2021

Examining Terrorism Attacks and Regional Preparedness in the United States

Trebor Curtis Yocum
Walden University

Walden University

College of Social and Behavioral Sciences

This is to certify that the doctoral dissertation by

Trebor Curtis Yocum

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review committee
Dr. Mark Stallo, Committee Chairperson,
Public Policy and Administration Faculty

Dr. Haroon Khan, Committee Member,
Public Policy and Administration Faculty

Dr. Anne Hacker, University Reviewer,
Public Policy and Administration Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2021

Abstract

Examining Terrorism Attacks and Regional Preparedness in the United States

by

Trebor Curtis Yocum

MBA, Embry-Riddle Aeronautical University, 2007

BS, Embry-Riddle Aeronautical University, 2001

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

School of Public Policy

Walden University

August 2021

Abstract

After the 9/11 terrorist attacks, the U.S. government renewed efforts to prepare for future attacks. Despite research on federal and state government preparedness, there was a lack of scholarship on trends in terrorist attacks at the local level. The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether significance exists between characteristics of the terrorism incidents (weapon used, target type) and region. The conceptual framework included Grundmann's risk management and Tomuzia et al.'s risk assessment scenario models. Answering the research questions entailed examining trends in terrorist attacks in the United States between 2001 and 2018 (number of incidents, injuries, fatalities), including relationships by region, weapon used, and target type. Secondary data from the Global Terrorism Database underwent analysis using ARIMA models for time-series data and chi-square and post hoc analyses for categorical level data. There was an examination of type of weapon used and target type for differences between regions. Findings revealed that trends in terrorist attacks for injuries did not differ across time; however, trends in terrorist attacks for fatalities decreased over time. Changes in terrorist attacks by region were significantly related to weapon used and target type. Findings may lead to positive social change by helping policymakers understand future targets and characteristics of terrorist attacks, potentially improving preparedness and thereby reducing injuries and death. Future research is needed to confirm and expand the findings, including studies on terrorist attacks against the United States on foreign soil, such as those directed at U.S. embassies.

Examining Terrorism Attacks and Regional Preparedness in the United States

by

Trebor Curtis Yocum

MBA, Embry-Riddle Aeronautical University, 2007

BS, Embry-Riddle Aeronautical University, 2001

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

School of Public Policy

Walden University

August 2021

Dedication

I would like to dedicate the research to the men and women on the front lines of emergency management. It is our first responders who make this country safe and help to thwart disasters.

Acknowledgments

I would like to thank my family and friends for helping me get to this point in my life. I would like to especially acknowledge my grandparents, Russell and Shirley Yocum, for helping me out, both financially and mentally. Without them, I wouldn't be here.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

With the ever-increasing rate of globalization in the 21st century, a tremendous number of people have moved to urban areas, creating densely populated cities. Although this growth of urban areas is worthy of celebration, recent history shows that the urban population lives amid an ever-present threat of terrorism (Clarke & Moghadam, 2018). According to Taylor (2019), terrorism is the unlawful use of violence or force against property or person to coerce or intimidate the civilian population, the government, or any other entity to advance a social goal or further a political agenda. Some notable terrorist actions include the 9/11 attack in the United States, the July 7, 2005, attack in London, the Paris attack of 2015, and the Mumbai attacks of 2008 (Lowry, 2018). These attacks indicate that many cities globally are at the risk of the ever-growing and evolving threat of terrorism.

Since the terror attacks on September 11, 2001, the United States has maintained a greater focus on preventing and stopping all forms of terrorism. Although there were terrorist attacks prior to 2001, including some as early as the 1980s against members of an Indian reserve and the LaGuardia Airport Bombing in 1975, the nature, scale, and societal impacts stemming from terrorism have dramatically changed since then (Lowry, 2018). Changes include the development of the Department of Homeland Security (DHS) and the Transportation Security Administration (TSA). Understanding the trends and methods used in terrorist attacks in the United States could better empower authorities to prevent terrorists from succeeding.

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. The importance of understanding the trends in terrorism attacks in the United States pertained to the need to be prepared to respond to potential attacks. Preparation at a regional level is especially important to gain public trust and confidence and to ensure the safety of everyone. Preparation for future terrorism events is necessary for every major city and region. The results of this study may be useful for regional leaders to reexamine their preparedness for terrorist attacks and what they need to do to combat terrorism effectively, particularly for regions that have had terrorist attacks since 2001.

This research was a descriptive quantitative study to examine trends in terrorism attacks, including the number of incidents, weapon used, fatalities, injuries, and target type. Also examined were the differences in these variables based on the region in which the terrorist incident took place. This chapter presents the background and statement of the problem, purpose of the study, and guiding research questions and hypotheses. Further, in this chapter, I discuss the theoretical framework, nature of the study, definitions of terms, assumptions, scope and delimitations, limitations, and significance of the study.

Background

Before September 11, 2001, the threat of a terrorist attack was considered unlikely; however, attention to terrorist attacks grew during the anthrax incident in the

United States that followed the attack (SteelFisher et al., 2012; Sun & Yang, 2017). The creation of the DHS was a means of keeping the country safe from future terror attacks. The TSA aimed to protect airports and other modes of widescale public transportation. The emergence of the Health Protection Agency following several outbreaks of new infectious diseases provided a new organizational umbrella for addressing preparedness for a terrorist attack. The tactic of terrorism also calls for generating as much fear in the population as possible (Kar et al., 2012). The threat of terrorism itself can be unnerving. Therefore, although terrorism ranks as a low-risk danger, its characteristics make it a source of ongoing worry and concern.

In the United States, the threat of terrorism remains despite the measures adopted to address the surging cases of domestic terrorism (Taylor, 2019). Some of these measures include the enactment of counterterrorism legislative acts and proactive law enforcement initiatives. Clarke and Moghadam (2018) affirmed that with the growing incidences of religious intolerance, terrorist-related acts in the United States increased steadily from 2014 to 2019. Although the majority of these acts have links to domestic terrorism, the United States still faces notable challenges from international terrorists. Zulli et al. l. (2021) classified the international terrorists facing the United States into three groups: formalized terrorist organizations, radical international jihad movement, and state sponsors of terrorism. Taylor (2019) identified two groups of domestic terrorists: the right and left wings. According to Clarke and Moghadam, addressing the international and domestic terror threats in the United States will require collaborative and innovative initiatives anchored on coordination and preparedness at all levels.

Preparedness is a comprehensive concept, including issues such as communication, infrastructure, education, and response (Arrazola et al., 2018; Manuell & Cukor, 2010; Poutanen, 2007; Smith & Davison, 2010; Waterer & Robertson, 2009). Public compliance is also a key issue (Manuell & Cukor, 2010). Public compliance refers to a person's public expression and change in behaviors related to a group or public pressure. For example, if government leaders order an evacuation due to a perceived disaster, people might choose not to evacuate based on the individuals around them. If they cannot get off of work or their family thinks complying with the evacuation order is not the right move, people could go against what is accurate and make the wrong decisions.

In acts of terrorism, lockdown and evacuation are two critical tools of response, and compliance with either mandate is crucial. Arguing that specific stakeholder perception of preparedness is important, Jacobson et al. (2010) surveyed nurses in North Texas regarding their sense of preparedness for a terrorist attack. Less than 10% of participants felt they were prepared, although 30% expressed willingness to collaborate with state and federal agencies in responding to an event. Also, 69% reported a need for more training to consider themselves prepared for such an event. A simulation-based training process would likely improve nurses' sense of preparedness (Morrison & Catanzaro, 2010). Katz et al. (2006), however, found that due to funding constraints, inadequate surge capacity, and workforce shortages in public health, most hospitals still would not be equipped to respond well to a terrorist event.

Problem Statement

The problem addressed in this study was that local officials were only modestly confident in their local communities' and governments' preparation to adequately respond to a terrorist event based on analysis of multiple factors (Brandeau, 2019; David & Le Dévédec, 2018; Scott & Errett, 2018; Welby-Everard et al., 2020). A primary paradigm to formulate a plan to respond to a terrorism incident is the concept of preparedness. Preparedness involves forecasting and taking precautionary measures before an imminent threat when warnings are possible (United Nations International Strategy for Disaster Reduction, n.d.). Previous research shows the public was poorly prepared for terrorism; also, many in the health care and public health communities were relatively unprepared both in knowledge and capacity to respond effectively to a terrorist attack (Eto & Kanatani, 2018; Funk, 2018). Despite research on state government preparedness for potential terrorist attacks (Grundmann, 2014), there is a lack of scholarship on the trends in terrorist attacks at the local level.

Although terrorism has alarming consequences, some fail to take the threat of terrorism seriously. Many stakeholders do not think themselves susceptible to the threat, with establishing preparedness for such a minimal threat often viewed as too expensive or involved (Green et al., 2019; Tournier et al., 2019). In a resource-constrained environment, the level of preparedness depends not only on its potential impact but also on its likelihood of occurrence (Banerjee et al., 2017; Ryan, 2016). This was particularly true at the local, or city and community, level, where officials often find themselves caught between funding problems and a need for preparedness; as a result, they do not

exhibit a high degree of preparedness for terrorism (Zacchia & Schmitt, 2018). As such, this study mainly focused on trends in terrorist attacks between 2001 and 2018 and how these trends differ by region.

Purpose of the Study

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance exists between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. Understanding surveillance, early detection, effective evacuations, control of the movement of involved individuals, and risk communication is essential for improving preparedness for terror attacks and may help to improve preparedness for natural disasters (Green et al., 2019). The importance of understanding the trends in terrorism attacks in the United States pertains to the need to be prepared to respond to potential terrorist attacks. The secondary data used in this quantitative study came from the Global Terrorism Database (GTD). Descriptive statistics included frequency counts and time-series analysis, which I used to determine the trends in terrorism attacks in the United States between 2001 and 2018, including trends by region in the number of incidents, injuries, and fatalities. I used multinomial logit analysis to determine the relationships between the region of the terrorist attack and the characteristics of the attack (weapon used and target type).

Research Questions and Hypotheses

The following research questions (RQs) and associated hypotheses guided this study:

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States?

$H_0$1: There were no changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States.

H_a1: There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States.

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States by region?

$H_0$2: There were no changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States by region.

H_a2: There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States by region.

RQ3: What was the relationship between the region of the terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type)?

$H_0$3: There was no statistically significant relationship between the region of terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type).

H_a3: There was a statistically significant relationship between the region of terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type) for one or more regions and one or more characteristic of terrorist attack.

Conceptual Framework

Conceptual frameworks are useful for providing an illustrative representation and can be diagrammatic or descriptive (Rathert et al., 2012; Robson, 2002). The two models in this study's conceptual framework were the flowchart for major areas of concern connected to bioterrorist attacks developed by Grundmann (2014) and the flowchart of categories used to assess risk related to a terrorism scenario developed by Tomuzia et al. (2013). In adapting Grundmann's model to this study, I removed the elements related to decontamination and pre- and postexposure prophylaxis.

As shown in Figure 1, the model for the major areas of concern connected to a terrorist threat was appropriate for this study because it incorporates the aspects of risk assessment, risk management, and risk communication involved in addressing a terrorist threat (Grundmann, 2014). Grundmann (2014) identified a need for additional research in each area to improve responses to terrorism threats. For the study, Grundmann's model was useful in understanding how the areas of risk assessment, explored in the study's data analysis, could be connected to areas of risk management, such as preparedness, to improve the response to terrorist threats a local level.

Figure 1

Major Areas of Concern Connected to a Terrorist Threat
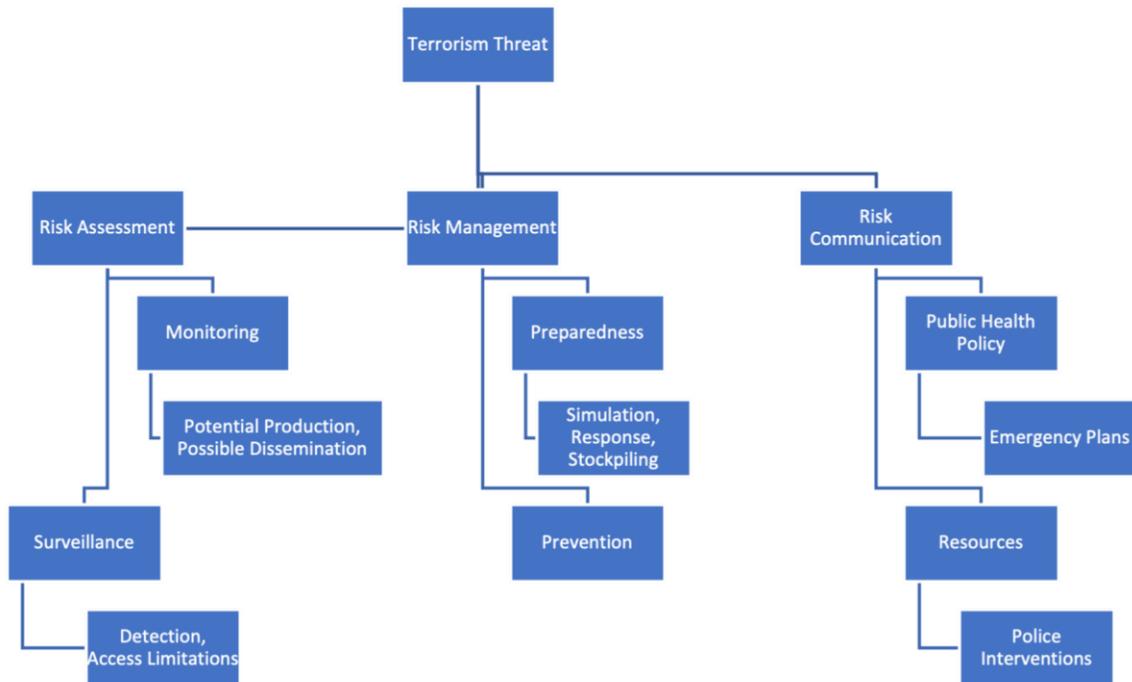
Note. Copyright 2014 by Dove Medical Press. Adapted with permission.

There are many areas of concern related to terrorist threats, such as monitoring and identifying potential terrorist attacks, preventing attacks, and managing the response plans for the attacks that do occur. These processes can be time-consuming and expensive, preventing certain regions from having the same access to threat management as others. Some regions might have other areas of concern when it comes to managing a potential terrorist attack. For example, securing cities with important national or international infrastructure components, such as ports or federal buildings, might justify additional concern.

Nature of the Study

A quantitative method was appropriate in this study as it aligned with the purpose of this study, which was to examine trends in terrorist attacks in the United States between 2001 and 2018 and investigate whether factors related to terrorist attacks vary by region. This was a descriptive quantitative study. The purpose of descriptive quantitative research is to describe and interpret the status of individuals, settings, conditions, or events (Mertler, 2014, 2016). In this study, I examined and interpreted the status of terrorist incidents in the United States from 2001 to 2018 as reported in GTD. To answer RQ1 and RQ2, I used descriptive statistics, including frequency counts and time-series charts, to examine the trends in the number of incidents, injuries, and fatalities associated with terrorist incidents between 2001 and 2018, as well as trends in the regions in which the terrorist incidents occurred. To answer RQ3, I used a multinomial logit model. The multinomial logistic model was appropriate because it assumes that the data are case-specific and is thus useful with nominal variables (Long, 2014; Rodriguez, 2007). For RQ3, the independent/predictor variables examined against the dependent variable of region were the weapon used and target type of the terrorist incident.

Because I used historical secondary data to analyze previous terrorist attacks, the data were case-specific by each terrorist attack, also referred to as a terrorist incident. I used secondary data obtained from the GTD. I used descriptive statistics, including frequency counts and time-series analysis, to determine the trends in terrorist attacks in the United States between 2001 and 2018, including trends by region in the number of incidents, injuries, and fatalities. Multinomial logit analysis allowed me to determine the

relationships between the region of the terrorist attack and the characteristics of the attack (weapon used and target type). There were no human subjects used in this study. The subject was terrorism incidents, also known as terrorist attacks, in the United States between 2001 and 2018. All terrorism incidents occurring between 2001 and 2018 in the United States and recorded in the GTD merited inclusion in this study.

Definitions

Bioterrorism. The deliberate release of viruses, bacteria, or other germs (agents) used to cause illness or death in people, animals, or plants (Tegos, 2013).

Man-made disasters. A disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions (Bilala & Galamas, 2015).

Preparedness. The extent to which the education of the public has become a part of preparedness and the extent to which the community itself is aware or prepared for a terrorist event (Pinto, 2013).

Terrorism. The U.S. Code of Federal Regulations defines terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, or social objectives" (General Functions, 1965, para. i).

Assumptions

Because of the use of secondary data, the central assumption was that the data from GTD were accurate and represented the terrorist attacks in the United States between 2001 and 2018. The second assumption was that each terrorist attack in the United States between 2001 and 2018 was an independent event. This assumption was

important for the assumption in the analysis that the data on each incident were case-specific.

Scope and Delimitations

The focus of this study was terrorist attacks that occurred in the United States between 2001 and 2018 and were reported in the GTD. The findings reflected trends in terrorist attacks in the United States between 2001 and 2018, including region-level data. Being prepared at the regional level is especially important to gain public trust and confidence. Therefore, a region-level focus was appropriate in this study to determine whether there were differences in the characteristics of the terrorist attack (weapon used and target type). This study also concerned what influences the region's preparedness and how federal, state, and local resources can help. As such, the scope of this study primarily revolved around the man-made disaster of a terrorist attack. Excluded from this study were man-made disasters not considered as acts of terrorism.

Limitations

One limitation of this study was the use of secondary data, as the findings were limited to the data included in the GTD. The study's findings were also limited to terrorist attacks in the United States between 2001 and 2018. Therefore, the results are not generalizable to other countries.

Significance

Based on the review of literature, the public is ill-prepared for such an event. Citizens are poorly educated in terms of preparedness. Even the health care and first responder communities are unprepared in both knowledge and capacity to respond

effectively to a terrorist attack. Further, the research showed that many stakeholders do not think themselves susceptible to the threat. Many perceive establishing preparedness for such a minimal threat as too expensive, having a low sense of self-efficacy in administering or carrying out a plan. According to the literature, these beliefs are particularly true at the city and community levels. Local officials struggle between funding problems and a need for preparedness and thus do not exhibit a high degree of preparedness for terrorism (Alba & Gable, 2011; Choi, 2009; Roof & Oleru, 2008). Accordingly, this study is of significance, as it provided evidence of trends in terrorism and may be useful in helping regions prepare for future attacks by understanding trends in such incidents in the United States between 2001 and 2018. The study was also helpful in determining whether there were trends in the characteristics of terrorism incidents based on the region in which they occurred between 2001 and 2018, showing whether identifying specific predictive measures could improve preparedness for future attacks.

