (see Figure 2-1) for this study suggests that three domains should be used to determine the preparedness levels of the community healthcare providers. The first domain is the willingness to respond to a bioterrorism attack, domain two describes administrative competencies, and domain three describes clinical competencies.

The first domain examined whether the provider was willing to respond to a high risk event and to a low risk event, and at what distance (proximity) from the normal workplace (local event, regional event, state event, national event). This domain used a modified interpretation of the Theory of Reasoned Action (TRA) to help model an individual’s willingness to respond levels. According to TRA the most important determinant of his/her behavior is a person’s behavioral intention, in this case, willingness to respond. (51;52) The direct determinants of an individual’s behavioral intention (willingness) are his attitudes toward performing the behavior (responding) and his subjective norm (perceived belief of professionals) associated with that behavior. (53) TRA has the underlying assumption that all individuals are rational actors (i.e. all individuals’ process information and are motivated to act on it). The strength of the TRA is that it provides this study a framework for discerning the reasons that motivate individuals to perform a behavior. (52) In the case of this study, we looked at the behavioral intentions in the issues of perceived threats/benefits for responding (community/family ties- proximity), the perceived community’s/personal ability to successfully respond and the perceived level of risk to the responders with various demographic factors. This allowed the researcher to understand the factors associated with healthcare providers’ willingness to respond and to hypothesize the specific reasons
that can motivate the behavior of interest. While TRA has not been directly used to explain the willingness to respond in an emergency (i.e., hurricane, bioterrorism), it has been used in predicting and explaining a wide range of health behaviors. These behaviors include clinical breast exams, contraceptive use, drinking, mammography use, smoking, seat belt use, and safety helmet use. (54)

Figure 2-2: Predictive Model of the Theory of Planned Behavior. Source: Based on Ajen. (55)

The second domain examined the administrative competency of the healthcare provider. It was developed using Public Health Workers’ Emergency Preparedness Core Competencies for Emergency Response and Bioterrorism. These were used to determine: the providers’ ability to know the role of their workplace in an emergency response; the providers’ knowledge of their chain of command in emergency response; their ability to identify and locate the agency emergency response plan; knowledge of his/her functional
role(s) in emergency response and participation in these role(s) during regular drills; the providers competency level in the correct use of communication equipment used for emergency communication; the providers’ ability to locate the communication role(s) in emergency response plan and understand his/her role; the providers’ ability to identify limits to own knowledge, skill, and authority, and identify key system resources for referring matters that exceed these limits; and the ability to creatively solve problems and use flexible thinking for unusual challenges within his/her functional responsibilities to respond to a bioterrorism event.

The third domain examined the clinical competency levels of the healthcare providers. This domain was shaped using the Emergency Response Clinician Competencies in Initial Assessment and Management. These competencies examined: the providers’ ability to know his/her expected clinical role in the bioterrorism response for the specific practice setting as a part of the institution or community response; ability to respond to an emergency event within the emergency management system of his/her practice, institution and community; ability to recognize an illness or injury as potentially resulting from exposure to a biologic, chemical or radiological agent possibly associated with a terrorist event; ability to report identified cases or events to the public health system; ability to facilitate surveillance and investigation using the established institutional or local communication protocol, and initiate patient care within his/her professional scope of practice and arrange for prompt referral appropriate to the identified condition(s); ability to communicate risks and actions taken clearly and accurately to patients and concerned others; ability to recognize and treat the psychological impact of a bioterrorism event on victims and health care professionals as appropriate to the event;
and the ability to recognize unusual events that might indicate an emergency and describe appropriate actions.

In addition to the three domains, the researcher examined the provider’s individual demographics such as age, gender, race, highest educational degree, years worked as licensed professional, current position, employment status, and work duties. It also examined the workplace demographics such as workplace zip code, patient encounter volume, city type, population size, workplace type, and the existence of a disaster plan at the workplace. Perceived benefits and threats were used to examine the providers’ beliefs regarding the benefits of preparedness training, whether his/her community were at real risk of a bioterrorism attack, and whether they had the ability to respond to such an event.

Finally, the different types of training methods and their ability to affect the overall preparedness levels of health care providers were examined. The training types used in this study are grouped as: (1) traditional lecture format (i.e., slides, handouts, videos, etc.); (2) online interactive (i.e., discussion boards, tutorials, simulations, etc); (3) webcasts, teleconferences, or satellite broadcasts and; (4) self learn, self paced study (i.e., independent study courses).
Data Collection Tools: a comparison among Web-based, e-mail, and traditional mail survey

Traditional mail surveys have been used as a major data collection method in health professionals for their current knowledge, practice patterns, and attitudes of providing healthcare services. Recently, email and Internet surveys became valid alternative data collection tools to traditional mail survey since researchers were allowed access to the Internet in early 1980s. (56-58)

The early phases of email based surveys, the questionnaires were constructed using simple text (ASCII) and embedded in the body of an email and sent via Internet. (59;60) These email questionnaires had similar characteristics as paper surveys in respect of the format of the questions and its length limitation, except the email surveys obviously took shorter time to deliver to the recipients as compared to the traditional mail surveys. When the Internet became more widely accessed, web based surveys was introduced for data collection in early to mid 1990s in supplement to the email survey and even sometimes administrated solely in the that method. In general, web based surveys had the ability to offer multimedia applications including audio, pictures, and video, which significantly improve the user interface with these interactive features.

The benefits and limitations of email based and web based surveys, comparing to traditional mail surveys, are still under debate. While several studies on email and traditional mail surveys suggest that email surveys have potential benefits over the traditional mail surveys by decreasing time of delivery and response, and cost (59;60), other studies found that email and web surveys have significantly lower response rates. (61-67) Since this study applied a dual mode survey method using an email to introduce the research study and to provide a link to a web based survey, literature regarding an
email and a web based survey of health professionals are discussed in comparison to the traditional mail survey.

This section discusses the issues regarding survey techniques, sample coverage, response rate, cost, time to response, and possible errors of web, email and traditional mail survey methods. Comparisons of advantages and disadvantages of these survey methods are described based on literature.

**Survey Techniques**

There are several advantages of a web based survey over mail survey, if the optimal web-survey software is applied. First, the questions can be programmed to automatically input the data into the desired format. Transcription errors during data entry are eliminated. Second, logical check for the answers is possible by programming the order of the questionnaire items. Third, web surveys allow real-time monitoring of the respondents and automatically send a follow-up message to the lists of non-respondents in a timely manner. Fourth, web surveys overcome one of the major limitations of traditional mail survey by automatically skipping the questions that are not applied to a certain population. This technique is called “skip pattern automation”. By using this technique, the length of the questionnaires and time to complete could be greatly reduced. A study by Jepson et al. 2005 found that a negative association between the length of the questionnaires and response rates, and the completeness of the returned surveys. (68)
Survey Population Coverage and External Validity

For the traditional mail survey, the study population is well defined, then samples are selected by either convenient sample or a random sampling methods. Then a letter of invitation and an informed consent form are sent by postage mail with or without the questionnaires. Email surveys apply similar methods of selecting a study sample. (69;70) Several email survey studies have selected samples from members who have email address registered with professional associations, e.g., the American Urological Association (57), the College of Family Physicians of Canada (71), the Association of Cardiothoracic Anesthetists. (56) The limitations of the email surveys regarding the representation of the population is that characteristics of people who have email addresses may be different from people who did not have an email address and thus, are not included in the study. Email addresses might not be updated. The samples may not receive the questionnaire survey due to the spam e-mail blocking software. From the above limitations, email survey faces challenges that may compromise external validity.

For the email combined with a web based survey, the same limitation of population coverage and external validity applied. However, for web based survey alone it offers benefits in allowing unlimited access by any participant who volunteer to complete the survey. Several studies recruited participants from advertising in newsgroups, specific web pages, or in newspapers, which obtained convenient samples. From this method, there is no defined population and thus response rate cannot be calculated with this particular recruitment method for web-surveys.
Response rates

Response rates of e-mail surveys vary based on the content of the survey and the populations. A review by Chonlau et al. summarizes response rates of the Internet surveys in 31 studies. (72) Web surveys obtained 7 to 44% response rates compared with 6 to 68% for email surveys. The author summarizes that the response rates of email and web surveys are usually lower than traditional mail survey. However, using a web survey to supplement email survey shows an improvement response rates. Examples of two studies of attitudes of physicians toward healthcare services using email and/or web survey found relatively high response rates. Kedall and his colleagues conducted e-mail survey on infection control for adult cardiac surgery. The response rate was 81% (29/36 units). (56) A study of attitudes of urogynecology and maternal-fetal medicine specialists toward primary elective cesarean delivery was conducted using email attached with web based survey. Response rate after an initial email and two follow-up emails after one month was 52.9%. (70)

A study of online resource utilization (Internet and email) of Scottish general practitioners found that small number of GPs using internet or email to communicate with their colleagues and patients (21%, 13%, and 4% respectively). Younger GPs were more likely to use the Internet. The results of this study suggest that web based or email survey modes may be more suitable for surveying younger practitioners. (58)

Time of Delivery and Response

Seguin conducted a clinical trial in 2004 comparing response rate and time between email and traditional mail survey methods among Canadian family physicians. (71) The study found that the response rate of a traditional survey is
significantly higher than an email survey (52.7% vs. 33.6%). However, delivery and response time of the email survey was much faster than the mail survey. Completeness of the content was not different between the two methods, but the email survey contained longer and more frequent comments. The authors concluded that email survey is appropriate method when quick response is required.(71)

Cost

Costs of web or email surveys compared with mail surveys are not still understudied. According to the existing literature, costs varied depending on the types of survey, numbers of mail-outs or number of completed responses, and the implemented technology. For the web survey, most costs were associated with personnel who design and test the survey. Marginal personnel costs are almost always significantly greater than other marginal survey cost, e.g., paper, printing, and postage.

A study by Couper and his colleagues showed no significant cost benefit of e-mail survey compared with traditional mail survey. (61) The cost in constructing e-mail surveys included the building and evaluating e-mail software which required more than 150 hours and approximately cost $1.74 per completed case, while the cost of postage-mail was $1.81 per reply. In addition, in most cases email surveys require technical support, e.g., toll-free calls that add more cost of this method, which seemed to offset any potential savings.

The study from Schleyer and Forrest comparing cost of web and mail survey methods found that web survey cost 38% less than mail survey for 22-item questionnaires.(61) However, the benefit depends on the number of respondents. If there are more than 347 respondents; web survey offers cost-saving. On the other hand, if the
number of respondents is less than 189, mail survey is preferable. It is not a conclusive choice of method, if the respondents are between 189 and 347.

Other two studies concluded that email and web surveys are less expensive than mail surveys, when cost of personnel was excluded. The results of the study in the UK indicated that email alone, and email and web cost less than mail surveys (35 pence, 41 pence, and 92 pence per reply, respectively). (62) The authors referred to the cost saving simply from eliminating cost of paper, printing, and postage.

Data Quality

Data quality is defined by the percentage of the respondents who have missing data at least one survey item or the percentage of the missing items per questionnaires. Literature suggests that traditional mail survey had significantly smaller percentage of missing items comparing with e-mail survey (0.3-0.8% vs. 0.3-3.7%). (61), (64), (73-75)

Data quality based on the percentage of respondents who missed at least one questionnaire item is controversial. Paolo et al. found that mail survey had lower rate of incomplete returned questionnaires compared with e-mail survey, 27% vs. 9%. (75), while Kiesler and Sproull found the opposite results (10% vs. 22%). (76) Two other studies by Tse et al. found no significant different in the percent of incomplete responded questionnaires. (67), (77)
‘We’ll never use the damn germs…

If someone uses germs on us, we’ll nuke ’em.’

President Richard Nixon, 1969
CHAPTER 3
RESEARCH METHODOLOGY

This study was motivated by the recognized threat of weaponized biological agents being released upon Florida’s population and the uncertainty that Florida’s community healthcare providers have the necessary competency levels and the willingness to respond to a bioterrorism attack within the State of Florida. Understanding the current competency levels of Florida’s community healthcare providers and their willingness to respond is crucial to the ability of the State of Florida to activate current bioterrorism plans. The current plans rely on large numbers of licensed healthcare providers to diagnosis and treat patients. The numbers currently required by these plans greatly exceed the number employed by the state government system, thus requiring licensed healthcare providers from the community to fill these roles.

Study Design and Methodology

The design of this study relied on the development of a conceptual framework that was based on the public health bioterrorism core competencies (see Chapter 2: Bioterrorism Core Competencies), and the design and implementation of a descriptive, cross-sectional survey to evaluate the level of bioterrorism preparedness of the healthcare providers in Florida. The study also examine numerous factors that are related to preparedness levels, such as individual and workplace demographics, perceived benefits
and threats, and methods and modalities of trainings. These factors, along with the “willingness to respond”, were examined from the point of view of their relationship to the preparedness levels of healthcare providers as a whole and between the professional groups. The primary aims of this study was: 1) to give insight into Florida’s community healthcare providers’ clinical and administrative competencies to manage a bioterrorism attack, 2) give an insight into their willingness to response to a biological terrorism attack within the State of Florida, and 3) assess the current level of preparedness of Florida’s community health care providers (physicians, pharmacists and nurses) to identify and manage a biological terrorism attack. The study also attempted to verify in Florida’s population of healthcare providers the 2002 study findings suggesting that 75% of the U.S. physicians do not "Feel" prepared to identify and manage a biological terrorism attack. (5)

**Survey Sample**

The population under study is all Florida licensed nurses, pharmacists and doctors. The only inclusion criteria are to have an active license in the State of Florida (population boundary), and reside in the State of Florida a portion of the year (geographic boundary).

These particular professions were chosen because of their legal ability to either give and/or dispense medications/immunizations to humans in the State of Florida. In a suspected biological terrorism attack, a large percentage of the health services provided are triaging and treatment by physicians and nurses, and the dispensing of antibiotic medications (pharmacists) and/or giving inoculations of the “Worried Well” population by all three professions.
A list of emails for Florida’s licensed nurses, pharmacists and physicians were retrieved from the State Board of each health profession and/or its professional association. These emails were selected for their convenience and the limited availability of funding resources to mail paper surveys. A total of 42,000 emails were able to be retrieved for this study. These emails were checked for duplication and visual accuracy (i.e. Name@Companyname.Com). Duplicated emails were deleted and emails that had obvious errors (i.e. Name@Companyname.cn), were corrected. All uncorrectable emails were removed from the list.

A non-probability sampling technique was used for this study. By the fact that the emails were requested from different professional groups, quota sampling was used to obtain the required population proportions for each of the healthcare professions. A total of 34,482 (16,807 Physicians, 2,807 Pharmacists, and 14,868 Nurses) emails that presented no visual errors were obtained. A large proportion of these email addresses were 18 months or older.

**Sample Calculations**

Sample sizes were calculated based on 5% error rate, 95% confidence interval. There were 274,653 primary care physicians, 20,760 full-time pharmacists and 170,000 nurses licensed in Florida in 2004. The sample size requirement was 384 respondents for the physician grouping, 377 respondents for the pharmacist grouping, and 383 respondents for the nurse grouping. A 5% response rate was approximated, thus the researcher had to email a minimum of 7,600 questionnaire invitations to each healthcare profession. A minimum of 22,800 total questionnaire invitations were sent to reach the required sample size. Even though response rates for similar studies have been as high as
65% (5), it was decided to use a 5% response rate. This was due to the fact that the population of Florida previously had four major hurricanes and there could have been Internet connection outages and/or persons relocating to other states while their homes were being repaired. The survey was managed completely via the world-wide web, and large percentage of provider emails collected for this study were 18 months or older. The average attrition rate of opt-in email addresses were 6 to 8% per month.(78) Estimating that the email mean age is 8 months, the total email attrition rates could range between 48% (16,551) to 64% (22,068). The attrition rates were calculated using custom design server based logging software. Even though the email could produce numerous return emails explaining the email was bad or blocked, the software could determine unique returns, filtering duplicates.

The response rate (RR) was calculated as the surveys were completed, divided by the number of emails sent, minus the bounced /blocked emails due to attrition.

\[
\text{Response Rate} = \frac{\text{Surveys Completed}}{\text{Total Emails Sent – Bounced Emails}} \times 100
\]

Letters of Invitation

Letters of invitation to participate in this study were sent out via email to healthcare providers. The healthcare provider opted into the study by visiting the designated website listed in the email and agreed to complete the questionnaire. The letter and the referring website outlines the subject’s right to confidentiality and the anonymity of the data.
This letter was sent out maximum three times to all participants. Since no identifying information was collected during the survey, there was not a way of tracking which participant completed the survey, thus having to perform follow-ups with all participants. Once the needed sample size was accomplished, no further email reminders were sent out.

**Research Instrument**

The questionnaire was offered completely online at the website, Questionpro.com and consisted of 59 questions presented in an attractive, brief and easy to respond format (see questionnaire in Appendix A.). While this survey recruited participants via email, this survey is considered a World Wide Web (WWW) survey since the data was collected via a website and not by return emails.

