AN ABSTRACT OF THE DISSERTATION OF

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Title: Bioterrorism: A Survey of Western United States Hospital Response Readiness

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A study to evaluate the level of hospital preparedness to respond to a bioterrorist attack such as smallpox or anthrax, in the western United States (Arizona, California, Idaho, Nevada, Oregon and Washington) was conducted from May to September 2000. A survey questionnaire was mailed to 300 randomly selected hospitals. A telephone survey followed.

The data examined the population served, licensed bed capacity, median income of the population served, the geographic location, and the type of facility served. The findings from the 177 hospitals that answered the survey showed that only 28.8% of them had a specific plan in place in the event of a bioterrorist attack to their communities.

More hospitals with large bed capacity serving large populations had plans to respond to the event of a bioterrorist attack than those hospitals with small bed capacity, usually serving small rural communities.

Although the comparison of hospitals in each of the six western states showed no statistically significant difference between the number of hospitals with a plan to respond to a biological threat, hospitals in California showed the largest

percentage of specific plans addressing biological events, followed by hospitals in the state of Washington.

When the type of facility was considered, private hospitals more often developed a plan due to high-density population through their area than non-private hospitals, which indicates that bioterrorism plans may be developed when the funds are available.

The most frequent answer given for not developing a plan was lack of adequate funding. Findings indicated a need for additional resources directed to hospitals, especially in rural areas.

Because this study was conducted before the tragic terrorism events occurred in the United States in the fall of 2001, it may be considered a benchmark for future readiness evaluations of the response to the impact of those events in the Western states.

Bioterrorism: A Survey of Western United States Hospital Response Readiness

by
Margaret J. Phillips

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TABLE OF CONTENTS

Page

Chapter 1 – Introduction 1

1.1 The Problem 1

1.2 Responses to the Problem 2

1.3 Purpose of the Study 6

1.4 Objective of the Study 6

1.5 The Significance of the Study 6

Chapter 2 – Literature Review 7

Chapter 3 – Methods 15

3.1. Study Population 15

3.2 Hypotheses 17

3.3. Survey Instruments 18

3.4. Data Analysis 19

3.5 Limitations 20

3.6. Definition of Terms 22

Chapter 4 – Results 24

4.1 Response 24

4.2 Level of Planning 25

4.3. Urban versus Rural 27

4.3.1. Population 27
4.3.2. Facility Size 29
4.3.3. Median Income 30

TABLE OF CONTENTS (Continued)

Page

4.4. Results of Hospital with a Specific Bioterrorism Plan 30

4.4.1. Type of Facility by State 30
4.4.2. Type of Facility by Department 31
4.4.3. Motivating Factors 31
4.4.4. Contributors to the Plan 32
4.4.5. Seminars for Bioterrorism 33
4.4.6. Isolation Plans for Receiving Mass Casualties 34
4.4.7. Participating in Training 34
4.4.8. Hospitals on Biological Alert 35
4.4.9. Summary of Final Comments 36
4.4.10. Summary of Telephone Survey 36
4.4.11. Summary of Results 38

Chapter 5 – Discussion 41

Chapter 6 – Conclusions and Recommendations 51

6.1. Conclusions 51

6.2 Recommendations 52

6.2.1. Health Care Organizations 52
6.2.2. More Research 54

Bibliography 55

LIST OF TABLES

Table		Page
1	Total Number of Available Hospitals.	16
2	Definition of Terms.	23
3	Results of the Primary Research Question that there was not a Difference in the Number of Hospitals with a Formal Terrorist Plan by State and by Facility Type.	26
4	Comparisons of Population Served And Facility Size With a Bioterrorist Plan For All 177 Hospitals.	28

LIST OF APPENDICES

Appendix		Page
A	Appendix A - Equation to calculate sample size	66
B	Appendix B - Survey (Questionnaire # 1)	67
C	Appendix C - Telephone Survey (Questionnaire #2)	71
D	Appendix D - Survey Cover Letter	75
E	Appendix E - Sample of the one-week follow-up Postcard	76
F	Appendix F - Cover letter to be sent 3 weeks after the first letter	77
G	Appendix G - A Summary of Responses (Question #5b)	78
H	Appendix H - List of Final Comments (Question #12)	79
I	Appendix I - Summary of Reasons For Not Developing a Bioterrorism Plan.	81
J	Appendix J - Figures	82
K	Appendix K - Tables	90

LIST OF APPENDIX FIGURES

Figure		Page
1	Hospitals with a Bioterrorism Plan.	82
2	Hospitals with a Specific Plan, or a Plan in Progress.	83
3	Hospitals with a Bioterrorism Plan by Facility Type.	84
4	Hospitals with a Bioterrorism Plan by State.	85
5	Motivating Factors Leading to the Development of a Bioterrorism Plan.	86
6	Groups Consulted During the Planning Process.	87
7	Major Contributors to a Bioterrorism Plan by Facility Type.	88
8	Major Contributors to a Bioterrorism Plan by State.	89

LIST OF APPENDIX TABLES

Table		Page
5	Comparison of Hospital Classifications.	90
6	Response by State.	90
7	Motivating Factors Influencing a Bioterrorism Plan by Facility Type.	91
8	Motivating Factors For a Bioterrorism Plan by State.	91
9	Groups Consulted by Hospitals During Bioterrorism Planning Sorted by Type of Facility.	92
10	Groups Consulted During Bioterrorism Planning Sorted by State.	93
11	Comparisons of Hospitals with a Bioterrorism Plan and Isolation Plans (n=51).	94

BIOTERRORISM: A SURVEY OF WESTERN UNITED STATES HOSPITAL RESPONSE READINESS

CHAPTER 1 - INTRODUCTION

1.1. THE PROBLEM

During the months of October and November 2001, the Centers For Disease Control and Prevention (CDC) reported as many as 23 cases of anthrax[1] exposure (Bell, et al., 2002; CDC, 2001b). Prior to these anthrax-related events, it was suggested that few hospitals in the United States had a disaster plan specific to mass exposures to a biological agent (Macintyre, et al., 2000; Wetter, et al., 2001). Many reports have indicated the need to examine the current levels of first responders' preparation, i.e., hospital emergency rooms and medical clinics, but most specifically, the need to examine the level of training required to recognize a biological event. Additionally, medical personnel should know where to access the necessary support, equipment, and advice for such a response (Hoffman, 2000; Khan et al., 2000; McDade and Franz, 1998; Mayer, 1999; Wiant, 1998).

Some large metropolitan cities, such as New York City, have conducted specific drills to respond to biological terrorism (Stephenson, 1998; Wise, 1998). Results of these drills indicated that improvements were needed in the medical system to attend to mass biological exposure victims, including decontamination, triage, and the psychological effects on staff and the public (Simon, 1997). On September 11, 2001, New York City was forced to test its health care system's ability to respond to a massive casualty terrorist event when two-hijacked

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[1]Anthrax illness is caused by contraction of spores of the bacterium *Bacillus anthracis*

commercial jet airliners crashed into the two largest towers of the World Trade Center.

Because prevention may not always be possible, early detection of a biological outbreak and immediate response are significant components of a biological event preparation program at the community level.

1.2. RESPONSES TO THE PROBLEM

The federal government has developed several plans to respond to biological terrorism through its many agencies including the Pentagon and the CDC. The military has developed a series of responses for providing local communities with detection and decontamination equipment. Probably the most important response from the government to the threat of domestic biological terrorism prior to the anthrax-related events of 2001 was that of President Bill Clinton, who signed the bill known as the 1996 Anti-Terrorism Act. This act directed the CDC to regulate any transfer and/or use of agents that are potential public health threats. According to the Act, the CDC requires any person working with restricted agents to register with the federal authorities. In addition, laboratories must identify one person who is responsible for containing and disposing of regulated agents. The CDC is required to ensure compliance with the law, including whether transfer forms for shipment exists for these agents (Ferguson, 1997).

The CDC published its version of a plan for preparation and response to biological terrorism (CDC, 2000). The primary focus of the plan establishes relationships among federal, state, local, and first responders to a medical crisis caused by a biological terrorist attack.

Despite preparations for bioterrorism, reports indicate that many of the various government agencies' response plans, especially at the state and local

levels, are fragmented. It has been speculated that first responders such as local hospitals are still unprepared to meet the needs of the community in the event of a massive biologic attack (Bartlett, 1997b; Danzig and Berkowsky, 1997; Kadlec et al., 1997; McDade and Franz, 1998; Rabkin, 2000; Simon, 1997).

At the state level, during 1999, the CDC provided some states with a total of forty million dollars as part of a grant program to increase bioterrorism readiness. For example, the state of Oregon received one million, one hundred thousand dollars. Part of this grant was used to improve communications between health officials and the state (CDC, 1999; Kimsey and Binder, 1999c). In addition, Portland, Oregon received $300,000 in grant money from the Department of Defense, (DOD) to provide equipment to first responders. Portland also received funds from the US Public Health Service to develop a program for first responders and local hospitals to identify and communicate biological and chemical terrorist events. Portland was the twenty-eighth city to receive this type of grant according to Bruce Binder of the Portland VA Medical Center (Kimsey and Binder, 1999a,b). To assist communities in the United States prepare for a biological terrorism event, Congress appropriated $133 million dollars to the United States Department of Health And Human Services (DHHS) for the fiscal year 1999. Most of the money went to either the CDC for increased infectious disease surveillance or laboratories for improvements in biological detection at the federal and state levels. However, Congress also directed the DHHS to spend $51 million dollars of the money to stockpile vaccines and antibiotics specific for organisms identified for use as potential weapons (Henderson, 1999).

After the terrorists attacks of September 11, 2001 in New York City, terrorist contingency planning, including bioterrorist response, has proliferated at all levels of federal, state, and local levels. In November 2002, President Bush signed the Homeland Security Act and established the Department of Homeland Security to coordinate domestic terrorist activities. Agencies such as the DHHS, FEMA, and the FBI under the auspices of the Department of Justice were now

answerable to this new office (Whitehouse, 2002). In January 2002, funding was assigned to DHHS to strengthen bioterrorism planning and increase detection of infectious diseases (DHHS, 2002). Part of these funds targeted development of comprehensive plans at the federal, state, and local levels including local hospitals, as well as an increase of infectious disease surveillance (not just potential agents for bioterrorism). At the same time, these funds targeted plans to increase the national emergency stockpile of pharmaceuticals and medical supplies needed for a bioterrorist event, and to expand communication and coordination among the various government agencies and first-responders, including hospitals (DHHS, 2002). Since the September 11 terrorist attacks, the DHHS has become dedicated to improving the public health infrastructure, particularly at the state and local levels. DHHS has targeted funds to increase the number of cities to the Metropolitan Medical Response System (MMRS) programs, enhance laboratories around the country to help identify infectious disease outbreaks, and to enhance the Health Alert Network (HAN), a network for the CDC to communicate potential disease outbreaks with state and local health departments (DHHS, 2002; O'Toole Testimony, 2002)

In 2002 and 2003, President George W. Bush authorized $1.1 and $1.4 billion respectively for the CDC and the individual states to spend on bioterrorism preparedness, which includes bioterrorism planning, infectious diseases treatment, and public health as well as support planning in larger cities known as the Metropolitan Medical Response System (MMRS, DHHS, 2003). Funding for bioterrorism planning in the state of Oregon was approximately $14 million in 2002 (DHHS, 2002) while in 2003 it was $18 million (DHHS, 2003).

To assist health care systems in gathering information, many health-related professional organizations such as the American Hospital Association (AHA), the American Academy of Medical Administrators (AAMA), the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and the Association for Professionals in Infection Control and Epidemiology (APIC) provide hospitals with

extensive information on bioterrorism, potential biologic agents, even frameworks for contingency planning. AHA, like many other professional organizations for health professionals, provided a website with extensive information health professionals need for comprehensive bioterrorism planning and links to other professional organizations such as the CDC and APIC (AHA, 2002).

A possible explanation as to why some hospitals may be more reluctant than other hospitals to develop a bioterrorism plan, prior to the anthrax-related event of 2001, include Rogers' Diffusion of Innovation Theory. Briefly, Rogers' theory classified adopters of innovations into five categories ranging from innovators, to early adopters, early majority, late majority, and finally the traditionalist or laggard. The rate hospitals adopt new ideas depends, in part, on the amount of available resources, education, ease of access to information, and the perception of need to change. For example, innovators and early adopters are more likely to change due to the aforementioned higher degree of education, access to information through the media, and greater resources. On the other hand, the late majority and laggard categories lack the necessary resources and are motivated to change by pressure from outside sources such as government mandates (Green and Kreuter, 1991; Rogers, 1995).

1.3. PURPOSE OF THE STUDY

The purpose of this study was to evaluate the level of preparedness of local hospitals to bioterrorist events in the western United States before the bioterrorist attacks of 2001 which followed the terrorist assaults to the New York World Trade Center in September 11, 2001.

1.4. OBJECTIVE OF THE STUDY

The objective of this pilot study was to examine the extent of planning of hospitals to respond to community-wide biological terrorist events in the western United States by facility size and by the number of people individual hospitals serve before the bioterrorist attacks of 2001.

1.5. THE SIGNIFICANCE OF THE STUDY

The subject of bioterrorism has been widely reported in the media, in journals, and in various books. Before this study was conducted, very little research had been conducted assessing the levels of preparedness by hospitals for a bioterrorist event (McDade and Franz, 1998). Therefore, considering the large amounts of money the federal government has spent to assist various government agencies, including the CDC and the military, and many of the large cities around the country to prepare for a bioterrorist event, it is necessary to quantify what preparations the first responders have made (Wiant, 1998). Communities, hospitals, and the various levels of government need to have this information to determine whether additional preparations for a bioterrorist event are actually needed, and if so, what level of preparation is adequate (Mayer, 1999).

CHAPTER 2 – LITERATURE REVIEW

Until recently, biological terrorism by non-governmental individuals was considered a minimal threat by many authorities for a variety of reasons. The most obvious explanation was that the use of biological agents required a level of sophistication many dissident groups were thought not to have. It was considered extremely difficult to develop most biological agents without harming the people attempting to create and deliver these agents.

However, several cases of individuals or groups of individuals have been reported either interested in the use of biological or chemical weaponry as terrorist tools or having actually used such weapons (Cameron et.al., 2000; Tucker, 1999. For example, in 1994 and 1995, a Japanese cult, the Aum Shinrikyo, has been responsible for having released the nerve gas Sarin[2] as well as dispersed anthrax and botulism[3] in at least a couple of incidents in different locations in Japan resulting in multiple deaths and injuries (Cole, 1996; Slater and Trunkey, 1997; Tucker, 1999).

The two organisms considered by experts as most threatening biological agents are smallpox[4] and anthrax. Smallpox and anthrax were thought to create the highest case-fatality rates when dispersed in aerosolized forms, an estimated 30% for smallpox and 80% for anthrax (Henderson, 1998). It has been suggested that few, if any, first line responders, such as emergency personnel, have ever seen or been trained to identify and treat the signs and symptoms of smallpox (Atlas, 1998; Bartlett, 1997b; Breman et al., 1998; Henderson et al., 1999).

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[2] Man-made chemical warfare agent classified as a nerve agent. It chemically belongs to the group of organo-phosphorous compounds. It is considered deadlier than cyanide.