Summary

The problem addressed in this study was that local officials were only modestly confident of their local communities and governments being prepared to adequately respond to a terrorist event and that there were many reasons for the gaps between ideal and current state of preparedness (Bush & Perez, 2012; Sun & Yang, 2017). As such, the purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance exists between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. Understanding surveillance, early

detection, effective isolation of terrorists, control of the movement of involved individuals, and risk communication is essential for improving preparedness for terrorist attacks. Awareness could also help to improve preparedness for natural disasters (Green et al., 2019). I analyzed secondary data from the GTD using descriptive statistics and multinomial logit analysis. Chapter 2 presents a review of the literature regarding terrorism and region-level medical preparedness for countering terrorist attacks.

Chapter 2: Literature Review

The problem addressed in this study was that local officials were only modestly confident of their local communities' and governments' preparation to adequately respond to a terrorist event based on analysis of multiple factors (Brandeau, 2019; David & Le Dévédec, 2018; Scott & Errett, 2018; Welby-Everard et al., 2020). A primary paradigm utilized to formulate a plan to respond to a terrorism incident is the concept of preparedness. Preparedness involves forecasting and taking precautionary measures prior to an imminent threat when advance warnings are possible (United Nations International Strategy for Disaster Reduction, n.d.). Previous research shows that the public is poorly prepared for terrorism. Many corners of the community are relatively unprepared in both knowledge and capacity to respond effectively to a terrorist attack (Eto & Kanatani, 2018; Funk, 2018). There is also a lack of research on the trends in terrorist attacks based on the region of attack. This gap is particularly apparent at the local, or city and community, level, where local officials are caught between funding problems and a need for preparedness and do not exhibit a high degree of terrorism preparedness as a result (Zacchia & Schmitt, 2018). Thus, new region-specific research is necessary to provide key stakeholders with the knowledge to make effective evidence-based decisions about terrorism preparedness. I focused this study particularly on trends in terrorist attacks between 2001 and 2018 and how these trends differ by region.

Literature Search Strategy

The reviewed literature review emerged from a search of the following EBSCO databases: Academic Search Premier, MasterFILE Premier, Business Source Premier,

ERIC, Communication & Mass Media Complete, Psychology and Behavioral Sciences

Collection, PsycINFO, and PsycARTICLES. To find relevant research for this review, I

searched key terms and phrases, such as *terrorism, preparedness, preparation, disaster*

preparedness, disaster response, terrorism preparedness, terrorism attacks, local

government, and *local officials*. Despite some seminal and theoretical works cited to

provide a comprehensive understanding of the topic, most of the reviewed research was

published within the past 5 years to ensure relevance.

In the review, I examine the extent to which local officials perceived that they

were prepared to respond adequately to a terrorist incident in their communities (Bush &

Perez, 2012; Sun & Yang, 2017). I first provide insight into how the theoretical

framework will guide addressing the research questions. Subsequently, I examine the

threat of terrorism in the United States. The concept of preparedness forms the major

paradigm in response to an event; accordingly, I reviewed studies of the general

preparedness of the United States on federal, state, and local levels. This entailed

examining the concept of preparedness, the extent to which educating the public has

become a part of preparedness, and the degree to which the health care community is

aware of or prepared for a terrorist event.

In this chapter, I review various types of preparedness, including terrorism

surveillance systems, emergency plans, security, and the extent to which the public health

and military infrastructures need to overlap and collaborate to respond adequately to a

terrorist attack. I also appraise the validity of the health belief theory and models of

public health, as they might be useful to gain a better sense of the accuracy of

stakeholders' perceptions of preparedness. I then examine several case studies of localities undertaking preparedness plans for emergencies in general and terrorism specifically to determine their effectiveness. The review closes with studies about the perceptions of local stakeholders, especially local government officials, on the state of preparedness for a terrorist attack in their communities. I discuss research on stakeholders' perceptions of how well their community is prepared for such an event, finding that many gaps remain in preparedness for terrorism at the local or regional level.

Conceptual Framework

The two models I used for the conceptual framework in this study were the flowchart for major areas of concern connected to a terrorism threat developed by Grundmann (2014) and the flowchart of categories used to assess risk related to a terrorism scenario developed by Tomuzia et al. (2013; see Figure 1). I selected the model for the major areas of concern connected to a terrorism threat for the study because it incorporates the aspects of risk assessment, risk management, and risk communication involved in addressing a terrorism threat (Grundmann, 2014). Grundmann identified a need for additional research in each area to improve preparedness and response to terrorism threats, developing a framework to demonstrate the complexity of addressing potential terrorist threats.

Grundmann's (2014) model was useful in understanding how the areas of risk assessment, explored in the data analysis of the study, connect to areas of risk management, such as preparedness, to improve the response to terrorism threats on a regional level. Specifically, the problem addressed was preparedness for potential

terrorist attacks, particularly given that the ability to prevent such attacks is limited (Pal et al., 2017). With Grundmann's (2014) model, preparedness is within the category of risk management along with prevention. I examined the status of terrorist threats between 2001 and 2018 by analyzing terrorism incidents in this period. In accordance with Grundmann's (2014) model, I focused on risk assessment by analyzing aspects of monitoring and surveillance, as tracked in the GTD. Grundmann was also relevant for the study because, as reflected in Figure 2, I incorporated the federal, state, regional, and local considerations in addressing a potential terrorist attack. The conceptualization of the different levels of agency response and preparedness for a potential terrorist attack was important, as the focus of this study was on preparedness at the regional level (which Grundmann considers the local level). As shown in Figure 2, Grundmann's model reflects the different levels of agency requirements needed to prepare for and respond to terrorist attacks.

Figure 2

Federal, State, Regional, and Local Agency Involvement in a Potential Terrorist Attack
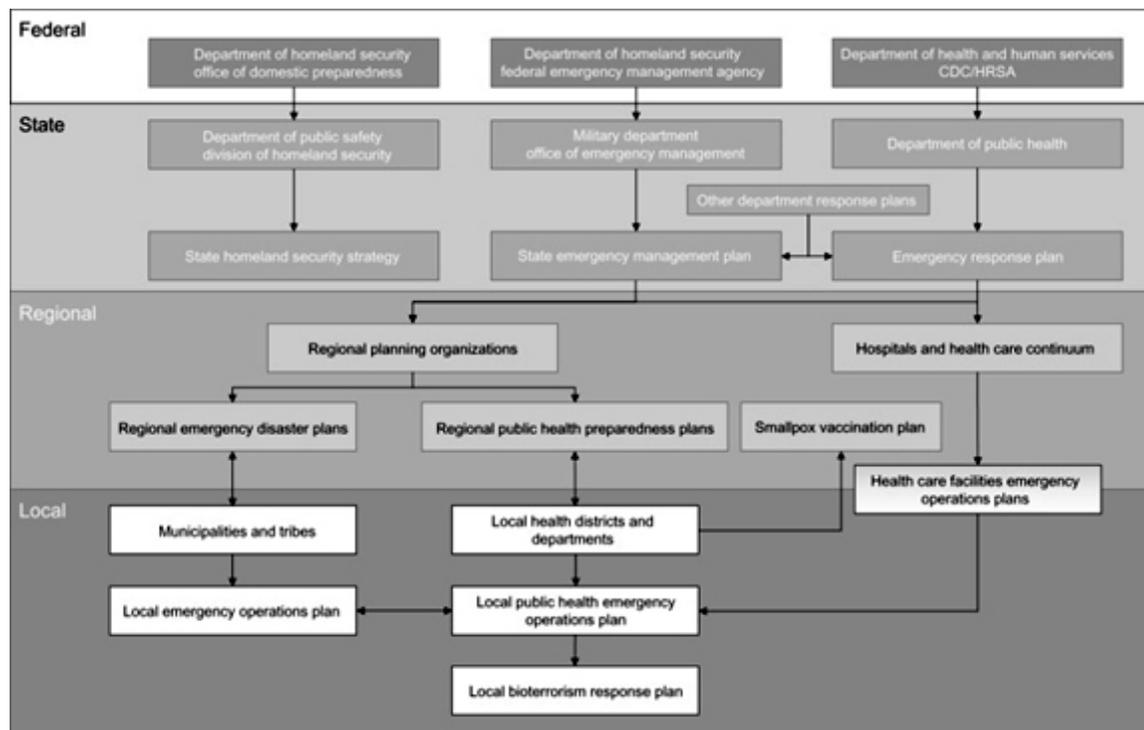
Note. Copyright 2014 by Dove Medical Press. Reproduced with permission.

<div align="center">

Review of the Literature

</div>

The analysis of terrorism must begin by defining what terrorism is. Given its long

and complicated history, terrorism is difficult to define. One of the frustrating things

about studying terrorism is the openness of the definition to include a large number of

possible events (Simeon, 2019). "What is terrorism?" is a question often asked by the

media, politicians, educators, and others who are interested in preventing terror attacks on

U.S. soil (Lowry, 2018). Sometimes, this question emerges as if terrorism were a

scientific study with a single definition. Although terrorism can be vague and broad, it is

easily recognized by people who perceive it as a "know it when you see it" type of

phenomenon (Zulli et al., 2021). Still, a general definition can be helpful in understanding what terrorism is and how it affects people.

Terrorism is the use of violence and the intimidation of civilians in the pursuit of political ends (Clarke & Moghadam, 2018). According to Saul (2006), terrorism is "extreme fear" (p. 34). There are many disagreements as to what constitutes terrorism. Is it only crimes against innocent civilians? What happens if one side deems the other as needing to be punished or guilty? Internationally, terrorism is defined as "criminal violence intended to intimidate a population or coerce a government or international organization; some national laws add an ulterior intention to pursue a political, religious, or ideological cause" (Saul, 2006, p. 36).

The use of terror is not new. In World War II, terrorism was one of the weapons of mass destruction. Because the definition of terrorism can encompass many different events, an analysis of terrorism is complicated (Lowry, 2018). There is no single defining element that qualifies an event as terrorism. For example, a group of armed gunmen occupying and robbing a bank can intimidate civilians but not be terrorists because there is no plot to influence politics (Simeon, 2019). However, that same group of gunmen in an airport where a diplomat landed and is taken hostage indicates a clear case of terrorism. In other cases, acts of violence, such as bombings of public places, have no political motivations but manage to terrify the public and are considered terrorism (Huff & Kertzer, 2018). This confusion over what constitutes terrorism stems from the practical application of the label *terrorism* to describe different events that might not fit the strict definition but are widely accepted as such.

The Rise in Terrorism

Terrorism has existed in one form or another for centuries, something not clearly evident from the current views on terrorism. Many regard the beginning of terrorism as the September 11, 2011, World Trade Center attacks; however, 9/11 was just the beginning of the modern age of terrorism (Jones et al., 2020). This single attack significantly reshaped the act of terrorism and its reception by communities around the world, placing terrorism at the forefront of the world's consciousness, where it had little consideration before 2001 (Clarke & Moghadam, 2018). The United States, for example, had not seen a major terrorist attack that affected the entire country in such a way in decades (Lowry, 2018). September 11 changed that, making terrorism a threat of which every American was aware and in some way affected.

Considered the beginning of the modern age of terrorism, the 9/11 attacks signaled a significant and persistent rise in terrorism over the following decades (Taylor, 2019). Traditional Western powers, such as the United Kingdom, saw a significant increase in terrorism as groups saw they could inflict pain and fear on the countries against which they held vendettas (Jones et al., 2020). It is important to note that much, if not most, of this rise has been from homegrown terrorists who are largely disgruntled citizens of the country they attack. This is in stark contrast to the view that Middle Eastern countries are sending terrorists to Western countries to attack civilians and government organizations (Simeon, 2019). Countries are, in essence, creating their own terrorists that attack from within.

Despite a surge in terrorist attacks after 9/11, that trend slowly decreased over time. There are fewer attacks on average per day today than in the years after 9/11 (Jones, 2018). Statistical data may not show the full extent of how this change has occurred. Efforts by multiple countries receive credit for the decrease, but they do not fully explain the downward trend (Jones et al., 2020). Still, terrorism continues to be a significant issue in parts of the world and is an ever-constant threat everywhere. Efforts to curtail terrorism have profoundly affected how people live their lives, despite the decrease. These security measures are still in place and contribute to significant changes in industries and how countries relate to each other (Taylor, 2019). Military action has undoubtedly stressed relationships between countries, which may prove permanent or take a very long time to correct.

Understanding Terrorism in the United States

It is important to note that although terrorism has declined, the number of terrorism-like events has increased. Statistics fail to indicate what terrorism is globally or, in particular, in the United States (Lowry, 2018). It could be that the number of deaths from carjacking has gone up, but without catching the perpetrators, the number of dead victims from being hit by a vehicle has gone down. Likewise, it could be that the number of public shootings has gone up, but without apprehending the shooters, the number of dead victims from such shootings has gone down (Jones, 2018). Thus, it is impossible to infer trends from these statistics.

Differentiating Between Domestic and International Terrorism in the United States

In the United States, there is both international and domestic terrorism. Since 9/11, there is a perception of most terrorism as international, where foreign actors from other countries come onto American soil and commit crimes against civilians, such as the attack on the World Trade Center (Zulli et al., 2021)—in this case, Muslim terrorists from the Middle East. However, this is not the only type of terrorism in America. Domestic terrorists, such as those taking part in the insurrection against the U.S. Capitol on January 6, 2021 (Taylor, 2019), are forces of terrorism from within a nation; other examples include a mass shooting in a public space by a citizen (Huff & Kertzer, 2018). In the United States, known domestic terrorist groups include the Ku Klux Klan, United Freedom Front, and Aryan Nations (Lowry, 2018). However, an individual does not need to be a part of an identified group to be a terrorist.

As the number of mass shootings in the United States has risen dramatically, the vague definition of terrorism makes it challenging to determine incident type. Many of these shootings have the same circumstances as terrorist events but without the terrorism label for various reasons (Taylor, 2019). Race is a significant factor in the labeling of events, with non-White perpetrators deemed terrorists and White perpetrators rarely so (Jones, 2018). There is a bias about terrorism that involves the concept of domestic or White terrorism, where the public is more likely to label an event as a disturbed individual's call for help instead of domestic terrorism (Felthous, 2014).

The National Security Agency (NSA) provides comprehensive data to understand terrorism in the United States (Lansford, 2018). The NSA monitors and intercepts the

communications of international terrorist organizations and other suspicious activities that are not of intelligence interest to the U.S. government (Simeon, 2019). The 1970s saw the advent of organized crime in the United States, accompanied by a significant increase in terrorism. In addition, that decade's economic boom led to an increase in real estate crimes, which increased property crimes (Taylor, 2019).

History of Terrorism in the United States

The history of terrorism in the United States is interesting. Many people are confused about the events that transpired during those years because of inadequate information (Jones, 2018). When such events occurred, citizens suffered from what the country deemed "soft terrorism"—meaning political and social unrest—which was much less harmful than the hard terrorism carried out by al Qaeda and the Taliban (Lansford, 2018). Soft terrorism, then and now, encompassed a wide variety of events. In some cases, even civil rights actions that disrupted society received the label of terrorist actions. After the 9/11 attacks, the U.S. leaders began to use the phrase "hard terrorism" (Jones, 2018) to describe incidents such as the anthrax attacks in New York and the attempted attacks on the U.S. homeland using airplanes. Other acts of terrorism in the United States include:

- Shooting at the Pentagon in 2010
- Suicide attacks on the Internal Revenue Service building in Austin in 2010
- Pulse nightclub shooting in 2016
- Russian interference with the 2016 U.S. presidential election
- Attack on Ohio State University in 2016

- Shooting of Republican Congressman at a baseball game in 2017

- Tree of Life Synagogue shooting (Chaliand, 2019).

There has also been a rise in cyberterrorism, or acts terrorism involving the internet, computers, and online resources (Ahmed, 2018; Lansford, 2018). Cyberterrorism has become a significant concern over the past decade, responsible for many major world events. One of the most notable examples is accusations of cyberterrorism and tampering during the 2016 U.S. elections by Russia (Chaliand, 2019). Other instances include major data breaches for international companies and organizations, direct interference in the operation of power grids from other countries, and the escalation of space-based systems interference (Huff & Kertzer, 2018).

Terrorism Preparedness in the United States

There has been significant talk about terrorism preparedness within the United States. With many politicians and citizens asserting that the United States is close to danger, it is easy to see how serious this issue has become. The reality is, no one is safe from terrorism anywhere in the world (Malmin, 2020). There are always sleeper cells, international terrorists, and rogue nation-states determined to harm innocent life. Because of this, terrorism preparedness must be an immediate concern for every American citizen (Romano et al., 2019). The objective has expanded from protecting the American people from random attacks to ensuring the country's safety from terrorist groups (Chaliand, 2019). When a nation is on high alert for any activity from external sources, there are high expectations for law enforcement to stop any potential terrorist attacks.

Organizations at all levels participate in terrorism and mass casualty training. There are many types of terrorism, including natural disasters and civil unrest. For instance, terrorist groups often set off large-scale attacks in large cities like Los Angeles or New York (Ahmed, 2018). The fear in these areas is great enough that the police and law enforcement community are on high alert. Law enforcement agencies provide both specific terrorism training and general terrorism training in dealing with a wide variety of threats. Among the training available to law enforcement personnel is how to respond to dangerous situations (Malmin, 2020), which includes notifying residents about a dangerous situation and location and safely evacuating the area.

The final piece of terrorism preparedness is dealing with terrorist acts themselves. Unfortunately, local resources to help with this type of training are limited (Chaliand, 2019). Although most police departments have some available terrorism information and training manuals, they usually reserve these for classified situations (Malmin, 2020). A bomb squad will also likely be on hand, but they usually work on terrorism cases only. Thus, there is insufficient preparedness for the average citizen (Hojman et al., 2019). Local and regional governments must rely on national and international agencies for help.

The general public needs to know how to respond if they see something suspicious or are involved in a terrorist attack themselves. Fortunately, there is a large terrorism preparedness industry that strives to provide this sort of education for the general public (Malmin, 2020). Various websites offer terrorism training and how-to guides, from reporting suspicious luggage at an airport to connecting with appropriate authorities.

Terrorism Response in the United States

In response to heightened threats of terrorism, countries worldwide adjusted their policies and practices to prepare for, resist, and respond to terrorist activity. The United States's response to terrorism has been controversial at best, as it is not clear how successful the changes have been (Hojman et al., 2019). The U.S. response to terrorism has been two-fold, with an international strategy and a domestic strategy. The international strategy incorporated more intensive military, espionage, and counterterrorism operations overseas; examples include sending forces to Afghanistan, Iraq, and Somalia to find and punish those responsible for the 9/11 attacks (Huff & Kertzer, 2018). The United States now has a pronounced counterterrorism posture with collaboration from partner countries around the world.