The survey was structured to reflect the objectives of the study, while at the same time not asking leading questions. The survey utilized electronic branching, which varied the length of the survey depending on the answer applied to the previous question, and asked mostly closed questions to improve the response rates of the participants.

**Phases of Development**

The survey instrument was developed in several phases. First, personal communications with known experts and the examination relevant literature were conducted to determine a method to measure Florida’s community health care providers’ “bioterrorism preparedness” level. Second, the conceptual framework was developed (see Figure 2-1.) based on the information retrieved.
Third, a group of experts was asked to examine the study framework and the competencies used to measure the providers’ bioterrorism competency levels (BCL) for correctness. The group assigned weights to each of the administrative and clinical competencies, and weighted the competency groups according to importance, using their expert knowledge and experience with the core competencies and emergency preparedness (see Figure 3-1). This expert group included such members as the public health core bioterrorism and emergency competencies’ developer from Columbia University, Dr. Kristine Gebbie; the current Chief of Staff of the Office of Public Health Emergency Preparedness at Health and Human Services (HHS); the former Director of Navy Medicine, Office of Homeland Security; the Duty Director of the Global Center for Disaster Management and Humanitarian Action at the University of South Florida, along with preparedness experts employed by the State of Florida, particularly the Florida Department of Health. These experts were chosen either because of their years of leadership experience in emergency planning and response, and/or their in-depth knowledge of bioterrorism and the core competencies.

Fourth, other surveys and, when available, their results were examined from across the country. It was decided to include a few of the same questions that were presented across the spectrum of surveys for future population comparability. Since a survey instrument did not exist, the questionnaire had to be developed specifically for this study. The survey’s questions were developed to capture the necessary data.

Fifth, content and face validity of the research instrument was conducted. Face validity was conducted by a cursory review by fellow researchers, students and coworkers at the University of South Florida and the University of Florida. Content
validity was assessed by experts in the Florida Department of Health, the University of Florida and other government agencies. In addition, questions 46 through 49 were verified that those questions were able to correctly test a basic level of bioterrorism preparedness knowledge of the subjects. To examine these particular questions, 30 participants were separated in two subgroups of 15, novice and advanced. The advanced subgroup was known to have the basic knowledge on bioterrorism and preparedness, while the novice subgroup was known not to have any knowledge of the subject. Each subgroup included healthcare providers from each profession. The advanced group answered all the questions correctly, while the novice subgroup only answered 25% correct. The results confirmed that the questions had the ability to correctly determine whether the subject had basic knowledge of bioterrorism or not.

Sixth, a pilot study was conducted to test the research instrument for internal validity and errors. The internal validity or reliability (correlation between the questions) of the questionnaire for the questions regarding the preparedness level to bioterrorism attack was tested using Guttman Split-half approach, Cronbach’s alpha = .8109. The Cronbach’s alpha coefficient is greater than 0.65, which indicates that the questionnaire has high reliability. (79) Demographic questions were not tested for reliability. Finally, the email invitation will be emailed out and data collected.
Figure 3-1. Weighted Competency Values

Data Collection

The letter of invitation was sent via email to all subject participants. The survey was opened on a Sunday night and ran for 7 days. Reminder emails were sent out on days 3 and 7.

The subjects who chose to opt into the survey followed a unique link to the website hosting the questionnaire and collecting the data. This unique link assigned by the survey software prohibits the same person from taking the survey more than once.

Once the participant arrived at the website, he/she received additional information about the survey and was given the option to “continue” the questionnaire. The questionnaire only asked one question at a time and did not allow the return to the previous question, or to save and return at a later date. Once the questionnaire was completed, the participant was directed back to the University of South Florida, College of Public Health website.
The website was password protected and encrypted for data security. The data was kept in a database on the server until the survey was closed. Once closed, the data was retrieved in both a comma-delimited format and in a Microsoft Excel® formatted file. Once the data was successfully retrieved, the survey and the data were permanently removed from the server.

**Data Preparation**

The data, once collected from the server, was visually inspected for quality control. SPSS, version 11.5 (80) was selected as the preferred statistical software program to conduct the analysis.

**Measurements**

Demographic characteristics of the Florida healthcare providers were collected using 15 questions. There are two types of characteristics: individual and workplace characteristics that are potentially associated with the bioterrorism preparedness level. Individual’s characteristics include: age, gender, race, highest educational degree, years worked as licensed professional, current position, employment status, and work duties. Workplace characteristics are zip code, patient encounter volume, city type, population size, and workplace type. These demographic variables were tested for the prediction of the preparedness level using a logistic regression model.
Willingness to Response

Willingness to respond within Florida was assessed in six situations based on the proximity of the events (local, regional, and statewide, see Figure 3-2) and the level of personal risks to the healthcare providers (low risk and high risk). The question used a 5-point Likert Scale to measure the level of willingness to respond (1-5, very likely to very unlikely). The score was calculated in each situation as one (willing to respond), if the subjects choose “very likely” or “somewhat likely”, and zero (not willing to respond), if the subjects choose “neither likely or unlikely” or “Somewhat unlikely” or “Very unlikely”.

Figure 3-2. “Willingness to Respond”- Example Proximity of the Events
Willingness to Respond in their Local Community (within the county)

The healthcare provider willingness level in the providers’ local community (HCPWL\textsubscript{local}) was calculated based on two survey questions (questions 50 and 54) addressing the willingness to respond to a high risk event and a low risk event in their local community.

\[ \text{HCPWL}_{\text{local}} = \frac{(\text{WR}_{\text{hr, local}} + \text{WR}_{\text{lr, local}})}{2} \]

- \text{HCPWL\textsubscript{local}: Mean score of the healthcare provider willingness level in the providers’ local community}
- \text{WR}_{\text{hr, local}:} Willingness to respond score with high risk to provider’s safety in a local community response
- \text{WR}_{\text{lr, local}:} Willingness to respond score with low risk to provider’s safety in a local community response

Willingness to Respond within the Region (surrounding counties)

The healthcare provider willingness to respond level within the region (HCPWL\textsubscript{region}) was calculated based on two survey questions (questions 51 and 55) addressing the willingness to respond to a high risk event and a low risk event within the surrounding counties.

\[ \text{HCPWL}_{\text{region}} = \frac{(\text{WR}_{\text{hr, rg}} + \text{WR}_{\text{lr, rg}})}{2} \]

- \text{HCPWL\textsubscript{region}: Mean score of the healthcare provider willingness level within the counties surrounding the local community}
Willingness to respond score with high risk to provider’s safety to bioterrorism events within the counties surrounding the local community

Willingness to respond score with low risk to provider’s safety to bioterrorism events region within the counties surrounding the local community

Willingness to Respond within the State of Florida

The healthcare provider willingness to respond level within the State of Florida (HCPWL\text{statewide}) was calculated based on two survey questions (question 52 and 56) addressing the willingness to respond to a high risk event and a low risk event within the State of Florida.

\[
\text{HCPWL}_{\text{Statewide}} = \frac{\text{WR}_{\text{hr, statewide}} + \text{WR}_{\text{lr, statewide}}}{2}
\]

HCPWL\text{statewide}: Mean score of the healthcare provider willingness level within the State of Florida

WR\text{hr, statewide}: Willingness to respond score with high risk to provider’s safety to bioterrorism events within the State of Florida

WR\text{lr, statewide}: Willingness to respond score with low risk to provider’s safety to bioterrorism events region within the State of Florida

Willingness to Respond within the United States

The subjects were asked about their willingness to respond at the U.S. level (at high risk and low risk situations). This assessment provided additional information of whether Florida healthcare providers were willing to respond to the events outside Florida. The
healthcare provider willingness to respond level within the United States (HCPWL\textsubscript{usa}) was calculated based on two survey questions (questions 53 and 57) addressing the willingness to respond to a high risk event and a low risk event within the United States.

\[
\text{HCPWL}_{\text{usa}} = \frac{(\text{WR}_{\text{hr}_{\text{usa}}} + \text{WR}_{\text{lr}_{\text{usa}}})}{2}
\]

- **HCPWL\textsubscript{usa}**: Mean score of the healthcare provider willingness level within the United States
- **WR\textsubscript{hr}_{\text{usa}}**: Willingness to respond score with high risk to provider’s safety to bioterrorism events within the United States
- **WR\textsubscript{lr}_{\text{usa}}**: Willingness to respond score with low risk to provider’s safety to bioterrorism events region within the United States

**Administrative Competency Level (ACL)**

The administrative competency level was measured in two terms: 1) the mean percentage of the sample population who are competent (number of subjects who are competent in each competency divided by total number of subjects), e.g., on average 80% of subjects are competent in the administrative core competencies, and 2) the mean percentage of the individuals’ competency level (number of competencies possessed by a subject divided by eight), e.g., on average the subjects are competent in 70% of the overall core administrative competencies.

ACL was calculated by the weighted average of each of the eight administrative core competencies (see Figure 3-1). Eight experts assigned the weight to each competency based on a total weight of 100% divided between the eight competencies. If the competencies are equally important the weight is 12.5%. The mean weight of each
competency was calculated from all assigned weights from the experts. This mean weight was used in the calculation of the ACL of the sample.

$$ACL = (0.103 \times AC1) + (0.126 \times AC2) + (0.103 \times AC3) + (0.159 \times AC4) + (0.153 \times AC5) + (0.062 \times AC6) + (0.103 \times AC7) + (0.191 \times AC8)$$

Note: The descriptions of AC1-8 are described below.

Administrative Competency 1 (AC1)

AC1: *Describe the role of your workplace in an emergency response.*

The AC1 was demonstrated in one question (question 37). If the subject knew their workplace’s role in a suspected bioterrorism attack (“Strongly Agree” or “Agree”), the value of one was assigned to this variable. If the subject did not know their workplace’s role in a suspected bioterrorism attack (“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero was assigned.

Administrative Competency 2 (AC2)

AC2: *Identify the chain of command in emergency response.*

The AC2 was demonstrated in one question (question 36). If the subject knew their chain of command in a suspected bioterrorism attack (“Strongly Agree” or “Agree”), the value of one was assigned to this variable. If the subject did not know the chain of command in a suspected bioterrorism attack (“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero was assigned.
Administrative Competency 3 (AC3)

AC3: Identify and locate the agency’s emergency management plan.

The AC3 variable was demonstrated using two questions. If the subject knew if the organization had an emergency response or disaster plan (question 13, answer of “Yes”), a value of one was assigned to variable AC3_Ident and if the subject knew where the plan was located (question 14, answer of “Yes”), the value of 1 was assigned to variable AC3_Locate. The variable called AC3 was assigned a score of one, if both AC3_Ident and AC3_Locate had a score of one. If either AC3_Ident or AC3_Locate had a value of zero, a zero was assigned to AC3. If the subject did not know if the organization had an emergency response or disaster plan (question 13, answer of “NO” or “I do not know”), the value of zero was assigned to AC3.

Administrative Competency 4 (AC4)

AC4: Describe his/her functional role(s) in emergency response and participate in these role(s) during regular drills.

The AC4 variable was demonstrated using two questions. If the subject knew his/her functional role in an emergency response (question 35, answer of “Strongly Agree” or “Agree”), a value of one was assigned to variable AC4_Role and if the subject had participated in a disaster drill (question 21, answer of “Yes”), the value of one was assigned to variable AC3_Part. The variable called AC3 was assigned a score of one, if both AC3_Role and AC3_Part had a score of one. If either AC3_Role or AC3_Part have a value of zero, a zero was assigned to AC3. If the subject did not know his/her functional role in an emergency response (question 35, answer of “Neither Agree or Disagree”, “Disagree,
or “Strongly Disagree”) or if the subject had not participated in a disaster drill (question 21, answer of “No”), the value of zero was assigned to AC3.

**Administrative Competency 5 (AC5)**

AC5: *Demonstrate the correct use of communication equipment used for emergency communication. (phone, fax, radio, satellite phone)*

The AC5 was demonstrated in one question (question 20). If the subject knew how to use three of four communication methods (each of the following marked “True”: Phone, Fax, Radio or Satellite Phone), the value of one was assigned to this variable. If the subject did not know how to use three of four communication methods (each of the following not marked: Phone, Fax, Radio or Satellite Phone), the value of zero was assigned to AC5.

**Administrative Competency 6 (AC6)**

AC6: *Ability to locate the communication role(s) in the emergency response plan and understand his/her role.*

The AC6 variable was demonstrated using two questions. If the subject knew whom to call to report/refer a suspected bioterrorism attack (question 38, answer of “Strongly Agree” or “Agree”), a value of one was assigned to variable AC6Refer and if the subject knew if the emergency plan addressed communications (question 19, answer of “Yes”), the value of one was assigned to variable AC6Plan. The variable called AC6 was assigned a score of one, if both AC6Refer and AC6Plan had a score of one. If either AC6Refer or AC6Plan had a value of zero, a zero was assigned to AC6. If the subject did not know whom to call to report/refer a suspected bioterrorism attack (question 38,
answer of “Neither Agree or Disagree”, “Disagree, or “Strongly Disagree”) or if the
subject did not know if the emergency plan addressed communications (question 19,
answer of “No”), the value of zero was assigned to AC6.

Administrative Competency 7 (AC7)

AC7: Identify limits to own knowledge, skill, and authority, and identify key system
resources for referring matters that exceed these limits.

The AC7 was demonstrated in one question (question 40). If the subject knew their
limits in knowledge, skill and authority in a suspected bioterrorism attack (“Strongly
Agree” or “Agree”), the value of one was assigned to this variable. If the subject did not
know their limits in knowledge, skill and authority in a suspected bioterrorism attack
(“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero
was assigned TO AC7.

Administrative Competency 8 (AC8)

AC8: Demonstrate creative problem solving and flexible thinking to unusual
challenges within his/her functional responsibilities to respond to a
bioterrorism event.

The AC8 variable was demonstrated using two questions. If the subject had current
knowledge of the medical aspects of the management of bioterrorism related illnesses
(question 45, “Very Good” or “Good”), a value of one was assigned to variable AC7Solve
and if the subject had been trained for chemical or biological terrorism (question 25,
answer of “Yes”), the value of one was assigned to variable AC8Trained. The variable
called AC8 was assigned a score of one, if both AC7Solve and AC8Trained have a score of
one. If either AC8\textsubscript{solve} or AC8\textsubscript{Train} have a value of zero, a zero was assigned to AC8. If the subject did not have current knowledge of the medical aspects of the management of bioterrorism related illnesses (question 45, answer of “Fair” or “Poor”), or if the subject had not been trained for chemical or biological terrorism (question 25, answer of “No”), the value of zero was assigned to AC8.

**Clinical Competencies Level (CCL)**

The clinical competency level was measured in two terms: 1) the mean percentage of the sample population who were competent (number of subjects who are competent in each competency divided by total number of subjects), e.g., on average 80% of subjects were competent in the clinical core competencies, and 2) the mean percentage of the individuals’ competency level (number of competencies possessed by a subject divided by eight), e.g., on average the subjects are competent in 70% of the overall clinical core competencies.

CCL was calculated by the weighted average of each of the eight clinical core competencies (see Figure 3-1). Eight experts assigned the weight to each competency based on a total weight of 100% divided between the eight competencies. If the competencies were equally important the weight is 12.5%. The mean weight of each competency would be calculated from the all assigned weights from the experts. This mean weight was used in the calculation of the CCL of the sample.

\[
\text{CCL} = (0.113*\text{CC1}) + (0.118*\text{CC2}) + (0.153*\text{CC3}) + (0.11*\text{CC4}) + (0.129*\text{CC5}) + (0.131*\text{CC6}) + (0.106*\text{CC7}) + (0.14*\text{CC8})
\]

Note: The descriptions of CC1-8 are described below.
Clinical Competency 1 (CC1)

CC1: Describe his/her expected clinical role in bioterrorism response for the specific practice setting as a part of the institution or community response.

The CC1 variable was demonstrated using two questions. If the subject knew their role as a health care provider in a suspected bioterrorism attack in their community (question 35, “Strongly Agree” or “Agree”), a value of one was assigned to variable CC1Role and if the subject knew their role according to the organization’s emergency response / disaster plan (question 16, answer of “Yes”), the value of one was assigned to variable CC1Role2. The variable called CC1 was be assigned a score of one, if both CC1Role and CC1Role2 had a score of one. If either CC1Role or CC1Role2 had a value of zero, a zero was assigned to CC1. If the subject did not know their role as a health care provider in a suspected bioterrorism attack in their community (question 35, answer of “Neither Agree or Disagree”, “Disagree” or “Strongly Disagree”), or if the subject did not know their role according to the organization’s emergency response / disaster plan (question 16, answer of “No”), the value of zero was assigned to CC1.

Clinical Competency 2 (CC2)

CC2: Respond to an emergency within the emergency management system of his/her practice, institution and community.