[3] Acute food poising caused by the contamination of food with spores of the bacterium *Closterium botulinum*

[4] An acute, contagious febrile virus disease characterized by skin eruption with pustules, sloughing, and scar formation.

Recently, in the months of October and November 2001, the CDC centers reported 23 confirmed anthrax cases (CDC, 2001b). *Bacillus anthracis* spores were identified in different states in association with handling mail (Altman & Kolata, 2002; CDC, 2001a,b). It is still unknown whether this was a result of a terrorist group.

An aerosolized biological agent can also be used in terrorism. These agents are odorless and colorless, allowing a large number of individuals to be unknowingly exposed in an event. As an example of the possible damage, the US Congressional Office of Technology Assessment in 1993 estimated that between 130,000 to 3,000.000 deaths could occur if one hundred kilograms of aerosolized anthrax were released upwind over Washington, DC. The CDC estimated a total cost, including health care costs, of approximately twenty-six billion dollars per one hundred thousand people exposed to a massive biological event of this type (Inglesby et al., 1999). For comparison purposes, the influenza pandemic of 1918 caused morbidity in close to a billion people and killed over twenty million people worldwide, which depleted health care systems (Schoch-Spana, 2000). Scientists speculated in a national symposium that the influenza outbreak would appear modest in size and magnitude when compared to a bioterrorist event (Bartlett, 1997). This raises the question whether or not government, public health officials, and first responders would be able to efficiently respond to an event of at least the size of the influenza epidemic of 1918 (Schoch-Spana, 2000).

Biological terrorism associated with food products is rare. Kolavic et al. (1997) reported a case of four Canadian students who fell ill with a respiratory disease after having eaten food contaminated with *Ascares suum* embryos, a ringworm associated with swine. In 1996, a report by the same authors stated that 12 laboratory workers in a large medical center in Texas fell ill probably as the result of having ingested muffins contaminated with spores of the rare bacterium *Shigella dysenteriae* Type II. In 1984, 751 people in the Dalles, Oregon, were infected with *Salmonella typhurmium* during two outbreaks associated with salad

bars in ten local restaurants. Investigations by the state and local health departments with the assistance of the CDC determined that a cult known as the Rajneeshees caused the outbreak by purposely contaminating food in the restaurants (Carus, 1998; Torok et al., 1997).

Accidents in laboratories producing biological weapons are also possible. In 1979, in Sverdlovsk, Russia, 77 cases of anthrax exposure ended in 66 deaths as the result of an accident nearby a biological weapons laboratory (Christopher, 1997; Henderson, 1998; Inglesby et al., 1999).

Before the 1996 Anti-Terrorism Act, it was apparently quite simple to acquire pathogenic agents from any of the biotechnology firms, which abound in the market. Cole (1996) illustrated this in the case of a laboratory technician from Ohio who in 1995 ordered samples of the bubonic plague bacteria from a Maryland biotechnology firm for his personal use. Had the laboratory not become suspicious of this request after the impatience shown by the Ohio technician in receiving his order, the order would had been shipped and, most likely, misused as Mr. Harris was later convicted of mail fraud. At this time, it is suspected that it may be possible to purchase biological agents, including smallpox, directly from black market sources (Henderson et al., 1999).

The Federal Bureau of Investigation (FBI) records over 200 biological threats per year in the nation (Kimzey and Binder, 1999). In 1998, the CDC received reports of a series of bioterrorist threats some of which involved letters allegedly laced with anthrax and sent to various organizations in different states. Three incidents involved telephone threats claiming anthrax was released in ventilation systems of public and private buildings. Each of these threats was determined to be hoaxes (CDC, 1999). In Portland, Oregon three biological threats were received in 1999 (Kimzey and Binder, 1999a).

The public health implications for mass casualties from a terrorist attack using biological agents could be catastrophic as the various governmental, community hospitals, and media converge in response. Some of the primary

problems that have been identified by governmental officials relate to the identification and treatment of those afflicted with disease, public safety needs, panic, and dissemination of information (Simon, 1997).

Even though threats and occurrences of biological terrorism have been reported in the media, health care officials may overlook the possibility of such a threat. For example, in Albany, New York, on October 3, 1999, a busload of British vacationers arrived from Canada. Many of these vacationers were experiencing flu-like symptoms from an unknown airborne illness. A local Veterans Administration Area Emergency Manager became involved due to the large number of victims and the circumstances of their illness. Some of the concerns the manager documented included: a busload of ill victims, unsure of their destination; dispersal of people experiencing flu-like symptoms; and no effort to determine the cause as the emergency rooms discounted each case as just being the flu (Kim, 1999). If this incident had been a case of biological terrorism, early diagnosis for appropriate treatment, possible decontamination, and isolation of victims to protect others, and notification of appropriate public officials to assist would have been crucial for containing a potentially devastating situation.

Although small, non-governmental, terrorist groups were not, in general, considered as threats in the past, most governments continue to believe that a few, rogue countries could pose a greater threat by developing and maintaining a biological arsenal for offensive warfare. These suspicions continue even though the 1972 Biologic and Toxin Weapons Convention (BWC) prohibited the development, production, acquisition, and stockpiling of biological weapons (Christopher et al., 1997). The BWC was eventually ratified by 140 countries, but has no provision to monitor the activities of countries intent on stockpiling such an arsenal (Henderson et al., 1999). A review of the literature revealed estimations of the number of countries suspected of having active biological weapons programs. According to a 1982 quote by CIA Director William Webster, these estimates ranged from 10 to 17 countries (Cole, 1996; Kaufmann et al., 1997).

Countries considering the use of biological agents as weapons face more risk of retaliation than the smaller, non-governmental terrorist groups. As an example, Iraq's decision not to release biological weapons for offensive attack on other countries during Desert Storm was due to the threat of nuclear retaliation (Danzig and Berkowsky, 1997).

Developing a capability to produce pathogenic organisms is relatively inexpensive given the appropriate expertise for either terrorist countries or terrorist groups. Kathleen Bailey, a former assistant director of the US Arms Control and Disarmament Agency, estimates that a major biological weapon arsenal can be developed in a room 15 feet by 15 feet, with just ten thousand dollars-worth of equipment, at very little risk to the creator. The creator(s) would need only a beer fermenter, a gas mask, and plastic outer garments. Developing a small sample would require even less money and equipment, and could be accomplished with information easily obtained over the Internet (Cole, 1996; Anderson, 1998).

Most recently, Wetter, Daniell, and Treser (2001) examined hospital preparedness for incidents involving chemical or biological weapons, and reported that only 20% of the responding hospitals had developed a plan for a chemical or biologic event. Another report that surveyed 900 health care hospitals in Nebraska concluded that hospitals were not prepared for a bioterrorist event. However, because the survey received only a 14.6% response rate, the results might be questionable. On the other hand, the authors reported that 98% of the respondents felt unprepared for a bioterrorist event in their community (Helget & Smith, 2002).

Despite the increased availability of government support, education resources, and the anthrax-related events of 2001, smaller hospital populations of lesser socioeconomic status may remain slow to adopt specific bioterrorism plans. A possible explanation as to why some hospitals are more resistant than other hospitals to developing a bioterrorism plan may be found in Rogers' Diffusion of Innovation Theory (Rogers, 1995). According to Rogers' theory, large, urban hospitals with access to financial and educational resources are more inclined than

their rural counterparts to adopt preventative innovations such as bioterrorism planning. Prevention measures have a particular slow rate of adoption as the relative advantage of adoption is usually based on perception of need to respond to a nebulous future event such as a bioterrorist attack on their community. The lack of any incentives such as government mandates, JCAHO accreditation, and community influence, especially prior to the fall of 2001, may be added to the slow rate of adoption of preventive measures. Because some hospital administrators are more progressive, they are easily influenced by media messages if they perceive the hospital needs to change to accommodate bioterrorist planning. These administrators are then, quick to adapt, given adequate resources, funding, and access to the necessary education (Green, et.al., 1991; Rogers, 1995). Likewise, more isolated, traditional hospitals may be more resistant to change if access to media messages and government funding are limited and the perception of risk is low (Green, et. al., 1991; Rogers, 1995). Rogers' theory explains why some hospitals chose to adopt a formal bioterrorism plan and why some hospitals chose not to plan prior to 2001 depending on their geographic location, socioeconomic status, or access to information. What Rogers' theory does not adequately address is, why some hospitals adopted a formal bioterrorism plan prior to 2001, despite serving small, rural communities with scarce resources. Rogers' theory assumes that only wealthy, educated, urban hospitals are innovators, whereas smaller, isolated hospitals with fewer resources and entrenched with the past are less likely to adopt anything new.

DiMaggio and Powell's interpretation of Institutional Theory may also explain why some hospitals are more inclined to adopt prevention measures than other hospitals (DiMaggio & Powell, 1991). These authors argue that institutions tend to become similar (isomorphism) in an effort to gain legitimacy within their environments (Mizruchi & Fein, 1999). In this case, institutions (hospitals) tend to use one of three forces to achieve isomorphism: coercion, mimetic, and normative (DiMaggio& Powel, 1991). Coercive isomorphism exerts pressure on other

dependent institutions, such as JCAHO or the federal government demanding that hospitals prepare for a possible bioterrorist event; for example, after the fall 2001 events. Hospitals may also apply coercive pressure on other hospitals to prepare for a possible bioterrorist event, as hospitals became increasingly aware a bioterrorist event could occur within their community. Mimetic isomorphism occurs when hospitals mimic other hospitals that are perceived as more successful hospitals. In the normative process, the increased number of employees attending bioterrorism seminars and increased networking among colleagues from other hospitals encouraged hospitals to plan for a bioterrorist attack before 2001 (Mizurchi, et.al., 1999; DiMaggio & Powell, 1991). However, this theory does not adequately account for individual perceived risk to a possible bioterrorist attack. Hospitals may receive media messages and information that encourage development of a bioterrorist plan irrespective of pressure or a need to become similar to other hospitals.

Since the events of the fall 2001, many articles have been published stressing the need for increased preparedness for another bioterrorist attack. Most of these articles focus on the need for additional government funding to enhance planning at the local levels including enhancing communication links between first-line responders such as hospitals and other emergency responders to local and state public health departments (JCAHO, 2001; DHHS, 2002; Gerberding et al., 2002; Voelker, 2002; Crupi et al., 2003; Marmagas et al., 2003).

Recent reports also stress the need for health organizations, including hospitals to develop internal and external response plans that specifically address bioterrorism (JCAHO, 2001; DHHS, 2002; Johns Hopkins University, 2002; Morse, 2003). For example, the Joint Commission for the Accreditation of Health Organizations (JCAHO) sets standards of health care and accredits close to 18,000 health-care organizations in the United States. After an informal study of the health organizations, which determined that healthcare hospitals were unprepared for a bioterrorist event, the JCAHO began to focus on individual hospitals'

bioterrorism preparedness planning by conducting on-site surveys (JCAHO, 2002). Areas that the JCAHO is currently examining include:

- The level of training of clinical and non-clinical hospital employees,
- Whether the hospital has participated in realistic drills, and
- The level of planning with the various community response agencies (JCAHO, 2001).

These areas are part of the focus of the present study.

SUMMARY – LITERATURE REVIEW

Until the fall of 2001, bioterrorism was speculated as a possible event that could happen in the United States. Released biological agents, for example anthrax, have occurred throughout history either accidentally or as the result of a terrorist action. The Anti-Terrorist Act of 1996 attempted to make difficult the access of lethal biological agents by terrorists. Although the United States Government is expending millions of dollars assisting communities in preparing for biological events, preparations are still fragmented and largely ignored in small town hospitals.

CHAPTER 3 – METHODS

3.1. STUDY POPULATION

The study population consisted of a representative sample of the 837 hospitals located in the western United States (Washington, Oregon, California, Idaho, Nevada, and Arizona), as reported in the comprehensive listing of healthcare hospitals of the in the United States published by the American Hospitals Association Guide (AHA) (AHA, 1997).

To estimate an appropriate sample size, the procedure below was followed. First, it was estimated by inference from the existing literature that somewhere between 10% to 20% of all hospitals had a disaster plan addressing biological events (Aday, 1989; Portney and Watkins, 1993). Selecting 14% would give a figure slightly less than the 50% difference between 10% and 20%. Therefore, to assess the readiness of hospitals, it was desirable that at least 14% of the hospitals responding to the survey request had a specific biological event plan. To achieve the 14% goal using a 95% confidence level (an $\alpha = 5\%$), it was determined that a representative sample needed to be 152 hospitals out of the 837[5] eligible hospitals (see Appendix A - Equation to calculate sample size). As it was estimated an approximately 50% response rate, the representative sample of 152 was doubled and rounded to 300 hospitals At this conservative response rate of 50%, 150 hospitals would respond, which at the estimated 14% that would have a bioterrorism plan, at least 21 of the hospitals responding would have a bioterrorism plan.

In order to survey both rural and urban hospitals, it was decided to randomly select eligible hospitals by state rather than by other considerations such

[5] Only 711 of the 837 hospitals were designated by the AHA guide as medical/surgical hospitals appropriate for receiving medical casualties.

as facility type. To ensure equal representation by state, the percentage of each state's contribution to the total number of eligible hospitals listed in the AHA guide was used to calculate the number of hospitals per state in the sample (see Table 1). Since a sample size of 300 hospitals is approximately 35% of the original 837 hospitals, the final sample selection for each state was at least 35 % of the total number of hospitals each state contributed to the total of 711 (see Table 1).

Table 1. Total Number of Available Hospitals.

State	Contribution of Each State in AHA Guide List (%)	Number of Hospitals per State in Final Sample
Arizona	10.6	33
California	58.1	174
Idazo	6.1	18
Nevada	3.2	9
Oregon	9.0	27
Washington	13.1	39

Random selection of eligible hospitals was accomplished with a computer software program, SPSS (Version 10). Due to the study proposal rationale, it was decided to keep the sample size at 300. Seven hospitals (two in Arizona, four in California, and one in Nevada) were deleted from the original list as they later were determined to be military hospitals and should not have been part of the original sample. As a result, the total number of hospitals that were actually qualified to participate in the survey totaled 293.

3.2. HYPOTHESES

The null hypotheses are as follows:

1. In the western United States, there will not be a statistically significant number of hospitals with a formal bioterrorist plan.
2. In the western United States, there will be no statistically significant differences in population counts for those medical hospitals with a formal bioterrorist plan compared to medical hospitals with no formal plan.
3. In the western United States, there will be no statistically significant differences in licensed bed counts for those hospitals with a formal bioterrorist plan compared to hospitals with no formal plan.
4. In the western United States, there will be no statistically significant difference in median income for those hospitals with a formal bioterrorist plan compared to hospitals with no formal plan.
5. In the western United States, there will be no statistically significant difference for type of facility (private, public, religious, or *other*) for those hospitals with a formal bioterrorist plan compared to hospitals with no formal plan.
6. In the western United States, there will be no statistically significant difference for location by state for those hospitals with a formal bioterrorist plan compared to hospitals with no formal plan.
7. In the western United States, there will be no statistically significant differences among only those hospitals with a formal bioterrorist plan by motivating factors, consultants, isolation planning, employees sent to biological seminars, or participation in emergency preparedness training.