The domestic strategy has proven to be even more controversial and involves the NSA. The NSA has access to many of the data routes and systems that people use to conduct business and in their daily lives (Chaliand, 2019). Despite well-established protections from unwarranted observations specified by U.S. law, the NSA began covertly collecting data about U.S. citizens without their knowledge (Zulli et al., 2021). While the practice was controversial, it contributed to identifying several domestic terrorists and their support networks. Domestic terrorism increased after 9/11 and continues to be a significant problem. These terrorist attacks take the form of mass shootings perpetrated by one or two gunmen (Hojman et al., 2019). While the media and some in law enforcement resist labeling these events domestic terrorism, many acts indicate political and societal motivations. Today in the United States, more domestic

terrorist groups are preying on the public and security (Hojman et al., 2019). Some plot

attacks against civilian populations, whereas others have vaguely malicious reasons. The

United States has systems in place to identify and stop these cells. Still, many agree that

the increasing number of domestic terrorists is a significant problem that could

circumvent the established policies and practices.

Types of Terrorist Attacks

Terrorism has become an increasingly relevant threat used to justify many

governmental policies, military actions, and acts of aggression (Romano et al., 2019).

Terrorism has been defined as the illegal use of violence or force against persons or

property intended to intimidate or coerce the civilian population into compliance with a

government or its representatives (Ahmed, 2018). The law of terrorism has many gray

areas. For instance, it can be unclear which acts constitute terrorist activity and which do

not (Romano et al., 2019). Many factors are difficult to define or agree upon, such as the

motivation of a public official for conducting a terror attack and whether certain acts are

legal or classified as military operations (Ahmed, 2018). Acts of terrorism include

bombings of civilians or buildings, suicide bombers and other attacks, explosives,

vehicular attacks, chemical weapons, nuclear attacks, cyberterrorism, mass shootings,

stabbings, and bioterrorism.

Acts of terrorism occur when an individual or group of individuals use violence or

the threat of violence to gain political power. When multiple shooters attack a key

facility, the Federal Bureau of Investigation (FBI) consults a terrorism watch list to

uncover coordination between the shooters and anyone else involved in the attack

(Ahmed, 2018). The watch list helps government officials identify the perpetrators and those who may have assisted them (Romano et al., 2019). If a key facility undergoes repeated terrorist attacks, then the U.S. government begins to look for ways to prevent future attacks. They often rely on watch lists to find individuals and groups engaging in such activities.

Other types of suspicious activity could also signal that someone is engaging in terrorist activity. Such suspicious activities include changing vehicles, traveling from location to location, and purchasing large amounts of weapons and equipment (Romano et al., 2019). Buying vast quantities of expensive items could signal that they are funding or receiving help from terrorist groups (Hojman et al., 2019). On the other hand, if someone travels from location to location frequently, this could be a sign of their being a courier and not a terrorist (Zulli et al., 2021). Either way, suspicious activity is an important consideration to prevent terror attacks on U.S. soil.

U.S. targets have been the victim of terrorist acts many times. The 1995 Oklahoma City Bombing was an act of terrorism, as was the incident at the IRS building in Austin, Texas, that same year (Zulli et al., 2021). However, the reality is that most cases of terrorism are the acts of multiple individuals who may have various motives (Hojman et al., 2019). Therefore, determining if an individual is a terrorist requires the investigation of multiple acts of this nature and the procurement of concrete evidence against an individual.

Another type of terrorism involves the use of violence or malicious destruction of property. However, determining the motive can be extremely difficult to determine

(Simeon, 2019). Some individuals believe they are seeking retribution when they are actually planning to commit an act of terrorism (Hojman et al., 2019). Therefore, it is essential to watch all videos that seem planned for a terrorist act. Other types of terrorism include planting bombs near places of worship, sending viruses through email, and public violence, such as an attack on civilians.

Bioterrorism

Bioterrorism is the intentional release of a biological toxin into the environment to cause death (Casadevall, 2012; Tegos, 2013). Bioterrorism is a form of terrorism involving the intentional release or dissemination of biological agents such as bacteria, viruses, or toxins in either a naturally occurring or a human-modified form to incapacitate or kill humans, plants, and animals, which then can lead to biological warfare (Casadevall, 2012; Tegos, 2013). In other words, bioterrorism is the use of microorganisms or infected samples to cause terror and panic and is a form of terrorism that is centuries old (Barras & Greub, 2014). There are more than 180 pathogens identified as possible agents of bioterrorism, all easily disguised and transported from one place to another without detection (Bezek et al., 2020). Biosafety and biosecurity have emerged with the increased recognition of bioterrorism as a threat (Pal et al., 2017).

Bioterrorism is one of the world's most feared forms of terrorism after the terrorist attacks of September 11, 2001, and the discovery of human anthrax cases and exposures several weeks later (Greub & Grobusch, 2014; Jansen et al., 2014). Government agencies specializing in public health, national defense, security, and public relations have created research teams and collaborated to ensure the safety and

preparedness of their communities when bioterrorism occurs again (Bilala & Galamas, 2015; Pinto, 2013). The concepts of medical preparedness, the extent to which public education has become a part of preparedness, and the extent to which the health care community is aware or prepared for a bioterrorist event are paramount in every community (Pinto, 2013; Tegos, 2013).

The Threat of Bioterrorism in the United States

Before September 11, 2001, the threat of a bioterrorist attack in the United States appeared unlikely. A rare attack in the United States occurred in 1984 with salad bars in The Dalles, Oregon, contaminated with salmonella (Grundmann, 2014; Pal et al., 2017). Despite the small number of bioterrorism incidents in the United States before the 21st century, countries have engaged in bioterrorism for hundreds of years, with accounts dating back to the 14th century (Pal et al., 2017). Perceptions of the likelihood of a bioterrorist attack changed during the anthrax incident in the United States, quickly following 9/11 (Sun & Yang, 2017). The distribution of letters containing anthrax to media organizations and politicians was a clear incident of bioterrorism (Pal et al., 2017). The challenge of bioterrorism is that although the number of terrorist attacks worldwide has decreased in recent years, the lethality of the attacks has become a greater concern.

Etchegary et al. (2008) expressed concern that biological terrorism might not be adequately addressed simply because the public does not recognize or distinguish it from other forms of terrorism. Ambiguous knowledge on the part of the public leads to poor risk assessment and public reception to risk communication messages. Arrazola et al. (2018) argued that in addition to concerns over the extent to which public health

personnel know what bioterrorism is, there is also a need for professional definitions of

preparedness. The concept of nursing bioterrorism preparedness provides nurses with a

protocol for their responsibilities during a bioterrorism attack. Preparedness is important

for an additional reason: The level of knowledge that various stakeholders have of

infectious agents linked to a bioterrorism attack impacts the degree to which they will

behave professionally during an outbreak and treat patients (Rokach et al., 2010). This

kind of knowledge is particularly relevant to bioterrorism agents such as anthrax, as only

informed persons would know, for example, that pulmonary infection from anthrax is not

contagious. Research has repeatedly found that fear of the unknown may result in

medical personnel's reluctance to treat patients.

Because of several outbreaks of new infectious diseases, the Health Protection

Agency emerged as a new organizational umbrella for addressing preparedness for a

bioterrorist attack. However, some researchers, such as Sun and Yang (2017), contend

that the threat of bioterrorism in the United States is ever-increasing due to continued

technological and biological advancements harnessed with good or evil intentions. Thus,

policymakers and researchers in developed, industrialized nations must assume that as

their understanding of the threat of bioterrorism increases, so do terrorists' repertoires of

tools and capacity for inflicting harm. The common bioagents used to spread and cause

disease include anthrax, brucellosis, tularemia, smallpox, viral hemorrhagic fevers,

Botulinum, and Ricin (Pal et al., 2017). In response to the various bioagents with the

potential to be used as weapons, the Centers for Disease Control and Prevention (CDC)

developed a categorization of bioterrorism weapons based on the characteristics of each

pathogenic agent (CDC, 2018; Pal et al., 2017). The classification of bioterrorism

weapons is in three categories, A, B, and C, as presented in Table 1 (CDC, 2018; Pal et

al., 2017; Sandrock, 2016). In an overview of biological weapons and bioterrorism, Pal et

al. (2017) argued for the need to identify potential risks despite limited ability to prevent

bioterrorist attacks. Early detection of diseases and active nationwide surveillance were

critical for preventing and addressing new and emerging bioterrorism agents and future

attacks.

Table 1

CDC Classification of Potential Biological Agents Used for Bioterrorism Attacks

Category A agents	Category B agents	Category C agents
• Can be easily disseminated or transmitted from person to person • Result in high mortality rates and have the potential for major public health impact • Might cause public panic and social disruption • Require special action for public health preparedness	• Are moderately easy to disseminate • Result in moderate morbidity rates and low mortality rates • Require specific enhancements of the CDC's diagnostic capacity and enhanced disease surveillance	• Are available • Can be easily produced and disseminated • Show potential for high morbidity and mortality rates and major health impact
Anthrax (*Bacillus anthracis*) Botulism (*Clostridium botulinum toxin)* Plague (*Yersinia pestis)* Smallpox (*Variola major*) Tularemia (*Francisella tularensis*) Viral hemorrhagic fever (e.g., Ebola, Marburg, Lassa, Machupo)	Brucellosis (Brucella species) Epsilon toxin (Clostridium perfringens) Food safety threats (e.g., Salmonella species, Escherichia coli O157:H7, Shingella) Glanders (Burkholderia mallei) Melioidosis (Burkholderia pseudomallei) Psittacosis (Chlamydia psittaci) Q fever (Coxiella burnetii) Ricin toxin (Ricinus communis) Staphylococcal enterotoxin B Typhus fever (Rickettsia prowazekii) Viral encephalitis (e.g., Venezuelan equine encephalitis, Eastern and Western equine encephalitis) Water safety threats (e.g., Vibrio cholerae, Cryptosporidium parvum)	Emerging infectious diseases Nipah virus Hantavirus

Note. Copyright 2014 Dove Medical Press. Reproduced with permission.

As an act of terrorism, bioterrorism is the intentional release of a biological toxin into the environment with the goal of causing death. Bioterrorism is the deliberate use or threat to use biological agents, such as viruses, bacteria, or toxins, to cause illness or death to people, animals, or plants (Pal et al., 2017). The ideology of bioterrorism also calls for generating as much fear in the population as possible. The threat of bioterrorism itself can be unnerving. There are over 180 pathogens identified as possible agents of bioterrorism, all easily disguised and extremely transportable without detection (Sun & Yang, 2017). Therefore, although bioterrorism is ranked as a low-risk danger, its characteristics make it a source of continued worry and concern.

Bush and Perez (2012) argued that the October 2001 anthrax attack was a signature event, commencing a new era of awareness of bioterrorism. This was because up to then, an attack of this type—sending through the mail numerous envelopes and packages containing anthrax—was thought to be only theoretically possible. The event revealed the vulnerability of current systems, with the official response receiving both praise and criticism. Thus, public health exists in a new paradigm. As participants in the diagnosis of anthrax during the event, Bush and Perez offered a 10-year review of the events surrounding the bioterrorist incident. Immediately, there was an anthrax diagnosis in Florida with authorities notified, resulting in "one of the largest epidemiologic and criminal investigations in U.S. history" (p. 42). The first federal response was to declare the event isolated, with little likelihood of spreading. However, with 21 additional cases confirmed over the ensuing 7 weeks, this view underwent revision as spread occurred due to travel, leading to additional cases.

Ironically, in the weeks before the incident, a federal commission had issued a report warning that the United States was ill-prepared to deal with a bioterrorist attack (Bush & Perez, 2012). Researchers in a Canadian study had examined precisely the sort of mail-delivered scenario of anthrax inhalation, reducing the number of casualties. Bush and Perez adopted a broad model of bioterrorism, in which the incident itself is a means to instill fear in the populous in a way that disrupts and changes lives. The attacks resulted in the creation of the Office of Public Health Preparedness within the U.S. Department of Health and Human Services, a tenfold increase in the biodefense budget, and an extensive investigation into the crime. The report on the investigation, the *Amerithrax Investigative Summary*, published in 2010, concluded that a rogue microbiologist in the U.S. Army had acted alone in planning and executing the act of terrorism. Other experts, however, continue to contest this finding.

Upon reviewing the *Amerithrax Investigative Summary*, Bush and Perez (2012) found that the laboratory work during the incident was good, and the National Pharmaceutical Stockpile for responding to the disease worked well, reducing the mortality rate. Many medical personnel risked their lives to respond to the outbreak, which was also exemplary. At the same time, Bush and Perez argued that the knowledge about anthrax was old and outdated, hampering the investigation; the administration of the anthrax vaccine was confused and delayed; and physicians' hoarding of antibiotics for personal patients was problematic, leading to a 600% increase in antibiotics sales immediately following the event. In addition to providing a framework for understanding preparedness for bioterrorism attacks, Grundmann (2014) explained that preparedness in

the United States following the 2001 anthrax attacks requires health care workers to effectively detect the nature and characteristics of pathogens.

Poor bioterrorism surveillance increases not only the likelihood of an attack but also the significance of the potential consequences (Sun & Yang, 2017). The syndromic surveillance system for early detection of illness put in place by the CDC long before 2001 failed to detect anthrax, resulting in some misdiagnoses (Bush & Perez, 2012). Bush and Perez argued that, despite such systemic approaches, it is still necessary to have individual clinicians able to diagnose potential bioterrorist agents. As clinicians, Bush and Perez concluded, "We firmly believe that an astute clinician will once again be the first to recognize the next patient with an illness resulting from deliberate exposure to a biologic agent" (p. 44).

In consideration of emerging health security threats, the primary organization involved in countering bioterrorism in the United States is the General Accounting Office (Ali et al., 2020). In September 2001, the General Accounting Office reported on federal preparedness to counter bioterrorism. The approach to counter bioterrorism, particularly since September 2001, has been preparedness. The Department of Health and Human Services is the leading agency in responding to terrorist attacks and emergencies that impact public health.

A key element of evaluating the threat of bioterrorism in the United States and beyond is biological threat characterization (BTC; Watson et al., 2017). Periodic laboratory research improves BTC by increasing the accuracy of biological risk assessment and offering government officials a relevant source of empirical knowledge to inform the prioritization of bioterrorism resources. Watson et al. (2017) conducted a

Delphi study of BTC best practices in the United States. The researchers aimed to elicit knowledge from expert participants concerning

> The need for BTC research by the U.S. government (USG); risks of conducting this research; rules or guidelines that should be in place to ensure that the work is safe and accurate; components of an effective review and prioritization process; rules for when characterization of a pathogen can be discontinued; and recommendations about who in the USG should be responsible for BTC prioritization decisions. (p. 2390)

Findings from Watson et al. (2017) showed the need for continued research, as there was a significant lack of consensus among the participating experts. Particularly, participants noted the necessity of continuous review and adjustment of BTC research approaches, working toward optimal effectiveness, and decreasing the significant hazards and risks associated with conducting BTC research. Thus, in some cases, the first step toward a more comprehensive understanding of the threat of bioterrorism in a given region is improving BTC research procedures.

General Preparedness for Bioterrorism Attacks

This section presents the literature on preparedness for bioterrorism attacks. As mentioned, preparedness, particularly in response to bioterrorism attacks, is important because there are limitations to preventing such attacks (Pal et al., 2017). Moreover, bioterrorism attacks may be an attractive alternative to conventional weapons (Oliveira et al., 2020). General preparedness requires federal, state, regional, and local involvement for effective response (Grundmann, 2014).

Preparedness

Preparedness is a comprehensive concept, including issues such as communication, infrastructure, education, and response (Arrazola et al., 2018; Manuell & Cukor, 2010; Smith & Davison, 2010; Sun & Yang, 2017). The U.S. government defined preparedness as the ability to plan, organize, and mobilize Homeland Security personnel in carrying out their assigned missions based on nationally accepted standards (California State Auditor, 2006). Public compliance is also a key issue (Manuell & Cukor, 2010). The definition of bioterrorism preparedness, however, has been mainly in health care settings. According to the American Public Health Association (n.d.), bioterrorism preparedness refers to the responsibility of a complicated web of agencies at the federal, stage, and local levels and encompasses a wide array of professionals, from planners to public health officers, fire, police, school personnel, and others.

Since the anthrax attacks in the early 2000s, researchers and experts have remained divided regarding the threat of bioterrorism in the United States and how prepared the country is for future incidents. More than 10 years later, Sun and Yang (2017) continued to classify a bioterrorist attack as a low-risk potential, albeit one for which preparation was essential, as it could have a high-impact result. However, other researchers, such as Evans et al. (2018), have placed more stress and urgency on addressing unanswered questions and challenges associated with bioterrorism preparedness. The researchers noted how the lack of relevant data about anthrax attacks and other bioterrorism incidents impacts how effectively statisticians can predict bioterrorism preparedness and implications and inform medical personnel and other relevant stakeholders accordingly.

In acts of bioterrorism, quarantine and evacuation are two important tools of response, and compliance with either mandate is critical for success. Manuell and Cukor (2011) examined compliance problems by the public with authority mandates, even in emergencies. The findings showed a link between compliance and various issues, including life circumstances and work. Perception also played a key role, including the perceived credibility of public spokespersons, influential family members, and trusted friends (Manuell & Cukor, 2010).

Previous experience—or the lack thereof—can influence risk perception of a similar event, with previous experience both working to favor accurate perception of risk and lead to denial if, for example, a person perceives that a previous evacuation was uncalled for. If the hazard is new, it is common for people to respond with disbelief, especially if "there is any vagueness regarding the warning, or if the person has reacted to previous warnings of events that never attained the magnitude predicted" (Manuell & Cukor, 2010, p. 425). The bottom line of perceived risk is that if people do not feel their life is in danger, they are unlikely to comply with government or public health directives.

This situation is complicated by the localness of such experience, with some older individuals believing that having weathered one emergency, they can do it again. People in isolated locales may come to rely on family member perceptions far more than officials' determination of risk level. Individuals' public pronouncements about the danger of the SARS outbreak led many to disobey quarantine requests. Even persons diagnosed as having SARS downplayed the risk, refusing to comply with further restrictions, like wearing masks or monitoring their temperatures. While some experts recommended using fear to reach these people, Manuell and Cukor (2011) felt otherwise.