The CC2 was demonstrated in one question (question 50). If the subject was willing to respond to a high risk event bioterrorism event that affected their community (“Very Likely” or “Somewhat Likely”), the value of one was assigned to this variable. If the subject was not willing to respond to a high risk event bioterrorism event that affected
their community (“Neither Likely nor Unlikely”, “Somewhat Unlikely” or “Very Unlikely”), the value of zero was assigned.

Clinical Competency 3 (CC3)

CC3: Recognize an illness or injury as potentially resulting from exposure to a biological, chemical or radiological agent possibly associated with a terrorist event.

The CC3 was demonstrated in questions 46, 47, 48, and 49. These questions tested the current knowledge of the subject to recognize an illness or injury as potentially resulting from exposure to a biological agent used in a terrorism attack. If the subject could answer at least 50 percent of the questions correctly, the value of one was assigned. If the subject could not answer 50 percent of the questions correctly, the value of zero was assigned.

Clinical Competency 4 (CC4)

CC4: Ability to report identified cases or events to the public health authorities to facilitate surveillance and investigation using the established institutional or local communication protocol.

The CC4 was demonstrated in one question (question 38). If the subject knew whom to call to report / refer a suspected bioterrorism attack (“Strongly Agree” or “Agree”), the value of one was assigned to this variable. If the subject did not know whom to call to report / refer a suspected bioterrorism attack (“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero was assigned.
Clinical Competency 5 (CC5)

CC5: *Initiate patient care within his/her professional scope of practice and arrange for prompt referral appropriate to the identified condition(s).*

The CC5 variable was demonstrated using two questions. If the subject had current knowledge of the medical aspects of the diagnosis of bioterrorism related illnesses (question 44, “Very Good” or “Good”), a value of one was assigned to variable CC5\textsubscript{Diagn} and if the subject had current knowledge of the medical aspects of the management of bioterrorism related illnesses (question 45, “Very Good” or “Good”), the value of one was assigned to variable CC5\textsubscript{Manage}. The variable called CC5 was assigned a score of one, if both CC5\textsubscript{Diagn} and CC5\textsubscript{Manage} had a score of one. If either CC5\textsubscript{Diagn} or CC5\textsubscript{Manage} had a value of zero, a zero was assigned to CC5. If the subject did not have current knowledge of the medical aspects of the diagnosis of bioterrorism related illnesses (question 44, answer of “Fair” or “Poor”), or if the subject did not have current knowledge of the medical aspects of the management of bioterrorism related illnesses (question 45, answer of “Fair” or “Poor”), the value of zero was assigned to CC5.

Clinical Competency 6 (CC6)

CC6: *Communicate risks and actions taken to patients and concerned others clearly and accurately.*

The CC6 was demonstrated in one question (question 45). If the subject had current knowledge of the medical aspects of the management of bioterrorism related illnesses, which included communicating risks to the patient (“Very Good” or “Good”), the value of one was assigned to this variable. If the subject did not have current knowledge of the medical aspects of the management of bioterrorism related illnesses,
which included communicating risks to the patient (“Fair” or “Poor”), the value of zero was assigned.

Clinical Competency 7 (CC7)

CC7: Recognize and manage the psychological impact of a Bioterrorism event on victims and health care professionals, as appropriate to the event.

The CC7 was demonstrated in one question (question 40). If the subject could recognize and treat the psychological effects to victims and health care professionals due to bioterrorism attack (“Strongly Agree” or “Agree”), the value of one was assigned to this variable. If the subject could not recognize and treat the psychological effects to victims and health care professionals due to bioterrorism attack (“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero was assigned.

Clinical Competency 8 (CC8)

CC8: Recognize unusual events that might indicate an emergency and describe appropriate action.

The CC8 was demonstrated in one question (question 39). If the subject could recognize signs and symptoms of an illness due to bioterrorism in their own patients (“Strongly Agree” or “Agree”), the value of one was assigned to this variable. If the subject could not recognize signs and symptoms of an illness due to bioterrorism in their own patients (“Neither Agree nor Disagree”, “Disagree” or “Strongly Disagree”), the value of zero was assigned.
Bioterrorism Competency Level (BCL)

Bioterrorism competency level was the overall weighted mean scores of the ACL and the CCL. Eight experts assigned the weight to the BCL based on a total weight of 100% divided between ACL and CCL. There were two types of measurements of the BCL corresponding to the measurements of the ACL and the CCL, of which: 1) the mean percentage of the sample population who were competent (number of subjects who were competent in each competency divided by total number of subjects), e.g., on average 80% of subjects were competent in all core competencies, and 2) the mean percentage of the individuals’ competency level (number of competencies possessed by a subject divided by eight), e.g., on average the subjects were competent in 70% of all core competencies.

\[ \text{BCL} = (0.364 \times \text{ACL}) + (0.636 \times \text{CCL}) \]

BCL: Bioterrorism competency level  
ACL: Administrative competency level  
CCL: Clinical competency level

Preparedness Level (PL)

Preparedness level is comprised of two components: healthcare provider willingness to response at the statewide level (HCPWL\text{\_statewide}) and the bioterrorism competency level (BCL). The researcher created the PL variable based on matching each subject in HCPWL\text{\_statewide} and BCL. To have the PL value coded as “prepared” (value of 1), the subject had a HCPWL\text{\_statewide} “willing to respond” value greater than 50% of the time, and had a BCL “competency level” that is greater than 50%. If the subjects did not follow the above inclusion criteria, the PL value was coded as “not prepared” (value of
0). Matching was used because the subject may have had a high bioterrorism competency level (BCL = 100%) but not willing to respond to an event in Florida (HCPWL\textsubscript{statewide} = 0%), or vice-versa (BCL = 0% and HCPWL\textsubscript{statewide} = 100%). To be prepared, the subject must have been willing to respond to a bioterrorism event and must have had a minimal level of competency to effectively function without endangering him/herself and others.

\[
\text{If } \text{HCPWL}_{\text{statewide}} > 50\% \text{ AND } \text{BCL} > 50\%, \text{ PL} = 1 \\
\text{Or, If } \text{HCPWL}_{\text{statewide}} \leq 50\% \text{ OR } \text{BCL} \leq 50\%, \text{ PL} = 0
\]

The PL\textsubscript{overall} was calculated by the number of subjects who are prepared (PL=1) divided by total number of sample subjects.

\[
\text{PL}_{\text{overall}} = \frac{\text{Number of subjects with PL}=1}{\text{Total number of sample subjects}}
\]

**Perceived Benefits of Bioterrorism Training (PBT)**

This variable was measured by a question (question 43) asking whether they perceived it was important to have bioterrorism preparedness training. The scale was 3-point scale: not important at all (a score of 0), important (1), and very important (2). The PBT variable was tested in the logistic regression model as to whether it predicted the PL or did not predict the PL.

**Perceived Threats of the Risk of a Bioterrorism Attack in the Local Community (PTR)**

This variable was measured by a question (question 33) asking whether they perceived threats of the risk of a bioterrorism attack within the provider’s local
community. The scale is 5-point Likert scale: strongly disagree to strongly agree (1-5, respectively). The PTR variable was tested in the logistic regression model as to whether it predicted the PL or did not predict the PL.

**Healthcare Providers’ “Feeling” Prepared (FP)**

The healthcare providers’ “feeling” prepared was measured by one question (question 58) asking whether they felt prepared to diagnose and manage the bioterrorism attack. The scale is 3-point scale: not prepared (a score of 0), somewhat prepared (1), and very prepared (2).

**Previous Participation in Preparedness Drills (PPD)**

Previous participation in preparedness drills was assessed by one question (question 21). If the subjects participated in any preparedness drills, the value of one was assigned to this variable. If the subjects did not participate in the disaster drills within the last 12 months, the value of zero was assigned. The PPD variable was tested in the logistic regression model as to whether it predicted the PL or did not predict the PL.

**Previous participation in Preparedness Trainings (PPT)**

The previous participation in preparedness trainings was asked assessed one question (question 23). If the subject participated in any preparedness trainings, the value of one was assigned to this variable. If the subject did not participate in the preparedness trainings, the value of zero was assigned. The PPT variable was tested in the logistic regression model as to whether it predicted the PL or did not predict the PL.
DATA ANALYSES

1. *Are Florida’s community healthcare providers (physicians, pharmacists and nurses) prepared to identify and manage a bioterrorism attack?*

   The percentage of overall preparedness level (PL_{overall}) of all subjects in the study is presented in Chapter 4.

2. *Are the levels of preparedness to respond to a bioterrorism attack different among physicians, pharmacists, and nurses?*

   The percentages of overall preparedness level (PL_{overall}) of each professional grouping (physicians, pharmacists, and nurses) was compared using Chi-Square test ($\chi^2$) at a significance level of .05. ($\alpha = .05$).

3. *Do Florida’s healthcare providers (physicians, pharmacists and nurses) “Feel” prepared to identify and manage a bioterrorism attack?*

   The percentages of the Florida’s healthcare providers who did not “Feel” prepared (“not prepared” vs. “somewhat prepared” and “very prepared”) is presented in Chapter 4.
4. Do previous emergency preparedness trainings and drills predict the overall level of preparedness of the healthcare providers?

Logistic regression analysis was used to test whether the previous training or drills predicted the preparedness level (PL) at significance level of .05 ($\alpha = .05$).

$$PL = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + e$$  \hspace{1cm} (Model 1)

- $\beta_0$: intercept of the model
- $x_1$: Previous participation in preparedness drills (PPD)
- $x_2$: Previous participation in preparedness training (PPT)

Note: $x_1$ and $x_2$ are categorical variables

5. Do previous emergency preparedness trainings and drills predict the Florida’s healthcare providers’ willingness to respond to a biological terrorism attack within the State of Florida?

Logistic regression analysis was used to test whether the previous training or drills predicted the healthcare provider’s willingness to respond within the State of Florida ($HCPWL_{statewide}$) at significance level of .05 ($\alpha = .05$).

$$HCPWL_{statewide} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + e$$  \hspace{1cm} (Model 2)

- $\beta_0$: intercept of the model
- $\beta_{1,2}$: coefficient of each factor
- $e$: error term
- $x_1$: Previous participation in preparedness drills (PPD)
- $x_2$: Previous participation in preparedness training (PPT)

Note: $x_{1,2}$ are categorical variables
6. *Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks within their local community?*

The percentage of Florida’s healthcare providers (HCPWL$_{\text{local}}$) is presented in Chapter 4.

7. *Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks outside their local community (Statewide)?*

The percentage of Florida’s healthcare providers (HCPWL$_{\text{Statewide}}$) is presented in Chapter 4.

8. *Do demographic factors of Florida’s community healthcare providers (physicians, pharmacists and nurses) predict a biological terrorism overall level of preparedness?*

Logistic regression analysis was used to test whether the demographic factors predicted the preparedness level (PL) at significance level of .05 ($\alpha = .05$).

\[
\text{PL} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \\
\beta_{11} x_{11} + \beta_{12} x_{12} + \beta_{13} x_{13} + e
\]  
(Model 3)

$\beta_0$: intercept of the model  
$\beta_{1-13}$: coefficient of each factor
9. Does the perceived benefit of bioterrorism preparedness training predict the overall level of preparedness of the healthcare providers?

Logistic regression analysis was used to test whether the perceived benefits of bioterrorism preparedness training (PBT) predict the preparedness level (PL) at significance level of .05 ($\alpha = .05$).

$PL = \beta_0 + \beta_1 x_1 + \epsilon$  \hspace{1cm} (Model 4)

$\beta_0$: intercept of the model
$\beta_1$: coefficient of perceived benefits factor
$x_1$: Perceived benefits of bioterrorism training (PBT)

Note: $x_1$ is ordinal variables
10. Does the perceived threat that a provider's community is at real risk of a bioterrorism attack predict the overall level of preparedness of the healthcare providers?

Logistic regression analysis was used to test whether the perceived threats of risks of a bioterrorism attack (PTR) predicted the overall preparedness level (PL) at significance level of .05 (α = .05).

\[ PL = \beta_0 + \beta_1 x_1 + e \]  

(Model 5)

- $\beta_0$: intercept of the model
- $\beta_1$: coefficient of perceived threats factor
- $x_1$: Perceived threats of bioterrorism attack in a local community (PTR)
- Note: $x_1$ is ordinal variables

11. Do the demographics, perceived threat of bioterrorism attack, perceived benefits of bioterrorism training, previous trainings, and previous drills predict the level of preparedness of the healthcare providers?

Logistic regression analysis was used to test whether the demographic factors, perceived threats and benefits, and previous training and drills predicted the preparedness level (PL) at significance level of .05 (α = .05).

\[ PL = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + \beta_{12} x_{12} + \beta_{13} x_{13} + \beta_{14} x_{14} + \beta_{15} x_{15} + \beta_{16} x_{16} + \beta_{17} x_{17} + e \]  

(Model 6)

- $\beta_0$: intercept of the model
- $\beta_{1-17}$: coefficient of each factor
- $x_1$: age
- $x_2$: gender
- $x_3$: race
x₄ : highest educational degree
x₅ : years worked as licensed professional
x₆ : current position
x₇ : employment status
x₈ : feeling of being prepared
x₉ : zip code
x₁₀ : patient encounter volume
x₁₁ : city type
x₁₂ : population size
x₁₃ : workplace type
x₁₄ : Previous participation in preparedness drills (PPD)
x₁₅ : Previous participation in preparedness training (PPT)
x₁₆ : Perceived benefits of bioterrorism training (PBT)
x₁₇ : Perceived threats of bioterrorism attack in a local community (PTR)

Note: x₁₋₁₅ are categorical variables, x₁₆ and x₁₇ are ordinal variables (3-point and 5-point Likert scale, respectively); the bold text represents the studied factors addressed in this question.
“... with terrorist groups today... we’re in a new era... where the unthinkable could be done with unthinkable destructive power by groups that are willing to do the unthinkable.”

Senator Sam Nunn, 1996
CHAPTER 4
RESULTS

This chapter first discusses the distribution of the questionnaire, and the descriptions of the study subjects and their work place. Second, it details the assessment of the healthcare providers’ competency levels and willingness to respond to determine the overall preparedness level of Florida healthcare providers. Finally, it presents the findings of the predictive modeling of an individual’s overall preparedness level.

Distribution of the Questionnaire

Of 22,800 questionnaire invitations sent to Florida healthcare providers by e-mail, 9,124 were assumed delivered, 13,676 mails were returned for reasons of an “unknown address”, “incorrect address” or were “blocked” by a spam filter. There were 2,879 healthcare providers from the 9,124 who received the e-mails that came to the study website and 2,279 opted into the study, which represent the study response rate of 24.97% (2,279/9,124).

The survey was opened for 7 days, from midnight Sunday until midnight of the following Saturday. There was only one reminder sent out to all providers on Tuesday of that week. From the 2,279 surveys that were started, 1,957 were completed (85.9%). Since the survey required the subjects to complete each question in sequence from
question 1 to 59, all question data were captured up to the point the subjects completed (n=1,957) or prematurely exited the survey (incomplete survey, n=349).

Description of the Study Subjects

The composition of the survey participants were majority nurses (n=1,152, 50.5%, see Table 4-1), but also included pharmacists (n=486, 21.3%), physicians (n=604, 26.5%), and “others”, which the provider type could not be defined (i.e. professor, n=37, 1.6%). The greater part of the subjects were female (n=1,275, 58.3%) and most of the providers were within the 35 to 54 year age range (n=1,329, 60.5%). Only 55 (2.5%) African Americans and 139 (6.4%) Hispanics participated.

<table>
<thead>
<tr>
<th>Table 4-1 Florida Healthcare Providers’ Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (n=2,198)</strong></td>
</tr>
<tr>
<td>18-34</td>
</tr>
<tr>
<td>35-54</td>
</tr>
<tr>
<td>&gt;55</td>
</tr>
<tr>
<td><strong>Gender (n=2,188)</strong></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td><strong>Race (n=2,182)</strong></td>
</tr>
<tr>
<td>African American</td>
</tr>
<tr>
<td>American Indian</td>
</tr>
<tr>
<td>Asian / Pacific Island</td>
</tr>
<tr>
<td>Caucasian</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>Highest Degree (n=2,184)</strong></td>
</tr>
<tr>
<td>Associate</td>
</tr>
<tr>
<td>Bachelor</td>
</tr>
<tr>
<td>Masters</td>
</tr>
<tr>
<td>Doctorate</td>
</tr>
<tr>
<td>Foreign Educated</td>
</tr>
<tr>
<td><strong>Years of Work Experience (n=2,168)</strong></td>
</tr>
<tr>
<td>&lt; 2</td>
</tr>
<tr>
<td>3 to 5</td>
</tr>
<tr>
<td>6 to 10</td>
</tr>
<tr>
<td>11 to 20</td>
</tr>
<tr>
<td>&gt; 20</td>
</tr>
</tbody>
</table>

* N is based on the number of completion of each question
As expected, every subject had at least a two-year college degree (n=288, 13.2%), with the majority having doctorate degrees (DO, Ph.D., MD, PharmD, DDS, n=852, 39.0%). There were 32 (1.7%) foreign educated subjects. While receiving good representation in all groupings, significant proportion of the most subjects had over 20 years of work experience as a licensed provider (physicians, n=284, 47.1%, nurses, n=544, 52.2%, and pharmacists n=176, 36.2%).