3.3. SURVEY INSTRUMENTS

Two questionnaires were developed for this study. The first, a mail questionnaire (questionnaire #1), was designed with a series of *yes/no* questions to examine whether or not the facility had prepared for a possible bioterrorist event (see Appendix B - Survey (Questionnaire # 1)). The second questionnaire (questionnaire #2) was designed as a follow-up telephone survey to explore a hospital's reasons for developing a specific plan for a biological event in greater depth (see Appendix C - Telephone Survey (questionnaire #2)). For example, the questionnaire queried who instigated development of a plan, who was resistant to the plan, and how prepared the facility and the community were for a bioterrorist event.

Only the survey instrument mailed to each facility was reviewed by the Statistics Research Center at Oregon State University (OSU) for content validity. Later, both surveys were reviewed and approved by the thesis committee and by the OSU Human Subjects Review Board.

Due to time and financial constraints, it was decided not to pre-test the survey instruments. Instead, the instruments were reviewed by some of the author's colleagues for clarification of the questions.

The surveys were mailed over a period extending from May 2000 to September 2000. Each survey included a cover letter addressed to the specific director of nurses for each facility as listed with the AHA Guide (AHA, 1997) (see Appendix D - Survey Cover Letter). The letter described the voluntary nature of the study and ensured confidentiality. It was hoped that by addressing the letter to a colleague, as opposed to the superior "chief executive officer", the response rate would increase. However, it is unknown if this personalized approach increased the response rate.

In the current study, the suggestions given by Dillman (1978) on how and when to mail surveys were followed. After the initial mailing (questionnaire #1), a

"Thank You" postcard was sent one week later to those who returned the survey and a reminder to those who had not yet responded (see Appendix E - Sample of the one-week follow-up Postcard). Two weeks after mailing the postcard, another copy of questionnaire #1 with a reminder-cover letter of the study were mailed to those who had not responded (see Appendix F - Cover letter to be sent 3 weeks after the first letter). The telephone survey was carried out between August and December 2000 (Appendix B - Survey (Questionnaire # 1)).

3.4. DATA ANALYSIS

These data were analyzed using a 0.05 alpha level comparing whether or not a hospital had a formal plan for a biologic release event. These data were stratified to examine five independent variables, including:

1. population served,
2. licensed bed capacity,
3. median income of the population served,
4. geographic location and,
5. type of facility served to the questions pertaining to planning and preparedness responses for bioterrorism.

As the mailed questionnaire had no specific question identifying a facility as urban or rural, the population served was used to estimate the community size (U.S. Census Bureau, 2001). For the purpose of this study, population sizes of less than 11,000 were considered rural, and populations greater than 95,665 were considered urban communities (populations between 11,000 and 95,664 were classified as semi-urban/suburban communities).

Because this is a descriptive study, most of these data are nominal and have been tabulated as frequency counts. Consequently, nonparametric tests of significance were based on cross-tabulations using the Chi-Square statistical test

with SPSS, a computer software statistical program. Some of these data, such as population, income, and licensed bed capacity data, were compared as categorical data and as interval data to take advantage of the more powerful Student's-t and Levene's tests for equality of variance (F).

3.5. LIMITATIONS

As no other similar studies were found in the literature at the time the actual survey was conducted. Thus, without a previously tested survey instrument, this study presents limitations inherit to any initial study. For example, the study survey was designed without an appropriate validated model focusing on bioterrorism planning.

After the survey was conducted and analyzed, it was determined that the survey instrument contained a few potentially confusing questions to the respondent. Some of the survey participants did not answer any more questions once they answered *no* to the specific bioterrorism plan question at the beginning of the survey (Question #5, see Appendix B - Survey (Questionnaire # 1)). As a result, only those hospitals with a specific biological plan were used for further analyses.

There were other questions unclear to many of the respondents. Twenty-one of the 177 hospitals did not answer the question concerning the size of the population the facility served (Question #10, see Appendix B - Survey (Questionnaire # 1)). Some of the respondents answered the question with "not applicable" or "unknown," resulting in a possible biased analysis of the question. Twelve (6.8%) of the hospitals reporting did not respond to the question of licensed bed capacity, and many who did respond provided answers that did not correspond with other sources (HCIA, 2000; AHA, 1997).

Some of the answers were not used in the analysis of the results. For example, median income was not used to compare communities as this question on the mailed survey apparently was not clear to the respondents and generated a variety of responses from a response of "unknown," to categorizing responses such as "medium to high income," to actual numbers. Answers to the median income question led to challenges with interpreting the question's results.

Comparing income as categorical data to having a specific bioterrorist plan was not possible, as 40% of the cases were excluded due to missing values (see Table 4 in – Results), or use of answers that were not measurable values such as a range of values, all of which interfered with the accuracy of the results.

In addition, in response to facility type, many of the hospitals listed in the *Other* category were identified as such by the respondents. The respondents, when asked to explain, identified their facility as community owned, investor owned, or health maintenance organizations. Many of these hospitals probably could have been classified as either private or public hospitals, but the answers were tabulated as the respondents indicated.

Bias may be problematic, as the sensitive nature of the subject of bioterrorism and the survey questions could have led a subject to respond in a self-perceived "approved" answer. For example, one respondent indicated the hospital had a plan specific for biologic release response, yet during a telephone interview stated HazMat would respond to any biologic release. Responses, such as the above comment, indicate a lack of knowledge as to the intent of the question regarding a specific bioterrorism plan. In addition, interviewer bias could have occurred during the telephone interviews during the follow-up portion of the survey if, for example, the person interviewed had limited time and directed the interview by discussing only one point important to him/her.

Another bias may have occurred because approximately 40% of the hospitals selected for the study did not participate in the survey. Thus, it is not known how representative the hospitals in the study are to the hospitals population.

Another limitation of the study was that most of the bioterrorist response plans were not reviewed by the investigator, thus the number of hospitals with bioterrorist plans may be over-estimated.

The survey instrument should have included a question about the presence of an on-site laboratory or ready access to a laboratory to enable identification of the biologic agents involved. Having access to such laboratories is crucial for a definitive diagnosis according to many sources including the Department of Defense (USAMERIID, Satellite Broadcast on September 26-28, 2000). In addition, a question regarding the hospital's location should have included whether the facility served a rural or an urban population, as some rural hospitals may have served large geographic areas such as the U.S. Public Health Indian Affairs with a large population base. Also, a question that examined the number of patients a facility could admit into its isolation unit was needed to quantify a facility's ability to respond to a mass casualty event.

As a result of the problems in reporting, a separate source was used to estimate population figures of cities where the hospitals were located (Farmighetti, 2000). For licensed bed capacity, another information source (AHA, 1997) was used for each of the hospitals responding instead of the self-reported figures.

3.6. DEFINITION OF TERMS

Selected terms as interpreted by the author for the purpose of this study are defined below.

Table 2. Definition of Terms.

TERM	DEFINITION
Bioterrorism	A malicious act against a civilian population using biological agents
High-density traffic	Large volume traffic, such as interstate highways and freeways
Licensed bed capacity	The number of beds per hospital, as listed by the respondent
Licensed bed count	The number of beds per hospital, as listed by the American Hospital Association (AHA)
People served	The number of patients the facility serves, as listed by the respondent
Population count	The 1988 population, as listed by The 2000 World Almanac (Farmighetti, 2000)
Private hospitals	For-profit hospitals, investor-owned
Public hospitals	Hospitals for general public access
Rural	Population counts less than 11,000
Semi-urban/suburban	Populations between 11,001 and 96,000
Urban	Population greater than 96,000

CHAPTER 4 – RESULTS

4.1. RESPONSE

One hundred-seventy-seven (59%) of the 300 hospitals randomly selected responded to the survey.

The target hospitals were classified in six categories including:

1. Public
2. Religious
3. Investor-owned
4. Public Health Services
5. Veteran Affairs
6. Indian Affairs

A comparison of the responding hospitals to the entire population of hospitals eligible for selection to participate in this survey indicated that the responding hospitals were closely representative of the target hospitals (see Table 5 in the Appendix). The only two exceptions are hospitals in the Public Health Services category and military hospitals, which were not represented in the survey sample. Only two Public Health Services hospitals were listed in the target population. Military hospitals were deleted from the survey sample as none responded to the survey (see Table 5 in the Appendix).

There were 41 hospitals (23.0%) that gave permission for a follow-up interview either by telephone. Twenty-five (14.1%) of the 177 hospitals responded to the follow-up survey.

The response by state to the survey is shown in Table 6 in the Appendix. Of these hospitals, 20 (26.7%) were from Arizona, 94 (22.8%) from California, ten (23.3%) from Idaho, four (17.4%) from Nevada, 23 (35.9%) from Oregon, and 26 (28.0%) from Washington.

4.2. LEVEL OF PLANNING

Among the 177 hospitals that responded, 96.5 % indicated they had an emergency response plan for any disaster in the community, and 85.4 % had designated an emergency response director. Further, 51 (28.8%) of the 177 responding hospitals indicated they had an emergency plan specifically addressing a possible bioterrorist event.

In addition, another 35 (19.8%) of the responding 177 hospitals indicated they had a plan addressing a bioterrorist event in progress either at the time of the survey or by the time of the follow-up telephone survey for a total of 86 (86/173, 49.7%) of the total 177 hospitals who responded (see Figure 2 in the Appendix J). However, hospitals with plans "in progress" were not included in these data analysis.

Of the hospitals that indicated they had a specific plan to a biologic event, private hospitals more frequently had a specific plan addressing bioterrorism (17/49, 34.7%), whereas public hospitals (14/49, 28.6%) ranked second (see Table 3 below and Figure 3 in the Appendix).

Hospitals within the state of California had the largest percent of specific plans addressing bioterrorism at the time of the survey compared with the other states (30/51, 58.8%). Washington ranked second among hospitals with a biological event plan (9/51, 17.7%). (See Table 3 below and Figure 4 in the Appendix).

Table 3. Results of the Primary Research Question that there was not a Difference in the Number of Hospitals with a Formal Terrorist Plan by State and by Facility Type.

Hospitals with a bioterrorist plan	**Number**	**Percentage of Respondent Hospitals (%) n = 177**	**P value[6]**	**Statistically significant?**
Total	51	28.8	0.0001	Yes
Hospitals with a bioterrorist plan by state	**Number**	**Percentage of Hospitals with a bioterrorist plan by state n = 51 (%)**	**P value**	**Statistically significant?**
Arizona	5	9.8	0.58	No
California	30	58.8		
Idaho	2	3.9		
Nevada	0	0		
Oregon	5	9.8		
Washington	9	17.6		
Hospitals with a bioterrorist plan by state[7]	**Number**	**Percentage of Hospitals with a bioterrorist plan by state n = 51 (%)**	**P value**	**Statistically significant?**
Arizona	5	9.8	0.67	No
California	30	58.8		
Oregon	5	9.8		
Washington	9	17.6		
Hospitals with a bioterrorist plan by type	**Number**	**Percentage of Hospitals with a bioterrorist plan by type n = 51 (%)**	**P value**	**Statistically significant?**
Public	14	28.6	0.11	No
Private	17	34.7		
Religious	8	16.3		
Veteran Affairs	3	6.1		
Others	7	14.3		
Hospitals with a bioterrorist plan by type[8]	**Number**	**Percentage of Hospitals with a bioterrorist plan by type n = 51 (%)**	**P value**	**Statistically significant?**
Public	14	28.6	0.06	No
Private	17	34.7		
Religious	8	16.3		
Other	10	19.6		

[6] Variables-bioterrorism plan : Yes vs. No.
[7] Idaho and Nevada eliminated (expected frequencies less than five).
[8] Veteran Affairs included with other category.

The analysis of the primary research question that there will not be a statistically significant number of hospitals with a formal bioterrorist plan yielded the results shown in Table 3. The comparison of the number of hospitals with a formal bioterrorist plan to those hospitals with no specific bioterrorism plan was found to be statistically significant with a one-sided p-value less than 0.0001 (Table 3). However, stratifying these data for hospitals with a specific bioterrorist event plan by state was not statistically significant, thus failing to reject the null hypothesis of no difference by state. Additionally, to examine a statistical significance by state, two states with expected frequencies less than five (Idaho and Nevada) were eliminated and still no statistical significance (see Table 3) was found.

Statistical analysis of the frequencies by facility type with a specific bioterrorism plan revealed no statistical significance (see Table 3). To compensate for three cells with expected counts fewer than five, these data were analyzed after combining two categories of hospitals, Veteran Affairs hospitals with *other* hospitals. Comparison of private, public, religious hospitals, and the combined *other* hospitals, the Chi-Square remained statistically not significant at p =0.06, failing to reject the null hypothesis of no difference by type of facility (see Table 3).

4.3. URBAN VERSUS RURAL

4.3.1. Population

Analysis of the question on the questionnaire referring to the number of people served by the hospital (See question 10, Appendix B - Survey (Questionnaire # 1)) excluded 26% of the hospitals due to omissions or inappropriate responses, yet the result was found significant at $p_{(2)}$=0.003.

Consequently, to verify this significant value, the population within the town or city of the facility site was determined using the 1998 population listed in the 2000 World Almanac (Farmighetti, 2000). Population counts were separated into three categories for comparison using the Chi Square statistic. Category 1 contained population counts of zero up to 10,999, category 2 contained population counts of 11,000 to 95,999, and category 3 consisted of populations 96,000 to 3,598,000.

Table 4. Comparisons of Population Served And Facility Size With a Bioterrorist Plan For All 177 Hospitals.

Object	No	(%)	P Value	Statistically significant?
People served[9, 10]	35/131	27	0.003	Yes
Population[9, 11]	51/172	30	0.001	Yes
Population [11, 13]	51/172	30	0.04	Yes
Licensed bed capacity [9, 10]	44/162	27	0.04	Yes
Licensed bed capacity [10, 13]	44/162	27	0.03	Yes
Licensed bed count [12,13]	51/172	30	0.012	Yes
Median income [9, 10]	29/107	27	0.17	No
Median income [10, 13]	29/107	27	0.19	No

Comparisons of these categorical data in Table 4 showed a significant relationship of population size to whether or not a facility had developed a specific plan for

[9] Comparison using a Chi-Square of hospitals with a plan Yes vs. No.
[10] As listed by the survey respondent.
[11] Population counts based on the 2000 World Almanac figures (Farmighetti, 2000).
[12] Licensed bed count based on the AHA Guide (AHA, 1997).
[13] Student's t-test.

responding to a community bioterrorist event ($p_{(2)}$ =0.001), rejecting the null hypothesis of no difference by population count. In addition, analysis of the strength of the association set by Cramer's V and Phi was 0.29, with an approximate p-value of 0.001. Standardized residuals indicate what each variable contributed to the overall effect. Standardized residuals showed –2.4 in category 1 for those hospitals with a bioterrorism plan, 0.1 for category 2, and 2.2 for category 3. The standardized residuals showed that category 3, the largest population group, contributed more to this overall effect of the analysis than the other two categories. as explained in Portney and Watkins (1993).

Additionally, a $p_{(2)}$-value of all the population data for all 177 responding hospitals was significant for population size at 0.043 level and a 95% confidence interval (8,283-518,162) of the mean difference for both groups of 263,223. The calculated mean for those hospitals without a plan was approximately 157,000 as compared to a population mean of 420,000 for those with a plan (see Table 4 above).