The researchers noted that fear usually causes people to act unwisely in panic mode, often leading to negative outcomes, such as those associated with noncompliance. For this reason, the warning confirmation process, defined as significant others confirming public reports, is critical for compliance.

Beyond these personal reasons, Manuell and Cukor (2011) also argued that local public figure response is critical in determining public compliance to evacuation or quarantine. In many cases, public figures may withhold information to avoid panic. However, establishing public trust requires clear, consistent, and reliable communication. A mistake that officials often make is to assume that residents know the risks of problems. Conflicting information coming from various sources can undermine public confidence in local officials. In contrast, in effective risk communication, people receive, comprehend, and act on warning information. Trust and credibility are critical for this sequence of events to occur. Manuell and Cukor presented several examples where localities responded to emergencies by communicating effectively or ineffectively. The general framework that supports overall public confidence in the trust and reliability of public officials is the general level of community preparedness created by emergency officials. If a community does not have a history of competent preparedness and has been made aware of the need for preparedness, all the above factors seem much less likely to contribute to public compliance. Therefore, Manuell and Cukor found that the perceptions of officials and the public are vital in determining whether a public complies with emergency preparedness plans.

Jacobson et al. (2010), arguing that specific stakeholder perception of preparedness was important, surveyed nurses in North Texas as to their sense of their

preparedness for a bioterrorist attack. They found that fewer than 10% felt prepared, although 30% expressed willingness to collaborate with the state and federal agencies in responding to an event. Some 69% reported that they needed more training to consider themselves prepared for such an event. Simulation-based training would likely improve nurses' sense of preparedness (Morrison & Catanzaro, 2010).

Perhaps the most critical errors in the wake of a bioterrorism attack occur in medical facilities and trauma centers; thus, ensuring bioterrorism preparedness requires preventing critical trauma procedure errors (Mackenzie et al., 2019). Mackenzie et al. (2019) used a trauma readiness index to assess critical surgical errors associated with four common trauma procedures. The researchers found that residents' trauma readiness was better than practicing surgeons'. Further, residents' trauma readiness steadily improved in proportion to new training and continued education. Compared to both residents and practicing surgeons, experts demonstrated error recovery that was five to seven times better. Findings from Mackenzie et al.'s research emphasize the need for continued education for medical personnel working in trauma centers.

Educating the Public

Preparation for a possible bioterrorism attack entails educating key emergency personnel in addition to the general public (Mishra, 2016). Collaboration and joint programs enacted by public health and law enforcement are key assets in some countries. Such collaborations can involve public health forums and presentations, emergency drills, distributing resources, and other activities (D'Arcangelis, 2016; Mishra, 2016).

Etchegary et al. (2008) expressed concern that biological terrorism might be inadequately addressed simply because the general public does not recognize what it is or

distinguish it from other forms of terrorism. They presented 1,502 Canadians with a series of word associations about chemical, biological, radiological, nuclear, and explosive terrorism to determine the extent to which the public could distinguish between types of terrorism. The study's premise was that if the public and frontline personnel are not aware of types of terrorism, they will not push for policy to enhance preparedness or, worse, be unprepared if such an incident occurred. Fuzzy knowledge on the part of the public also leads to poor risk assessment and reception of risk communication messages.

The researchers used the specialty of risk communication in their study (Etchegary et al., 2008). Formerly, risk communication occurred according to the deficit model of decision-making, with the public viewed as ignorant and in need of education by the experts. A new model has emerged that focuses on gaining the public's trust in regulations based on the belief that far from panicking, the public usually responds to crises in a calm and orderly fashion. This only happens, however, with the public viewed as a partner in sharing information. Still, if experts do not know what the public thinks, it is hard to craft a message to establish these connections. Etchegary et al. (2008) conducted content analysis on the results, revealing several uncertainties on the part of the public. Overwhelmingly, members of the public expressed a great deal of fatalism when describing various terrorist scenarios.

A survey of student nurses concerning bioterrorism showed their fears of taking care of patients with biological threats were misplaced (Etchegary et al., 2008). Student nurses did not fear the most dangerous entities, instead worrying about less serious problems. Results were similar for members of the general public. For example, the public repeatedly confounded biological and chemical terrorism, indicating that their

grasp of biological terrorism was poor. This concerned Etchegary et al. (2008), as such

confusion could mean failure to follow an appropriate course of action during an

emergency. That the public viewed the concept of terrorism as bombings was also

problematic, suggesting pathways of exposure and response to it that would not be

effective in the case of a biological attack. The emphasis on bombing also meant the

public does not fully understand escape pathways or responses to biological terror. Many

subjects had trouble finding word associations related to bioterrorism, further indicating a

very vague sense of what it is. Etchegary et al. recommended that public education is

needed to help individuals respond better to types of terrorist attacks, thus saving lives.

Education of the Health Care Community

Key health care leaders and personnel must have the proper education and

training to ensure medical preparedness in the event of a bioterrorism attack (Ejike,

2019). Despite government spending on the issue, Sun and Yang (2017) found that

complacency among the medical community continued to hamper efforts at preparedness

in the United Kingdom. Indeed, in the few years immediately following 2001, the

primary emphasis on preparedness was educating and training the medical and public

health communities in bioterrorism. Baldwin et al. (2005), for example, framed the need

for public health first responders to be aware of bioterrorism threats in the context of the

dangers connected with 9/11 and the War on Terror. The researchers focused on the

informational dimension of bioterrorism preparedness, arguing that educating public

health personnel about bioterrorism was the first step in improving overall preparedness.

Baldwin et al. (2005) described the bioterrorism response education program

provided through the health care intranet to train personnel cost-efficiently. Although

their study was of a trial run of the program, describing its various components and modules and evaluating its potential, the scholars nonetheless argued that the health community's overall poor level of awareness of how to respond to bioterrorism necessitated this approach.

The extent to which health care communities are educated and prepared for bioterrorism is often a reflection of the threat level and degree of focus on bioterrorism by state and federal government entities (Arrazola et al., 2018). In an assessment of epidemiology in the United States, Arrazola et al. (2018) revealed a significant decrease in the number of epidemiologists dedicated to bioterrorism preparedness. While epidemiology positions aimed at containing and preventing the spread of infectious diseases in the United States have increased steadily since 2004, positions for preventing intentional bioterrorism have significantly decreased. In particular, there were 487 epidemiologists hired between 2013 and 2017 to address the spread of disease; in contrast, there was a 55% decrease in the number of epidemiologists actively working to prevent bioterrorism in the United States during the same period.

During the same study, epidemiologists working for state governments expressed a need to hire approximately 1,200 more epidemiologists to ensure preparedness for an outbreak released intentionally or unintentionally (Arrazola et al., 2018). The results of Arrazola et al.'s (2018) study showed that while medical personnel's education is key to preventing or addressing bioterrorism, education can only increase bioterrorism preparedness among hired personnel. Ultimately, if not enough trained medical professionals are available to address a bioterrorism outbreak, superior education may be futile.

To ensure that nurses maintained a level of preparedness for emergency and bioterrorism response, Garbutt et al. (2008) evaluated an assessment instrument: the Emergency Preparedness Information Questionnaire. The purpose of Garbutt et al.'s study was to establish the construct validity and internal reliability of the psychometric characteristics of the scale. However, the study also indicated the need for preparedness assessment tools as disaster nursing has migrated from military nurses and emergency department personnel to all nurses and personnel. Research on nurses' level of preparedness in terms of knowledge of agents and other procedures for bioterrorism is minimal, necessitating an instrumental approach to maintaining preparedness.

Preparedness is deemed important for an additional reason: The knowledge various stakeholders have of infectious agents linked to a bioterrorism attack impacts how professionally they will behave during an outbreak and treat patients (Rokach et al., 2010; Sharma et al., 2019). This kind of knowledge is particularly relevant to bioterrorism agents such as anthrax, as only those persons with knowledge of the disease would know, for example, that pulmonary infection from anthrax is not communicable. Moreover, researchers have repeatedly found that fear of the unknown could result in medical personnel's reluctance to treat patients. Rokach et al. (2010) surveyed 76 nurses and physicians in emergency rooms in three public hospitals to analyze the connection between the two. The survey included 11 questions about willingness to treat diseases developed by the Israeli Defense Forces Home Front Command, noted experts in disaster medicine. The study found that physicians and nurses who had extensive knowledge of anthrax were 50% more willing to come to work. They were also 37% more willing to work with patients suspected of anthrax and 28% more willing to treat patients diagnosed

with anthrax. The results proved the need to educate medical personnel about all possible

infectious agents in a bioterrorist attack to maintain their commitment to treating infected

patients during the crisis.

A further dimension of bioterrorism preparedness involves the physician

specialists who would be most affected and effective in responding to a bioterrorist event

(Jorgenson-Rathke, 2018). At present, bioterrorists are most likely to use respiratory- or

pulmonary-disease-transmitted agents, like anthrax and plague. Thus, respiratory

physicians will likely be at the front line of a bioterror preparedness response; as such,

they must be prepared to recognize agents and maintain a clinical edge in doing so.

Syndromic Surveillance

An essential element in any preventive infrastructure against bioterrorism is a

surveillance system that detects bioterrorism agents and reports on their presence to alert

authorities to act (Arani et al., 2019). Syndromic surveillance systems report disease-

specific diagnoses using a statistical algorithm that detects aberrations from prediagnostic

data, setting off an alert. Simulations of various syndromic surveillance systems

addressed to specific bioterrorist agents have found predictive values in the receiver

operating characteristic curves. By accounting for mortality, morbidity, and costs of a

surveillance agent, a much more accurate and early detection is possible (Thomas et al.,

2018). This kind of surveillance system would be one presumably operated by public

health personnel.

Syndromic surveillance entails electronically monitoring and reporting real-time

medical data as a way to proactively identity unusual disease patterns in the population

(Stoto et al., 2006). Nordin et al. (2008) stressed the need to review the data from such

surveillance carefully, not to violate the civil rights of any individual. Three models of data provision to alert systems are currently in use. In the first, the National Bioterrorism Syndromic Surveillance Program analyzes aggregate data collected from several local medical organizations. Before submission, the system strips personal identifiers from disease detection information, with data provided only if an outbreak is detected. Another data collection system is Bionsense, operated by the CDC, which also removes personal identifiers unless necessary. They proposed three models for this national process consisting of public health information privacy boards, institutional review boards, or a combination of both. These surveillance groups would protect individual health information while extracting the data needed to alert authorities to the detection of a bioterror attack proactively.

To explore issues associated with bioterrorism surveillance, Nordin et al. (2008) reviewed a model case study of the complications and tensions between public safety and personal identification privacy in the instance of an outbreak based on bioterrorism. Although they examined ethical issues beyond this study's scope, Nordin et al. revealed an interface between the local and national where the complexity of ethical issues may result in a breakdown of support. One example is an unauthorized release of disease information of identified persons in Florida, compromising the privacy of the individuals. Nordin et al. stated,

> It is only a matter of time until another public disclosure or inappropriate use of private health data by public authorities will result in a massive public outcry; this could, in turn, lead to substantial regulatory restrictions on data access. (p. 806)

Therefore, another intersection of the public health system could cause a data bottleneck, impeding the quick identification and treatment of disease in the case of a bioterrorist attack.

In addition to detection, leaders in the public health system must make several decisions upon detecting a hazard (Finley, 2018). Mitchell-Blackwood et al. (2011) presented a cost-benefit model to help public health officials decide on a contingency plan and determine which actions are justified and appropriate in various scenarios. Public health officials must make the key decisions of when to undertake prophylactic antibiotic treatment, when to vaccinate, and when to decontaminate buildings. As applied to various prioritized elements of the population ranging from high to less exposed, these decisions will determine if lives are saved or lost. At present, most decision models are based on mathematical models in simulation contexts. Thus, a probability model has been used to predict the impact of anthrax and vaccination policies on emergency response without considering the costs of the action.

Mitchell-Blackwood et al. (2011) argued that too many models make mathematical predictions but fail to establish when action or treatment is required. Also, the cost-benefit factor is an infrequent consideration, presumably because the cost is an inhumane response. Mitchell-Blackwood et al. sought to demonstrate that a cost-benefit analysis can save lives to the extent that it can direct services where needed, according to priorities. In the case of the anthrax scare of 2001, the cost of decontaminating the whole Senate building would have been $28 million, while the cost of prophylactic treatment, found to be more effective, was considerably less. Mitchell-Blackwood et al. focused on an anthrax bioterrorist scenario and found nonnegligible risk thresholds below which

certain actions have costs that outweigh their benefits. The model used decision trees that presented options and response strategies and calculations of the expected value function for each possible outcome to identify the alternative with the highest expected value. The researchers used a switchover analysis, deciding when the values of response and no response become the same, necessitating a change of decision course. These then determine appropriate response strategies, further refined by sensitivity analysis. Mitchell-Blackwood et al. found that costly decontamination is less necessary than thought and that vaccination is also cost-beneficial when exposure is higher than 1 in 7,108. Therefore, public health requires many decision structures to ensure that response to a bioterrorist event does not cause more loss of life than indicated by a model.

There are many changing variables in the public health sector, all of which merit consideration during any attempt to combat a bioterror attack. Poutanen (2007), for example, stressed the importance of preparing clinical laboratories for bioterrorism. Poutanen cited the failure of many of the hospital clinical laboratories to respond adequately to a SARS outbreak in Toronto in 2002 as a worst-case scenario. The failure happened because labs had plans prepared, with no effort put into implementation. Poutanen reviewed the case study for what was and was not done well, making "recommendations for laboratory biohazard or bioterror emergency planning and preparedness" (p. 39). SARS awareness began with an email alert issued by the World Health Organization, followed by the admission of SARS-suspected patients. WHO issued a press release and held a teleconference with infectious disease physicians and microbiologists. Scientists conducted intense contact tracing to determine the extent of the initial outbreak. Hospitals implemented Code Orange, mandating the use of N95

respirators for all personnel and dictating hospital procedures. Public health officials made daily updates of outbreak figures.

Poutanen (2007) identified response failures, including (a) the lack of a single reliable communications system, (b) the absence of laboratory protocols in how to handle unknown transmissible elements in an open-concept laboratory, (c) decreased staff due to outbreak-imposed constraints or labeling as a nonessential worker and barring from the hospital according to the code, (d) the lack national laboratory testing dependability due to the inability to keep up with demand, (e) resistance from staff and families for autopsies, and (f) difficulty in following metrics throughout the outbreak. Despite recommended fixes, the problems indicated the lack of preparedness of a key element of the public health system, both nationally and locally: the clinical laboratory (Poutanen, 2007). One major area where preparedness matters is having access to necessary supplies and equipment. Research shows that "mortality was highly dependent on the local dispensing capacity" (Bravata et al., 2006, p. 244) for anthrax prophylactic antibiotics. Furthermore, only "47% [of hospitals] had allocated funds" (Thorne et al., 2006, p. 414) for bioterrorism events.

Biosecurity

So urgent have the security needs and concerns of the biological sector become that a new subspecialty has emerged: biosecurity (Ryan, 2016; Smith & Davison, 2010). This field incorporates all the risks that can develop from biological agents, whether in natural or laboratory settings. Smith and Davison (2010) reviewed the need to maintain disease detection and surveillance systems to keep track of infectious diseases and develop vaccines, antiviral drugs, and immune modulators. Smith and Davison also

mentioned dual-use risks or the unintended consequences of scientific research, where the challenge is managing risk while not impeding scientific progress.

Smith and Davison (2010) found the discussion of dual-use risks across the life sciences to be poor, with unclear policy and a lack of appreciation of the scope of risks. A key element of biosecurity is to ensure that all laboratory workers are adequately trained, with properly designed and managed tasks and well-maintained high-containment facilities. Best practices for high-containment laboratories were especially important. The potential threat of deliberate misuse of dual-use elements, or bioterrorism, was also part of the biosecurity purview. But both state-sponsored use of biological weapons and terrorist use of biological agents are included in these concerns. There is also the concern that developing defensive biological weapons will unintentionally increase the risk of an arms race. Smith and Davison argued that transparency is critical so that others do not misunderstand the preventive purpose of biodefense research programs. Bioterrorism is a lesser concern to Smith and Davison, if only because of the "low number of deaths from bioterrorism in comparison to the large mortality rates from infectious diseases" (p. 4). The anthrax outbreak of 2001 was caused by an insider threat in a laboratory, making internal security another concern and requiring more time to develop personnel reliability programs. Advances in biotechnologies, while beneficial, are also open to deliberate misuse. In other cases, the development of dual-risk agents has also led to more virulent strains of the agent.

Smith and Davison (2010) commented,

Whether planned or unplanned, advances in science and technology have the

potential to expand the scope of deliberate misuse of biological agents and

ultimately make it easier for both states and non-state groups or individuals to

develop and use biological weapons. (p. 5)

The cost of sequencing has dropped dramatically, leading to the wide availability of DNA

sequencing technology. Another tool, synthetic biology, provides tools for synthesizing

pathogens. Both of these advancements will increase the likelihood of nefarious

individuals acquiring dangerous pathogens. In response to these findings, Smith and

Davison called for a unified methodology to inform biological risk assessment. That

multidisciplinary input into the framing assumptions of this methodology will form the

core of biosecurity.

Whereas the focus of biosecurity is often high-tech threats, bioterrorists might be

more interested in low-tech biological work (Walsh, 2018). Many high-tech processes

associated with bioterrorism, such as replicating poliovirus synthesis, are highly

challenging and time-consuming, threatening the ability to extrapolate the process for

dual-use. Terrorist groups could have great difficulty in obtaining enough anthrax or

other material to cause significant harm. However, there is a lower technological hurdle

in such low-tech methods as contaminating food or water. Therefore, it is pertinent that

biosecurity threats are researched and understood based on their potential to do harm and

their likelihood of occurring and being accessible to terrorists (Walsh, 2018). Thus, there

should be greater attention on developing diagnostics, vaccines, and therapeutics to

strengthen protection against communicable diseases.

The Public Health and Military Nexus

Some officials and researchers have argued that educating the current public

health community is not enough to ensure bioterrorism preparedness. This approach is

more likely where "bio" meets "terrorism"—that is, at the intersection of the public

health community and the national defense, or military, community (Morse, 2018).

Friedman et al. (2008) adopted a quasimilitary perspective to address the bioterrorist

threat, viewing bioterrorism as instrumentalized through the weaponization of biological

agents. They described the primary agent of a bioterrorist attack as a bioweapon, an

example being distributing smallpox-infected blankets to the enemy in many wars.

Moreover, terrorism as a context makes the use of this agent worse insofar as terrorists

are only interested in an asymmetric war "whose main objective is to cause massive

causalities, panic, demoralization and economic disruption" (Friedman et al., p. 86).