Description of the Subjects’ Work Place

Most of the subjects worked in a health care setting (n=1,863, 86.2%, see Table 4-2), more precisely a hospital setting (hospital, none teaching n=470, 25.2% and teaching hospital n=331, 17.8%). The only exception was the pharmacist. While this subgroup had a large presence in hospitals (n=123, 28.4%), the primary work place was in a community pharmacy (n=197, 45.8%). There were also a total of 230 (12.4%) retirees that participated in the survey. While it was unknown whether the retirees continued to practice, this segment continued to echo the subject population at large in this study. There were not significant differences in the data examined.

The majority of the subjects worked in an urban area (n=1,084, 50.9%), with a population base greater than 75,000 (large city, n=1,296, 61%). The patient encounters of the subject’s workplace were normally less than 5,000 annually (558, 30.2%), with the exception of the pharmacist segmentation. Its largest subgroup (n=76, 17.8%) received greater than 80,000 encounters yearly.
### Table 4-2 Florida Healthcare Providers’ Work Place Demographics

<table>
<thead>
<tr>
<th>Work Place Setting</th>
<th>All Healthcare Providers (%)</th>
<th>Physician (%)</th>
<th>Nurse (%)</th>
<th>Pharmacist (%)</th>
<th>Others (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=2,162)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Care</td>
<td>1863 (86.2)</td>
<td>530 (88)</td>
<td>895 (86.1)</td>
<td>431 (89)</td>
<td>7 (19.4)</td>
</tr>
<tr>
<td>None Health Care</td>
<td>179 (8.3)</td>
<td>29 (4.8)</td>
<td>91 (8.1)</td>
<td>38 (7.9)</td>
<td>21 (58.3)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>120 (5.6)</td>
<td>43 (7.1)</td>
<td>54 (5.2)</td>
<td>15 (3.1)</td>
<td>8 (22.3)</td>
</tr>
<tr>
<td>Primarily Work Place</td>
<td>(n=1,862)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital, none Teaching</td>
<td>470 (25.2)</td>
<td>96 (18.1)</td>
<td>295 (32.9)</td>
<td>76 (17.7)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>Teaching Hospital</td>
<td>331 (17.8)</td>
<td>108 (20.4)</td>
<td>177 (19.8)</td>
<td>46 (10.7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Long-term Care Facility</td>
<td>47 (2.5)</td>
<td>1 (2)</td>
<td>30 (3.3)</td>
<td>16 (3.7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Home Health Care</td>
<td>37 (2)</td>
<td>1 (2)</td>
<td>30 (3.3)</td>
<td>6 (1.4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Private Single Practice</td>
<td>145 (7.8)</td>
<td>103 (19.5)</td>
<td>42 (4.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Private Multi- Physician Practice</td>
<td>179 (9.6)</td>
<td>107 (20.2)</td>
<td>69 (7.7)</td>
<td>2 (5)</td>
<td>1 (14.3)</td>
</tr>
<tr>
<td>Clinic Setting</td>
<td>158 (8.5)</td>
<td>53 (10)</td>
<td>88 (9.8)</td>
<td>17 (4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Institutional Pharmacy</td>
<td>21 (1.1)</td>
<td>0 (0)</td>
<td>1 (3)</td>
<td>20 (4.7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Community Pharmacy</td>
<td>197 (10.6)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>197 (45.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>University/Research</td>
<td>47 (2.5)</td>
<td>14 (2.6)</td>
<td>28 (3.1)</td>
<td>2 (5)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>Retired</td>
<td>230 (12.4)</td>
<td>46 (8.7)</td>
<td>136 (15.2)</td>
<td>48 (11.2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Yearly Patient Encounters</td>
<td>(n=1,848)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5000</td>
<td>558 (30.2)</td>
<td>200 (38)</td>
<td>289 (32.5)</td>
<td>68 (16)</td>
<td>1 (14.3)</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>291 (15.7)</td>
<td>99 (18.8)</td>
<td>139 (15.7)</td>
<td>51 (12)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>10,000 - 19,999</td>
<td>206 (11.1)</td>
<td>53 (10.1)</td>
<td>97 (10.9)</td>
<td>56 (13.1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>20,000 – 39,999</td>
<td>202 (10.9)</td>
<td>49 (9.3)</td>
<td>97 (10.9)</td>
<td>53 (12.4)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>40,000 – 59,999</td>
<td>147 (8)</td>
<td>19 (3.6)</td>
<td>75 (8.4)</td>
<td>53 (12.4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>60,000 – 79,999</td>
<td>83 (4.5)</td>
<td>17 (3.2)</td>
<td>43 (4.8)</td>
<td>22 (5.2)</td>
<td>1 (14.3)</td>
</tr>
<tr>
<td>&gt; 80,000</td>
<td>223 (9.8)</td>
<td>56 (10.6)</td>
<td>91 (10.2)</td>
<td>76 (17.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>138 (7.5)</td>
<td>34 (6.5)</td>
<td>57 (6.4)</td>
<td>47 (11)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Community Type</td>
<td>(n=2,128)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>244 (11.5)</td>
<td>56 (9.5)</td>
<td>125 (12.2)</td>
<td>56 (11.8)</td>
<td>7 (19.4)</td>
</tr>
<tr>
<td>Urban</td>
<td>1084 (50.9)</td>
<td>310 (52.5)</td>
<td>522 (50.9)</td>
<td>229 (48.2)</td>
<td>23 (63.9)</td>
</tr>
<tr>
<td>Suburban</td>
<td>800 (37.6)</td>
<td>225 (38.1)</td>
<td>379 (36.9)</td>
<td>190 (40)</td>
<td>6 (16.7)</td>
</tr>
<tr>
<td>Population Size</td>
<td>(n=2124)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small City (&lt; 25,000)</td>
<td>213 (10)</td>
<td>44 (7.5)</td>
<td>103 (10.1)</td>
<td>63 (13.3)</td>
<td>3 (8.3)</td>
</tr>
<tr>
<td>Med City (25,000 - 75,000)</td>
<td>615 (29)</td>
<td>140 (23.7)</td>
<td>332 (32.4)</td>
<td>133 (28.1)</td>
<td>10 (27.8)</td>
</tr>
<tr>
<td>Large City (&gt; 75,000)</td>
<td>1296 (61)</td>
<td>406 (68.8)</td>
<td>589 (57.5)</td>
<td>278 (58.6)</td>
<td>23 (63.9)</td>
</tr>
</tbody>
</table>

* N is based on the number of completion of each question

### Assessment of the Provider’s Current Preparedness Levels

According to the study’s conceptual model, the assessment of the provider’s current preparedness levels involved 4 steps. First, it needed to determine the subject’s eight core administrative competencies (AC1-8) and the eight core clinical competencies (CC1-8) levels. These findings could be used to determine which competency area in which an individual might have had a weakness, or an area which an organization may target for training of a group of providers.
Second, the weighted administrative competency level (ACL) and the weighted clinical competency level (CCL), which formed the weighted bioterrorism competency level (BCL), were calculated. The BCL, in itself, indicated the provider’s individual overall bioterrorism competency level.

Third, the provider’s willingness to respond to a statewide event was determined and assigned a score. This score could be used to estimate a response rate (number of providers willing to respond divided by the local population of providers) of volunteer medical providers for pre-event planning activities.

Finally, the BCL was matched with the provider’s willingness-to-respond rating to form the provider’s overall preparedness level (PL) score. This score was used for the overall preparedness level of the providers. The actual measurements for each of these processes (steps 1-4) are outlined in Chapter 3.

**Determine the Providers’ Competency Levels (AC1-8 and CC1-8)**

**Administrative Competencies (AC)**

Nurses (65.2%) had a higher administrative competency level than the physicians (59.1%) and pharmacists (54.9%) on the un-weighted administrative competencies. Further examination of the individual core administrative competencies revealed that healthcare providers as a whole are the most competent at *demonstrating the correct use of communication equipment used for emergency communication* (see Figure 4-1, AC5, all 72.7%, physicians 76.3%, nurses 74.3%, and pharmacists 66.2%), and being *able to describe his/her functional role(s) in emergency response, and partaking in these role(s) during regular drills* (AC4, all 70.1%, physicians 72.3%, nurses 69.3%, and pharmacists
70.1%). The survey findings, shown on Table 4-3, also suggests that the subjects could problem solve creatively and apply flexible thinking to unusual challenges within his/her functional responsibilities during a response to a bioterrorism event (AC8, all 70.6%, physicians 71.3%, nurses 66.5%, and pharmacists 78.5%).

Figure 4-1. Provider Administrative Competency Levels for Bioterrorism Preparedness.

Overall, physicians and pharmacists were the weakest at identifying limits to own knowledge, skill, and authority, and identify key system resources for referring matters that exceed these limits (AC7, physicians 45.2% and pharmacists 24.7%). The nurses’ weakest competency was their lack of knowledge of his/her work place’s role in an emergency response (AC1, 51.9%).
Table 4-3. Administrative Competency Levels of Florida Healthcare Providers

<table>
<thead>
<tr>
<th>AC</th>
<th>All Healthcare Providers (%)</th>
<th>Physician (%)</th>
<th>Nurse (%)</th>
<th>Pharmacist (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC1</td>
<td>47.7</td>
<td>46.8</td>
<td>51.9</td>
<td>40.3</td>
</tr>
<tr>
<td>AC2</td>
<td>56.1</td>
<td>47.6</td>
<td>64.6</td>
<td>49.3</td>
</tr>
<tr>
<td>AC3</td>
<td>57.1</td>
<td>47.6</td>
<td>68.2</td>
<td>46.3</td>
</tr>
<tr>
<td>AC4</td>
<td>70.1</td>
<td>72.3</td>
<td>69.3</td>
<td>70.1</td>
</tr>
<tr>
<td>AC5</td>
<td>72.7</td>
<td>76.3</td>
<td>74.3</td>
<td>66.2</td>
</tr>
<tr>
<td>AC6</td>
<td>67.7</td>
<td>65.3</td>
<td>70.5</td>
<td>64.1</td>
</tr>
<tr>
<td>AC7</td>
<td>46.1</td>
<td>45.2</td>
<td>56.6</td>
<td>24.7</td>
</tr>
<tr>
<td>AC8</td>
<td>70.6</td>
<td>71.3</td>
<td>66.5</td>
<td>78.5</td>
</tr>
</tbody>
</table>

AC1: Describe your work place’s role in an emergency response.
AC2: Identify the chain of command in emergency response.
AC3: Identify and locate the agency’s emergency management plan.
AC4: Demonstrate the correct use of communication equipment used for emergency communication. (phone, fax, radio, satellite phone)
AC5: Ability to locate the communication role(s) in the emergency response plan and understand his/her role.
AC6: Identify limits to own knowledge, skill, and authority, and identify key system resources for referring matters that exceed these limits.
AC8: Demonstrates creative problem solving and flexible thinking to unusual challenges within his/her functional responsibilities to respond to a bioterrorism event.

Clinical Competencies (CC)

Physicians (48.9%) had a higher competency level than the nurses (44.9%) and pharmacists (37.0%) on the un-weighted clinical competencies. As Figure 4.2 demonstrates, the clinical competency set has more deficits than the administrative core competency set. The clinical competencies examined skills not afforded by normal job duties such as using a fax, and involve specialized bioterrorism training.

The all provider clinical competency level for the eight individual un-weighted competencies range from the low of 17.9% (CC5, see Table 4-4), the ability to initiate patient care within his/her professional scope of practice and arrange for prompt referral appropriate to the identified condition(s), to the high of 73.9% (CC1), the ability to describe his/her expected clinical role in bioterrorism response for the specific practice setting as a part of the institution or community response.
Figure 4-2. Provider Clinical Competency Levels for Bioterrorism Preparedness.

Within the provider subgroups, physicians and pharmacists were the most competent at CC1 and CC2, the ability to respond to an emergency within the emergency management system of his/her practice, institution and community (CC1, 76.5% and 73.3%, and CC2, 76.5% and 71.6%, respectively). The nurses were also the most competent at CC1 (72.5%) and showed a strength in CC4 (67.8%), the ability to report identified cases or events to the public health authorities to facilitate surveillance and investigation using the established institutional or local communication protocol.

As with the all provider competency level, the provider subgroups all demonstrated the lowest competency level in CC5 (physician 25.7%, nurse 17.4% and pharmacist 9.2%). Physicians demonstrated deficits in their ability to communicate risks and actions taken to patients and concerned others clearly and accurately (CC6, 29.1%) and in their ability to recognize an illness or injury as potentially resulting from exposure to a biological, chemical or radiological agent possibly associated with a terrorist event (CC3, 34.6%). The nurses also have major deficits in CC3 (18.4%) and CC6 (22.3%).
Additionally, nurses report difficulty in the recognition of unusual events that might indicate an emergency and describe appropriate action (CC8, 37.3%). The pharmacist subgroup’s main deficit was CC5 (9.2%). Other deficits included CC3 (17.3%), CC6 (15.9%), CC8 (29.5%), and CC7 (24.7%), the ability to recognize and manage the psychological impact of a Bioterrorism event on victims and healthcare professionals.

Table 4-4. Clinical Competency Levels of Florida Healthcare Providers

<table>
<thead>
<tr>
<th></th>
<th>All Healthcare Providers (%)</th>
<th>Physician (%)</th>
<th>Nurse (%)</th>
<th>Pharmacist (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC1</td>
<td>73.9</td>
<td>76.5</td>
<td>72.5</td>
<td>73.3</td>
</tr>
<tr>
<td>CC2</td>
<td>70.5</td>
<td>76.5</td>
<td>67.2</td>
<td>71.6</td>
</tr>
<tr>
<td>CC3</td>
<td>22.6</td>
<td>34.5</td>
<td>18.4</td>
<td>17.3</td>
</tr>
<tr>
<td>CC4</td>
<td>61.4</td>
<td>56.4</td>
<td>67.8</td>
<td>54.6</td>
</tr>
<tr>
<td>CC5</td>
<td>17.9</td>
<td>25.7</td>
<td>17.4</td>
<td>9.2</td>
</tr>
<tr>
<td>CC6</td>
<td>22.8</td>
<td>29.1</td>
<td>22.3</td>
<td>15.9</td>
</tr>
<tr>
<td>CC7</td>
<td>46.1</td>
<td>45.2</td>
<td>56.6</td>
<td>24.7</td>
</tr>
<tr>
<td>CC8</td>
<td>38.4</td>
<td>47.3</td>
<td>37.3</td>
<td>29.5</td>
</tr>
</tbody>
</table>

CC1: Describe his/her expected clinical role in bioterrorism response for the specific practice setting as a part of the institution or community response.
CC2: Respond to an emergency within the emergency management system of his/her practice, institution and community.
CC3: Recognize an illness or injury as potentially resulting from exposure to a biological, chemical or radiological agent possibly associated with a terrorist event.
CC4: Ability to report identified cases or events to the public health authorities to facilitate surveillance and investigation using the established institutional or local communication protocol.
CC5: Initiate patient care within his/her professional scope of practice and arrange for prompt referral appropriate to the identified condition(s).
CC6: Communicate risks and actions taken to patients and concerned others clearly and accurately.
CC7: Recognize and manage the psychological impact of a Bioterrorism event on victims and health care professionals, as appropriate to the event.
CC8: Recognize unusual events that might indicate an emergency and describe appropriate action.

**Administrative Competency Level (ACL)**

To calculate the weighted Administrative Competency Level (ACL), the administrative competency results (AC1-8) above were placed in the following formula:

\[
ACL = (0.103*AC1) + (0.126*AC2) + (0.103*AC3) + (0.159*AC4) + (0.153*AC5) + (0.062*AC6) + (0.103*AC7) + (0.191*AC8)
\]

ACL = 0.6284

Note: The descriptions of ACL and AC1-8 are found in Chapter 3.
This resulted in a mean score of 0.6284. This mean score average suggests that 62.84% of subjects are competent in the administrative core competencies, and that on average each subject is competent in 62.84% of the overall core administrative competencies.

Clinical Competency Level (CCL)

To calculate the Clinical Competency Level (CCL), the clinical competency results (CC1-8) above were placed in the following formula:

\[
CCL = (0.113\times CC1) + (0.118\times CC2) + (0.153\times CC3) + (0.11\times CC4) + (0.129\times CC5) + (0.131\times CC6) + (0.106\times CC7) + (0.14\times CC8)
\]

\[
CCL = 0.4497
\]

Note: The descriptions of CCL and CC1-8 are found in Chapter 3.