4.3.2. Facility Size

The $p_{(2)}$-value for licensed beds per facility yielded a significant result of 0.03, an average difference of 76 licensed beds and a 95% CI (7.65-144.44) of the difference with an average number of beds of 144 for those without a plan and 220 for those hospitals with a plan.

A comparison of these data with the AHA figures, confirmed these results. With a $p_{(2)}$-value of 0.012, an average difference between the two groups of 62 licensed beds, a 95 % CI (13.53-110.01) of the difference, and a mean of approximately 156 beds for those hospitals without a specific plan to 217 beds for those hospitals with a specific bioterrorism plan, rejecting the null hypothesis of no difference by licensed bed count.

Interestingly, when comparing the number of beds by facility as to whether a hospital had a bioterrorist plan revealed using the less powerful X^2 yielded a $p_{(2)}$ value of 0.04. Category 1 consisted of bed counts from 6 to 72, Category 2 contained bed counts from 73 to 175, and Category 3 consisted of bed counts from 176 to 1110 (see Table 4 above).

4.3.3. Median Income

Responses to median income ranged between approximately $9,600 and $1,000,000. When compared to whether a facility had a specific bioterrorism plan, it was found not significant with a $p_{(2)}$-value of 0.17, largely due to the fact that 40% of the hospitals were excluded. The null hypothesis of no difference between hospitals with a specific bioterrorist plan to those hospitals without a specific biologic event plan when compared by income failed to be rejected.

4.4. RESULTS OF HOSPITALS WITH A SPECIFIC BIOTERRORISM PLAN

4.4.1 Type of Facility by State

Fifty-one hospitals had a specific plan for addressing a biological event at the time of the survey. Two of the five hospitals with plans were privately owned hospitals in Arizona. Of the private hospitals in California, 9/30 had specific bioterrorist plans. Two plans were reported by public hospitals in Idaho. More than half of the religious hospitals in Oregon (3/5) reported having a specific bioterrorist plan. Private hospitals (5/9) in Washington reported more often than the other types of hospitals in that state as having a specific plan. Two hospitals did not report its facility type, and Nevada did not report any hospitals with a

specific plan for a biological event. However, there were no statistically significant differences among hospitals with a specific plan. Therefore, the null hypothesis of no difference among the hospitals with a biologic event plan was not rejected.

4.4.2. Type of Facility by Department

A comparison of the fifty-one hospitals with a specific bioterrorism plan revealed that all but two had an emergency department or an intensive care unit. Each hospital had surgical services and a medical/surgical department. Eight of the fifty-one hospitals had a pathology department, and all but three had an outpatient department.

4.4.3. Motivating Factors

Looking at some of the reasons for developing a plan specific to a bioterrorist event, 59.2% (29/49) of hospitals reported high-density traffic. Proximity to a military base was reported by 30% (15/50) of the hospitals, and 22.5% (11/49) reported nearness to a research facility (see Figure 5 in Appendix J). Twenty-four percent (10/41) listed other reasons for developing a plan. Some of the reasons listed by the respondent in the *other* category included proximity to an aeronautic manufacturing plant, preparation for the turn of the century (Y2K), corporate policy, or "due diligence." A few of the hospitals (5/49, 10.2 %) reported some other history of an event that instigated development of a specific plan for bioterrorism. These events included threats such as major conventions in their areas, anthrax threats, and an actual contamination event.

Comparing some of the motivating factors for developing a specific bioterrorism plan by facility type, private hospitals more often developed a plan due to high-density traffic through their area than the other hospitals, and 21.3 % of the public hospitals cited high-density traffic. Government funding to develop

preparedness was listed as a motivating factor by 4.3 % of all the hospitals in each category of facility type (see Table 7 in Appendix K).

Stratifying the results by state, at least one hospital in each of the states listed high-density traffic as the reason for developing a plan. California was the highest within the group (18/29, 62.1%), then Washington (5/8, 62.5%), Arizona (3/5, 60.0%), Oregon (2/5, 40.0%), and Idaho (1/2, 50.0%) (see Table 8 in Appendix K).

California (7/29, 24.1%), Oregon (1/5, 20.0%), and Washington (1/8, 12.5%) listed government funding as the reason for developing a plan. Also, California (3/29, 10.3%), Oregon (1/5, 20.0%), and Washington (1/8, 12.5%) listed some history of an event that instigated their plans such as anthrax threats (see Table 8 in Appendix K).

4.4.4. Contributors to the Plan

Of the fifty-one hospitals with a specific bioterrorism plan, 56.5% (26/46) of the hospitals included the community in their planning process. Only half (3/6) of the religious hospitals included the community in the development of a specific bioterrorism plan, while a majority (8/13) of the public hospitals, and less than half (7/17) of the private hospitals (see Table 9 in Appendix K).

An analysis of other parties consulted during the planning process stratified by facility type, revealed that 87.0% (40/46) of hospitals consulted the fire department, most frequently by private hospitals (15/46, 32.6%), followed by public hospitals (12/46, 26.1%), religious (6/46, 13.0%), and *other* hospitals (5/46, 10.9%). Seventy-one percent (32/45) of the responding hospitals consulted with other hospitals to develop a bioterrorist plan. Twenty-seven percent (12/45) of the private hospitals, 20.0% (9/45) public hospitals, 11.1% (5/45) religious hospitals, and 8.9% (4/45) of the *other* types of hospitals consulted with other hospitals to develop a bioterrorist plan (see Table 9 in Appendix K).

Seventy-one percent (32/25) of the hospitals consulted with city emergency planners, primarily private hospitals (13/45, 28.9%). Of the 45 hospitals who responded, 73.3 % (33/45) had consulted with their local health departments, most often public hospitals (12/45, 26.7%). The Centers For Disease Control And Prevention were consulted by 46.5% (20/43) of the hospitals, mostly by public hospitals (8/43). Finally, 87 % (39/45) consulted with hospital staff, primarily private hospitals (14/45, 31.1%) ((see Table 9 in Appendix K).

When stratified by state, some of the interested groups that most often participated in the planning process included the fire department in all sampled hospitals in Arizona, Idaho, Oregon and Washington. Three-fourths of the hospitals in California consulted with their local fire department when developing their plans. All five hospitals in Arizona consulted with other hospitals during plan development, whereas most than half of the hospitals in California, one of two of the hospitals responding from Idaho, three of four of the Oregon hospitals, and five of seven of the Washington hospitals with a plan consulted with other hospitals (see Figure 8 in Appendix J.

Hospitals stratified by state that consulted with their local health departments included Washington (6/7, 85.7%), Arizona (4/5, 80%), California (22/29, 75.9%), with Idaho (1/2) and Oregon (2/4) at 50% each. The CDC was consulted by hospitals with a specific plan 100% (2/2) in Idaho, Washington hospitals (4/7, 57.1%), Oregon (2/4, 50.0%), California (13/28, 46.4%), and 25% (1/4) in Arizona (see Figure 7 in Appendix J).

4.4.5. Seminars for Bioterrorism

Most of the fifty-one hospitals with a bioterrorism plan (38/45, 84.4%) reported that their staff attended biologic incident seminars. Religious hospitals were the type of hospitals whose employees most frequently attended a biological seminar (7/7, 100.0%), followed by public hospitals at 92.3 % (12/13).

All of the hospitals in Idaho (2/2) with a specific plan for a biologic event reported their personnel attended seminars addressing biologic incidents . California hospitals reported 92.6% (25/27) of their staff had attended biologic event seminars. The corresponding figures for the other states were: 80% (4/5) Oregon, 66.7% (4/6) Washington, and 60% (3/5) Arizona.

4.4.6. Isolation Plans for Receiving Mass Casualties

Hospitals with a specific bioterrorism plan reported 63.8% (30/47) had an isolation plan for receiving large numbers of victims associated with contagious biologic agents. Public hospitals with a specific bioterrorism plan reported having an isolation plan in place (9/45, 20.0%), second to 24.4% (11/45) of private hospitals with a specific plan reported an isolation plan.

Hospitals with a specific bioterrorism plan were stratified by state as to whether or not they have an isolation plan for receiving mass casualties. As with facility type, whether a hospital with a formal plan had an isolation plan in place stratified by state was not statistically significant (see Table 10 in Appendix K).

4.4.7. Participation in Training

Sixty percent (30/50) of the hospitals with a bioterrorism plan had participated with other agencies in an emergency-preparedness training program to respond to mass biological outbreaks. Among these hospitals, 52 % (25/48) were involved with specific biologic response drills, and 20.4 % (10/49) participated in more than one drill. Sixty-one percent (30/49) of the time hospital staff was included in bioterrorism response training. Fifty-one percent of the hospitals included the fire department (25/49) and emergency medical technicians (25/49). Local law enforcement participated 38.8 % (19/49) in the planning, emergency city planners 34.7 % (17/49), and the health department 38.8 % (19/49), and other

agencies (6/49, 12.2%) including FEMA (1/51), CDC (1/51), and the military (1/51). Due to the small number of VA hospitals with a specific plan for bioterrorism (3), this category was combined with the *other* hospital category.

Comparisons of the fifty-one hospitals with a specific plan as to whether or not they ever participated with other hospitals or agencies in an emergency-preparedness training program to respond to mass biological outbreaks resulted in 80% (4/5) of Arizona hospitals had participated with other agencies, 53% in California (16/30) and Oregon (3/5), and 50% in both Idaho (1/2) and Washington (4/8).

4.4.8. Hospitals on Biological Alert

Finally, analyses of the frequencies of any one of the 177 hospitals that indicated its facility was ever placed on alert for a biologic event showed the following results. Although not statistically significant, seven of the 177 hospitals surveyed reported they had been placed on alert for a biologic agent release event such as anthrax. Of these hospitals, four were private hospitals, two were public hospitals, and one was a religious hospital.

Among the hospitals (7/177) involved in these biologic alerts, four hospitals developed specific plans for a biologic event, whereas three hospitals did not. One of the latter group reported it was working on a plan. Stratified by state, three of the seven hospitals placed on alert were in Washington, two in California and two other hospitals in Oregon.

Comparing hospitals placed on biologic alert by population served, only one facility in the lowest third population percentile was placed on alert (4,999-10,999). Two of the seven hospitals placed on alert were categorized in the second percentile (11,000-95,666). The remaining four hospitals were in the highest percentile (95,667-3.6 million). All four of the hospitals in the highest percentile of population had specific plans addressing bioterrorism.

Another variable analyzed was licensed bed capacity of those hospitals placed on alert for a possible bioterrorist event. Two of the seven hospitals were in the first percentile for bed capacity (15-79 beds), whereas one of the seven hospitals was in the second percentile (80-187 beds), and four hospitals were in the highest percentile of bed capacity (188-841).

Six of the seven hospitals placed on alert reported that employees have attended seminars focusing on these types of biologic events.

Three of the seven hospitals reported that an organized group was the perpetrator when the facility was placed on alert. One of the seven hospitals reported a lone person was the perpetrator.

Because of the alert status, five of the seven hospitals had participated with other agencies in an emergency preparedness drill and specific biologic response training. Further, of the four hospitals that reported a specific bioterrorism plan as a result of being placed on alert for a biologic event, three (75%) of the hospitals have participated with other agencies in emergency preparedness training programs.

4.4.9. Summary of Final Comments

The final question on the survey asked for any comments the respondent might have, and elicited questions. A summary list of final comments can be found in Appendix H.

4.4.10. Summary of Telephone Survey

Forty-one (23%) of the 177 respondents requested the follow-up survey. Thirty-one of the 177 respondents requested an email response, and 10 of the 177 requested a telephone call. Those who requested an email and did not respond were followed up at least twice. Telephone calls were made at least twice (three or

more times). Twenty-five (61%) of the forty-one hospitals that requested the follow-up survey responded. Of the 25 hospitals that responded to the follow-up survey, 19 (76%) hospitals serve communities with populations greater than 11,000. Two of the 25 hospitals responded by email attachment that were not accessible, and were subsequently lost to follow-up.

Twelve of the 23 hospitals (52.2%) reported they had a specific bioterrorism plan, were working on a formal plan, or were considering developing a specific plan. Five (21.7%) of the 23 hospitals reported they had a specific plan for a bioterrorist event. Five other hospitals (21.7%) of the 23 hospitals reported they had a specific plan in the development stage. Two (8.7%) of the 23 hospitals indicated they were either *researching* the idea of a plan or a plan was in the *verbal stage*. Eleven (47.8%) of the 23 hospitals that reported they had a plan or were either working on or considering a plan served communities of more than 11,000 people. Ten (43.5%) of the 23 hospitals that had a specific plan or were either working on a plan or considering developing a plan had bed counts greater than 79. Five (21.7%) of the 23 hospitals with a specific plan, or in some stage of development were public hospitals. In contrast, hospitals (11/23, 47.8%) that had no specific plan for a bioterrorist event, 91 % (10/11) hospitals served populations less than 95,665, and 72.7% (8/11) had bed capacity less than 188. Five of the 11 (45.5%) hospitals with no specific plans for a biologic event were religious hospitals and four of the 11 (36.4%) were public hospitals.

Of the ten hospitals that reported having a specific plan for bioterrorism or were developing a specific plan, three hospitals indicated the only barriers to developing a plan reported were time and funds for training and equipment. Two of the ten hospitals reported adapting an existing bioterrorism plan to their facilities. Two hospitals reported updating the plan every one to three years, or after drills. None of the hospitals reported any resistance from other groups such as physicians to developing a specific plan for a biologic event. In response to a question regarding the effectiveness of a specific plan for a biologic event, one

person indicated they had a *good plan hidden by its cover.* This person continued by stating: "No one is familiar with it. If a problem occurs, we'll be too busy to read it then."

Five of the ten hospitals (50.0%) indicated their in-house personnel were prepared to respond to a bioterrorist emergency. Two hospitals did not feel their employees were prepared, and two hospitals did not answer the question. One hospital reported two mass casualties in their community and indicated that the hospital *responded well.*

Six of the ten hospitals (60.0%) reported having involved the community in their preparations for a biologic event either in the planning stage or with actual drills. One facility requested *my crystal ball* to prepare the community in the event of a bioterrorist event.

Eight of the ten hospitals (80.0%) reported coordination efforts with other hospitals, local public health departments, and various city agencies such as the fire and police departments. Three of these hospitals identified extensive coordination efforts with such agencies as the Federal Emergency Management Agency, the Federal Bureau of Investigation, the CDC, radio communications, local emergency management systems, and the military.

Eleven (47.8%) of 23 the hospitals reported that they had no specific plan for bioterrorism and did not plan to develop one. Some of the reasons for not developing a plan included no need or lack of resources and time.

4.4.11. Summary of Results

Fifty-one (28.8%) of the 177 responding hospitals indicated they have an emergency plan specifically addressing a possible bioterrorism event. These data were statistically significant comparing hospitals with a specific plan for a mass biologic event to those without a specific plan with a $p_{(1)}$-value less than 0.0001. Of the fifty-one hospitals indicating they have a specific plan for a biologic event,

privately owned hospitals more frequently had a specific plan addressing bioterrorism (17/49, 34.7%), whereas public hospitals ranked second (14/49, 28.6%). (30/51, 58.8%) hospitals within the state of California have specific plans addressing bioterrorism at the time of the survey. Washington had the second highest number of hospitals with a bioterrorist plan (9/51, 17.6%).