Determining the potential danger of such an attack entails examining the nature of the

agent and the method of dissemination. By this measure, the most dangerous threat is

using advanced biotechnological methods to prepare or modify microorganisms, creating

hypervigilant microorganisms resistant to antibiotics.

The infiltration of public health systems could lead to disseminating biological

weapons to terrorists (Friedman et al., 2008). Addressing this risk requires creating an

infrastructure characterized by biosafety with the set of physical and administrative

means that help prevent accidents and biosecurity, which is all structures that prevent

terrorists from obtaining biological agents, involving physical containment, leakage

prevention, inspecting work with organisms, transport security, worker reliability,

information security and overview of science programs. Biodefense refers to the actions

taken to minimize the consequences of an attack. In their review of dangers, Friedman et

al. (2008) cited the ability to reproduce the entire genetic code of, for example, the

Spanish flu, and set it loose, which is particularly frightening. Speedy DNA production facilitates this ability, increasing bioweapon potential.

To Friedman et al. (2008), a particular concern was a byproduct of the military and health systems integration: the dual-use problem enabling the use of technology for civilian and military purposes. So much biological research is of a dual-use nature that it presents serious problems. Dual-use pertains not only to bioweapon development but apparently harmless biological methods designed to prevent disease's unexpected outcomes and their potential use as a bioterrorism weapon. While neutral and for science, some research has a clear dual-use potential—for example, publications on the Spanish flu virus—which individuals can now create synthetically in laboratories. A significant part of biodefense and consequence management must be to monitor and control the dual-use potential of biological research. Friedman et al. reviewed a study undertaken to determine the extent to which Israel's biodefense system is effective, finding several gaps. The researchers concluded that biodefense necessitates the military and public health working cooperatively, though they recommend creating agencies to coordinate between the two.

Scales of priority are a tool to determine to what extent public health resources and officials will be deployed to, for example, protect military personnel from a biological agent (Vargo, 2017). This bioterrorism prevention research is a means of standardizing response administration by creating quantifiable scales or measures. By developing evidence-based, systematic, and multifactorial methods for prioritizing the level of risk of each category of bioterrorism agents, decision-making is quicker. Classifying bioweapons entails considering the disease's impact using criteria such as (a)

infectivity; (b) case fatality rate; (c) stability in the environment, including ease of decontamination and reports of genetic modification; (d) the probability of attack criteria, including global availability; (e) ease of procurement, (f) ease of weaponization, and (g) historical examples upon which bioterrorists can model their efforts. Additional criteria used to classify the degree to which prevention or intervention is necessary include the lack of preventability and treatability. Systems of classification can be useful to guide public policy and help with decisions about which vaccines to amass, when and if to vaccinate the military, and how to enact a public response to a bioterrorism attack. Because of the link between preventability, lack of treatability, and emergency response, there is a need for effective cooperation between the military and public health officials in responding to and developing emergency planning for bioterrorism threats (Murthy et al., 2017). The military's primary interests in handling terrorism threats are to catch the parties responsible and to secure the area. Public health's goals are to limit the spread and save the most people. Sometimes these perspectives can conflict.

Local Health and Bioterrorism Emergency Planning

The prospect of ensuring safety and preparedness from biological infections worldwide is becoming increasingly challenging (Alba & Gable, 2011; Choi, 2009). One of the preparedness frameworks in the United States is the 2002 Public Health Emergency Preparedness cooperative agreement, which supports preparedness on the national, state, and local levels (Murthy et al., 2017). The agreement has directed $5 billion to states to develop their preparedness.

As a result of the agreement, the Stanford Center for Definitive and Curative Medicine (CDCM; 2008) found improvements in state preparedness, including (a) hiring

more epidemiologists for public health departments, increasing from 115 in 2001 to 232 in 2006; (b) a dramatic increase in the use of the Epidemic Information Exchange, 75% coming from state and local health departments; (c) the availability of 24/7 reception and evaluation of urgent threats in all 50 states, up from 12 in 2001; (d) implementation of training according to the Incident Command System in all 50 states; and (d) the creation of the Health Alert Network in all 50 states. At the same time, state preparedness continues to be hampered by (a) difficulties in recruiting epidemiologists, (b) the failure of 16 states to electronically exchange health data contained in disease surveillance systems, (c) uncertainty over the legal framework guiding preparedness practice, (d) the difficulty experienced by 31 state health laboratories in recruiting qualified laboratory scientists, (e) 39 states reporting a shortage of staff to perform polymerase chain reaction DNA testing to identify bioterrorism agents quickly, (f) states lagging in implementing advanced technology, including radiological testing, (g) the inability of any state-level laboratory to identity radioactive materials in samples, (h) poor training in most state public health departments, and (i) inadequate interoperable emergency communication systems in most states. CDCM identified five needs. First, state and local health departments need to increase their use of electronic health data for preparedness and response through networking. Second, there needs to be an expansion of state-level capacity for laboratory testing. Third, states must establish partnerships with commercial entities that supply medicines. Fourth, it is important to develop a core curriculum for preparedness to guide training. Finally, CDCM recommended that states collaborate with partners to improve public health.

Further case study details provided by CDCM (2008) highlighted some aspects of federal and state cooperation. State-level health departments studied a 2006 E. coli outbreak in 26 states after the federal FDA issued a consumption advisory to consumers. The FDA used the Health Alert Network to alert all states to an outbreak; in response, state laboratories performed DNA fingerprinting and submitted the data to the national PulseNet network. Using this network, states could compare and more quickly identify cases. Ultimately, state public health departments isolated spinach as the cause of the outbreak. Officials from all three levels of government—federal, state, and local—collaborated to confirm other cases and communicate advisories to consumers. As shown in this case, rapid identification led to a spinach recall and quick treatment of those with the infection, ending the outbreak. This scenario showed that local and state health departments are part of a three-level cooperative federal system that quickly communicates results to other states.

In another incident, a meningitis outbreak in Los California, the public health department was ready because of vaccination training, which improved health department collaboration with local authorities. Several other local responses to emergency situations were also surveyed. As a result, the response to this outbreak was more timely than for past events. In this model, the notion of the local is ancillary to the nation. That said, all nodes of the system must be prepared to respond. In response to weaknesses in local responses, the 2004 Cities Readiness Initiative was a means to help cities establish preparedness for biological outbreaks and bioterrorism (Murthy et al., 2017). CDCM (2008) found that despite much progress since 2001, state and local health department weaknesses remained. In appraising the preparedness of a state or locality, local officials

base a large part of their perceptions on their assessment of preparedness of the state system.

Some indication of local stakeholder perception of preparedness for bioterrorism is apparent in studies of stakeholder perceptions of emergencies or crises of any kind (Ferguson et al., 2019). Emergency preparedness is the general heading given to all such procedures and guidelines that local institutions, from schools to local governments, develop to respond to extraordinary circumstances (Alba & Gable, 2011). The type of emergency a school is most likely to face is violent crime, followed by acts of terror. Alba and Gable (2011) also mentioned natural disasters, such as "fires, hurricanes, floods and tornadoes" (p. 2), with bioterrorism presumably fitting in this classificatory system. At present, although 92% of schools have emergency preparedness plans in place, only 52% update them annually, and many more fail to support the written plan with training programs and provision of resources that make plans implementable.

Alba and Gable (2011) examined three Rhode Island school districts' crisis preparedness plans. The researchers were particularly interested in elementary and high school principals' perceptions of their level of preparedness for emergencies. Most emergency preparedness plans enable schools to implement various drills with first responders to ensure student safety. Alba and Gable surveyed 60 school principals, three district-level administrators, and three police and fire department first responders to determine if there was a significant difference in the perceptions of preparedness between urban and suburban stakeholders and elementary, middle, and high school principals, and if district leaders and first responders felt differently about preparedness than school officials. Respondents completed the Principal Perceptions of School Safety and

Preparedness Survey and engaged in interviews. The theoretical background of the study derived from crisis communication research focused on public relations. According to this model, a preparedness program must include identification and preparedness plans, response procedures to mitigate detrimental factors, and recovery actions to repair the institution.

The results of Alba and Gable's (2011) research indicated that schools at different levels had varying degrees of preparedness. Perhaps more interesting, principals perceived that external security was greater at the elementary school level, and internal security was better at the high school level. High school procedures were also more in line with the drills of first responders. Both district-level leaders and first responders felt that the procedures were not coherent, with little guidance provided by the state in cooperating better. A significant problem identified in the research was that stakeholders' role ambiguity compromised preparedness due to an unclear sense of responsibilities, resulting in several gaps in communication and a breakdown of effective collaboration between stakeholders.

The results of principal surveys about their schools' preparedness and ability to handle various situations indicated that although prepared for natural disasters, schools are not prepared to handle terrorism (Alba & Gable, 2011; see Table 2). School drills were in place for natural disasters 83.1% of the time and hostage situations 38.5% of the time. Some 63% of elementary schools were more concerned with a school shooting, while 49% had written plans for terrorist attacks in urban and suburban areas compared with only about 30% in rural areas. In California, the Standardized Emergency

Management plan mandates interagency cooperation but studies of preparedness in this regard found that only 45% of schools felt that they could cooperate adequately.

Table 2

School Preparedness by Event Type

Events	School preparedness to handle
Natural disasters	95.8%
Bomb threats or incidents	93.8%
Terrorism	40%
Bioterrorism	36.1%

Alba and Gable (2011) argued that this gap might be at the core of the lack of translation from written plans to active ability to put them into action. That is, while schools have plans in place, they are not training with first responders through drills and other means to make them real. Some 30% of schools had never even had drills, 27% of school officials had never met with local law enforcement, and 42% had never met with local EMS to discuss emergency planning. Alba and Gable concluded that while perceptions of preparedness were relatively high, a closer inspection of gaps in communication and interagency cooperation indicates "paucity…in the best practices regarding their refinement, evaluation and practice with first responder personnel" (p. 21). Insofar as interagency cooperation is the greatest failing detected in this research, Alba and Gable recommended much greater attention to this matter, with first responders perhaps taking the lead. That is, local government agencies, as opposed to school districts, should oversee the emergency preparedness planning of all local institutions. Moreover, although not a focus of the proposed study, the issues associated with federalism as related to interagency cooperation and local capacity were of note. Particularly, the issue of federalism impacts readiness at the local level (Grundmann,

2014). For this reason, there is a need for a comprehensive approach that incorporates local, regional, state, and national agencies.

Impact of Local Capacity

Local officials' perceptions of readiness for dealing with bioterrorism are partly based on their assessment of the capacity of the current local infrastructure involved in emergency preparedness and response (Ferguson et al., 2019; Murthy et al., 2017). Beam et al. (2010) described the system in place in Nebraska for the biocontainment of persons who contracted a bioterrorism transmitted disease. Biocontainment, as a response, entails the availability of isolation units for the care of such patients, a method found to reduce the likelihood of spread of exposure dramatically. Biocontainment is one of several responses a locality may make to an agent, in addition to or in place of quarantine, ring vaccination, or surge capacity for treatment. Nebraska began to develop its biocontainment option in 2004 in response to recent bioterrorist attacks, including the anthrax attack in 2001. Beam et al. described the procedures undertaken by the development team, showing that Nebraska sought help from national and military organizations to build its capacity.

Beam et al. (2010) detailed the creation of the Nebraska Biocontainment Unit, part of the emergency preparedness processes at the Nebraska Medical Center. The Chief Medical Officer of the state's Department of Health and Human Services activated the unit, composed of full-time health providers at the hospital. Quarterly personnel drills keep the team in a state of preparedness. Performance improvement follows from postdrill incident analysis and the creation of an action plan. Safety in putting on and disposing of personal protective equipment is a priority, a problem identified as a weak

link. The lab was also involved with the Omaha Metro Medical Response System to provide annual training on the equipment required in biological emergencies. Beam et al. found that the system's success lies in strong leadership, an engaged professional team, and successful collaboration with other stakeholders. In this instance, Beam et al. described a preparedness model whose implementation was entirely in the hands of public health stakeholders. Its recognition as a model of best practice could inspire local officials' confidence that Nebraska was prepared for a bioterrorist threat.

Choi (2009) studied the networks put in place following the creation of a formal plan for a local government setting response to emergency services to swine flu. The case study focused on the response by the state of California to the swine flu outbreak in 2009. Although this is not a bioterrorist event, the case study provided insight into the management strategies of local emergency management plans and policies. The primary problem, Choi argued, was that government officials tended to over-focus on the emergency at hand and not view the response in the broader context, incorporating elements such as hazard mitigation, disaster preparedness, and disaster recovery. Research also indicated that emergency management is a low priority at the local level, without emergency management experts to oversee local response. Many offices were underfunded, working with part-time personnel.

In a previous study, 77% of local emergency managers felt they had little influence on the direction of response. Choi (2009) argued that most of the existing government response system is "disarrayed, disconnected, uncoordinated, underfunded and discredited" (p. 3). This disconnect occurred due to government officials' tendency to see problems from their own vantage points only; different role perceptions, which also

affects response; the inability of emergency management officials to control public officials' actions, hampering coordination; and the lack of credibility of emergency management in the overall government system.

Choi (2009) used a cognitive accuracy model to measure the disparity between planning and practice in the delivery of local emergency services. Cognitive accuracy is "the degree to which an actor's perceived networks correspond to actual networks" (Choi, 2009, p. 3). Accuracy is linked to how well people do their jobs. Emergency departments might have a collective cognitive accuracy such that all involved in an agency have a common operational picture. Three kinds of emergency management network structures are the legal/official network, emphasizing lead agencies; the perceived influence networks, based on the organizations perceived as most influential; and the actual networks, which constitute the channels through which communication passes. Based on these models, Choi suggested that an emergency management network depends on the information passed through it to perform well. If the flow of information allows stakeholders to develop a complete and accurate picture of their position and duties, the network should work well. Stakeholders having a clear picture of the whole network also contributes to effective action. Deficiencies in perception will lead, however, to a lack of coordination. California has a history of uncoordinated responses to various natural disasters, from the state to the local levels. Despite the Health Emergency Response Plan in place, its implementation is sketchy. Such dysfunctionality jeopardizes life and property. The cognitive accuracy model used by Choi is in Figure 3.

Figure 3

Framework for Effective Local Emergency Management Network
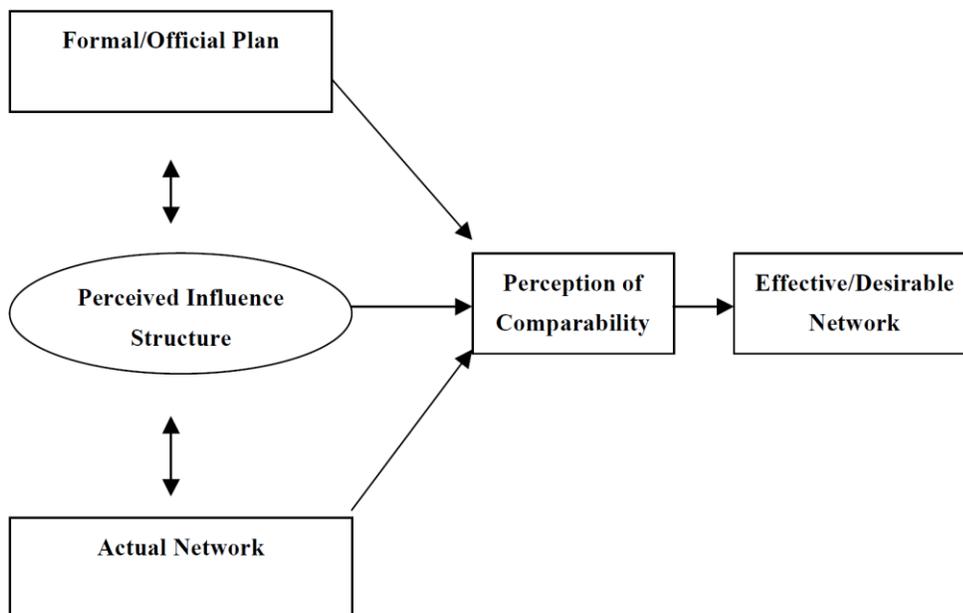
In Choi's (2009) study, 75% of respondents in all participating organizations declared that they understood the state emergency response plan only a little. This meant that, despite duties and responsibilities defined by the plan, few understood those duties. Only two of seven perceived influence structures identified the lead agency in the emergency management plan as most influential. Concerning network accuracy, "Both perceived and actual accuracy against the legal/official structure is relatively low" (Choi, 2009, p. 11). No respondents perceived the lead agency as most influential. They also suggested an overemphasis on the legal plan agency and the presence of "substantial misperceptions about how the actual network operates" (Choi, 2009, p. 11). Choi declared the overall emergency management network in California as Type IV, or incoherent. This failure could result from poor communication or local stakeholders having developed workarounds to overcome the barriers of antiquated plans and thus

working in ways different from the formal plans. Thus, Choi concluded that clear

leadership is best in public health networks, and that "networks with ambiguous or poorly

understood communication patterns are those that are most likely to fail under pressure

during a disaster or emergency (p. 14).

Government Officials' Perceptions of Preparedness for Bioterrorist Attacks

Local government officials' perceptions of preparedness for a bioterrorist attack

are indicative of the overall level of regional preparedness (Armstrong, 2012; Baldassare

& Hoene, 2003; Donahue et al., 2013; Maor, 2010; Nilsson, 2010; Putzer, 2006; Zogby,

2012). According to some government theory, public perception would likely be an

important antecedent to local official perceptions of emergency preparedness generally

and bioterrorism specifically (Zogby, 2012). Zogby (2012) conducted a nationwide

survey of public perceptions of likely behaviors in the event of an emergency, assessment

of the overall level of emergency preparations in their community, and opinions on the

current state of public safety. Zogby was particularly concerned with determining citizen

reactions to emergencies and if they have developed apathetic attitudes toward public

safety. Zogby found that although the number of emergencies declared under the Federal

Emergency Management Agency had increased (there were 99 declared in 2011), the

public remains unaware of most of the communication processes involved in an

emergency and generally apathetic about disaster preparedness.

Zogby's (2012) findings showed that too many people remained complacent

about emergency preparedness, many failed to act with a sense of urgency in times of

crisis, and apathy was widespread. This state of mind can lead to problems during

emergencies, compounding the problems of emergency managers to ensure public safety.

Statistically, the study found that 56% of Americans are aware of disaster preparedness plans, 67% of persons over 65 are aware, and 20% of male respondents think about such problems often. Some 64% of married persons claimed high levels of awareness; 65% of conservatives felt fully prepared for an emergency compared to 49% of liberals. Ultimately, over 50% of Americans rated their overall level of preparedness as low or very low.