This resulted in a mean score of 0.4497. This mean score average suggests that 44.97% of subjects are competent in the clinical core competencies, and that on average each subject is competent in 44.97% of the overall core administrative competencies.

Figure 4-3. Weighted Bioterrorism Competency Levels Scores for Florida’s Healthcare Providers.
**Bioterrorism Competency Level (BCL)**

To calculate the Bioterrorism Competency Level (BCL), the results from both the ACL and BCL above were placed in the following formula:

\[
BCL = (0.364 \times ACL) + (0.636 \times CCL)
\]

\[
BCL = .5117
\]

Note: The descriptions of BCL are found in Chapter 3.

This resulted in a mean score of 0.5117. This weighted mean score average suggests that 51.2% of the subjects have the necessary competency level to respond to a bioterrorist attack, and that on average each subject is 51.2% competent in the core bioterrorism competencies.

**Willingness-to-Respond**

The willingness-to-respond score is segmented into proximities and risk levels. Both factors are important for pre-incident planning of personnel expectations. Within this section, results of Research Questions 6 and 7 are presented.

**Willingness to Respond to an event within their local community**

*Research Question 6.* Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks within their local community?

The study results suggest that most Florida providers are willing to respond to both a high risk (HR) event and a low risk (LR) event within their local community (81.7% and 82.8%, respectively). Physicians are the most likely to respond to a HR event in the
local community (84.5%) and have the tendency to report a higher willingness to respond in a HR event than a LR event, unlike the other professions. Nurses are the most likely in a LR event (83.6%) in the local community. Pharmacist are the least likely to respond in all proximity categories (see Table 4-5).

Table 4-5. Percentage of Florida Healthcare Providers Willing-to-Respond to a Bioterrorism Attack

<table>
<thead>
<tr>
<th>Proximity</th>
<th>All Healthcare Providers</th>
<th>Physician</th>
<th>Nurse</th>
<th>Pharmacist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Local</td>
<td>81.7</td>
<td>82.8</td>
<td>84.5</td>
<td>83.3</td>
</tr>
<tr>
<td>Regional</td>
<td>64.4</td>
<td>68.1</td>
<td>66.5</td>
<td>65.9</td>
</tr>
<tr>
<td>Statewide</td>
<td>53.6</td>
<td>53.8</td>
<td>55.0</td>
<td>51.7</td>
</tr>
<tr>
<td>Nationwide</td>
<td>48.2</td>
<td>47.0</td>
<td>51.9</td>
<td>46.1</td>
</tr>
</tbody>
</table>

* The total n does not include the “others” category of provider.

High Risk Event was defined as a bioterrorism agent that does NOT have a known treatment and/or vaccination.

Low Risk Event was defined as a bioterrorism agent that has a known treatment and/or vaccination.

Proximity was defined as the distance from providers’ normal workplace to Ground Zero of the event.

Local was defined as the providers’ local community.

Regional was defined as counties surrounding the providers’ normal workplace.

Statewide was defined as responding anywhere in the State of Florida.

Nationwide was defined as responding anywhere in the United States.

Willingness to Respond to an event outside their local community

Research Question 7. Are Florida’s community healthcare providers (physicians, pharmacists and nurses) willing to respond to biological agent attacks outside their local community (Statewide)?

When asked if Florida’s community healthcare providers (physicians, pharmacists and nurses) were willing to respond to biological agent attacks outside their local community, all subject group percentages dropped dramatically (see Table 4-5). Within the statewide subgroup, only 53.6% of all subjects reported that they are willing to respond to a HR event (physicians 55.0%, nurses 56.9% and pharmacists 45.0%). It was also reported that only 48.2% of Florida’s community providers are willing to respond to a HR event and 47.0% to a LR event outside Florida.
Provider Preparedness Level (PL)

Figure 4-4. The Scored Conceptual Model for Bioterrorism Preparedness.
**Research Question 1.** *Are Florida’s community healthcare providers (physicians, pharmacists and nurses) prepared to identify and manage a bioterrorism attack?*

Overall, 67.5% of the Florida healthcare providers were not prepared for a bioterrorism attack. As identified by the BCL (see Figure 4-3), 51.1% of subjects have the minimal competencies needed to respond to a biological attack and 53.7% are willing to respond within the State of Florida (see Table 4-5). When the process of matching was applied to the subjects, only 32.5% (34.6% physicians, 38.4% nurses, and 17.4% pharmacist, see Table 4-4) of Florida’s community healthcare providers had both a minimal level of competency to effectively function without endangering him/herself and others, and are willing to respond to a bioterrorism attack.

### Table 4-6. Preparedness Levels of Florida Healthcare Providers

<table>
<thead>
<tr>
<th>Provider Type</th>
<th>Overall Preparedness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Prepared (%)</td>
</tr>
<tr>
<td>Physician N=537</td>
<td>351 (65.4%)</td>
</tr>
<tr>
<td>Nurse N=916</td>
<td>564 (61.6%)</td>
</tr>
<tr>
<td>Pharmacist N=436</td>
<td>360 (82.6%)</td>
</tr>
<tr>
<td>FL Healthcare Providers N=1889</td>
<td>1275 (67.5%)</td>
</tr>
</tbody>
</table>

* The total n does not include the “others” category.


Research Question 2. Are the levels of preparedness to respond to a bioterrorism attack different among physicians, pharmacists, and nurses?

Pharmacists seemed to be less prepared than physicians and nurses (17.4% vs. 34.6%, 38.4%, see Figure 4-5). A Pearson Chi-Square test of the percent preparedness of all three groups was performed. It showed that there was at least a significant difference between the levels of preparedness of a pair comparison (Pearson Chi-Square =60.916, df= 2, p=.000).

The researcher conducted a family-wise comparisons (alpha = .017) of the preparedness levels between provider types to identify the different. There were statistically significant differences of the levels of preparedness between physician and pharmacist groups (34.6% vs. 17.4%, Pearson Chi-Square=36.203, df=1, p=.000) and between nurse and pharmacist groups (38.4% vs. 17.4%, Pearson Chi-Square = 60.193, df=1, p=.000). There was no significant difference between physicians and nurses (34.6% vs. 38.4%, Pearson Chi-Square = 2.087, df=1, p=.159).

Figure 4-5. Overall Bioterrorism Preparedness Level (PL) by Provider Type.
**Research Question 3.** Do Florida’s healthcare providers (physicians, pharmacists and nurses) “Feel” prepared to identify and manage a bioterrorism attack?

The findings suggest that 55.5% (n=1957) of Florida’s community healthcare providers do NOT feel prepared (physicians n=545, 41.7%, nurses n= 943, 55.4%, and pharmacists n=439, 72.4%) and 41.5% feel somewhat prepared (physicians 51.6%, nurses 42.5%, and pharmacists 27.1%) to identify and manage a bioterrorism attack (see Figure 4-6). Only 3.0 of Florida’s providers feel very prepared (physicians 6.8%, nurses 2.1%, and pharmacists 0.5%).

![Figure 4-6. Percentage of Providers that “Feel” Prepared.](image-url)
The Work Place Emergency Plan

The findings suggest that 70% (physicians 68.9%, nurses 83.1%, and pharmacists 60.5%, see Figure 4-7) of Florida’s community healthcare providers know if their workplace has an emergency plan. Of those, only 52.9% (physicians 46.2%, nurses 60.3%, and pharmacists 44.9%) know where it is located.

Figure 4-7. Provider’s Knowledge of a Work Place Emergency Plan and It’s Contents
Emergency Preparedness Drills

The findings suggest that 31.5% (physicians 25.4%, nurses 40.5%, and pharmacists 20.1%, see Figure 4-8) of Florida’s community healthcare providers had participated in an emergency drill in the last 12 months. Of those, only 11.1% (physicians 10.3%, nurses 13.5%, and pharmacists 6.6%) have participated in a bioterrorism themed drill.

Figure 4-8. Provider’s Participation in an Emergency Preparedness Drills
Emergency Preparedness Training Activities

The findings suggest that 55.2% (physicians 33.2%, nurses 66.7%, and pharmacists 33.2%, see Figure 4-9) of Florida’s community healthcare providers have participated in an emergency training sometime during their career. Of those, only 11.1% (physicians 26.5%, nurses 36.9%, and pharmacists 22%) have participated in training within the previous 12 months and 32.3% stated that the training included a chemical or biological components. 32.4% of the providers stated that the training focused specifically to a biological agent exposure.

Figure 4-9. Provider’s Emergency Preparedness Training Activities
Method / Modality of Bioterrorism Training Received

The providers reported that 54% received their training in a traditional lecture format and that 21% used self learn materials (see Figure 4-10). The providers also suggested that traditional lecture format (44%) is the preferred choice to obtain future bioterrorism trainings, with online interactive courses (30%) being the next preferred.

Figure 4-10. Types of Bioterrorism Training Methods/Modalities for Providers
Perceived Benefits of Bioterrorism Training (PBT)

When asked *how important is it for you to be trained to identify a possible bioterrorism attack*, 46% of the providers reported that it was very important, 50% stated it was important and 4% believed it was not important (see Figure 4-11).

![Figure 4-11. The Providers’ Perceived Benefits of Bioterrorism Training (PBT)](image-url)
Perceived Threats of the Risk of a Bioterrorism Attack

When asked if a bioterrorism attack is a real threat within Florida, 86.4% of the providers either strongly agreed or agreed. When asked if a bioterrorism attack is a real threat within your local community, this percentage dropped to 59.8% that either strongly agreed or agreed, with 40.2% either being neutral or disagreeing. (Figure 4-12).

Figure 4-11. The Providers Perceived Threats of the Risk of a Bioterrorism Attack at the State and Local Levels
Predictive Factors of Provider Preparedness Levels

Research Question 4. Do previous emergency preparedness trainings and drills predict the overall level of preparedness of the healthcare providers?

The dependent variable is PL. If healthcare providers were prepared PL=1, otherwise PL=0 (not prepared). Since the dependent variable is discrete, the ordinary least squares regression can be used to fit a linear probability model. However, since the linear probability model is heteroskedastic and may predict probability values beyond the (0,1) range, the logistic regression model is used to estimate the factors which influence the overall preparedness.

Table 4-7 Descriptive Statistics of the Variables in the Logistic Regression Model for Question 4.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall preparedness N=1,919</td>
<td></td>
</tr>
<tr>
<td>Not prepared (0)</td>
<td>1,298 (67.6)</td>
</tr>
<tr>
<td>Prepared (1)</td>
<td>621 (32.4)</td>
</tr>
<tr>
<td>Previous Drills N=2,071</td>
<td></td>
</tr>
<tr>
<td>Yes (1)</td>
<td>653 (31.5)</td>
</tr>
<tr>
<td>No (2)</td>
<td>1,418 (68.5)</td>
</tr>
<tr>
<td>Previous Trainings N=2,068</td>
<td></td>
</tr>
<tr>
<td>Yes (1)</td>
<td>1,141 (55.2)</td>
</tr>
<tr>
<td>No (2)</td>
<td>927 (44.8)</td>
</tr>
</tbody>
</table>

Table 4-8 Logistic Regression Significant Results for Question 4

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disaster Drills (yes)</td>
<td>.941</td>
<td>.114</td>
<td>68.096</td>
<td>1</td>
<td>.000</td>
<td>2.562</td>
</tr>
<tr>
<td>Participated in Disaster Training (yes)</td>
<td>1.049</td>
<td>.117</td>
<td>79.915</td>
<td>1</td>
<td>.000</td>
<td>2.856</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.696</td>
<td>.093</td>
<td>335.535</td>
<td>1</td>
<td>.000</td>
<td>.183</td>
</tr>
</tbody>
</table>

Table 4-9 Model Summary for Question 4

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log Likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>217.838</td>
<td>.120</td>
<td>.167</td>
</tr>
</tbody>
</table>
Table 4-10 Model Prediction for Question 4

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted Overall Preparedness</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Prepared</td>
<td>Prepared</td>
</tr>
<tr>
<td>Step 1</td>
<td>Overall Preparedness</td>
<td>1097</td>
</tr>
<tr>
<td></td>
<td>Prepared</td>
<td>336</td>
</tr>
<tr>
<td>Overall %</td>
<td>Not Prepared</td>
<td>1097</td>
</tr>
<tr>
<td></td>
<td>Prepared</td>
<td>336</td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500

The results from logistic regression indicate that previous trainings (beta = .1049, p=.000) and drills (beta = .941, p=.000) were significant predictors of the overall preparedness level of Florida healthcare providers at 0.05 level.(Table 4-8) By using logistic regression analysis, beta is the regression coefficient of logarithm of the likelihood of preparedness

\[
\text{Log odds of being prepared} = \log \left( \frac{\text{probability of being prepared}}{1 - \text{probability of being unprepared}} \right)
\]

In order to interpret the results, exponential function of beta of each independent variable is used as a regression coefficient to predict preparedness (prepared vs. not prepared). If a healthcare provider has previous drills, they are 2.56 times likely to be prepared for a bioterrorism attack compared with no previous drills. Similarly, if a healthcare provider has previous drills, they are 2.86 times likely to be prepared for a bioterrorism attack compared with no previous trainings. The ability of variance of PL explained by this model is low (Nagelkerke R square = .167, see Table 4-9). However,
the model predicts 74% of the responses correctly, see Table 4-10). The preparedness of
the healthcare providers on a bioterrorism attack event is multifaceted and complex. It is
not expected that only previous trainings and drills would have high R square. The
predictive model is substituted below.

\[
\log P_L = -0.1696 + 0.941x_1 + 0.1049x_2 + e
\]

(Model 1)

**Research Question 5.** *Do previous emergency preparedness trainings and drills predict
the Florida’s healthcare providers’ willingness to respond to a biological terrorism
attack within the State of Florida?*

The results from logistic regression indicate that previous trainings (beta = .286,
p=.010) and drills (beta = .436, p=.000) were significant predictors of the willingness to
respond of Florida healthcare providers (see Table 4-11). The researcher used the
exponential function of betas to interpret the prediction of the overall preparedness with
similar reasons listed in question 4. If the healthcare providers had previous drills, they
were 1.55 times more likely to be willingness to respond to a bioterrorism attack
compared with no previous drills. If the healthcare providers had previous trainings, they
were 1.33 times more likely to be willingness to respond to a bioterrorism attack
compared with no previous trainings. The ability of variance explained by this model is
low (Nagelkerke R square = .027, see Table 4-12). However, the model predicts 55.8%
of the responses correctly (see Table 4-13). The willingness to respond to a bioterrorism
attack of the healthcare providers is multifaceted and complex. It is not expected that
only previous trainings and drills would highly predict the willingness to respond. There
is no constant included in the model (p=.105). The predictive model is substituted with
the regression coefficients below.
Log $HCPWL_{statewide} = \beta_0 + 0.436x_1 + 0.286x_2 + \varepsilon$  (Model 2)

Table 4-11 Descriptive Statistics of the Variables in the Logistic Regression Model for Question 5.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to Response (Statewide) level N=1,556</td>
<td></td>
</tr>
<tr>
<td>No (0)</td>
<td>713 (45.8)</td>
</tr>
<tr>
<td>Yes (1)</td>
<td>843 (54.2)</td>
</tr>
<tr>
<td>Previous Drills N=2,071</td>
<td></td>
</tr>
<tr>
<td>Yes (1)</td>
<td>653 (31.5)</td>
</tr>
<tr>
<td>No (2)</td>
<td>1,418 (68.5)</td>
</tr>
<tr>
<td>Previous Trainings N=2,068</td>
<td></td>
</tr>
<tr>
<td>Yes (1)</td>
<td>1,141 (55.2)</td>
</tr>
<tr>
<td>No (2)</td>
<td>927 (44.8)</td>
</tr>
</tbody>
</table>

Table 4-12 Logistic Regression Significant Results for Question 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig.</th>
<th>Exp($B$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disaster Drills (yes)</td>
<td>.431</td>
<td>.120</td>
<td>13.208</td>
<td>1</td>
<td>.000</td>
<td>1.547</td>
</tr>
<tr>
<td>Participated in Disaster Training (yes)</td>
<td>.286</td>
<td>.111</td>
<td>6.647</td>
<td>1</td>
<td>.010</td>
<td>1.331</td>
</tr>
<tr>
<td>Constant</td>
<td>-.125</td>
<td>.077</td>
<td>2.630</td>
<td>1</td>
<td>.105</td>
<td>.883</td>
</tr>
</tbody>
</table>

Table 4-13 Model Summary for Question 5

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log Likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>211.453</td>
<td>.020</td>
<td>.027</td>
</tr>
</tbody>
</table>

Table 4-14 Model Prediction for Question 5

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted WTR Statewide</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTR Statewide</td>
<td>Not Willing</td>
<td>Willing</td>
</tr>
<tr>
<td>Not Willing</td>
<td>321</td>
<td>392</td>
</tr>
<tr>
<td>Willing</td>
<td>298</td>
<td>548</td>
</tr>
<tr>
<td>Overall %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500 and WTR = Willingness to Respond
Research Question 8. Do demographic factors of Florida’s community healthcare providers (physicians, pharmacists and nurses) predict a biological terrorism overall level of preparedness?