A $p_{(2)}$-value of the population data, provided by the World Almanac, showed significant at a level of 0.001, with a mean of approximately 157,000 for those without a plan to 420,000 for those with a plan, a mean difference of 263,000, (95% CI=8,284-518,162).

A $p_{(2)}$-value for licensed beds per facility yielded a significant result of 0.030, with a mean difference between both groups of 76 licensed beds, 95% CI of the difference (7.65-144.4) with a mean of 144 beds for those without a plan and 220 beds for those hospitals with a plan.

High-density traffic (29/49, 59.2%) was the primary motivator for developing plan, followed by proximity to a military base (15/50, 30.0%).

The local fire departments (40/46, 87.0%) were the most frequently consulted outside agency or group by the 51 hospitals during the planning process, followed by individual hospital employees such as emergency department personnel (39/45, 87.0%) and the local health department (33/45, 73.3%).

Most of the fifty-one hospitals with a specific plan have sent employees to bioterrorism seminars (38/45, 84.4%).

Sixty-four percent (30/47) of hospitals have existing isolation plans for treating mass casualties with communicable diseases.

Seven hospitals have been placed on alert for a possible bioterrorist event, and four have developed specific plans for dealing with such an event.

Fifty-two percent (25/48) of the hospitals have participated in training programs dealing with a biologic agent release. Twenty-five (61.0%) of the forty-one hospitals that gave permission for a follow-up survey responded.

Seven (30.4%) of the 23 hospitals reported they were developing a specific plan, researching a plan, or discussing developing a plan.

Three (30.0%) of the ten hospitals with a plan, or developing one, indicated the only barriers to developing a plan were time and funds for training and equipment. None of the hospitals reported any resistance to developing a specific plan for a biologic event. Two (8.7%) of the 23 hospitals did not feel their employees were prepared. Eight (80.0%) of the ten hospitals that either had a plan or were working on one, consulted with other hospitals and local agencies, such as fire and police. Three (30.0%) of the ten hospitals identified extensive coordination efforts with agencies such as the Federal Emergency Management Agency, the Federal Bureau of Investigation, the CDC, radio communications, local emergency management systems, and the military.

Twelve of the 23 hospitals (52.2%) reported that they had a specific bioterrorism plan, were working on a formal plan, or were considering a specific plan.

Finally, eleven (47.8%) of twenty-three hospitals reported they had no specific plan to respond to bioterrorism, and did not plan to develop one.

CHAPTER 5 – DISCUSSION

Most notable among the findings of this study was that the majority of hospitals in the six-state region of the western U.S. was not prepared for a mass bioterrorist event by having a formal plan in place prior to the anthrax-related events of 2001. These results agree with those of Wetter (2001) and Helget (2002). In addition, the findings of this study indicated that, prior to the 2001 anthrax-related events, less-populated, more rural areas hospitals were generally unprepared to respond to mass casualties on any level of biological event preparedness. These findings may be partially due to limited resources available to most hospitals and to government funding directed at larger urban areas encouraging urban-area hospitals to prepare for bioterrorism (Binder et al., 1999; CDC, 1999). Lack of resources was supported by a telephone survey of respondents in this study prior to the anthrax-related events of 2001. The telephone survey identified lack of money and time as the principal resources as the greatest barriers to developing a biologic event plan. This finding was consistent with the literature published prior to the events of fall 2001 as to why hospitals may not be prepared for a mass casualty bioterrorist event (McDade & Franz ,1998; Wiant, 1998).

Another reason for the lack of bioterrorism planning in smaller, more rural hospitals may be attributable to a sense of isolation from larger urban centers and potential bioterrorist threats that were the focus of government funding and media attention. However, the reasons for the relatively few numbers of hospitals with a formal bioterrorism plan can be explained by the theory developed by the leading authority on why some organizations, including hospitals, are slow to adopt new ideas, E.M. Rogers. According to E.M. Rogers' Diffusion of Innovation theory, larger organizations serving large populations of higher socioeconomic status are quick to respond to media messages. They adopt innovations giving access to the right information and funding. On the other hand, organizations that are more

traditional, isolated, and serving populations of lower socioeconomic status without access to funding and information are less likely to respond to media messages. In addition to increased media messages, larger and more urban hospitals tend to network with other organizations more often than do their rural counterparts.

To briefly summarize Rogers' theory, some organizations are early adopters of new ideas and technology due to greater education, higher socioeconomic status, more contact with outside sources, greater social participation, a higher media exposure, and a higher level of sophistication than other organizations (Rogers, 1995). According to Rogers, large urban hospitals have more incentives to make changes given the dynamics of the community they serve and their competition and greater contact with agents of change than have smaller, more rural organizations (Green, 1991; Rogers, 1995). However, prevention planning proves more difficult for even the most innovative of hospitals due to the nebulous nature of future risk, especially the risk of a bioterrorist attack prior to 2001.

Therefore, as supported by the data analyses in his report, the few number of hospitals with a bioterrorist plan was larger hospitals serving urban populations with higher socioeconomic status. These larger institutions were more often privately owned hospitals, which with greater resources and more competition may tend to be early adopters of new ideas and were more likely to perceive a need to change from increased media messages that might affect them directly, while those hospitals in rural areas may not perceive that risk as pressure to change. Rogers (1995) identified early adopters of prevention planning by their perception of potential threats. Rogers further identified that some organizations may perceive a need to adopt a prevention plan based on some prestige aspect, proving their innovativeness. However, it is a question whether any of the hospitals have adequately planned for a bioterrorist event, as proven by the events of 2001, especially the over adopters that developed a plan simply to appear innovative. According to Rogers, over adopters tend to accept an innovation when many experts suggest they should not.

One of the many of theories that address why some hospitals adopted bioterrorist prevention plans prior to the anthrax-related events of 2001, is the theory known as the bandwagon effect (Abrahamson & Rosenkopf, 1993). For example, various forms of the media promoting the idea of increased bioterrorism risk, increase pressure on other institutions, such as hospitals, to adopt a formal plan. Then, as more hospitals in an area begin to develop a formal bioterrorism plan, the pressure increases on other hospitals to develop a plan as well (Abrahamson & Rosenkopf, 1993). This may help to explain further, why responding hospitals in this study serving large populations with a greater perceived risk tended to develop bioterrorism plans, whereas responding hospitals serving small populations did not.

In another context, an environmental continuum ranging from predictability to turbulence may influence organizations to adopt a bioterrorism plan before an actual event. This theory promotes an environment of uncertainty such as the potential risk of a bioterrorist attack as the driving force for a few hospitals to adopt a formal bioterrorist plan voluntarily before an event takes place. However, many hospitals wait until their exogenous environment becomes turbulent, even hyper-turbulent, such as the events of 2001 to voluntarily to begin planning for a possible response to a bioterrorist event (Friedman & Goes, 2000; Fligstein, 1991).

Another theory, promoted by DiMaggio and Powell (1991), as to why some organizations adopt innovations such as formal bioterrorism planning earlier than others is referred to as isomorphism. Various institutional forces compel organizations to become similar, especially in areas of risk aversion, such as voluntarily preparing a bioterrorism plan before any such event, as observed in the present study in the responding hospitals serving larger populations (DiMaggio & Powell, 1991; Zondra & Hinings, 1998; Mizruchi & Fein, 1999)

In addition to theories explaining external forces, such as environment and other organizations' influences, are the internal forces that compel a hospital to develop a bioterrorist plan prior to an actual event. These internal forces include

management attitudes and involvement in promotion of a culture that enhance innovativeness within the organization (Bradley et al., 2003). Management, especially senior management, can foster and support a relationship with their clinical staff to foster and develop new ideas, such as development of bioterrorist planning, and to overcome resistance to change (Weick & Quinn, 1999).

Theories explaining change, including change at the organizational level, are basically derived from Levin's three stages of change: to unfreeze, change, and refreeze, and his concept of why resistance occurs with any change (Weick & Quinn, 1999). Innovative hospitals exhibit the ability to anticipate the external environment through networking and communication, anticipate resistance to change, motivate and educate their personnel to make change, and assess the results to determine if the change was appropriate for their facility. Bioterrorism planning prior to the anthrax-related events of 2001 was largely a voluntary effort by hospitals. There was no environmental turbulence, such as the terrorist events of 2001, or any regulatory incentives to stimulate bioterrorism planning. Those hospitals that adopted a plan for a possible bioterrorist attack were innovative, early adopters, ahead of their competitors.

A bioterrorist event is very different than a typical chemical release which covers a relatively small area in a short period of time, such as a hazardous materials (HAZMAT) event. The HAZMAT approach assumes a biologic event would involve an immediate crisis event. The anthrax-related events of 2001 mentioned earlier prove otherwise, with people becoming infected over a period of days and weeks (Altman, 2002). A HAZMAT event can be easily cordoned off, confined and contained. The fall of 2001 proved that a typical bioterrorist event happens over a larger area and longer period of time, so that the typical HAZMAT response is not as likely. Clearly, bioterrorism planning requires a different approach to planning (Marghella, 2002).

Of the hospitals that developed a bioterrorist plan, the extent of their planning can be examined using some of the questions in this survey. The lack of

adequate planning, or planning based on a HAZMAT model, appears to be supported by these data in this report. Although not statistically significant due to the small sample size, the questions referring to what motivated hospitals to adopt a plan, whom they consulted during the planning, and what training has occurred to prepare for a possible bioterrorist attack lends credence to the existence of bioterrorist planning. For example, high volume traffic was the most frequently listed reason for developing a bioterrorist plan. High volume traffic as a risk factor tends to indicate a HAZMAT approach to bioterrorism planning of an immediate, visible event, such as a vehicle accident and subsequent spill, and not the slow onset as with the anthrax-related events of 2001.

Another example is with whom the hospital disaster planners consulted. The top three groups they consulted were the fire department, hospital personnel, and finally their local health departments. Consulting with the fire department is indicative of a HAZMAT-style approach, anticipating a fire department response to a single, immediate event. The health departments and the CDC are the leading collaborative agencies as evidenced by the events of 2001 (Bell, et. al., 2002; Campbell, 2002; CDC, 2001).

Whether hospitals participated in biologic event drills and with whom were other examples of the adequacy of their bioterrorism plans supports Rogers theory that private hospitals serving a more affluent clientele responding to increased community pressure were more apt to test their bioterrorist response plans.

The hospitals that indicated they had a specific plan for a biologic event in our study, private hospitals serving large, more affluent populations, were more likely to have a specific plan addressing bioterrorism than were public hospitals. This finding is disturbing because potential bioterrorist victims, especially those without health insurance, may overwhelm the resources of other hospitals, such as public and religious hospitals.

A major limitation of this study was that the investigator did not review the individual bioterrorist response plans. It is unknown how many hospitals may have

adopted bioterrorist plans using the HAZMAT approach of a highly toxic environment with small numbers of affected people (Macintyre, 2000).

Another consequence of not reviewing individual bioterrorist response plans is that some of the findings in this report were probably over-estimated and, in addition, the details of each plan are unknown. Despite these limitations, the findings of this study indicate a general lack of hospital preparedness to a bioterrorist event. These findings were largely consistent with other studies that surveyed hospitals, also in the western U.S., and that were published before and after the survey in this study was conducted (Bartlett, 1997; Danzig et al., 1997; Kadlec et al., 1997; Simon, 1997; McDade, 2000; Rabkin, 2000; Wetter et al., 2001 Helget & Smith, 2002).

Another limitation of this study was less than 100 percent response rate by the hospitals. Studies indicate this limitation could be an indication that non-responding hospitals did not feel vulnerable to a bioterrorist event in their community, thus did not feel compelled to respond to the survey request (Helget, 2002). In addition, this study may not accurately represent the general population of hospitals. For example, a larger sample of hospitals, including more VA hospitals and Public Health facilities represented in the *other* category, should be studied covering a larger geographic area to determine what levels of preparedness have occurred since the recent anthrax-related events.

Despite the limitations of this study, findings indicate a need for additional resources directed to hospitals, especially in rural areas. This need is beginning to be addressed by the federal government. In January 2002, $1.1 billion and another $1.4 billion in 2003 were authorized by Congress and signed into law by President Bush to help states defray the costs of bioterrorist planning and other public health emergencies (DHHS, January 25 & 31, 2002; Johns Hopkins, 2002; DHHS, 2003). A portion of these funds will target state and regional bioterrorism and infectious disease planning, state and local health departments, and local hospitals (DHHS, January 25 and January 31, 2002; Johns Hopkins, 2002; DHHS, 2003). Additional

study should be conducted to examine what resources the local hospitals are receiving at this time and what kinds of resources are needed to prepare hospitals for another bioterrorist event (O'Toole, 2002).

Complementing the federal government's efforts to fund states in biological preparedness, the Joint Commission on Accreditation of Healthcare Organization (JCAHO), a not-for-profit, private entity that accredits 18,000 healthcare organizations nationwide, has begun to examine each hospital it accredits for the presence of bioterrorist planning (JCAHO, 2001). Consequently, local hospitals now have the incentive to prepare for a bioterrorist event within their communities.

Important steps for hospital biological event preparedness are education, training and drills. These activities have been identified as essential for appropriate biologic event planning to enhance communication and coordination of services with other agencies and with the community (Morse, 1995; McDade, 1998; Atlas, 1998; JCAHO, 2001; Altman, 2002; Crupi et al., 2003; Marmagas, 2003). For example, since the October and November 2001 anthrax-related events, preliminary reports by health officials, including officials of the federal government, indicated that most of the government agencies in charge, including the Center for Disease Control and Prevention and the Department of Health and Human Services, experienced problems collaborating with other governmental agencies, and suffered a serious lack of communication to allay fears by the general public (Altman and Kolata, 2002).

Many of the hospitals with a bioterrorist plan in our study agreed with the experts that education, training, and communication were important components of their plan (Tucker, 1997; Johns Hopkins 2002; JCAHO, 2002; Crupi, 2003; Marmagas, 2003; Morse, 2003). For example, most of the facilities with bioterrorist plans identified in our study, had employees that attended seminars discussing biologic events. This finding indicated most hospitals found education of employees an important element of their planning. In addition, many of the facilities with a specific biologic plan had participated with outside agencies such

as the fire department in developing the plan. Even so, only half of the hospitals had ever participated in practice drills for a biologic event.

JCAHO agreed that training and community-wide drills must become an integral part of planning for any size and type of biologic event. JCAHO is beginning to require hospitals they accredit to conduct such drills (JCAHO, 2001). In light of the anthrax-related events in the latter part of 2001, biological drills must be reconsidered to include triage and treatment of potential victims exposed not exclusively by clouds of spores spread outdoors, but to include inside enclosed areas including contaminated envelopes or other containers (Altman & Kolata, 2002).

One additional finding of the current study indicated that five facilities reported a specific biologic history of an event, such as anthrax threats, before the events of the fall 2001, as a reason for developing a bioterrorist plan. Additionally, one facility reported that an actual biologic event involving restaurant contamination was a motivating factor for plan development, and two other facilities developed a bioterrorism plan in preparation for possible terrorist events targeting a large convention. Thus, the possibility of a bioterrorist event motivated these hospitals to develop a bioterrorist event plan. It would be interesting to examine the extent of bioterrorist planning by hospitals after the recent anthrax-related events.