About awareness as to the existence of a personal alert or notification system in their locality, Zogby (2012) found that:

- 71% reported being unsure if there was a local personal alert system.

- 36% of respondents reported that they would act based on an emergency alert issued by the system.

- There are more people motivated by an informed family member than radio or television.

- 27% of all adults did not even know if their community had a warning siren.

- 56% of respondents did not know when or if the sirens in their areas were tested.

- 70% would not recognize a siren, as they are unaware of the sounds and sirens associated with warnings.

- Only 47% of Americans reported that they would be motivated to act based on a warning of severe weather.

Although less than 3% of respondents were confident in federal officials and 16% in state officials, 58% were confident in local and regional officials, strongly indicating a local and regional perspective of safety among most Americans (Zogby, 2012). At the

same time, only 29% felt that their community officials were devoting enough attention to public safety, which seems contradictory. Also, 42% of Americans reported that the bad economy had negatively affected how much they invested in and concerned themselves with the community. Overall, the findings generally indicated a high degree of complacency about emergencies among Americans. In this context, 57% of respondents reporting confidence in local officials could suggest a "blank check" or "passing the buck," letting the officials deal with it. Of note, all questions involved television or radio notification of weather-related emergencies and, as noted elsewhere, local cultural traditions of weathering the storm could counteract attention. It may also be that such emergencies have become too routine, and TV notifications and sirens are no longer adequate methods of alert, not on par with developments in public media usage. Overall, it does not appear that local officials have to worry about public outcry or opinion when carrying out their duties.

The NIH has developed a model of dissemination consisting of Translation 1, from lab to test trials, and Translation 2, from test trials to practice (Barnes et al., 2008). Legislators, health organizations, scientists, and public officials have expressed public health concerns that developments that could help the public are not quickly translated to public service. Diffusion theory presents a succinct model to address this problem. More recently, there has been implementation theory developed to explain why "the effective application tends to wane, deviate from the intended use and take on new forms" (Green et al., 2009, p. 152), even when ideas and policies reach practitioners who claim to be using the new techniques. Researchers have identified 32 barriers to applying scientific advancements in an emergency in a way that would save lives. To ease these barriers,

public health officials strike to adopt practices that facilitate best practices. However, public health researchers on both national and local levels have not yet considered the degree to which geographic spread, mass media, community setting, and population issues prevent spread. Green et al. argued that the gap is partly the result of "social distance between the supply and demand sides of science in geography as well as in organizational and professional or personal self-identities" (p. 156). Gaps can be wide at the local level because "town-gown social distance prevails because scientists are more oriented to the international audiences of other scientists for which they publish than to the needs of practitioners, policymakers and the local public" (p. 155).

Green et al. (2009) argued that the main problem is scientists viewing knowledge development as a funnel-shaped pipeline extending beyond the question of usability of research in practice. As a result, they conduct more research than required for practice or basic research, which works well for biomedical interventions. Public health interventions must confront psychological processes, cultural contexts, and socioeconomic conditions that mediate or moderate the relationship between intervention and outcomes. As such, science scholars dismiss many results that could be relevant to the public, resulting in a gap. Green et al. found that it takes up to 17 years to funnel 14% of findings to the public, with more lost through leakage, attrition, or loss of knowledge.

Further, while 17% of research is never submitted, Green et al. (2009) argued that unsubmitted findings could include important insights and implications for diverse populations. Green et al. reviewed diffusion theory and knowledge utilization theory to construct a knowledge-utilization-focused surveillance framework that considered all the

social determinants and contexts impacting the diffusion of science for improving community and population health.

Diffusion theory is how innovations and new ideas spread in an area. People fall into different adoption groups, and information takes time to reach everyone, and some do not receive the communication. In the context of terrorism and preparedness, it is important to understand how to deliver new information and ideas about safety to large groups of people.

Knowledge utilization theory suggests that nonexperts will immediately use knowledge derived from experts to solve problems. However, this is not always what happens, as outside influences have a significant impact. For example, during the COVID-19 pandemic, experts professed the importance of masks and social distancing, unwelcome information in some groups based on political affiliations. While beyond the scope of this study, the umbrella model strongly suggests that as a stakeholder receives information, local officials' perceptions of their level of preparedness for any public health situation would be strongly influenced by the extent to which best practice knowledge has reached the local level (Green et al., 2009).

Donahue et al. (2013) argued that there remain "broad gaps in our understanding of how, why and when people react to risk, and how effective government preparedness policy initiatives are at improving individual preparedness" (p. 1). Donahue sought to better understand the nature of individual preparedness behavior as related to perceptions of risk and efficacy, implicitly making use of the health belief model. Another goal was to determine if the expectations and priorities of local government decision-making were consistent with individual citizen perceptions. The premise behind the study was that

government programs would be more effective if officials understood why individual

citizens respond or not to the programs.

Donahue et al. (2013) took the view that the more prepared individuals are, the

less governments need to intervene, and the more likely preparedness will be effective

and tailored to individual needs. Government officials have identified a significant reason

for the failure of preparedness efforts, namely that the public is unprepared and engaged

in denial consisting of "a combination of self-delusion, apathy and sheer stubbornness"

(Donahue et al., 2013, p. 6). As a result, despite many government efforts to create

preparedness programs, too many citizens remain underprepared for emergencies. One

study found that only 8% of Americans had done everything they need to do to prepare

for a disaster, and 32% had taken no steps at all. Concerning attitudes and perceptions,

researchers have determined that greater perceived risk often causes the public to support

proactive preparedness programs (Hong et al., 2019). Also, personal threat seems more

effective in making a person respond (both constructs in the health belief model). Trust in

government, or the lack thereof, is instrumental in connecting preparedness programs and

the public (Welby-Everard et al., 2020).

To determine if there was a link between individuals' and public officials'

perceptions of preparedness, Donahue et al. (2013) surveyed individuals and public

decision-makers in four coastal regions, with 11 public officials in each region.

Individuals discussed how much they thought of the consequences of an event, how

prepared they were, what they had done specifically to prepare, why they had or had not

prepared, their level of concern, how they appraised their ability to recover from the

event, and the likelihood of that event occurring; public officials responded about the

threats to the community, the likelihood of disaster, the current level of preparedness, the

adequacy of preparedness spending, how prepared residents were, why residents did not

prepare, on whom residents will rely in a disaster, how informed the residents are, and

whether the residents will follow directions. Donahue structured many of these questions

by calculating self-efficacy derived from health belief model studies.

Upon analyzing the data, Donahue et al. (2013) found that public officials were

more resilient and prepared to take risks than private citizens when faced with disaster.

While both felt that financial risk was the greatest national threat, officials saw natural

disaster risk as the most pressing at the community level. In contrast, citizens tended to

see terrorism as a greater risk. Similarly, the public thought they were better informed

about disasters than public officials thought they were. The public also believed

themselves more likely to follow directions than public officials expected. Most persons

reported that they would rely on themselves in an emergency, whereas public officials

thought the majority would rely on emergency responders. Citizens and local government

officials equally felt that they need not rely on state and federal agencies. Some 80% of

the public had considered the consequences of a disaster on their homes; however, most

did not think a major emergency would occur in their community and were not especially

worried about it. Public respondents conceded that a major disaster was a significant

problem, indicating a sense of the seriousness (though low susceptibility) of the threat.

However, although 75% of the public reported having done something to prepare for a

disaster, 23% said they had prepared because they take care of others or had been through

it before. Procrastination was the primary reason for not preparing, usually due to not

thinking it would happen, with 35% of public officials agreeing with this motivation for

not acting (linked to the susceptibility factor in human resource management).

Approximately 17% of public officials felt that people think it is too expensive to prepare

for a disaster (which would be a barrier; Donahue et al., 2013).

Donahue et al. (2013) concluded there was a misalignment between public

officials and some of their constituents. However, officials understood some of the

public's motivations regarding the seriousness of threats and susceptibility factors in

human resource management, which would account for the lack of preparedness

planning. Donahue found that public officials' minimization of citizens' preparedness for

a disaster correlates with research on the reality of public preparedness and "could help

explain why preparedness programs seem to have been ineffective at improving

preparedness" (p. 18). Overall, Donahue found mixed results about the accuracy of public

officials' perceptions of local preparedness in their agencies and among members of the

general public.

There has been some research on local government officials' perceptions of their

communities' overall crisis management capabilities. Nilsson (2010) analyzed the

perceptions of civil servants and political appointees of the strength or weakness of the

CMC of their communities. All respondents had participated in a vulnerability analysis of

the municipal capacity, so they had a solid sense of strengths and weaknesses. The results

were from 10 vulnerability studies conducted by local governments under the mandate of

the Swedish Emergency Management Agency Act of 2006. About the structure of the

EMCs in localities, most respondents felt they were lacking, improperly managed,

difficult to comprehend, or improperly designed. Thus, many perceived the plans as

based on misperceptions or simply too rigid and inflexible for use in a locality.

Respondents also indicated that many functions they expected the plans to have were missing and needed. Nilsson concluded that respondents' overall tendency to criticize structures and functions signaled that they were overconfident in the ability of managerial, preplanned ways of handling crises. Further, Nilsson suspected that their criticism could be due the lack of incorporating preparedness and readiness in the organizations, indicating that the organizations lack preparedness. Nilsson concluded that questions remain about the degree of comprehension most respondents had of their municipality's crisis management capabilities.

One solution to the lack of emergency response resources at the local level is for clusters of municipalities in similar regional areas to cooperate and respond to each other's problems (Canós & Piedrahita, 2017). In some regions with limited resources, particularly rural areas, government officials have expressed that sharing authority and resources is the only way for their municipality to protect citizens in an emergency. Nonetheless, utilizing purely human actors in regional or local emergency planning scenarios can result in misunderstandings. Therefore, Canós and Piedrahita (2017) strongly suggested developing a software architecture for community emergency planning. Further, Canós and Piedrahita argued that emergency management does not take place in government offices, but in the community, involving first responders, local hospitals and businesses, and, in the case of transit, local public transportation.

Researchers have explored the perceptions of various stakeholders involved in the biosecurity infrastructure about their confidence levels with the system. Insofar as these perceptions would influence communication and cooperation, they are important for their consequences on implementing preparedness plans. This issue is also an indication of

public trust in authorities, which is important for the successful implementation of preparedness plans. For example, Vartti et al. (2010) examined perceptual issues between the public health and military components of the biosecurity system. Specifically, they focused on the perceptions of conscripts to the Finnish military of the extent to which they trusted the information provided by biopreparedness authorities, whether from the military, police, health care institutions, or public health bureaucracy. They also discussed how well they thought the authority was prepared to protect the public during an infectious disease outbreak caused by deliberate bioterrorism compared to a natural outbreak. The conscripts reported having confidence in the authorities but placing their confidence differently based on the type of incident. That is, during a natural outbreak, they would be more likely to trust hospital or primary health care center authorities, while in the case of bioterrorism, their confidence switched to defense forces and central hospitals working together. Positive, trusting perceptions in both cases were linked to the level of education of the authorities involved. Finns have higher recorded confidence in authorities than Americans, 88% compared to 66%. This discrepancy is likely because the overall average level of completed education is higher in Finland, and more educated persons have greater confidence. Vartti et al. concluded that when communicating with the public in the context of a preparedness plan, "There is a greater need for tailoring communication to match the needs and expectations of various groups of people" (p. 610).

Maor (2010) reviewed efforts to improve local preparedness for a general emergency in Israel, where the government has created a unique response to preparedness problems. Maor defined emergency preparedness at the local level as "the readiness of a

police jurisdiction to react constructively to threats from the environment in a way that minimizes the negative consequences of impact for the health and safety of individuals" (p. 955). Unless the national government declares a state of emergency, localities are left to deal with preparedness issues on their own. In reviewing recent cases, Maor found a lack of preparation by central government bodies and local authorities, as well as "widespread failure" of the involvement of personnel from nongovernmental organizations. Israeli officials' solution to this problem was to appoint independent emergency management consultants to advise local authorities on developing an emergency preparedness plan, tailoring emergency preparedness to the specific needs of each locality. The project has been implemented at 30 localities in northern Israel.

Maor (2010) evaluated the effectiveness of the consultant's efforts to help local government officials create an optimal and targeted emergency preparedness plan for each of their localities. Emergency preparedness for a local administration requires disaster planning that involves assessing the management of community disasters, evaluating the concept of community preparedness, and considering whether the local government is federally or locally focused or both. Some local governments are designed to fulfill federal mandates at the local level, with an emphasis on uniformity. Locally focused governments address the training needs of individual local authorities, presumably because of a perception that the dynamics of the locality are unique and uniform approaches would not apply. Israel has generally adopted an integrated model, which involves a consultant to the local government.

To determine how well Israeli officials carried out the project and if it led to local emergency preparedness, Maor (2010) interviewed 32 senior city managers, emergency

preparedness consultants, and administrators. Maor was particularly concerned with whether consultant involvement caused single-loop learning—that is, simple application of facts—to become double-loop learning in which the knowledge learned then flows to emergency preparedness improvements in routine operations—that is, if lessons in one area are applicable in others. Maor found that due to the consultation concepts of emergency operation formulated and put into practice, there were structured procedures and an organizational structure created. Also, there were second-loop learning gains with the professional work patterns modeled by the consultant transferred to all local routines. After the consultant left, Maor still found some confusion and commented that "the absence of a core concept of municipal emergency operation creates a lack of clarity on the services each department in the municipality is supposed to supply to the others" (p. 966). Overall, however, the study showed that the consultants' work improved local authorities' beliefs that they were prepared for the next emergency in their communities.

Local Preparation for Bioterrorism Attacks

Local cases in various regions of the United States indicate emergency and medical personnel's perceptions of preparedness for bioterrorism and other large-scale emergencies. Aldhous (2012) stressed the importance of training, as even a small mistake when dealing with biological agents can result in a public health catastrophe. Reviewing procedures in place in Albuquerque, New Mexico, Armstrong (2012) found that the simulation of a bioterrorist event for health givers to practice caring in such a scenario can also help improve overall local preparedness for a bioterror event. Armstrong argued that simulation should become part of cities' routine regimens of preparedness such that it becomes a part of everyday life for all citizens.

In the wake of 9/11 and for about a year afterward, most agencies at most levels of government undertook studies to determine their level of preparedness for a terrorist attack of any kind (Medina, 2016). A few of these studies are important to review for establishing a baseline of immediate post-9/11 sense of preparedness and improvement efforts. Baldassare and Hoene's (2003) survey of California city officials' level of preparedness for a terrorist attack, administered in the year following 9/11, is relevant. The study was significant for identifying the concerns local officials must address in preparedness and response, such as the homeland security needs of different localities based on myriad sociodemographic and geographic factors. California, for example, is highly populated and located near many national ports of entry. However, the state has a long history of dealing with natural disasters at the local level and thus has a solid emergency preparedness infrastructure.

Baldassare and Hoene (2003) admitted that their survey represented a "snapshot in time, when city officials are in the early stages of assessing the new realities confronting local governments one year after the terrorist attacks in New York and Washington D.C." (p. 3). However, the results were not entirely promising. Although many city officials are concerned about homeland security issues, "especially with respect to biological and chemical attacks and cyber-terrorism" (p. 1), they spent most of their time addressing more immediate crime and economic issues. More specifically, only 50% and 48% of officials were concerned about biological and chemical attacks, respectively. This is a lower level of concern than from local officials in Florida and Texas, where 56% and 54%, respectively, are concerned about biological attacks, and much lower than local officials in the Northeast, 72% of whom are concerned. Western

officials may be less concerned about geography and distance, making it more difficult to implement a bioterrorist plan. As a result, the overall level of concern about such attacks in California is lower than in other parts of the country. Indeed, while 78% of officials expressed concern about crime and 63% about natural disasters, only 38% were concerned with biological attacks. Also, 64% cared more about crime, with only 25% noting concern about terrorism. Another finding was that most cities have emergency preparedness plans to address biological and chemical attacks, but not cyberterrorist acts.

Local officials in California were about as optimistic as city officials anywhere in the country (Baldassare & Hoene, 2003). However, they were less concerned with protecting water supplies and hospitals than other officials. One year after 9/11, Baldassare and Hoene still found low levels of cooperation between city and state and federal agencies, and California local officials did not believe that cooperation had increased. Officials in Western cities were the least likely to report high cooperation levels compared to the Northeast and Midwest. When it came to raising taxes to support more effective plans, most local officials were not optimistic. Since 9/11, only 48% of cities had increased security spending, compared to 61% of cities in the Northeast. Respondents identified a need for federal aid to train emergency response personnel and provide towns with necessary emergency equipment.

Although Baldassare and Hoene (2003) were concerned with reporting the survey results, the issue raised by the results was why local officials' responses differed based on unique priorities. Such varied perceptions of preparedness suggest that a one-size-fits-all approach to local preparedness against biological attack will not work. Instead, it is

necessary to tailor the response to each locality's specific cultural, economic, and geographic variables.

In the year after 9/11, a suspected anthrax bioterrorist attack led officials to focus on the broader dimensions of preparedness, including response to a public health emergency (Zacchia & Schmitt, 2018). As a result, the concept of preparedness also applied to public health emergencies, with public health advocates and physicians responsible for implementing emergency preparedness plans for bioterrorism and other attacks (Putzer, 2006). Thus, local public health emergency preparedness must assign officials, health advocates, and physicians to manage relevant parts of the plan. This designation is more true in rural locales where local physicians are often important community stakeholders. Hence, there remain serious questions about the work done thus far to establish preparedness.

The CDC found that exposing 10,000 people to an anthrax bioterrorist attack would cost $26.2 million to combat (Putzer, 2006). Absent a preparedness and intervention program, 50% of individuals would inhale anthrax, resulting in 32,000 deaths per 100,000 people. Although the United States has not experienced a large-magnitude anthrax attack, "The brush with anthrax in October 2011 filled every American with a sense of fear and foreboding" (Putzer, 2006, p. 2). The attack killed five, with Putzer describing the official response as "marred by misinformation, confusion and widespread public alarm which predominantly flowed from the lack of bioterrorism preparedness" (p. 2). There was panic as citizens flocked to a doctor's office to demand antibiotics, which would not have helped in any case. Putzer imagined that a large-scale

anthrax release, if handled in a comparable way, would result in "immeasurably greater levels of chaos, panic and mass hysteria" (p. 2).