The researcher selected the model of the regression analysis in step 5, which was the final step of the regression analysis using the backward elimination method. The results from logistic regression show that gender (male, beta=.280, p=.042), city type (rural, beta=.416, p=.020), current position (physician, beta=-1.992, p=.033), and primary workplace (home health care, private single practice setting, or private multi-physician practice beta= -1.396,-.705,-.908, p=.007,.005,.000, respectively) were significant predictors of overall preparedness of the Florida’s healthcare providers (see Table 4-15). If the healthcare providers were male, they were 1.32 times more likely to be prepared for the bioterrorism attack than female. If the healthcare providers worked in a rural area, they were 1.52 times more likely to be prepared for the bioterrorism attack than in a suburban area. If the healthcare providers were physicians or pharmacists, they were less likely to be prepared for the bioterrorism attack than providers in academia (i.e. professors). If the healthcare provider’s primary workplace was home health care, a private single practice setting, or a private multi-physician practice, they were less likely to be prepared for the bioterrorism attack than a retiree. The ability of variance explained by this model is moderate (Nagelkerke R square = .107, see Table 4-16). However, the model predicts 67.7% of the responses correctly (see Table 4-17). There might be other variables that were not measured in this study that predict the preparedness for a bioterrorism attack of the Florida healthcare providers. The predictive model is substituted below.
Log PL = - .280x_{2\_male} -1.992x_{6.1} -2.577x_{6.3} -0.037x_{8.4} -.705x_{8.5} -.908x_{8.6} + .416x_{11.1} + e  

(Model 3)

Table 4-15 Logistic Regression of Significant Results for Question 8

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig.</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (male)</td>
<td>.280</td>
<td>.137</td>
<td>4.148</td>
<td>1</td>
<td>.042</td>
<td>1.323</td>
</tr>
<tr>
<td>City type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rural</td>
<td>.416</td>
<td>.178</td>
<td>6.480</td>
<td>2</td>
<td>.039</td>
<td>1.516</td>
</tr>
<tr>
<td>Current position</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>physician</td>
<td>-1.992</td>
<td>.934</td>
<td>33.408</td>
<td>3</td>
<td>.000</td>
<td>.136</td>
</tr>
<tr>
<td>pharmacist</td>
<td>-2.577</td>
<td>.935</td>
<td>7.604</td>
<td>1</td>
<td>.006</td>
<td>.076</td>
</tr>
<tr>
<td>Work duties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>home health care</td>
<td>-1.396</td>
<td>.516</td>
<td>7.334</td>
<td>1</td>
<td>.007</td>
<td>.248</td>
</tr>
<tr>
<td>private practice</td>
<td>-.705</td>
<td>.251</td>
<td>7.912</td>
<td>1</td>
<td>.005</td>
<td>.494</td>
</tr>
<tr>
<td>private multi-physician practice</td>
<td>-.908</td>
<td>.242</td>
<td>14.121</td>
<td>1</td>
<td>.000</td>
<td>.403</td>
</tr>
</tbody>
</table>

Table 4-16 Model Summary for Question 8

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log Likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>198.629</td>
<td>.084</td>
<td>.117</td>
</tr>
<tr>
<td>2</td>
<td>198.673</td>
<td>.084</td>
<td>.117</td>
</tr>
<tr>
<td>3</td>
<td>198.938</td>
<td>.083</td>
<td>.115</td>
</tr>
<tr>
<td>4</td>
<td>199.299</td>
<td>.081</td>
<td>.112</td>
</tr>
<tr>
<td>5</td>
<td>200.012</td>
<td>.077</td>
<td>.107</td>
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Table 4-17 Model Prediction for Question 8

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<th>Percentage Correct</th>
</tr>
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<tbody>
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<td>1097</td>
<td>201</td>
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<td></td>
<td>Total</td>
<td>336</td>
<td>285</td>
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<td></td>
<td>Overall %</td>
<td>72.0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>1060</td>
<td>54</td>
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<td>Total</td>
<td>480</td>
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<tr>
<td></td>
<td>Overall %</td>
<td>68.1</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>1055</td>
<td>59</td>
<td>94.7</td>
</tr>
<tr>
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<td>Total</td>
<td>479</td>
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<td>14.5</td>
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<tr>
<td></td>
<td>Overall %</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1058</td>
<td>56</td>
<td>95.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>483</td>
<td>77</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td>Overall %</td>
<td>67.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1061</td>
<td>53</td>
<td>95.2</td>
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<tr>
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<td>Total</td>
<td>488</td>
<td>72</td>
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<tr>
<td></td>
<td>Overall %</td>
<td>67.7</td>
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<td></td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500
Research Question 9. Does the perceived benefit of bioterrorism preparedness training predict the overall level of preparedness of the healthcare providers?

The results from the logistic regression show that perceived benefits of training was significant predictors of the overall preparedness level of Florida’s community healthcare providers (beta = -2.158, p=.000 for “no perceived benefits”, Table 4-18). If the healthcare providers did not perceived benefits of bioterrorism training, they are less likely to be prepared for bioterrorism attack. The ability of variance explained by this model is low (Nagelkerke R square = .024, see Table 4-19). However, the model predicts 67.6% of the responses correctly (see Table 4-20). The preparedness of Florida’s community healthcare providers for a bioterrorism attack event is considered multifaceted and complex. It is not expected that only the perception of benefits of bioterrorism training would have high R square. The model is substituted below.

\[ PL = -1.786 - 2.158X_1 + \varepsilon \]  

(Model 4)

Table 4-18 Logistic Regression Significant Results for Question 9

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated in Disaster Training (yes)</td>
<td>-2.158</td>
<td>.516</td>
<td>17.458</td>
<td>1</td>
<td>.000</td>
<td>.116</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.768</td>
<td>.258</td>
<td>46.879</td>
<td>1</td>
<td>.000</td>
<td>.171</td>
</tr>
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</table>

Table 4-19 Model Summary for Question 9

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log Likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>238.324</td>
<td>.017</td>
<td>.024</td>
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</tbody>
</table>
Table 4-20 Model Prediction for Question 9

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Overall Preparedness</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Not Prepared</td>
<td>Prepared</td>
</tr>
<tr>
<td>Step 1</td>
<td>Overall Preparedness</td>
<td>1298</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Not Prepared</td>
<td>621</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Overall %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500

Research Question 10. Does the perceived threat that a provider's community is at real risk of a bioterrorism attack predict the overall level of preparedness of the healthcare providers?

The results from the logistic regression show that perceived threats of bioterrorism attack in the community was significant predictors of the overall preparedness level of Florida healthcare providers (beta = -.224, p=.026 for “no perceived threats”, see Tables 4-21). If the healthcare providers did not perceive threats of bioterrorism attack in the local community, they are less likely to be prepared for the bioterrorism attack. The ability of variance explained by this model is low (Nagelkerke R square = .004, see Table 4-22). However, the model predicts 67.6% of the responses correctly (see Table 4-23). It is not expected that only the perception of threats of bioterrorism attack in local communities would have high R square. The predictive model is substituted below.

Log PL = -.651 -.224x₁ + e  

(Model 5)

Table 4-21 Logistic Regression Significant Results for Question 10

<table>
<thead>
<tr>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Threat (yes)</td>
<td>-.224</td>
<td>.101</td>
<td>4.943</td>
<td>.026</td>
<td>.799</td>
</tr>
<tr>
<td>Constant</td>
<td>-.651</td>
<td>.062</td>
<td>110.184</td>
<td>.000</td>
<td>.522</td>
</tr>
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</table>
Table 4-22 Model Summary for Question 10

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log Likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>241.126</td>
<td>.003</td>
<td>.004</td>
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</table>

Table 4-23 Model Prediction for Question 10

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted Overall Preparedness</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Prepared</td>
<td>Prepared</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Preparedness</td>
<td>1298</td>
<td>0</td>
</tr>
<tr>
<td>Not Prepared</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared</td>
<td>621</td>
<td>0</td>
</tr>
<tr>
<td>Overall %</td>
<td></td>
<td>67.7</td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500

Research Question 11. Do the demographics, perceived threat of bioterrorism attack, perceived benefits of bioterrorism training, previous trainings, and previous drills predict the level of preparedness of the healthcare providers?

The researcher selected the model of the regression analysis in step 9, which was the final step of the regression analysis using backward elimination method. The results from logistic regression show that race (1, beta=-.965, p=.000 and 4, beta=-1.383, p=.002), perceived benefit (beta=2.425, p=.001), previous drills (beta=.689, p=.000), previous training (beta=.459, p=.002), and feeling not prepared (beta = -3.201, p=.000) were significant predictors of overall preparedness of the Florida healthcare providers (see Table 4-27). If the healthcare providers were Caucasian, Asian/ Pacific Islander, or just felt unprepared, they are less likely to be prepared for the bioterrorism attack. On the other hand, if healthcare providers have a perception of threats of bioterrorism attack, perceive benefits of bioterrorism training, had previous drills and trainings, they are more likely to be prepared. The ability of variance explained by this model is moderate.
(Nagelkerke R square = .370, see Table 4-28). However, the model predicts 76.9% of the responses correctly, see Table 4-29). The preparedness of the healthcare providers on a bioterrorism attack event is multifaceted and complex. There might be other variables that were not measured in this study predict the preparedness to a bioterrorism attack of the Florida healthcare providers. The predictive model is substituted below.

$$\text{Log PL} = -0.950x_{3(1)} - 1.383x_{3(4)} + 2.425x_{43} + .689x_{21.1} + .459x_{23.1} - 3.201x_{58.1} - 1.459x_{58.2} + \epsilon$$

Table 4-24 Logistic Regression Significant Results for Question 11

<table>
<thead>
<tr>
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<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Df</th>
<th>Sig</th>
<th>Exp(B)</th>
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<td>Race</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>-.950</td>
<td>.334</td>
<td>13.342</td>
<td>5</td>
<td>.004</td>
<td>.387</td>
</tr>
<tr>
<td>Asian / Pacific Islander</td>
<td>-1.383</td>
<td>.438</td>
<td>9.980</td>
<td>1</td>
<td>.002</td>
<td>.251</td>
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<tr>
<td>Perceived benefits</td>
<td>2.425</td>
<td>.761</td>
<td>10.146</td>
<td>1</td>
<td>.001</td>
<td>11.307</td>
</tr>
<tr>
<td>Previous drills</td>
<td>.689</td>
<td>.137</td>
<td>25.227</td>
<td>1</td>
<td>.000</td>
<td>1.991</td>
</tr>
<tr>
<td>Previous trainings</td>
<td>.459</td>
<td>.147</td>
<td>9.728</td>
<td>1</td>
<td>.002</td>
<td>1.583</td>
</tr>
<tr>
<td>Feeling Prepared</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Prepared</td>
<td>-3.201</td>
<td>.404</td>
<td>178.467</td>
<td>2</td>
<td>.000</td>
<td>.041</td>
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<td>Somewhat Prepared</td>
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<td>.389</td>
<td>14.060</td>
<td>1</td>
<td>.000</td>
<td>.233</td>
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Table 4-25 Model Summary for Question 11

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<th>Step</th>
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<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
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<td>.389</td>
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<tr>
<td>2</td>
<td>158.174</td>
<td>.280</td>
<td>.389</td>
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<tr>
<td>3</td>
<td>158.483</td>
<td>.279</td>
<td>.387</td>
</tr>
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<td>4</td>
<td>158.513</td>
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<td>.387</td>
</tr>
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<td>5</td>
<td>158.793</td>
<td>.278</td>
<td>.385</td>
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<td>6</td>
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<td>9</td>
<td>161.381</td>
<td>.266</td>
<td>.370</td>
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Table 4-26 Model Prediction for Question 11

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<th>Observed</th>
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<th>Percentage Correct</th>
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<td>Prepared</td>
</tr>
<tr>
<td>Step 1</td>
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<tr>
<td>Overall Preparedness Not Prepared</td>
<td>954  157</td>
<td>85.9</td>
</tr>
<tr>
<td>Prepared</td>
<td>214  346</td>
<td>61.8</td>
</tr>
<tr>
<td>Overall %</td>
<td></td>
<td>77.8</td>
</tr>
<tr>
<td>Step 2</td>
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<tr>
<td>Overall Preparedness Not Prepared</td>
<td>953  158</td>
<td>85.8</td>
</tr>
<tr>
<td>Prepared</td>
<td>215  345</td>
<td>61.6</td>
</tr>
<tr>
<td>Overall %</td>
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<td>77.7</td>
</tr>
<tr>
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</tr>
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<td>Overall Preparedness Not Prepared</td>
<td>953  158</td>
<td>85.8</td>
</tr>
<tr>
<td>Prepared</td>
<td>214  346</td>
<td>61.8</td>
</tr>
<tr>
<td>Overall %</td>
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<td>77.7</td>
</tr>
<tr>
<td>Step 4</td>
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<td>951  160</td>
<td>85.6</td>
</tr>
<tr>
<td>Prepared</td>
<td>214  346</td>
<td>61.8</td>
</tr>
<tr>
<td>Overall %</td>
<td></td>
<td>77.7</td>
</tr>
<tr>
<td>Step 5</td>
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<td>953  158</td>
<td>85.8</td>
</tr>
<tr>
<td>Prepared</td>
<td>215  345</td>
<td>61.6</td>
</tr>
<tr>
<td>Overall %</td>
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<td>77.7</td>
</tr>
<tr>
<td>Step 6</td>
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<td></td>
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<tr>
<td>Overall Preparedness Not Prepared</td>
<td>952  159</td>
<td>85.7</td>
</tr>
<tr>
<td>Prepared</td>
<td>219  341</td>
<td>60.9</td>
</tr>
<tr>
<td>Overall %</td>
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<td>77.4</td>
</tr>
<tr>
<td>Step 7</td>
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<tr>
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<td>85.3</td>
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<td>Prepared</td>
<td>218  342</td>
<td>61.1</td>
</tr>
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<td>Overall %</td>
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<td>77.2</td>
</tr>
<tr>
<td>Step 8</td>
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<td>Overall Preparedness Not Prepared</td>
<td>943  168</td>
<td>84.9</td>
</tr>
<tr>
<td>Prepared</td>
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<td>62.5</td>
</tr>
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<td>Overall %</td>
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<td>77.4</td>
</tr>
<tr>
<td>Step 9</td>
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<td></td>
</tr>
<tr>
<td>Overall Preparedness Not Prepared</td>
<td>937  174</td>
<td>84.3</td>
</tr>
<tr>
<td>Prepared</td>
<td>212  348</td>
<td>62.1</td>
</tr>
<tr>
<td>Overall %</td>
<td></td>
<td>76.9</td>
</tr>
</tbody>
</table>

Note: The Cut Value is 0.500
“Genetic Engineering for Biological Agents? There’d be No Protection. These are the Weapons of the Future and the Future is Coming Closer and Closer.”

CHAPTER 5
DISSCUSION

This study was designed to assess Florida’s community healthcare providers’ clinical and administrative competencies to manage a bioterrorism attack, assess their willingness to response to a biological terrorism attack within the State of Florida, and assess their current level of overall preparedness to identify and manage a biological terrorism attack. This chapter provides discussions on the study results, methodology, and its’ limitations.

Evaluation of the Demographic Factors

Most of the study subject were between the ages of 35 and 54 years old (15%, see Table 4-17). Since the largest licensed provider group in Florida are registered nurses, the majority of the study participants were nurses (50.5%) and Florida’s smallest licensed provider group are the pharmacists and their participation was also reflective (21.3%). There were more female (58.3%) respondents than males (41.7%). This was probably based on the larger representation of the nurses within the study. Nurses are still majority female.

The greater part of the subjects was Caucasian (82.5%), followed by the Hispanics (6.4%). There were only 48 (2.5%) African Americans, 108 (4.7%) Asians / Pacific Islanders, and 7 (0.4%) American Indians. The researcher was unable to find the
population percentages of minorities practicing in Florida to compare whether the minority groupings were accurately represented. The reasons for a lower participation among African Americans are unknown.

Most of the subjects have a Doctorate degree (39%) and have been working as a licensed professional over 20 years (47%). The majority of the providers are currently working in a healthcare setting (82.6%) with 5.6% of the subjects were unemployed at the time of the study. The primary workplace for the providers was in a hospital setting and with less than 5000 patient encounters yearly. 50.9% of the subject worked in an urban area with a population base over 75,000.

Overall, with the possible exception of the African American race grouping, the study has a good representation of Florida’s healthcare providers and the population as a whole.