Clearly, there is a need for more research designed to determine whether hospitals have made changes in their readiness to respond to a biologic event, especially in light of the recent anthrax and other terrorist events. Importantly, because these data for the current study were collected before September 11, 2001, the study findings serve as a valuable baseline on which to gauge changes in hospitals' readiness to respond to events having either large numbers of casualties and/or infectious etiologies. Past events such as the influenza pandemic of 1918 should serve as a reminder of just how easily health care systems can be

overwhelmed by major catastrophes such as a mass biologic event, especially if hospitals are unprepared for such an event (Bartlett, 1997; Schoch-Spana, 2000).

SUMMARY

The majority of the hospitals surveyed were not prepared for a mass bioterrorist event. Larger facilities serving more populous areas (urban) were most likely to have a specific biologic event plan, supporting Rogers' theory of diffusion of innovation (Rogers, 1995). Private hospitals were more inclined to develop plans than were the other categories of facilities, including public hospitals. A telephone survey of respondents conducted prior to the anthrax-related events in 2001, indicated that more than half of the hospitals still did not have a specific plan, nor planned to develop one. When queried as to why, money, time, and resources were the greatest reported barriers to developing a biologic event plan, which supported the literature concerning why hospitals are not prepared for a mass casualty bioterrorist event.

The interviewer did not review individual plans, which is problematic, as it is unknown how many of the hospital bioterrorism plans were fashioned on a HAZMAT scenario. This would make most bioterrorism responses unworkable, as HAZMAT incidents involve highly toxic areas with small numbers of people affected, occurring in a short timeframe. This is illustrated by the anthrax-related events of 2001 involved many people infected over a wide geographic area during a period of weeks.

The findings that indicated a general lack of hospital preparedness to bioterrorism was largely consistent with other studies published before and after this study was conducted.

Less than a 100% response rate could be an indication that the non-responding hospitals did not feel a significant level of risk to bioterrorism.

Due to the terrorist events of 2001, government funding is increasing to assist local hospitals with bioterrorism planning. In addition, JCAHO is beginning to require hospitals to have a specific bioterrorism plan in place before they are accredited or reaccredited.

Communication and coordination of services are essential to bioterrorist planning. They should be enhanced by education and drills by hospitals, as well as the entire health care system, including local and state health departments.

Findings in the study showed a few hospitals described involvement in either an actual bioterrorist event, or a potential threat of an event before the terrorist events in the fall of 2001. However, four of the seven hospitals involved in actual or potential biologic events were motivated to develop a plan as a result.

The findings of this study should serve as a benchmark for the level of hospitals' preparedness in the western United States when future studies evaluate the improvements in preparedness conducted after to the terrorist events of 2001.

CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

1. There were a statistically significant number of hospitals that responded to the survey with a formal bioterrorist plan as opposed to those hospitals without a formal plan in the western United States. The null hypothesis of no difference between hospitals was rejected.
2. Of the hospitals that responded to the survey, hospitals with a formal bioterrorist plan compared to hospitals without a formal plan, indicated that a difference in population counts was statistically significant. Again, the null hypothesis of no difference was rejected.
3. There was a statistically significant difference in licensed bed counts between those hospitals with a formal bioterrorist plan and those without, thus rejecting the null hypothesis that there was no difference.
4. The null hypothesis that there would not be a difference between hospitals with a formal bioterrorist plan to hospitals without a formal plan failed to be rejected as the socio-economic status of median income could not be analyzed.
5. In the western United States, there was no statistically significant difference between hospitals with bioterrorist plan and those without plans when type of facility was considered.
6. In the western United States, there was no statistically significant difference between hospitals with bioterrorist plan and those without plans when the state was considered.

7. There was no difference among facilities with a formal bioterrorist plan to hospitals without a formal plan when the motive was considered due to the small sample size, thus failed to reject the null hypothesis of no difference.
8. This study provides a valuable baseline to compare the bioterrorism planning efforts made by hospitals before and after the 2001 bioterrorist events
9. Finally, only about half of all the hospitals responding to this survey either reported having a specific plan for a mass bioterrorist event or were in the planning stages of developing a plan prior to the bioterrorist events of 2001.

6.2. RECOMMENDATIONS

6.2.1. Health Care Organizations

A. Because of the lack of preparedness and the events of 2001, the federal government was encouraged to increase funding to enable health care systems' ability to respond appropriately (The Whitehouse, 2002). This funding must be adequate and sustainable to allow hospitals to develop the level of competency needed to respond to any infectious disease outbreak, including bioterrorism.
B. Hospitals and health care professionals should be able to exchange information and access support from external sources, such as the public health systems and other health care systems readily, as supported by other studies (AHA; 2002; Inglesby, 2002; O'Leary, 2001; O'Toole, 2002).
C. Bioterrorism planning should be a requirement by other health care systems such as doctor's offices and clinics. Many victims of a biologic release might seek attention from their private physicians, or nurse practitioner

before going to a hospital, especially if the initial symptoms indicate the flu, as many of potential bioterrorist pathogens, such as anthrax, initially exhibit as mentioned by Inglesby (1999) and Henderson (1999).

D. The funding provided to hospitals from government agencies should ensure that all physicians and health care practitioners outside the hospital system have adequate training to identify signs, symptoms, and treatment of biologic organisms.

E. In addition, hospitals need to include their communities in their bioterrorist preparations. The study shows many hospitals focus on the public health agencies, hospitals and other emergency responders, and often exclude the community in their planning.

F. Health care systems must develop risk communication procedures to provide local communities with accurate information and education as to what resources are available and inform the public how and where to respond in the event of a biologic event, including a hotline to access information in the event of an infectious disease outbreak. For example, if a large number of people are exposed to an infectious agent, health authorities may want to triage potential victims in an area away from the hospital for the safety of their hospital personnel and patients.

G. Coordination and communication among agencies involved with the community are required for a comprehensive crisis response. The anthrax-related events in 2001 pointed out how unprepared the various levels of governments were for close collaboration with each other and the local health care systems (Atlas, 2002).

H. The number of biologic training and drills should increase to include local hospitals, emergency responders, and the public health systems in order to evaluate plans and levels of preparedness before an event actually happens in their community (JCAHO, 2002). These drills should also include other health care systems such as medical offices and health care clinics.

6.2.2. More Research

A. This study and others conducted before those bioterrorist events of 2001 should serve as a baseline to compare with post-2001 bioterrorism planning by hospitals (Wetter, 2001; Helget, 2002).

B. Studies of post-2001 bioterrorism planning by hospitals should be conducted to determine levels of preparations and if resources are adequate for hospitals, especially in rural areas.

C. Finally, more study is needed to determine what other preparations are needed to increase the readiness of government agencies, hospitals, clinics, and the community for a mass biological event.

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APPENDICES

APPENDICES

APPENDIX A - EQUATION TO CALCULATE SAMPLE SIZE

N = 837 total # of hospitals (specific subgroup of hospitals within the total number of hospitals in the United States)

n = sample size

n_o = # of completed surveys needed to reach the predetermined confidence level (95%) and allowable error (5%)

$$n_o = \frac{(1.96)^2 * (0.14) * (0.86)}{(0.05)^2}$$

Since this population is limited, the sample size needs to be adjusted.

$$n = \frac{n_o}{1 + \frac{n_o}{N}} = \frac{185}{1 + \frac{185}{837}}$$

n = 152

Considering the response rate as 50%, the number of surveys to be sent should be 304, which has been rounded to 300.
This is a subgroup, a finite group within a larger population.

APPENDIX B - SURVEY (QUESTIONNAIRE # 1)

Hospital Emergency Preparedness Survey

1 What type of facility is your hospital? (*Please circle one number*)

1 PUBLIC
2 PRIVATE
3 RELIGIOUS
4 VETERANS ADMINISTRATION
5 OTHER (*Please specify)*

2. What is your facility's licensed bed capacity?

3. Please indicate whether or not your facility has a/an: (*Please circle one number for each*)

		YES	NO
A	EMERGENCY DEPARTMENT	1	2
B	SURGICAL SERVICES	1	2
C	INTENSIVE CARE UNIT	1	2
D	WOMEN'S DEPARTMENT	1	2
E	PEDIATRIC UNIT	1	2
F	MEDICAL/SURGICAL UNIT	1	2
G	OUTPATIENT DEPARTMENT	1	2
H	PATHOLOGY DEPARTMENT	1	2
I	OTHER (*Please specify in space below)*	1	2

4. Does your hospital have a designated emergency response director? (*Please circle one number*)

1 NO (***Please Skip to Question #5***)
2 YES

→ 4a. What is his/her official title?

5. Has your facility developed an emergency preparedness response plan to a possible community disaster event? (*Please circle one number*)

1 NO (***Please skip to question #6, Page 2***)
2 YES

→ 5a. Does this plan specifically address a biologic event, such as a mass anthrax, botulism, or plague exposure? (*Please circle one number*)

1 NO
2 YES

(PLEASE TURN THE PAGE)

5b. Please indicate whether or not each of the following was instrumental in developing a disaster plan addressing a possible biologic event? (Please circle one number for each)

		YES	NO
a	Proximity to a military installation	1	2
b	Proximity to a research facility	1	2
c	High density traffic through your community	1	2
d	Government funding	1	2
e	History of an event *(Please specify what occurred)*	1	2
g	Other *(Please specify in space below)*	1	2

5c. Was the community involved in the emergency planning process, such as a community forum, panel, or other meeting? *(Please circle one number)*

1 NO
2 YES

5d. Who was consulted when developing this plan? *(Please circle number for each)*

	YES	NO
a. Fire Department	1	2
b. Other hospitals	1	2
c. City emergency planners	1	2
d. Local health department	1	2
e. State health department	1	2
f. State disaster planning	1	2
g. Centers for Disease Control and Prevention	1	2
h. Hospital staff *(Please specify)*	1	2
i. Other *(Please specify in space below)*	1	2

6. Has your disaster response staff attended any biologic incident seminars? *(Please circle one number)*

1 NO
2 YES

(PLEASE GO ON TO NEXT PAGE)

7. Does your hospital have an isolation plan for receiving mass victims having diseases suspected to be contagious? (*Please circle one number*)

   1 NO
   2 YES

8. Has your hospital ever been on alert for a real biologic event such as a large number of persons who have been exposed to an organism like anthrax? (*Please circle one number*)

   1 NO (***Please skip to question #9***)
   2 YES

   → 8a. What occurred and when?

   8b. Who were the perpetrators? *(Please circle number for each)*

		YES	NO
a.	An organized group.....	1	2
b.	Acted alone.....	1	2
c.	Do not know.....	1	2

9. Has your hospital ever participated with other hospitals or agencies in an emergency preparedness-training program to respond to mass biological outbreaks? (*Please circle one number*)

   1 NO (***Please skip to question #10, Page 4***)
   2 YES

   → 9a. Did this training program include specific biologic exposure response drills? *(Please circle one number)*

   1 NO
   2 YES

   9b. Please indicate whether or not your hospital participated in any biologic exposure response training drills. *(Please circle one number)*

		YES	NO
a.	More than once.....	1	2
b.	One time only.....	1	2
c.	Never.....	1	2

(PLEASE TURN THE PAGE)

9c. Who was involved with this training? *(Please circle one number)*

		YES	NO
a.	Hospital personnel.....	1	2
b.	Other hospitals.....	1	2
c.	Fire department.....	1	2
d.	Paramedics.....	1	2
e.	Local law enforcement.....	1	2
f.	City emergency planners.....	1	2
g.	Health department.....	1	2
h.	Other *(Please specify in space below)*.....	1	2

10. How many people does your hospital serve?

11. What is the median income of the clientele your hospital serves?

12. One final question, do you have any other comments about biological event planning or emergency preparedness in general you wish to share with us?

THANK YOU FOR YOUR COOPERATION!

APPENDIX C - TELEPHONE SURVEY (QUESTIONNAIRE #2)

1. Do you have a formal disaster response plan for bioterrorism? YES/NO

2. Who was instrumental in instigating and developing this plan?
   Who in-house specifically?

   An outside agency such as JCAHO?

3. Who are the major stakeholders associated with this plan?

4. What were/are the major barriers to developing and updating this plan?

5. How often, if ever, is this plan updated?

6. Who were most resistant to developing this plan and why?

7. How did you overcome this resistance?
   (Did you exclude them overcome their objections, what?)

8. Do you feel this plan in its current state could be effective if a biologic event with mass casualties occurred today? Why?

9. Do you feel your staff is adequately prepared to respond to an event with mass casualties? Why?

10. Do you feel your community is adequately prepared to respond to such an event? Please explain.

11. What do you think the community should do to prepare for an event such as this?

12. Coordination with other agencies is a critical element in disaster planning preparation. Please describe what links you have with other agencies if the community is affected by a biologic event, such as:

    Other hospitals (who will triage, who is designated as a trauma site, designated as support care, determine who receives what patients, etc.)?

    Public health department

    City agencies (such as communications, fire, police, disaster planners)

    State

    Federal agencies

13. Is there any additional information you would like to add?

14. Would it be possible to review a copy of your plan?
    IF THE RESPONSE IS NO:

1. If no, do you think you need this type of plan? Please explain.

2. If no, have you tried to develop a biologic event plan? Please explain.

3. If no, what or who got in the way of your developing a plan?

4. Has any other agency encouraged you to develop a plan?

OPTIONAL

Would you be willing to discuss this subject further?
If so, please fill out this form and return it with your questionnaire.

NAME_____

PHONE NUMBER_____

THE BEST TIME TO CALL TO MAKE AN APPOINTMENT FOR A 15 MINUTE PHONE DISCUSSION WITH YOU_____

WOULD YOU RATHER I E-MAIL YOU?

E-MAIL ADDRESS_____

Study should be conducted to examine what resources are reaching the local hospitals at this time and what more is needed to prepare hospitals for another bioterrorist event.

APPENDIX D - SURVEY COVER LETTER

Address

To Whom Address

Dear (Nursing Director) *will have specific name*:

As recent events in the news indicate, the US might be at risk for various forms of human-caused terrorism. As early as 1996, President Clinton began to take note of this possibility by directing the Department of Defense and other agencies such as FEMA to develop plans addressing bioterrorist events in this country. However, it is unclear what actions have been taken at the community level. For example, hospitals and medical clinics have been identified as the first likely responders rather than law enforcement or the public health departments in the event of a biologic terrorist attack. We are assessing what preparations have been made by hospitals, and whether or not any events instigated the need to plan.

We would greatly appreciate your taking a few minutes of your valuable time to help us assess planning for a mass biological event. Your facility was drawn in a random sample of hospitals located in the Western US because your facility represents others similar to yours. It is especially important that we receive your response as to whether or not you have a specific plan. If possible, we would be especially grateful if you would return the questionnaire by February 27, 2000.

Participation in this survey is purely voluntary, and all responses will be held in strictest confidence. Each questionnaire has an identification number for mailing purposes. Neither your name nor the name of your facility will be entered on your questionnaire. In order to maintain your confidentiality, please do not identify yourself on the questionnaire.