Growing concern is merited. Despite few large-scale bioterrorist attacks historically, there has been a spike in attacks since 1995, with 175 incidents occurring in 1999 (Putzer, 2006). In 2001, there were 629 incidents, although 603 were hoaxes. The current definition of a bioterrorist attack is the intentional release of a biological infectious agent, such as anthrax, smallpox, the plague, or botulism. The U.S. response is Operation Dark Winter, a role-playing exercise undertaken in 2001 to discern federal, state, and local agencies' ability to respond to bioterrorism. The Dark Winter exercise, which incorporates an imaginary release of smallpox to 20 states resulting in 1,000 deaths, showed "several vulnerabilities in emergency bioterrorism preparedness" (Putzer, 2006, p. 17). Weaknesses occurred in areas of supply, communication, and organization. The real-world response to October 2001 anthrax scare demonstrated, however, that a multidisciplinary effort involving epidemiologists, public health officials, law enforcement personnel, government agencies, laboratory staff, media organizations, and health professionals was possible.

Putzer (2006) argued that "no amount of planning could have produced a good outcome without an astute physician who suspected and diagnoses the first case and immediately notified the appropriate authorities" (p. 18). The solution, according to Putzer, is that frontline health care responders, such as primary care physicians, are trained and educated regarding bioterrorism agents to allay patient fears. Putzer questioned the viability of many of the purported emergency operations plans developed by hospitals, concurring with other researchers that health care was unprepared.

A key element in the knowledge of how to respond to anthrax and other agents is that contamination usually begins with flu-like symptoms. Thus, patients are more likely to visit primary care physicians than emergency rooms, which puts physicians on the front line of bioterrorist attacks (Zacchia & Schmitt, 2018). Due to the location of energy and nuclear sites in rural locales, they are ill-prepared. Urbanites are likely to stream into rural locales during bioterrorist attacks, doubling small towns' lack of preparedness.

A review of the research on physician preparedness indicated only a few reports of physicians being well prepared for a public health emergency. In one survey, just 22% reported adequate preparation at their primary care site. After a spike in 2001, physician interest in bioterrorism has declined (Putzer, 2006). Additional research has led to more questions about the extent to which the public health system's current capacity can respond adequately to a bioterrorist attack. A significant factor that has emerged in research based on worst-case scenarios is surge capacity, defined as "the system's ability to rapidly expand beyond normal services to meet the increased demand for qualified personnel, medical care, and public health in the event of bioterrorism" (Putzer, 2006, p. 29). Physicians likely need more training to assist effectively in bioterrorism response efforts.

Physicians' willingness to respond and their level of training are linked, indicating that training is also a way to respond to surge capacity needs (Zacchia & Schmitt, 2018). In research of physicians' perceptions of the system to respond to bioterrorism, however, only 19% believed that the local medical community could respond adequately. In addition, just 21% of physician respondents had confidence in the ability of their local hospital to respond (Putzer, 2006). Although 95% of physicians believed that

bioterrorism is a real threat, only 13% felt it would happen in the next 5 years. While 65% of physicians believed they would respond to a natural disaster or an infectious disease outbreak, only 26% felt the same about a bioterrorist attack, which suggests the latter has elements especially challenging to physicians. That said, physicians who felt they could deal with an infectious outbreak were four times more likely to state they could respond effectively to bioterrorism.

Several physicians reported receiving additional training in the period immediately following 9/11; however, rural and local physicians remained unprepared to address the threat of a bioterrorist attack in their community (Putzer, 2006). Funk (2018) reinforced Putzer's (2006) findings in studying the U.S. health care system's overall capacity to respond to a bioterrorist attack. Results vary by region and locality, with only 25% of hospitals in the Northwest reporting being prepared. For the purpose of analysis, Putzer (2006) distinguished between actual preparedness and perceived preparedness, which are rarely synonymous. For example, even physicians trained to recognize and treat bioterrorist contamination might not perceive themselves as prepared because they have never had a real-life experience doing so. There are also actual and perceived barriers to preparedness (Funk, 2018).

Putzer's (2006) analysis of rural preparedness for bioterrorist attacks in Florida showed a widespread lack of preparedness for bioterrorist attacks among the six representative rural physicians interviewed. Lack of preparedness emerged in cognitive, clinical, expectation, simulation, and resource preparedness facets. That is, most rural physicians were untrained in recognizing the signs and symptoms of bioterrorist-inducing agents, as well as the health risks and how to respond. Few rural physicians reported

having participated in a simulation exercise or training to prepare themselves to respond

to a bioterrorist attack, indicating that their overall level of expectation preparedness was

low. Lack of resources was the most commonly cited reason for being unprepared. Rural

physicians had many gaps in their understanding of bioterrorism, not due to ignorance but

to their personal choice and discretion in prioritizing what seemed most important to

them in their daily performance. Putzer recommended procuring funds for rural

physicians to attend preparedness seminars to improve their knowledge of bioterrorist

infectious agents and the procedures and requirements of preparedness.

Overall, Putzer (2006) questioned the capacity of the U.S. health care system,

assigned to bioterrorism in the preparedness model developed after 9/11, to respond to

bioterrorism without assistance in funding, training, and resource supply. Solutions to the

lack of preparedness have come from researchers such as Adams et al. (2017), who

argued that community health improvement process models are needed to guide localities

in improving their response to such events.

Local Preparedness for Bioterrorism Threats

Gaining a sense of the effectiveness of the local emergency response in particular

localities is difficult, as there are limited studies worldwide (Vedula & Shalin, 2017).

There have also not been studies in each city where bioterrorism attacks have occurred,

which makes comparing incidents between cities difficult. Nonetheless, local

preparedness is essential in ensuring an effective response in the event of a bioterrorism

attack (Grundmann, 2014). How officials and media outlets address medical emergencies

and terrorist incidents can impact the perceptions of and responses to future incidents

(Lu, 2017).

The GTD has reviewed news and media reports to obtain data on bioterrorism attacks for entry into the database (National Consortium for the Study of Terrorism and Responses to Terrorism [START], 2020). This information provided the data used in the present study. The following selection presents a summary of the GTD's key findings.

Long-Term Impacts of Terrorism

The long-term impacts of terrorism on the American people are largely unknown. There have been few articles written to educate the general public on what happens following the loss of life due to terrorist acts of violence and havoc. Many authors have published articles and books to address the topic, but they are not comprehensive. An important area of discussion is the psychology of terrorism: how it affects the minds of people who suffer such acts, and how it affects U.S. foreign policy in the name of protecting the United States and its people from harm.

Fear is a profound, long-term impact of terrorism. Even after a series of domestic terror attacks, people are still as surprised and horrified when it happens again. The feeling of panic and disorientation that follows an event can be either short- or long-term, dissipating after a few months or remaining for years. Victims who live near the event or lose family members might never regain their sense of self or normalcy.

Some long-term implications of terrorism are not as widely known. Terrorism breeds fear in foreign nations and the American people. Foreign leaders often blame another country's citizens and the media for reporting on and encouraging terrorism. The long-lasting impacts of terrorism tend to lower a nation's GDP. Even if a country can defeat a terrorist organization, it will still suffer the long-term impacts due to the severe disruption of its domestic and foreign policies. Terrorism can impede economic growth

through other means. In addition, many victims of terrorism become unemployed. They may face difficulties in society because of an inability to find jobs due to economic turmoil.

Summary

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. The literature review showed that regional officials are only modestly confident that their local communities and governments are prepared to adequately respond to a terrorist event (Bush & Perez, 2012; Sun & Yang, 2017). In addition, there are many reasons for gaps between ideal preparedness and the current state of preparedness. The review showed that the factors measured in the health belief model, whether acknowledged or not in studies of preparedness, frequently affect how officials and others calculate their current level of preparedness. Establishing local capacity for preparedness and disaster response also emerged as a significant issue. As reflected in this review, there have been no published quantitative descriptive studies on terrorism in the United States between 2001 and 2018 using information from GTD.

The review showed preparedness as the primary paradigm utilized to formulate a plan to respond to a terrorism incident. The general state of preparedness for a terrorist attack from federal to local levels in the United States was only adequate (Arrazola et al., 2018; Manuell & Cukor, 2010; Poutanen, 2007; Smith & Davison, 2010; Sun & Yang, 2017). The review showed that the public is poorly prepared for such an event and poorly

educated about preparedness. Even the health care community is unprepared, both in knowledge and the capacity to respond effectively to a terrorist attack. The preparedness infrastructure is highly complex, calling for terrorism surveillance systems and the myriad collaboration problems between the public health and military sectors.

A few case studies indicated how localities could create preparedness and respond effectively to a terrorist event as interpreted through the lens of the health belief model. However, local officials' perceptions of preparedness are fair to poor, which provides a fairly accurate picture of the actual state of preparedness (Armstrong, 2012; Baldassare & Hoene, 2003; Donahue et al., 2013; Maor, 2010; Nilsson, 2010; Zogby, 2012). However, there is a lack of quantitative data to provide a comprehensive picture of the state of terrorism in the United States. Moreover, with the current COVID-19 pandemic, there is a lack of equipment and facilities due to the increased strain on the system. Although the present study does not contribute to the literature on understanding the state of preparedness, it was an examination of the state of terrorism in the United States. Moreover, the results of the present study could help to determine whether differences existed in the attacks between 2001 and 2018 based on the region of the terrorism incident, information useful to help regions that have experienced such attacks prepare for future attacks or threats. Chapter 3 presents the study's methodology, including the research design, sample selection, and data analysis approach.

Chapter 3: Research Method

The problem addressed by this study was that regional and local officials were only modestly confident that their communities and governments were prepared to adequately respond to a terrorist event based on analysis of multiple factors (Brandeau, 2019; David & Le Dévédec, 2018; Scott & Errett, 2018; Welby-Everard et al., 2020). A primary paradigm utilized to formulate a plan to respond to a terrorism incident is the concept of preparedness. Preparedness involves forecasting and taking precautionary measures prior to an imminent threat when advance warnings are possible (United Nations International Strategy for Disaster Reduction, n.d.). Previous research showed that the public was poorly prepared for terrorism and that many corners of the health care community were relatively unprepared both in knowledge and capacity to respond effectively to a terrorist attack (Eto & Kanatani, 2018; Funk, 2018). There was also a lack of research on the trends in terrorist attacks based on the region of attack. This was particularly true at the local, or city and community, level, where local officials were caught between funding problems and a need for preparedness and did not exhibit a high degree of preparedness for terrorism as a result (Zacchia & Schmitt, 2018). Thus, new region-specific research was necessary to provide key stakeholders with the necessary knowledge to make effective, evidence-based decisions about terrorism preparedness. This study focused specifically on trends in terrorist attacks between 2001 and 2018 and how these trends differ by region.

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents

(weapon used and target type) and the region in which they occurred. Understanding

surveillance, early detection, effective isolation of terrorists, control of the movement of

potentially involved individuals, and risk communication was essential for improving

preparedness (Green et al., 2019). The importance of understanding the trends in terrorist

attacks in the United States is the need to be prepared to respond to potential terrorist

attacks. In this chapter, I present the methodology for this study. This chapter includes

the research design and rationale, research method, threats to validity, and ethical

procedures. Chapter 3 concludes with a summary and transition to Chapter 4.

Research Design and Rationale

A quantitative approach aligned with the purpose of this study to examine trends

in terrorist attacks in the United States between 2001 and 2018 and whether factors

related to terrorist attacks varied by region. Quantitative researchers collect and analyze

numerical data to describe, explain, predict, or control variables pertaining to the

phenomenon of interest (Gay et al., 2009). In this study, I described and interpreted the

status of terrorist incidents in the United States from 2001 to 2018 as reported in GTD.

Therefore, quantitative methodology was best suited for the study.

A descriptive quantitative study design was appropriate for examining this

phenomenon. The purpose of descriptive quantitative research is to describe and interpret

the status of individuals, settings, conditions, or events (Mertler, 2014, 2016). I described

and interpreted the status of terrorist incidents in the United States from 2001 to 2018 as

reported in GTD. To answer the RQ1 and RQ2, I used descriptive statistics, including

frequency counts and time-series charts, to examine the trends in the number of incidents,

injuries, and fatalities associated with terrorism incidents between 2001 and 2018, as well

as trends in the regions in which the terrorism incidents occurred. To answer RQ3, I used a multinomial logit model because it assumed that the data were case-specific and could be used with nominal variables (Long, 2014; Rodriguez, 2007). For RQ3, the independent/predictor variables that I examined against the dependent variable of region of the incident were the weapon used and target type of the terrorism incident.

Because I utilized historical secondary data to analyze previous terrorist attacks, the data were case-specific by each terrorist attack (i.e., terrorism incident). I utilized secondary data in this quantitative study from the GTD. I used descriptive statistics, including frequency counts and time-series analyses, to determine the trends in terrorist attacks in the United States between 2001 and 2018, including trends by region in the number of incidents, injuries, and fatalities. I used multinomial logit analysis to identify the relationships between the region of the terrorist attack and the characteristics of the terrorist attack (weapon used and target type).

Population

There were no human subjects used in this study. The subject of this study was terrorism incidents, also known as terrorist attacks, in the United States between 2001 and 2018. The data included all terrorism incidents that occurred between 2001 and 2018 in the United States and appeared in the GTD.

Sampling and Sampling Procedures

The sample included GTD-recorded data on terrorism incidents that occurred between 2001 and 2018 in the United States. There was no sampling from the database, with all incidents included in the data set.

Procedures for Recruitment, Participation, and Data Collection

I utilized secondary data from the GTD study. The GTD data are available to the public for individual use, including scholarly, educational, and research purposes (START, 2020). I obtained permission to download and use the GTD data by registering online as an individual user. I did not access the data set until completing the proposal defense and obtaining Walden University Institutional Review Board (IRB) approval.

Instrumentation and Operationalization of Constructs

The source of data for this study was the data set obtained from the GTD. All data were from terrorism incidents in the United States between 2001 and 2018. All constructs used in this study were based on the definition of variables included in the GTD. Variable definitions were not modified in this study. GTD (2019) defined a terrorist attack as "the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation" (p.1 /para. 3). Within this definition, the following attributes were present to consider an incident a terrorist attack: (a) the incident was intentional, (b) the incident involved some level of violence or immediate threat of violence, and (c) the perpetrators of the incident were subnational actors. In addition to the attributes, at least two of the following criteria were present for each incident included in the GTD:

1. The act must be aimed at attaining a political, economic, religious, or social goal.

2. There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) than the immediate victims.

3. The action must be outside the context of legitimate warfare activities. (GTD, 2019, p. 11)

To answer RQ1 and RQ2, I used descriptive statistics, including frequency counts and time-series charts, to examine the trends in the number of incidents, injuries, and fatalities associated with terrorism incidents between 2001 and 2018, as well as trends in the regions in which the terrorism incidents occurred. A description of these variables, including how they were conceptualized in the GTD (2019) codebook, appears in Table 3.

Table 3

Operationalization of Variables for Research Question 1 and Research Question 2

Type of variable	Name of variable in GTD codebook	Description of variable
Explanatory/descriptive variables		
Incident ID	Eventid	Starting from 1 (all terrorism incidents that occurred between 2001 and 2018 in the United States)
City of incident	City	Text variable (nominal)
Year of incident	Iyear	Numeric variable
Total number of injured	Nwound	Numeric variable
Total number of fatalities	Nkill	Numeric variable

I used a multinomial logit model to answer RQ3. I selected the model because of the assumption that the analyzed data were case-specific and could be used with nominal variables (Long, 2014; Rodriguez, 2007). For RQ3, the independent variable was the region of the terrorist attack, and the dependent variables were the weapon used and target type of the terrorism incident. For the manipulation of the data, the incidents were

nested (collapsed) by the region in which the incident occurred. A description of these
variables, including their conceptualization in the GTD (2019) Codebook, is in Table 4.

Table 4

Operationalization of Variables for Research Question 3

Type of variable	Name of variable in GTD codebook	Description of variable
Dependent variable		
Region of incident	region	Text variable (nominal)
Independent variables		
Weapon used	weapdetail	Text variable (nominal)
Target/victim type	targtype1; targtype1_txt	Target type variable (nominal)

Data Analysis Plan

Descriptive statistics, including frequency counts and time-series analysis, were
useful to determine the trends in terrorist attacks in the United States between 2001 and
2018, including trends by region in the number of incidents, injuries, and fatalities.
Multinomial logit analysis was appropriate to determine the relationships between the
region of the terrorist attack and the characteristics of the terrorist attack (weapon used
and target type). Specifically, multinomial logit analysis allowed me to predict
categorical (nominal) placement or the probability of membership of a dependent
variable based on multiple independent variables. As I used secondary data for this study,
I downloaded and cleaned them in Microsoft Excel before analysis. I used R software to
complete all analyses in this study.

The following research questions and associated hypotheses guided this study:

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of
incidents, injuries, and fatalities) in the United States?

$H_0$1: There were no changes in terrorist attacks (number of incidents, injuries, and

fatalities) between 2001 and 2018 in the United States.

H_a1: There were changes in terrorist attacks (number of incidents, injuries, and

fatalities) between 2001 and 2018 in the United States.

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of

incidents, injuries, and fatalities) in the United States by region?

$H_0$2: There were no changes in terrorist attacks (number of incidents, injuries, and

fatalities) between 2001 and 2018 in the United States by region.

H_a2: There were changes in terrorist attacks (number of incidents, injuries, and

fatalities) between 2001 and 2018 in the United States by region.

RQ3: What was the relationship between the region of the terrorist attack and the

characteristics of the terrorist attack (independent/predictor variables: weapon used and

target type)?

$H_0$3: There was no statistically significant relationship between the region of

terrorist attack and the characteristics of the terrorist attack (independent/predictor

variables: weapon used and target type).

H_a3: There was a statistically significant relationship between the region of

terrorist attack and the characteristics of the terrorist attack (independent/predictor

variables: weapon used and target type) for one or more regions and one or more

characteristic of terrorist attack.

Threats to Validity

The use of secondary data necessitates consideration of threats to validity. The

GTD was appropriate for this study because it was the most comprehensive unclassified

database for terrorist attacks in the world (START, 2020). The data included in the GTD were from more than 4 million news articles and 25,000 news sources on incident data between 1998 and 2019. As the world's most comprehensive unclassified database managed by a team of researchers and technical staff, the GTD was valid for this study.

Ethical Procedures

After obtaining IRB approval (No. 09-21-18-0077352), I accessed the data from the GTD database for use in this study. Prior to accessing the data, I obtained permission from START by completing the GAD registration form. No confidential participant data were collected as no human subjects were engaged in this study. I stored all electronic data on my password-protected personal computer. I will keep all the data for 5 years following study completion, after which time I will shred all physical data and delete all electronic files.