**The Questionnaire**

The study questionnaire, with a response rate of 25%, is relatively comparable with other studies using a mail/web survey (72). The choice of an email/web survey was beneficial to the researcher because it was less expensive than a traditional mail survey, it was time efficient for both the researcher and the subjects, it successfully prevented transcription errors, and it allowed for real-time monitoring.

The difference in cost of the web based survey versus the traditional survey was tremendous. The study by Couper in 1999 showed no significant cost benefit of an e-mail survey compared with a traditional mail survey (61). He suggested that the cost in constructing e-mail surveys required more than 150 hours and approximately cost $1.74 per completed case, while the cost of postage-mail was $1.81 per reply. For this study,
the researcher, using an available online software service (www.questionpro.com), took approximately 3 hours to convert the survey from a paper format to the web based format. This survey’s total cost per respondent was less than 5¢ each ($109.95, labor $60 and 1 month software lease $49.95). Using the $1.81 figure suggested by Couper, this bioterrorism survey would have cost a minimum of $4,123.18 USD by postage-mail. This calculation does not include the 22,800 invitations sent (50¢ each) and the increase in postage stamps since 1999.

The use of the email/web model survey instrument also proved to be a time efficient method for surveying Florida’s healthcare providers. The survey was completed in 7 days from start to finish, with most of the subject responding within days 1-3. A reminder was sent out at midnight on day 3 to all study subjects, which allowed a surge in responses on day 4 and 5. The two other planned reminders were not sent out because the study received the required number of respondents early on, and the researcher did not want to give the impression of “spam” emails to the subjects whom had already completed the survey. For the subjects, the survey was also more time efficient because the technique of branching was utilized. This allowed subjects to jump non-applicable questions within the survey based on their previous answer.

The data was recorded electronically, which reduced transcription errors to zero. While data quality based on the percentage of respondents who missed at least one questionnaire item is controversial, it was suggested by Paolo et al. that the traditional mail survey had a lower rate of incomplete returned questionnaires compared with the email survey, 27% vs. 9%. (75). This was not the case in this study with an 85.7% completion of all questions.
Finally, mail/web survey permitted the researcher to monitor the survey in real-time, allowing constant updates of the number of individuals who were currently taking the survey, and the number who exited without completion and successfully completed it.

The only real down sides are lower response rate because the researcher allowed only 1 week completing the survey and did not allow second attempt, if the first attempt was incomplete. The uncompleted survey may have been a factor related to the busy schedule of healthcare providers that could not finish the survey in one sitting.

Additionally, in the months following the survey closure, 100s of providers continued to visit the site and to reply to the invitation email, seeking to take the survey or view the results from the survey. This suggests that the research topic is one of concern to the healthcare providers within Florida and that the response rate could have been much higher.

The Assessment of the Providers Competency Levels

The assessment of the providers’ competency levels was the core component of this study. This assessment of the competencies should provide Florida with a better understanding of its current provider preparedness levels and what areas the needs to be focused upon for improvement.

The Individual Core Competencies

Within this study, the core bioterrorism competencies were used to evaluate the provider’s administrative skills and the clinical knowledge. Each of these core competencies represents an individual base knowledge area that is deemed necessary to have to be minimally prepared to identify and manage a bioterrorist attack.
The eight administrative competencies should be very basic, such as using communication equipment (i.e. fax), and knowing one’s role in a bioterrorism response. It is not specialized knowledge, such as the ability to manage a nuclear incident response or being able to disarm a dirty bomb. These would be considered advance skills for the average provider and not set at a core level for his/her job description. This is a very common mistake when governmental agencies and private entities are developing and/or adjusting the core competency sets for it organizations. This is because many of the administrative core competencies seem to be too basic at first glance, as with AC3, the correct use of communications equipment, such as phones, radios, and fax machines. Nevertheless, it was found that only 72.7% of the Florida’s providers had an acceptable competency level in this area. This means if one of those 27.3% healthcare providers needed to report a possible bioterrorism attack and could not operate the basic communication equipment, this would possibly place lives in jeopardy.

The clinical core competencies, while still basic knowledge, are more related to the healthcare providers’ clinical ability to identify and manage a bioterrorism attack. These included such knowledge areas as being able to describe his/her expected clinical role in a bioterrorism response (73.9%) and the ability to recognize and manage the psychological impact of a bioterrorism event (46.1%). Overall, the individual clinical competency (CC1-8) scores are much lower than the administrative competency (AC1-8) scores. The results of this study revealed that Florida’s providers’ un-weighted CC (1-8) average is only 44.2% (physicians 48.9%, nurses 44.9%, and pharmacists 37.0%) and the un-weighted AC(1-8) average is 61.2% (physicians 59.1%, nurses 65.2%, and
pharmacists 54.9%). The individual strength and weaknesses by provider type can be examined in Chapter 4, Results.

**The Administrative Competency Level and Clinical Competency Level**

The Administrative Competency Level (ACL) and Clinical Competency Level (CCL) are the weighted averages of administrative competencies and the weighted averages of the clinical competencies, respectively. The use of the weighted scores helped to adjust the importance of a knowledge area (see Chapter 3, Methods for details). For example, AC3, the use of a fax is not rated by experts as important as the AC9, creative problem solving. The results from this study reported that the ACL average was 62.8% and the CCL average was only 44.9%. These weighted scores increased the ACL for 61.2% un-weighted to 62.8% weighted and the CCL from 44.2% un-weighted to 44.9% weighted in this study’s sample. Within another setting (i.e. health department employees, hospital, or State of Alabama), these adjustments of the individual scores may greatly increase or decrease the ACL and CCL scores.

**The Bioterrorism Competency Level**

The bioterrorism competency level (BCL) is used to score the overall competency level of the individual and the grouping as a whole. The BCL looks at only the weighted knowledge (competency level) of the providers, not the overall preparedness levels. The BCL in this study was 51.1%. This suggests that only 51% of Florida’s community healthcare providers have the minimum bioterrorism competency level to identify and manage an event without hurting themselves and/or others.
These results of the BCL should convince the FDOH to move some of its bioterrorism training and exercise dollars away its professional emergency planners / coordinators, to the community’s healthcare providers. The bioterrorism trainings developed over the past two years by FDOH, various Florida universities and the other contracted entities, have all been presented at an awareness level. There have been little, if any operational level training conducted. These types of trainings, hopefully, do not better prepare the FDOH emergency planner/ coordinator. These planner/ coordinators should already possess awareness level knowledge prior to being hired. With only awareness training, it would be correct to say that the emergency planner/ coordinators would be very aware of an attack, but would not know what to do to correct the issue. Unlike hurricanes, where the FDOH responds after the impact of the event, a bioterrorism attack is ongoing and the threat may or may not be present during the response. The emergency planners / coordinators, along with the executive staff (county health department directors), will not be able to use its standard practice of working thought the event, learning as you go, without endangering the health and safety of themselves and the population.

On the other hand, the administering of awareness training to community health providers would greatly increase the preparedness levels of the community healthcare providers and possible encourage the formation of a volunteer grassroots health care emergency response system (provider volunteers), and also increase enrollment of the Florida’s Medical Reserve Corps (MRC). These providers will be needed to successfully activate the county emergency management plans during a bioterrorism event and/or mass casualty incident. The results of this study suggested that providers who have had
previous trainings (beta= .1049, p=.000) and/or drills (beta = .941, p=.000) were over 2.5 times more likely to be prepared than providers not trained or drilled.

The Assessment of the Providers Willingness to Respond

The assessment of the providers’ willingness to respond was also a core component of this study. This assessment of the provider’s willingness to respond to various proximities across Florida and to different levels of risk (high risk / low risk, defined in Chapter 3, Methods) should provide Florida with a better understanding of its current preparedness levels and moreover, to provide a more accurate estimate of the expected volunteer provider levels during an event. These provider estimates will hopefully be used for pre-incident planning of personnel expectations of projected large scale emergencies.

This study results suggested that most Florida providers were willing to respond to both a high risk (HR) event and a low risk (LR) event within their local community (81.7% and 82.8%, respectively, see Chapter 4, Results). In the Alexander and Wynia’s study (2003), it was suggested that physicians were willing to respond 80% of the time in a lower risk environment, 40% in a higher risk environment and 33% in the highest risk environment.(45) Florida physicians however, reported that 84.5% would respond to a HR event and 83.6% would respond to a low LR event within their local community. This elevated willingness to respond score in HR events could possibly be explained by the proximity factor. In the Alexander and Wynia study, no proximity was expressed. When a disaster affects your friends, family and neighbors, physicians may be more willing to help, even when the risk is higher. In contrast, when Florida physicians were
asked if they were willing to respond to biological agent attacks outside their local community, only 53.6% of all subjects reported that they are willing to respond to a HR event. While it is still much higher than the previous study, the physicians’ willingness level dropped over 20 percent points.

The remaining gap in the differences may be explained by the providers seeking out bioterrorism training activities and/ or participating in drills and exercises since 2003. The results from this study indicate that previous trainings (beta = .286, p=.010) and drills (beta = .436, p=.000) were significant predictors of the willingness to respond. So, it is suggestive that healthcare providers that had attended bioterrorism drills were 1.55 times more likely to be willing to respond to a bioterrorism attack compared with providers who have never participated in drills, or if that healthcare provider has had a previous emergency preparedness training, they were 1.33 times more likely to be willing to respond to a bioterrorism attack compared with no previous trainings.

It was also found that providers under 24 (66.7%) and between the ages of 55-64 (59.6) were the most willing to respond to a statewide event. Females (54.5%) are more willing than males (53.7%). American Indians (n=7, 83.3%) and African Americans (65.9%) were more likely to respond than Caucasians (52.8%) and Asian/ Pacific Islanders (53.7%). Providers with associate degrees (59.1%) are more likely to respond than providers with doctorate degrees (53.7%) and the foreign educated (n=10, 50.0%). Providers with a primarily work place in a clinic setting (60.4%) and non-teaching hospital (56.4%) are much more like to respond than providers that work in the home health care setting (40.9%) or in a university/research setting (41.9%).
The researcher’s main concern over these statistics was the lack of willingness to respond by the majority of the providers that are assigned to care for the sick in their homes (home health setting, 40.9%). This is a legal requirement of provider companies that have licensed home health companies within the state. This has been an ongoing issue during other emergencies, such as hurricanes / flooding with the activation of the special needs shelters. At the time of the study, this issue was awaiting address by the State legislature. Home health agencies do not want to be required to provide care for their patients during the time of emergencies, and for their patients at special needs shelters. This issue, which is not normally addressed in the CEMP, should be addressed or corrected.

The willing to respond to a statewide event was used in the calculation of the overall providers’ preparedness level. The statewide calculation was used because the boundaries are more defined than the local community and in an event of a large scale event, as Florida’s Strategic National Stockpile plans are written, it will take providers from across the state to activate the plans and treat the patients effectively.

The Assessment of the Providers Overall Preparedness Level (PL)

The overall bioterrorism preparedness level of the public health system, FDOH and the community healthcare providers has been in question since the 2001 anthrax attacks. If the physician, who reported the 1st case of inhalation anthrax in Florida, did not recognize the symptoms (competency), and was not willing to be proactive throughout the response (willingness to response), the outcome would have been much worse.

The calculation of the bioterrorism preparedness level (PL) was the final step within the study’s conceptual framework. It combined the providers’ bioterrorism
competency level (BCL) and their willing to respond to a statewide event by matching individual providers scores. To be deemed prepared, the provider must be willing to respond at least 50% of the time and have a BCL greater than 50%.

When the WTR and BCL were examined separately, the providers’ WTR to a statewide event was 53.7% and their BCL was 51.1%. But when the WTR and BCL were Matched, the PL scores dropped to 32.2% for the community providers (physicians 34.6%, nurses 38.4% and pharmacists 17.4%, see Figure 4-5). This indicates that 32.2% of Florida’s community healthcare providers had both the minimal level of competency to effectively function without endangering him/herself and others, and are willing to respond to a bioterrorism attack within the State of Florida. The nurses were recognized as more prepared than the other subgroups due to their skills in both the ACL and CCL. Physicians had the highest CCL but lacked the nurses on the ACL. The pharmacist scored lowest in both the ACL and CCL. This may be due to their normal job functions and the perception of the not being a direct clinical provider during an attack. So, the pharmacist may not perceived benefits of bioterrorism training and not sought it out, which is a predictor for being prepared for bioterrorism attack. If a provider had participated in a training, he/she is 2.86 more time likely to be prepared than a provider who has not been trained.

The examination of the ACL, the CCL, the BCL and the WTR scores individually (as described above) are very beneficial in identifying areas to target for interventions and trainings. However, when the scores have been calculated and matched, this allows for a more accurate provider preparedness level. Providers may be willing to respond but lack the skills to function and, providers may be 100% competent in their skills, but never
responds to the event. In the onset of the event, it is more important to be competent in identifying the attack (competent). Once the event is ongoing, it is more important to be willing to respond. Both roles should be addressed when looking at the providers’ preparedness levels.

It was also found that, even though females were more willing to respond and had a higher competency level than males, male providers were 1.32 times more likely to be prepared for the bioterrorism attack than female. This is explained by the fact that the females, who were competent, were not willing to respond and, the females that were willing to respond were not as competent.

In a earlier nationwide survey, only 25 percent of family physicians felt prepared to respond to a bioterrorist event in 2001 (5) and again in 2002, only 21 percent of the physicians surveyed, felt personally well prepared for a bioterrorism attack (45). In comparison, the findings of this study suggest that 55.5% of Florida’s community healthcare providers do NOT feel prepared and 41.5% feel somewhat prepared to identify and manage a bioterrorism attack (see Figure 4-6). Only 3.0 of Florida’s providers feel very prepared. Since the personal perception of individual preparedness, “feeling” prepared, was defined by the subject, this study can only be generally compared (feeling prepared or feeling not prepared) to the 2001 and 2003 surveys. While 75% of the surveyed provider did not feel prepare in 2001, and 79% of the surveyed did not feel prepared in 2002, this 2005 survey of Florida’s providers suggest that only 55.5% do not feel prepared. This increase in perceived preparedness levels, the “feeling” of being prepared, suggests that providers have more current confidence in their knowledge base and clinical skills. This could be a direct result of bioterrorism trainings and drills
received or the fact the issue of bioterrorism is less prevalent in society, than in 2001 and 2002.

**List of Study Limitations**

1. This study only surveyed providers that had an active email listed.

2. The selection of the subjects was based on the e-mail listed in a public database of licensed healthcare providers. The lists might not be completed or updated, e.g., number of members, e-mail addresses, current job setting. This might results in the eliminations of some populations from the study, who were listed as working in the institutional settings (hospitals), but actually they work in the community setting.

3. Although the researcher reviewed the e-mail lists closely and corrected most of obviously incorrect e-mail addresses in the lists, the errors remained and cannot be corrected by the researcher. This issue posted a problem of high undelivered e-mails with the invitation letters.

4. The number of questionnaires that should be sent out to obtain the required sample size for statistical power was calculated for each healthcare profession based on the same response rate. The response rates of electronic surveys might be different among healthcare professions. However, the researcher decided to use the same rate, but conservative (low response rate), across the selected professions.

5. The responses may have been influenced by a socially desirable bias in this time of War on Terror.
6. Even though the questionnaire obtained a response rate similar to other web based surveys, African Americans may have not received appropriate representation within the study.

7. The administrative, clinical and social demographic characteristics that was recognized, only explained a small variance for the subject overall preparedness levels and willingness to respond. The defining characteristics of a bioterrorism response by healthcare providers are multifaceted and complex.

8. The researcher is not able to identify whether the non-responders were similar to the responders or not. It is difficult to eliminate response biases. For example, the responders might be the subjects who were interested or involved in preparedness of bioterrorism events.

9. The Bioterrorism Preparedness Model and the questionnaire were designed to fulfill the study’s objectives. Further statistical validation of the Bioterrorism Preparedness Model and the questionnaire is continuing.
Conclusion and Implications

This study was motivated by the recognized threat of bioterrorism attack upon Florida’s population and the uncertainty that the planning efforts by the State of Florida since 2001 could be operationalized during a biological terrorism attack. It has been able to determine Florida’s community healthcare providers’ overall preparedness levels and by provider subgroups, and to suggest the key factors that influence these levels. This study also determined the willingness of the provider to respond to a bioterrorism attack within the State of Florida at various proximities and risk levels.

The conceptual framework was created to serve the study’s objectives. It consisted of three domains, the first two were based on the core competency sets (administrative and clinical) whose development was sponsored by the CDC and used by numerous entities across the nation, and the third is the providers’ willingness to respond. This framework also included a methodology to calculate the bioterrorism competency and preparedness levels based on the importance of several leading experts in the field of public health preparedness at the time of this study. This was the first study that attempted a methodology to actually measure the provider’s preparedness levels, and to examine physicians, nurses and pharmacist as a single provider grouping. Past provider studies have mainly examined physicians or nurses, but in a real event all licensed providers will be called upon.