If you have any questions regarding this study, please call Margaret J. Phillips at (541) 737-3828 or Dr. Rossignol at (541) 737-3840. Thank you very much for your assistance.

Sincerely,

Margaret J. Phillips RN, BSN, MS, Graduate Student

Annette M. Rossignol, Sc.D., Professor

APPENDIX E - SAMPLE OF THE ONE-WEEK FOLLOW-UP POSTCARD

February xx, 2000

Last week, you were mailed a questionnaire seeking your opinions on hospital planning for community exposures to human-caused biologic events. The name of your facility was drawn as part of a random sample of hospitals from six western states.

If you have completed and returned your questionnaire to us, thank you very much for helping us. If you have not had an opportunity to complete the questionnaire, we would greatly appreciate your completing it and returning it to us today. Because the questionnaires have been sent to a small sample, it is very important that your response is included in our study. In this way, the results will adequately represent all the hospitals in these six states.

If for some reason you have not received your questionnaire please let us know and we will gladly send you another one. We can be reached at (541) 737-3828 or (541) 737-3840. Thank you very much for your assistance.

Sincerely,

Margaret J. Phillips, RN, BSN, MS, Graduate Student

Annette M. Rossignol, Sc.D., Professor

APPENDIX F - COVER LETTER TO BE SENT 3 WEEKS AFTER THE FIRST LETTER

To Whom Address

Dear (Nursing Director) *will have specific name*:

We wrote to you about three weeks ago asking your opinion on disaster planning for mass exposures in the community. As of this date we have not received your completed questionnaire.

Our study is examining the extent of biologic disaster planning at the community level with respect to the preparations hospitals have made. Thus, your questionnaire is very important to us to adequately assess how prepared we are in the community. The name of your facility was chosen in a scientific sampling process in which every hospital in the western United States had an equal chance of being selected. To be representative of the all the hospitals in these six states, it is essential for each facility selected to return the questionnaire. Thus, we would be especially grateful to receive your response.

A replacement questionnaire has been included with this letter if the previous one was misplaced.

Thank you very much for your assistance. If you have any questions regarding this study, please call Margaret J. Phillips at (541) 737-3828 or Dr. Rossignol at (541) 737-3840.

Sincerely,

Margaret J. Phillips RN, BSN, MS, Graduate Student

Annette M. Rossignol, Sc.D., Professor

APPENDIX G - A SUMMARY OF RESPONSES (QUESTION #5B)

History Of An Event

- 47 exposed to overhead spraying of pesticide
- Earthquakes, train accidents, Y2K
- Anthrax threat proved negative
- False anthrax threat
- Anthrax scare and trucks driving over a dam

Other Reasons

- Heightened public awareness and Infection Control Medical Director
- Routine preparedness in the medical community
- Working with local emergency services
- Salmonella poisoning by a cult
- Earthquake
- Agriculture community
- Education in community
- Corporate policy
- Due diligence
- Proximity to a large aircraft manufacturing company and scenario for a drill led to revised policy
- Preparation for a large event
- Countywide plan for terrorism
- Beginning to participate in Emergency Preparedness Committee
- Farming
- Trauma center

APPENDIX H - LIST OF FINAL COMMENTS (QUESTION #12)

- Work in progress, areas has a large tourism population
- A team to investigate a plan was just formed
- Only a few actually trained
- Keep information consistently available as it relates to policies and plans…
- Require more information on what other small rural hospitals are doing
- People trained on state levels might share information with counties
- New area for the hospital, beginning to address these issues
- Biological plan in progress due to proximity to military, research hospitals, and agriculture
- Have decontamination plan-Code Orange for HazMat incident, reference book for chemical/biological/nuclear incidents, training opportunities
- Would like to see the county put on countywide drills
- Hospitals need more training and resources
- In process of new decontamination unit, staff education, and training to start September 2000
- More state driven than local health department driven
- We are not involved in development, nor ready for an occurrence
- As of June 2000, have WMD training with state and local agencies planned
- Until mandated by JCAHO will not happen
- Most counties some training, voluntary
- Very hard to plan for an event, affect water, transportation, air quality
- Sent staff and doctors, haven't started, designed a HAZMAT plan
- Biologic event planning is in infancy and encapsulated in general disaster preparations
- More training and training time needed for staff
- Will be participating a statewide drill this year, thin will deal with biologic events
- Currently in planning process, unknown completion date
- Funding is an issue for training equipment
- Biologic event in planning stage
- Rural, haven't addressed
- Not real high on priority list, rural Rocky Mountain, feel safe
- Something to consider and plan for
- Currently adding language to plan-want a copy of results
- Funding a challenge for education and training
- Plan began with Y2K; need to get money to extend level
- Biological event plan is a goal for this year
- Who is a good resource? How to know area at risk? (Wanted no further contact)

- Need countywide disaster plans and drills and increased awareness of funding
- Problem-difficult education and training of medical community
- Wants a copy of the results-Dislike the tone of the f/u letter
- Lot of focus and repetitive surveys
- Working on a plan
- Close to major highway and railroads, potential present
- In process of state and federal funded program to develop county and hospital plan
- In process, draft form currently
- Greatest need-How to recognize bioterrorism exposure in timely, selection appropriate state, adequate isolation, rapid access, drugs
- Difficult for smaller facility to develop necessary response and training
- Anxious to participate, would appreciate funding. Curious about federal plans
- Something we need to think about as a multi-county initiative
- Prepared to deal with small incident exposures, preparing for large incidents
- Tremendous difficulty getting groups to work together-have plan
- Applying for certification, need to develop
- Still needs lots of work, all community hospitals are working together
- Would like more information, like to participate in countywide drill
- Grants available?
- Included in disaster plan
- Small community, could use money for education and setup
- Costs are too high to implement program

APPENDIX I - SUMMARY OF REASONS FOR NOT DEVELOPING A BIOTERRORIST PLAN

- Small, rural, no time, money, personnel, or resources
- Not a lot of interest at this time
- Focus on HazMat
- Rural area. Perceived threat/risk is low
- Waiting for further information from the federal government on training, no
    - money or time to develop a plan
- Lack time and expertise
- Just feel no need
- Time and energy
- No case scenario to really target need. Few have a sense of urgency
- No current need

APPENDIX J - FIGURES

Figure 1. Hospitals with a Bioterrorism Plan.

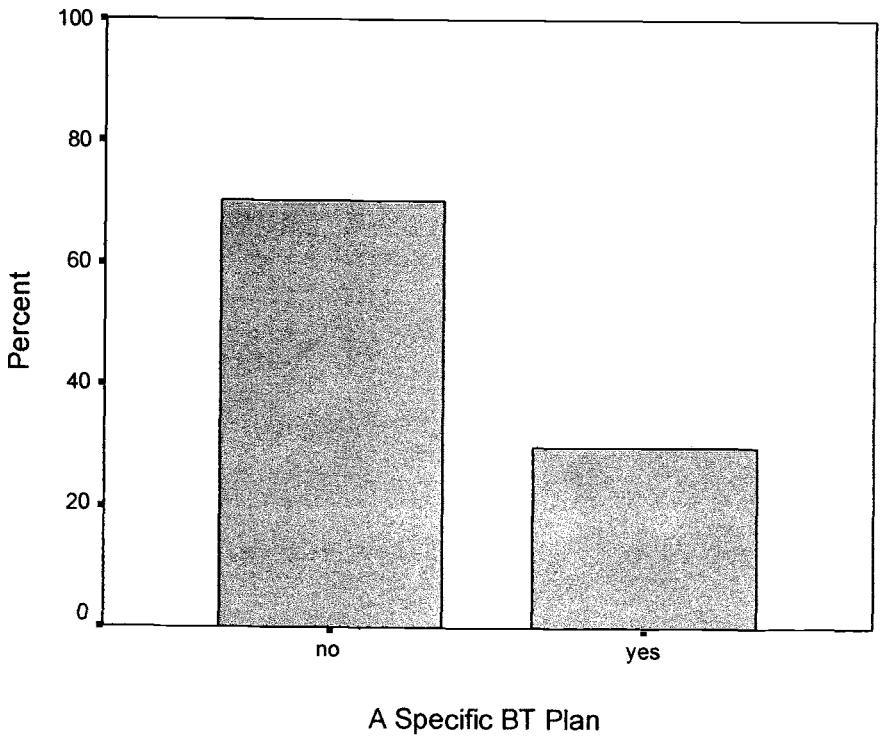


Figure 2. Hospitals with a Specific Plan, or a Plan in Progress.

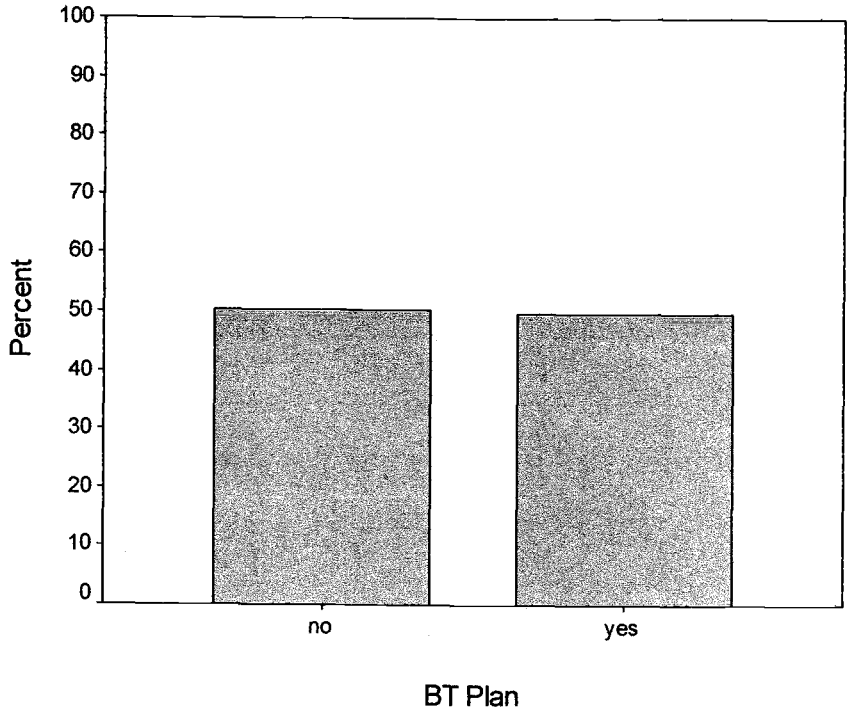


Figure 3. Hospitals with a Bioterrorism Plan by Facility Type.

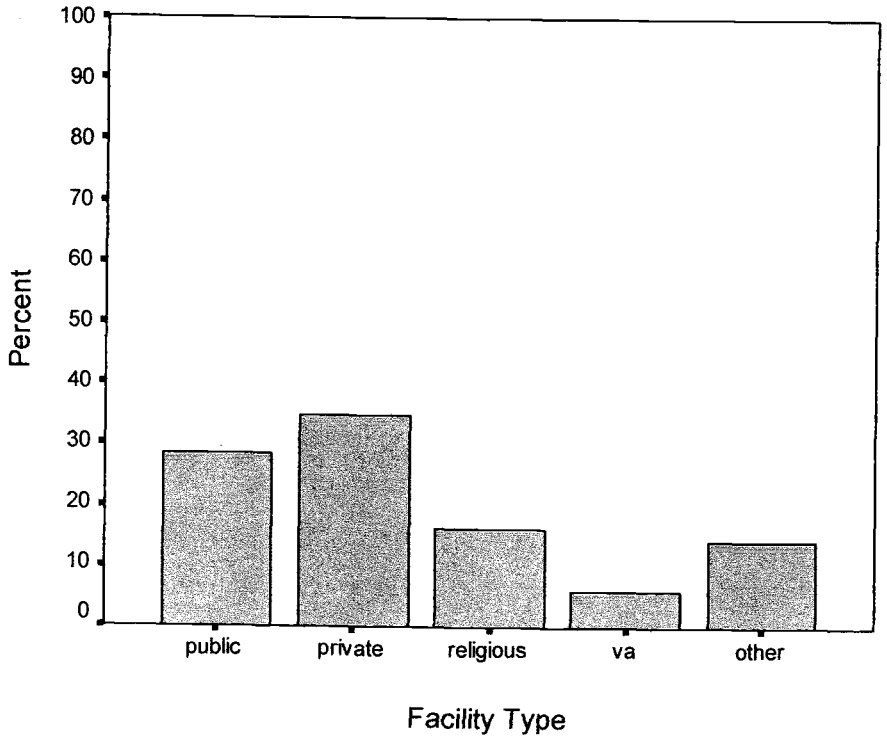


Figure 4. Hospitals with a Bioterrorism Plan by State.