The study’s results are useful identifying critical areas for bioterrorism preparedness training and education, and the improving of bioterrorism planning and preparedness. The conceptual framework and its measurements, can be used to benchmark between provider groupings, between states and between organizations of all sizes. It also could be used as a base line of preparedness levels, which can be used to
document changes over set periods of time. These changes can be used to monitor whether interventions are successful and justify the continuation of federal funded projects. Finally and most important, this study can guide emergency planners/coordinators better project in the pre-disaster phase, the number of healthcare providers that are willing and able to respond to a bioterrorist attack.
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APPENDICES
APPENDIX A
QUESTIONNAIRE

FLORIDA HEALTH CARE PROVIDER BIOTERRORISM PREPAREDNESS SURVEY

Welcome!! I am asking for your help as a part of a survey I am conducting regarding Florida health care providers’ Bioterrorism preparedness levels and their willingness to respond.

COMPLETING THE ONLINE SURVEY: Please plan on taking about 15 minutes to complete the following survey. You must complete the survey in one sitting. You will not be able to go back to previous questions or to change answers. When you have completed the survey, please click on the button that says “continue.” Your candid answers are important to ensure an accurate assessment of Florida’s health care provider’s bioterrorism preparedness levels. Please answer the questions on your own and to the best of your ability, without using any resources (books, websites, co-workers).

CONFIDENTIALITY: Your participation in this survey is strictly confidential. No information about you, or provided by you, will be disclosed to others. No personal data (i.e., Name, Address, Employer Name) will be collected in the survey. The identities of individuals who complete the survey and their results will be kept confidential. Individual results will not be released. Any reports, publications, or other materials developed from results of this survey will not contain any identifying information about you.
FURTHER INFORMATION: If you have any questions about this survey or how the information will be used, please contact Mr. Jeffrey Crane at 704-865-8902 or e-mail jcrane@jscrane.com. If you have questions regarding your rights as a research subject, please contact the USF Office of Research at 813-974-5570.

Thank you for participating in this important assessment survey. Your time and effort are greatly appreciated!
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 1. What is your current AGE? *

☐ Under 18
☐ 18 - 24
☐ 25 - 34
☐ 35 - 44
☐ 45 - 54
☐ 55 - 64
☐ 65 or older

Please select a single answer (Required)

Question 2. What is your GENDER? *

☐ Male
☐ Female

Please select a single answer (Required)

Question 3. What is your RACE? *

☐ Caucasian
☐ African American
☐ American Indian, Eskimo, or Aleut
☐ Asian or Pacific Islander
☐ Hispanic
☐ Other
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 4. What is the HIGHEST EDUCATIONAL DEGREE that you have completed? *

- [ ] Associate's degree
- [ ] Bachelor's degree
- [ ] Master's degree
- [ ] Doctorate (DO, Ph.D, MD, PharmD, DDS)
- [ ] Foreign Educated (Please Specify) [ ]

Please select a single answer (Required)

Question 5. How many years have you worked as a licensed professional? *

- [ ] Less than 1 year
- [ ] 1 to 2 years
- [ ] 3 to 5 years
- [ ] 6 to 10 years
- [ ] 11 to 20 years
- [ ] Over 20 years
- [ ] I have NOT WORKED as a licensed professional.

Please select a single answer (Required)

Question 6. Which of the following BEST represents your current position? *

- [ ] MD- Medical Doctor
- [ ] DO- Doctor of Osteopathy
- [ ] NP- Nurse Practitioner
- [ ] RN- Registered Nurse
- [ ] RPh- Registered Pharmacist
- [ ] Pharm.D.- Doctor of Pharmacy
- [ ] Other (Please Specify) [ ]
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 7. I am currently: *

☐ Employed in a Healthcare Setting
☐ Not Employed in a Healthcare Setting
☐ Unemployed
☐ Retired

Please select a single answer (Required)

Question 8. What is your PRIMARY work place? *

☐ Hospital, none Teaching
☐ Teaching Hospital
☐ Long-term Care, none Home Healthcare
☐ Home Healthcare
☐ Private Single Practice
☐ Private Multi-Physician Practice
☐ Clinic Setting
☐ Institutional Pharmacy (Hospital and Long-term Care)
☐ Community Pharmacy (Retail/Chain)
☐ University or Research Setting
☐ I am Retired.
☐ Other, Please Specify: [ ]
Question 9. Average 2002-2003 patient encounter volume for your PRIMARY work place? *

- Under 5,000
- 5,000 – 9,999
- 10,000 – 19,999
- 20,000 – 39,999
- 40,000 – 59,999
- 60,000 – 79,999
- 80,000 +
- Not Applicable
Please select all answers that apply (Required)

Question 10. Services that YOU provide in your PRIMARY work place? (Please Check ALL That Apply): *

- [ ] General Medicine
- [ ] ICU/CCU
- [ ] Mental Health
- [ ] Substance Abuse
- [ ] Pediatric Medicine
- [ ] Laboratory
- [ ] X-Ray
- [ ] Institutional Pharmacy Services (Hospital and Long-term Care)
- [ ] Community Pharmacy Services (Retail/Chain)
- [ ] Obstetrical
- [ ] Gynecology
- [ ] Inpatient Surgery
- [ ] Outpatient Surgery
- [ ] Emergency Room Services, none Trauma
- [ ] Trauma Center Services
- [ ] Home Health Care Services
- [ ] Public Health (Epidemiology and Immunizations)
- [ ] Long-term Care Nursing Service
- [ ] Teaching / Research
- [ ] I am Retired.
- [ ] Other, Please Specify: [ ]
Question 11. Which of the following BEST describes the city or county where you work? *

- [ ] Rural
- [ ] Urban
- [ ] Suburban

Question 12. Which of the following BEST describes the population size of the city or county where you work? *

- [ ] Small City (Less than 25,000 persons)
- [ ] Medium City (25,000 to 75,000 persons)
- [ ] Large City (Greater than 75,000 persons)

Question 13. Does your organization have an Emergency Response/ Disaster plan? *

- [ ] Yes
- [ ] NO, We do not have an Emergency Response/ Disaster plan.
- [ ] I Do NOT know.

Question 14. I know where the plan is located? *

- [ ] Yes
- [ ] No
- [ ] Don't Know
Please select a single answer (Required)

Question 15. I have reviewed the plan in the last 12 months? *

- [ ] Yes
- [ ] No
- [ ] Don’t Know

Please select a single answer (Required)

Question 16. I know my role according to the plan? *

- [ ] Yes
- [ ] No
- [ ] Don’t Know

Please select a single answer (Required)

Question 17. Did the Plan have a special organizational structure and organized leadership (e.g., incident command system) during a disaster or emergency? *

- [ ] Yes
- [ ] No
- [ ] Don’t Know

Please select a single answer (Required)

Question 18. Does the plan specifically address bioterrorism? *

- [ ] Yes
- [ ] No
- [ ] Don’t Know
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 19. Does the plan address emergency communications? *

☐ Yes
☐ No
☐ Don’t Know

Please select all answers that apply (Required)

Question 20. Please check ALL of the following statements that are TRUE. *

☐ I am competent in the operation of a telephone.
☐ I am competent in the operation of a fax machine.
☐ I am competent in the operation of a two-way radio.
☐ I am competent in the operation of a satellite phone.

Please select a single answer (Required)

Question 21. Have you participated in a disaster drill within the last 12 months? *

☐ Yes
☐ NO I have not participated in a disaster drill within the last 12 months.

Please select all answers that apply (Required)

Question 22. Types of the disaster drills that you participated: (Check ALL that Apply) *

☐ Biological agent exposure
☐ Bomb threat
☐ Chemical agent exposure
☐ Nuclear/radiology agent exposure
☐ Mass casualty
☐ Not Applicable
☐ Other (Please List)
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 23. Have you received training in disaster awareness, preparedness, and response? *

☐ Yes
☐ NO I have not received training in disaster awareness, preparedness, and response.

Please select a single answer (Required)

Question 24. I received training within the last 12 months? *

☐ Yes
☐ No

Please select a single answer (Required)

Question 25. My training included preparedness for chemical or biological terrorism events? *

☐ Yes
☐ No

Please select a single answer (Required)

Question 26. It was an annual “Refresher” training in disaster preparedness? *

☐ Yes
☐ No
APPENDIX A (CONTINUED)

Please select all answers that apply (Required)

**Question 27. What type of training did you receive? (Check ALL that Apply.)** *

- [ ] Biological agent exposure
- [ ] Bomb threat
- [ ] Chemical agent exposure
- [ ] Nuclear/radiology agent exposure
- [ ] Mass casualty
- [ ] Other (Please List)

Please select all answers that apply (Required)

**Question 28. When you participated in training for bioterrorism, which of the following teaching methods/ modalities were used? (Please check ALL that Apply) ** *

- [ ] Traditional lecture Format (i.e., slides, handouts, videos, etc.)
- [ ] Online interactive (i.e., Discussion boards, tutorials, simulations, etc)
- [ ] Web-casts, teleconferences, or satellite broadcasts
- [ ] Self learn, self paced study (i.e., independent study courses)
- [ ] Other

Please select a single answer (Required)

**Question 29. Generally Speaking, which SINGLE METHOD/MODALITY would you prefer for future bioterrorism content training? ** *

- [ ] Traditional lecture Format (i.e., slides, handouts, videos, etc.)
- [ ] Online interactive (i.e., Discussion boards, tutorials, simulations, etc)
- [ ] Web-casts, teleconferences, or satellite broadcasts
- [ ] Self learn, self paced study (i.e., independent study courses)
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 30. Generally Speaking, in Self-learning content on bioterrorism, which would be the SINGLE BEST source for you? *

☐ A Textbook
☐ Information packets
☐ Journal articles
☐ Brochures
☐ Video
☐ Pre-prepared PowerPoint Slides
☐ Online Resources

Question 31. Bioterrorism attacks are a real threat within the UNITED STATES? *

Strongly Agree  Agree  Neither Agree nor Disagree  Disagree  Strongly Disagree

Question 32. Bioterrorism attacks are a real threat within FLORIDA? *

Strongly Agree  Agree  Neither Agree nor Disagree  Disagree  Strongly Disagree

Question 33. Bioterrorism attacks are a real threat within your LOCAL COMMUNITY? *

Strongly Agree  Agree  Neither Agree nor Disagree  Disagree  Strongly Disagree

Question 34. My LOCAL medical community could effectively respond to a Bioterrorism attack? *

Strongly Agree  Agree  Neither Agree nor Disagree  Disagree  Strongly Disagree
**APPENDIX A (CONTINUED)**

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>Question 35. I know my role as a health provider in a suspected Bioterrorism attack in my community? *</td>
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<th>Question</th>
<th>Strongly Agree</th>
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<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>Question 39. I would recognize signs and symptoms of an illness due to bioterrorism in my own patients? *</td>
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<td>Question 40. I would recognize and treat the psychological effects to victims and healthcare professionals due to a bioterrorism attack? *</td>
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<td>Question 41. I know my limits in knowledge, skill, and authority in a suspected bioterrorism attack? *</td>
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<td>Question 42. How important is it for your LOCAL HEALTHCARE SYSTEM to be prepared for a bioterrorism attack? *</td>
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<td>Question 43. How important is it for YOU to be trained to identify a possible bioterrorism attack? *</td>
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<td>Question 44. What is your current knowledge of the medical aspects of the DIAGNOSIS of bioterrorism related illnesses is: *</td>
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<tr>
<td>Question 45. What is your current knowledge of the medical aspects of the MANAGEMENT of bioterrorism related illnesses is: *</td>
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Very Important | Important | Not Important At All

Very Important | Important | Not Important At All
Question 46. From the list below, please choose ALL of the known bioterrorism agents/diseases?

- Tetanus (Tetanus)
- Bacillus Anthracis (Antrax)
- Bacterial Meningitis (Meningitis)
- Clostridium Botulinum Toxin (Botulism)
- Schistosomiasis (Schistosomiasis)
- Francisella Tularensis (Tularemia)
- Varicella Disease (Chickenpox)
- Yersinia Pestis (Plague)
- Parvovirus B19 Infection (Fifth Disease)
- Variola Major (Smallpox)
Question 47. Please READ the following Disease Description and CORRECTLY identify the disease from the list below?

Disease Description
It is caused by a gram-negative bacillus. It is a zoonosis that affects primarily rodents. It is endemic to Arizona, Colorado, New Mexico, and California. Transmission of the disease occurs in one of five ways; bites of infected fleas, human to human transmission by respiratory droplets, handling of infected animal carcasses, cat bites or scratches, deliberate aerosolization of bacteria (Bioterrorism). Symptoms develop 1 to 6 days following exposure and are rapidly developing bronchopneumonia characterized by fever, cough, dyspnea, and serosanguineous sputum. Patients usually have fever, weakness, and rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery sputum. Nausea, vomiting, and abdominal pain may also occur. Without early treatment, it usually leads to respiratory failure, shock, and rapid death. The time from respiratory exposure to death ranges from 2 to 6 days.

- Bacillus Anthracis (Anthrax)
- Clostridium Botulinum Toxin (Botulism)
- Yersinia Pestis (Plague)
- Viral Encephalitis
Question 48. Which of the following Pictures CORRECTLY illustrates the typical pattern of smallpox rash distribution? (please do NOT look up!)

- Case A
- Case B
- Both Cases A and B
- None of the Above
APPENDIX A (CONTINUED)

Question 49. Examine the two sets of pictures of the rash of four different days (day 3, day 5, day 7 and day 10). Which set is Smallpox? (Please do NOT look up!)

- [ ] Set A (Red)
- [ ] Set B (Blue)
- [ ] Both Sets A and B
- [ ] None of the Above
APPENDIX A (CONTINUED)

INSTRUCTIONS: Please answer ALL the following questions as CANDIDLY as possible. (Please Note that a HIGH RISK event is defined as a bioterrorism agent that does NOT have a known treatment and/or vaccination.)

QUESTION: How likely do you believe that YOU would respond to a bioterrorism event if your medical services were requested:

<table>
<thead>
<tr>
<th>Question</th>
<th>Very Likely</th>
<th>Somewhat Likely</th>
<th>Neither Likely or Unlikely</th>
<th>Somewhat Unlikely</th>
<th>Very Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 50. in a HIGH RISK event that affects YOUR COMMUNITY? *</td>
<td></td>
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</tr>
<tr>
<td>Question 51. in a HIGH RISK event that affects a NEIGHBORING COUNTY? *</td>
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</tr>
<tr>
<td>Question 52. in a HIGH RISK event that affects FLORIDA? *</td>
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</tr>
<tr>
<td>Question 53. in a HIGH RISK event that affects the UNITED STATES? *</td>
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</tr>
</tbody>
</table>

INSTRUCTIONS: Please answer ALL the following questions as CANDIDLY as possible. (Please Note that a LOW RISK event is defined as a bioterrorism agent that has a known treatment and/or vaccination.)

QUESTION: How likely do you believe that YOU would respond to a bioterrorism event if your medical services were requested:

<table>
<thead>
<tr>
<th>Question</th>
<th>Very Likely</th>
<th>Somewhat Likely</th>
<th>Neither Likely or Unlikely</th>
<th>Somewhat Unlikely</th>
<th>Very Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 54. in a LOW RISK event that affects YOUR COMMUNITY? *</td>
<td></td>
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</tr>
<tr>
<td>Question 55. in a LOW RISK event that affects a NEIGHBORING COUNTY? *</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Question 56. in a LOW RISK event that affects FLORIDA? *</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 57. in a LOW RISK event that affects the UNITED STATES *</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX A (CONTINUED)

Please select a single answer (Required)

Question 58. Do you "feel" prepared to diagnose and manage a bioterrorism attack? *

☐ Very Prepared       ☐ Somewhat Prepared       ☐ Not Prepared

Enter 5-Digits Only

Question 59. Please enter your ZIPCODE. *
ABOUT THE AUTHOR

Jeffrey S. Crane

Jeff completed a BA degree from Appalachian State University in 1995, the Masters of Public Administration degree from Troy State University in 1997, the Masters of Business Administration degree, and a Graduate Certificate in Disaster Management from the University of South Florida in 2002/2003.

His military career included service with the 11th Army’s Special Forces Group as an engineer/medic, and Naval service as a Corpsman. Professional achievements have included the positions of ER Director of a hospital, and the Director of a multimillion dollar pharmaceutical company in Washington, DC. Recently, he was an adjunct faculty member at the University of Florida’s (UF), Department of Pharmacy Administration. He is a Professor at the American Public University System, Department of Public Sector and Critical Infrastructure and teaches Emergency Planning for Western Carolina University in NC. Jeff has also worked as an Emergency Planner/Coordinator for the Florida Department of Health and Director, Pasco County Medical Reserve Corps.

He is the President of J.S. Crane, LLC (www.jscrane.com).