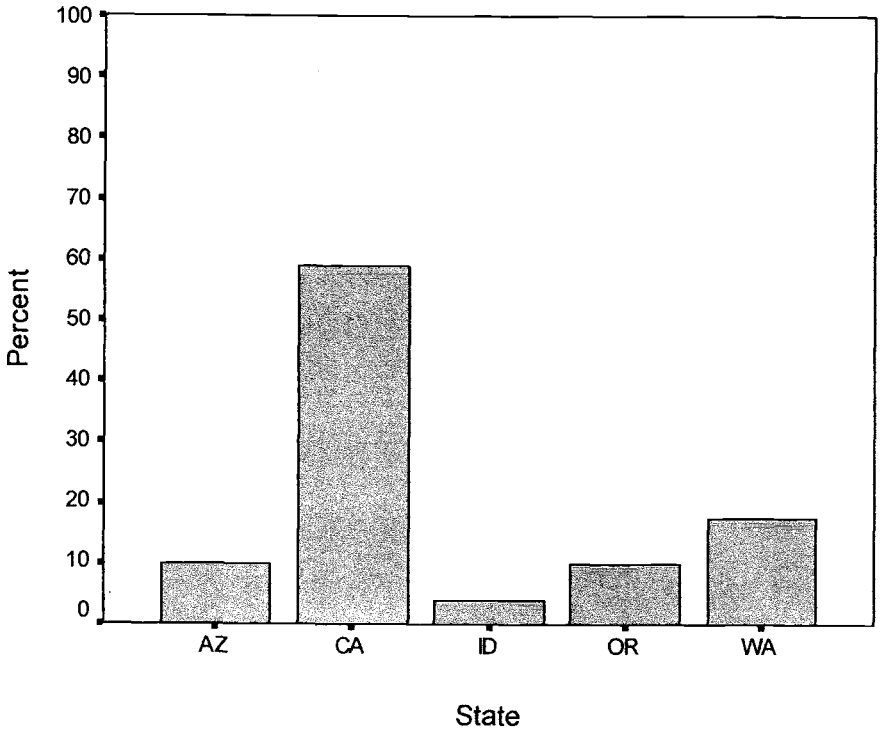
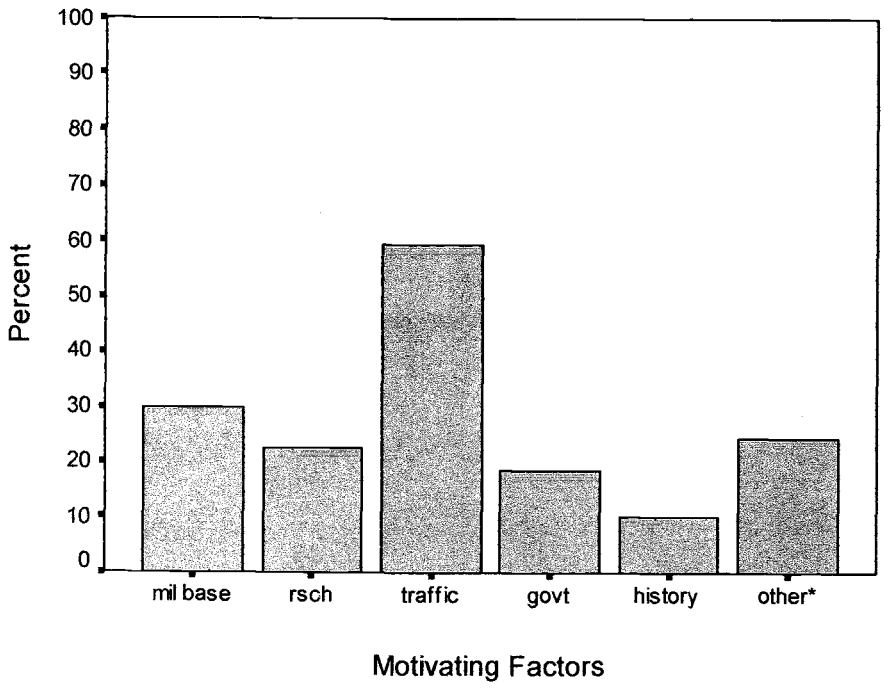
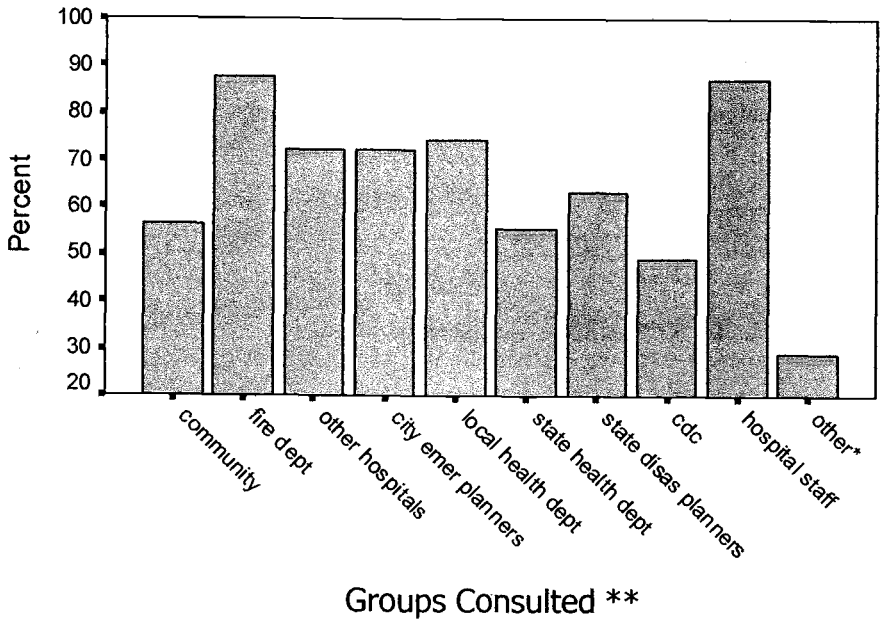


Figure 5. Motivating Factors Leading to the Development of a Bioterrorism Plan.



* as indicated by respondent

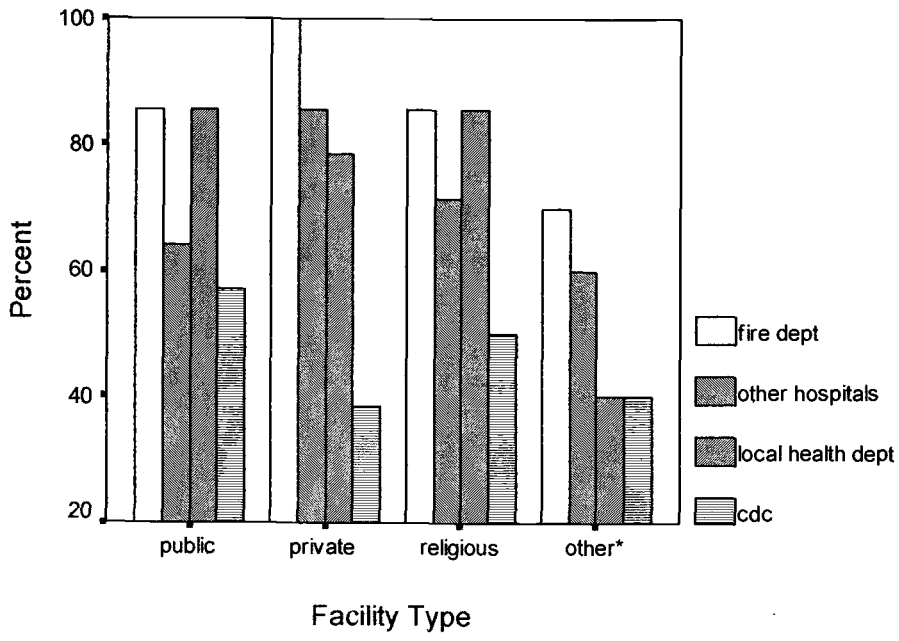
Figure 6. Groups Consulted During the Planning Process.



*as indicated by respondent

**respondents could choose more than one group

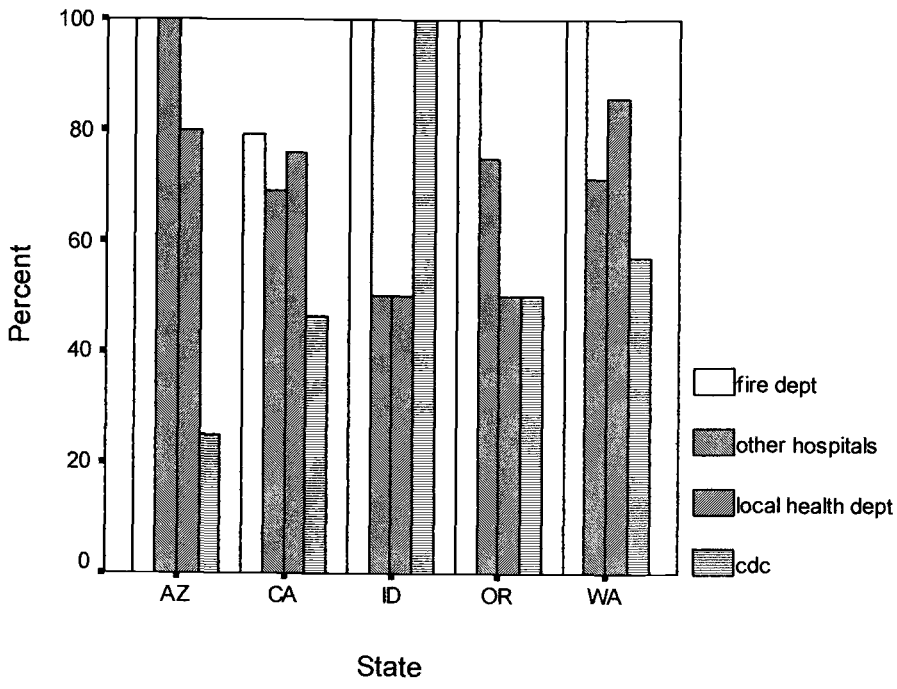
Figure 7. Major Contributors to a Bioterrorism Plan by Facility Type ** .



*includes veteran affairs and public health services

**respondents could choose more than one group

Figure 8. Major Contributors to a Bioterrorism Plan by State*.



*respondents could choose more than one group

APPENDIX K - TABLES

Table 5. Comparison of Hospital Classifications[14].

Category	Eligible Hospitals		Responding Hospitals		Responding as Percentage of Eligible
	Number	%	Number	%	%
Public[15]	445	62.6	118	66.7	26.5
Religious	87	12.2	24	13.6	27.6
Investor-Owned	131	18.4	27	15.3	20.6
Public Health Services	2	0.3	0	0	0
Veteran Affairs	17	2.4	5	2.8	29.4
Indian Affairs	10	1.4	3	1.7	30.0
Military	19	2.7	0	0	0
Total	**711**		**177**		

Table 6. Response by State.

State	Eligible Hospitals		Selected Hospitals[16]		Responding Hospitals		Responding as Percentage of Eligible
	Number	%	Number	%	Number	%	%
Arizona	75	10.6	33	11.0	20	11.3	26.7
California	413	58.1	174	58.0	94	53.1	22.8
Idaho	43	6.1	18	6.0	10	5.7	23.3
Nevada	23	3.2	9	3.0	4	2.3	17.4
Oregon	64	9.0	27	9.0	23	13.0	35.9
Washington	93	13.1	39	13.0	26	14.7	28.0
Total	**N=711**	100	**n=300**	100	**177**	100	

[14] AHA Guide (AHA, 1997)
[15] Combined categories of government, non-federal and non-governmental, non-profit
[16] Randomly selected using SPSS Ver.10.

Table 7. Motivating Factors Influencing a Bioterrorism Plan by Facility Type.

Factors	**Facility Type**			
	Public	Private	Religious	Other
Military	5/48, 10.4%	4/48, 8.3%	1/48, 2.1%	4/48, 8.3%
Research	4/47, 8.5%	4/47, 8.5%	2/47, 4.3%	1/47, 2.1%
Traffic	10/47, 21.3%	12/47, 25.5%	3/47, 6.4%	3/47, 6.4%
Government	2/47, 4.3%	2/47, 4.3%	2/47, 4.3%	2/47, 4.3%
History	1/47, 2.1%	2/47, 4.3%	1/47, 2.1%	1/47, 2.1%
Other [17]	1/40, 2.5%	4/40, 10.0%	2/40, 5.0%	3/40, 7.5%

Table 8. Motivating Factors For a Bioterrorism Plan by State.

	State				
Factors	**Arizona**	**California**	**Idaho**	**Oregon**	**Washington**
Military	4/5, 80%	9/30, 30%	0	0	2/8, 25%
Research	0	7/29, 24%	0	1/5, 20%	3/8, 38%
Traffic	3/5, 60%	18/29, 62%	1/2, 50%	2/5, 40%	5/8, 62.5%
Government	0	7/29, 24%	0	1/5, 20%	1/8, 13%
History	0	3/29, 10%	0	1/5, 20%	1/8, 13%
Other [17]	1/5, 20%	4/25, 16%	0	3/5, 60%	2/8, 25%

[17] As reported by respondent

Table 9. Groups Consulted by Hospitals During Bioterrorism Planning Sorted by Type of Facility .[18]

	Hospitals By Facility Type (N=51)					
Groups Consulted	**Public No (%)**	**Private No (%)**	**Religious No (%)**	**Veteran Affairs No (%)**	**Other No (%)**	**Total No (%)**
Community	8 (17.4)	7 (15.2)	3 (6.5)	2 (4.4)	6 (13.0)	26/46 (56.5)
Fire Department	12 (26.1)	15 (32.6)	6 (13.0)	2 (4.4)	5 (10.9)	40/46 (87.0)
Other Hospitals	9 (20.0)	12 (26.7)	5 (11.1)	2 (4.4)	4 (8.9)	32/45 (71.1)
City Emergency Planners	11 (24.4)	13 (28.9)	3 (6.7)	3 (6.7)	2 (4.4)	32/45 (71.1)
Local Health Department	12 (26.7)	11 (24.4)	6 (13.3)	1 (2.2)	3 (6.7)	33/45 (73.3)
State Health Department	7 (15.6)	9 (20.0)	5 (11.1)	1 (2.2)	2 (4.4)	24/45 (53.3)
State Disaster Planners	10 (22.7)	9 (20.5)	4 (9.1)	1 (2.3)	3 (6.8)	27/44 (61.4)
CDC	8 (18.6)	5 (11.6)	3 (7.0)	1 (2.3)	3 (7.0)	20/43 (46.5)
Hospital Staff	11 (24.4)	14 (31.1)	5 (11.1)	3 (6.7)	6 (13.3)	39/45 (86.7)
Other	1 (2.3)	5 (11.6)	4 (9.3)	0	2 (4.7)	12/43 (27.9)
Totals	89 (31.2)	100 (35.1)	44 (15.4)	16 (5.6)	36 (12.6)	285 (100)

[18] Hospitals could consult more than one group.

Table 10. Groups Consulted During Bioterrorism Planning Sorted by State [19].

	Hospitals Sorted By State (N=51)					
Groups Consulted	**Arizona No (%)**	**California No (%)**	**Idaho No (%)**	**Oregon No (%)**	**Washington No (%)**	**Total No (%)**
Community	3 (6.3)	16 (33.3)	1 (2.1)	2 (4.2)	5 (10.4)	27/48 (56.3)
Fire Department	5 (10.4)	23 (47.9)	2 (4.2)	5 (10.4)	7 (14.6)	42/48 (87.5)
Other Hospitals	5 (10.6)	20 (42.6)	1 (2.1)	3 (6.4)	5 (10.6)	34/47 (72.3)
City Emergency Planners	4 (8.5)	19 (40.4)	2 (4.3)	2 (4.3)	7 (14.9)	34/47 (72.3)
Local Health Department	4 (8.5)	22 (46.8)	1 (2.1)	2 (4.3)	6 (12.8)	35/47 (74.5)
State Health Department	4 (8.5)	15 (31.9)	2 (4.3)	2 (4.3)	3 (6.4)	26/47 (55.3)
State Disaster Planners	4 (8.5)	16 (34.8)	2 (4.4)	2 (4.4)	5 (10.9)	29/46 (63.0)
CDC	1 (2.2)	13 (28.9)	2 (4.4)	2 (4.4)	4 (8.9)	22/45 (48.9)
Hospital Staff	5 (10.6)	24 (51.1)	1 (2.1)	4 (8.5)	7 (14.9)	41/47 (87.2)
Other	3 (6.7)	5 (11.1)	0	3 (6.7)	2 (4.4)	13/45 (28.9)
Totals	38 (12.5)	173 (57.1)	14 (4.6)	27 (8.9)	5 1(16.8)	303 (100)

[19] Hospitals could consult more than one group.

Table 11. Comparisons of Hospitals with a Bioterrorism Plan to their Isolation Plans (n=51).

Hospitals with an isolation plan	**No (%)**	**p Value**
Hospitals with an isolation plan [20]	30 (63.8)	p=0.06[21]
Hospitals sorted by state [20]		
Arizona	3 (6.4)	p= 0.48[20]
California	20 (42.6)	
Idaho	1 (2.1)	
Nevada	0	
Oregon	4 (8.5)	
Washington	2 (4.3)	
Hospitals sorted by type[22]		
Public	9 (20.0)	p= 0.95[20]
Private	11 (24.4)	
Religious	4 (8.9)	
Veteran Affairs	1 (2.2)	
Other[23]	5 (11.1)	

[20] Missing Values = 4
[21] Variables-isolation plan: Yes vs. No.
[22] Missing Values = 6
[23] Other includes hospitals listed as other *by respondent*