Summary

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. A quantitative method aligned with the purpose of this study, which was to examine trends in terrorist attacks in the United States between 2001 and 2018 and investigate whether factors related to terrorist attacks varied by region. There were no human subjects used in this research. The study subject was terrorism incidents, also known as terrorist attacks, in the United States between 2001 and 2018. All terrorism incidents that occurred in the United

States during this time and were recorded in the GTD comprised the data set for this study.

I used secondary data to examine and interpret the status of terrorism incidents in the United States from 2001 to 2018 as reported in GTD. To answer RQ1 and RQ2, descriptive statistics, including frequency counts and time-series charts, were useful to examine the trends in the number of incidents, injuries, and fatalities associated with terrorism incidents between 2001 and 2018, as well as trends in the regions in which the terrorism incidents occurred. I used a multinomial logit model to answer RQ3. The multinomial logistic model was appropriate because it assumed that the data were case-specific and could be used with nominal variables (Long, 2014; Rodriguez, 2007). Multinomial logit analysis is effective to predict categorical (nominal) placement or the probability of membership of a dependent variable (region of the terrorism incident) based on the independent variables (weapon used and target type of the terrorism incident). For RQ3, the independent/predictor variables I examined against the dependent variable of region were the weapon used and target type of the terrorism incident. I used R software to analyze the data in this study.

In this chapter, I described the specific details of the methodology. The discussion included the research design and rationale, instrumentation, data collection procedures, and data analysis plan. The chapter also included the threats to validity and ethical procedures in consideration of the use of secondary data and the absence of human participants in this study. Chapter 4 presents the results of this study obtained by using the methods described in Chapter 3.

Chapter 4: Results

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. I used secondary data obtained from the GTD. There were 531 terrorist attacks recorded across the United States between 2001 and 2018. I conducted descriptive analysis and chi-square analysis to address the research questions.

This chapter begins with a restatement of the research questions and hypotheses that guided this study. Discussions about the data collection procedures, descriptive analysis of the sample, and testing of data assumptions follow. Next, I present the results from descriptive analysis and time series analysis for the research questions. A summary of the results concludes this chapter.

Research Questions and Hypotheses

This study focused on identifying key variables related to trends in terrorist attacks in the United States. The three research questions and hypotheses that guided this study were:

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States?

$H_0$1: There were no changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States.

H_a1: There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States.

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States by region?

$H_0$2: There were no changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States by region.

H_a2: There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States by region.

RQ3: What was the relationship between the region of the terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type)?

$H_0$3: There was no statistically significant relationship between the region of terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type).

H_a3: There was a statistically significant relationship between the region of terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type) for one or more regions and one or more characteristic of terrorist attack.

Data Collection

I collected GTD data after obtaining IRB approval. The data included terrorist attacks from 2001 to 2018 along with number of injuries, fatalities, weapons used, target type, and perpetrator group. The perpetrator group comparisons were not relevant due to the large number of groups and sparseness of the data. The terrorist attacks were also categorized by the city and state in which they occurred. Because the number of attacks by city and state was too small for analysis, I used the regions' numbers.

Descriptive Statistics

The sample included 531 terrorist attacks between 2001 and 2018. Of this sample, the most attacks occurred from 2016 through 2018. In contrast, the smallest number of attacks occurred in 2004, 2006, and 2007 (see Figure 4). The average number of people injured across terrorist attacks was 1.20 ($SD = 7.55$). The average number of fatalities across terrorist attacks was 6.11 ($SD = 83.57$).

Figure 4

Number of Attacks by Year
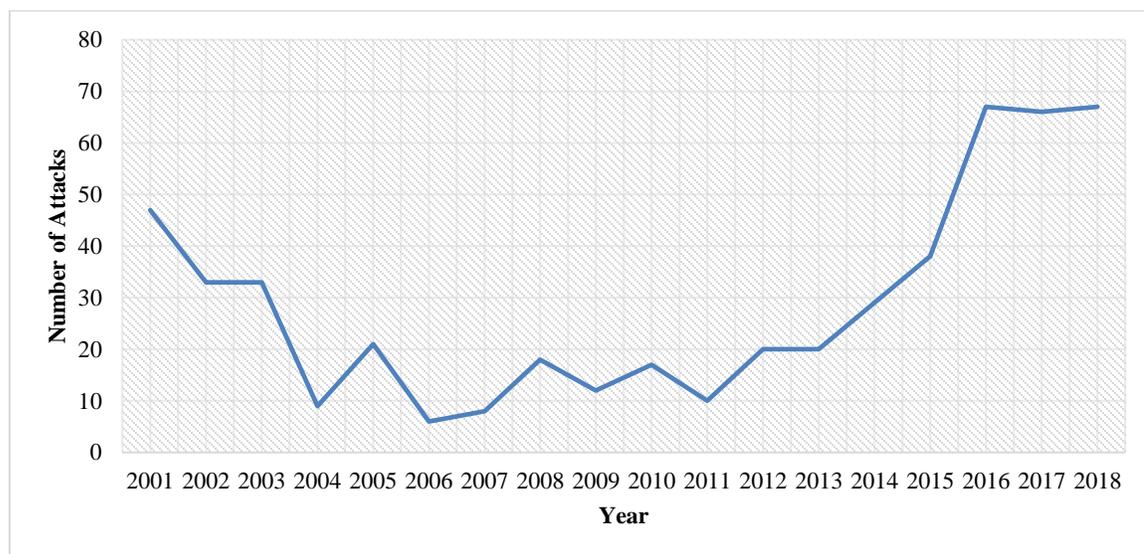
Table 5 presents the characteristics of the terrorist attacks between 2001 and 2018. The majority of attacks occurred in California ($n = 76$; 14.3%), followed by New York ($n = 53$; 10.0%), Washington State ($n = 36$; 6.8%), Texas ($n = 34$; 6.4%), Florida ($n = 32$; 6.0%), and Virginia ($n = 17$; 3.2%). In addition, the majority of terrorist attacks were targeted toward private citizens and property ($n = 137$; 25.8%), businesses ($n = 100$; 18.8%), and religious figures or institutions ($n = 97$; 18.3%). For terrorist attack type, 237 (44.6%) were facility/infrastructure attacks, 125 (23.5%) were armed assaults, 112

(21.1%) were bombings or explosions, 40 (7.5%) were unarmed assaults, 6 (1.1%) were

hijacking, 5 (0.9%) were hostage (barricade), 4 (0.8%) were assassination, and 2 (0.4%)

were hostage (kidnapping). Most terrorist attacks take place in large, population-dense

states. This is likely because more people live in these areas, making them target-rich

environments. However, the research does not prove a causal relationship.

For weapon type, 234 (44.1%) were incendiary, 114 (21.5%) were firearms, 101

(19.0%) were explosives, 35 (6.6%) were melee, 20 (3.8%) were biological, and 15

(2.8%) were vehicle. Less common weapon types were chemical ($n = 5$; 1.0%), sabotage

equipment ($n = 4$; 0.8%), other ($n = 2$; .4%), and fake weapons ($n = 1$; 0.2%).

Table 5

Characteristics of the Terrorist Attacks Between 2001 and 2018

Variable	Frequency (n)	Percentage (%)
Location of attack (state)		
California	76	14.3
New York	53	10.0
Washington	36	6.8
Texas	34	6.4
Florida	32	6.0
Virginia	17	3.2
Pennsylvania	16	3.0
Missouri	15	2.8
Arizona	14	2.6
District of Columbia	14	2.6
Others	224	42.2
Attack type		
Facility/infrastructure attack	237	44.6
Armed assault	125	23.5
Bombing/explosion	112	21.1
Unarmed assault	40	7.5
Hijacking	6	1.1
Hostage-taking (barricade incident)	5	0.9
Assassination	4	0.8
Hostage-taking (kidnapping)	2	0.4

Variable	Frequency (*n*)	Percentage (%)
Target type		
Private citizens and property	137	25.8
Business	100	18.8
Religious figures/institutions	97	18.3
Government (general)	51	9.6
Educational institution	29	5.5
Abortion related	28	5.3
Police	28	5.3
Military	14	2.6
Journalists and media	9	1.7
Utilities	8	1.5
Others	30	5.6
Weapon used		
Incendiary	234	44.1
Firearms	114	21.5
Explosives	101	19.0
Melee	35	6.6
Biological	20	3.8
Vehicle	15	2.8
Chemical	5	0.9
Sabotage equipment	4	0.8
Other	2	0.4
Fake weapons	1	0.2

Assumption Testing

To address the research questions, I conducted time-series analysis and chi-square analysis. The time-series analysis was for RQ1 and involved the use of line graphs and descriptive statistics. In contrast, the chi-square analysis conducted for RQ2 and RQ3 required specific assumptions for its usage. The assumptions for the time-series analysis and chi-square analysis receive discussions in the following sections.

Time-Series Analysis

Time-series analyses were useful to evaluate the effects of terrorist attacks in the United States using R Version 1.2.5033. I conducted the time-series analysis using autoregressive integrated moving average (ARIMA) models and transfer functions to test

the hypothesized impact of number of injured and number of fatalities during terrorist attacks across several days.

The identification of models consisted of examining the autocorrelation function (ACF) and conducting formal tests for unit roots with the augmented Dickey-Fuller test. Preliminary $ARIMA(p, d, q)_{365}$ models were conducted, and the adequacy of the ACF and Ljung-box Q was examined. The ARIMA model for injured (as shown in Figure 5) suggested a $ARIMA(0,0,0)_{365}$ with a nonzero mean. The ARIMA model for fatalities (as shown in Figure 7) suggested a $ARIMA(0,0,2)_{365}$ with a zero mean. The residuals in the models presented exhibited independence and normality.

Figure 5

Autocorrelation Function and Partial Autocorrelation Function of Injured
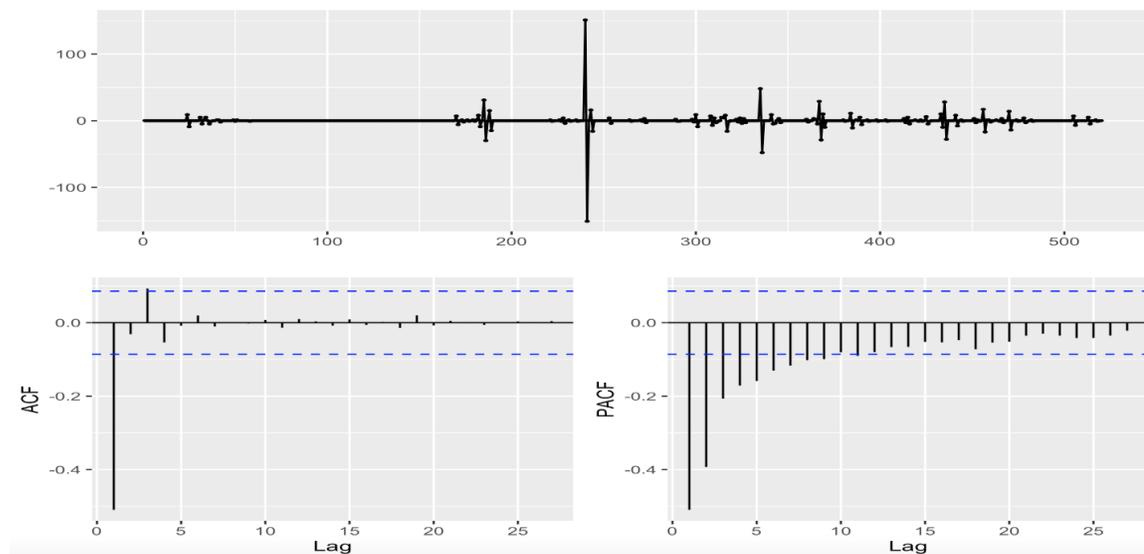
Figure 6

Autocorrelation Function and Partial Autocorrelation Function of Fatalities
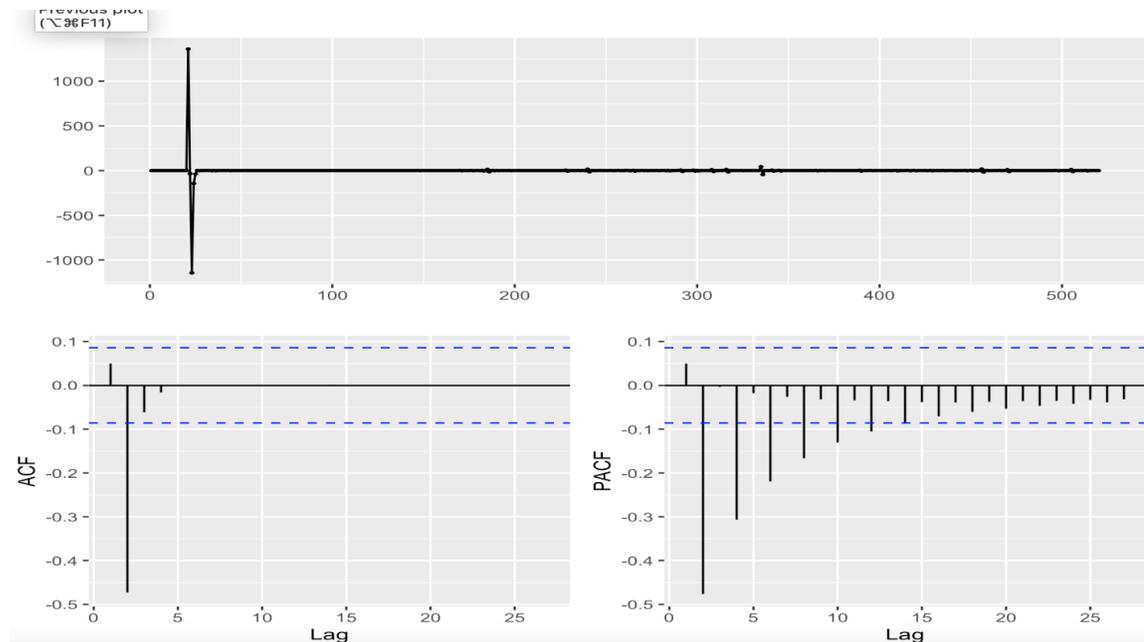
Chi-Square Analysis

Chi-square analysis has six assumptions that must be met before its use.

Following are the assumptions:

Assumption 1: The Data in the Cells Should Be Frequencies or Counts of Cases Rather Than Percentages or Some Other Transformation of the Data. The data in the cells for RQ2 and RQ3 were the number of attacks, injuries, and fatalities. These variables were measured in continuous form (or counting form). Specifically, the number of attacks refers to the total count of unique terrorist attacks recorded, the number of injuries refers to the total count of people who were injured for each terrorist attack, and the number of fatalities refers to the total count of people who died for each terrorist

attack. Therefore, the assumption that the data in the cells should be frequencies or counts of cases was met.

Assumption 2: The Levels (or Categories) of the Variables Are Mutually Exclusive. The levels for RQ2 and RQ3 came from region, attack type, target type, and weapon used. As seen in Table 5, each of these variables was measured categorically, and each of the categories was different from the others. In other words, each terrorist attack can only belong to one category for region, attack type, target type, and weapon used. For example, the 9/11 terrorist attack was considered hijacking (attack type), private citizens and property (target type), and vehicle (weapon used) in the Northeast region. Therefore, the assumption that levels of the variables are mutually exclusive was met.

Assumption 3: Each Subject May Contribute Data to One and Only One Cell in the $\chi 2$. The data gathered from GTD were all unique terrorist attacks that had happened between 2001 and 2018. There were no duplicate records found. Each subject (terrorist attack) was categorized according to region, attack type, target type, and weapon used. As per Assumption 2, each terrorist attack was categorized uniquely to each of the categories of region, attack type, target type, and weapon used, which indicates that each terrorist can contribute to the chi-square table only once. Therefore, the assumption that each subject may contribute data to one and only one cell in the χ^2 was met.

Assumption 4: The Study Groups Must Be Independent. As mentioned, each record of terrorist attack was unique and was categorized independently. There were no paired samples in the data set. Therefore, the assumption that the study groups must be independent was met.

Assumption 5: There Are Two Variables, and Both Are Measured as

Categories, Usually at the Nominal (Categorical) Level. For and RQ2 and RQ3, the

three examined variables were region and either injuries or fatalities, as well as region

and either attack type, target type, or weapon used. I measured these variables nominally.

Therefore, the assumption that there are two nominal variables being examined was met.

Assumption 6: The Value of the Expected Cell Should Be Five or More in at

Least 80% of the Cells, and No Cell Should Have an Expected of Less Than One.

The results of the chi-square analysis for RQ2 and RQ3 confirmed that the assumption

where the *expected* cell should be five or more in at least 80% of the cells was met.

Results

Research Question 1

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of

incidents, injuries, and fatalities) in the United States?

Time-series analysis was the means to identify trends in the number of injured

and fatalities in terrorist attacks from 2001 to 2018. Table 6 shows the parameter

estimates calculated from the time-series analysis. For injured, the model suggested was

ARIMA(0,0,0). However, this model would typically represent white noise, which was

not the case as per the Ljung box test. As such, I manually trained the ARIMA model and

determined that ARIMA (1, 0, 0) was appropriate for the analysis.

Table 6

AR and Seasonality Parameter Estimates

	Model	Estimate	Std.	Error	Z-value	Pr(>|z|)
Injuries	AR	-0.51312	0.060267	-8.5141	2.20E-16	***
	SAR	-0.50236	0.060944	-8.2429	2.20E-16	***
Fatalities	AR	-0.50988	0.060449	-8.4349	<2e-16	***
	SAR	-0.00418	0.005931	-0.7045	0.4811	

The AR model for the injuries time-series data set indicated time was a significant predictor of injuries associated with terror activities ($\beta = -0.513$, $p = 0.001$), suggesting a downward trend in injuries likely to occur during terrorist attacks in the United States between 2001 and 2018. Second, the seasonality model for the injuries data set was also statistically significant ($\beta = -0.5023$, $p = 0.001$), suggesting a similar downward trend after every 12 months.

The AR model for fatalities was statistically significant ($\beta = -0.51$, $p = 0.001$), indicating a downward trend in the number of fatalities that occur during terrorist attacks in the United States between 2001 and 2018. However, the seasonality model for the fatalities data set was not statistically significant ($\beta = -0.0042$, $p = 0.48$), indicating no trend in the number of fatalities after every twelve months.

Consequently, the first alternative hypothesis—There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States—was accepted. Generally, the findings indicate the numbers of fatalities and injuries associated with terrorist attacks are reducing with time. The statistical results are consistent with the visual analysis conclusions of Figures 7 and 8. The number of injured and fatalities across time are relatively low throughout the 8-year period, with

some notable spikes such as during the 9/11 terrorist attack, Boston Marathon bombing in

April 2013, and Pulse nightclub mass shooting in June 2016, among others.

Figure 7

Number of Injured Across Time
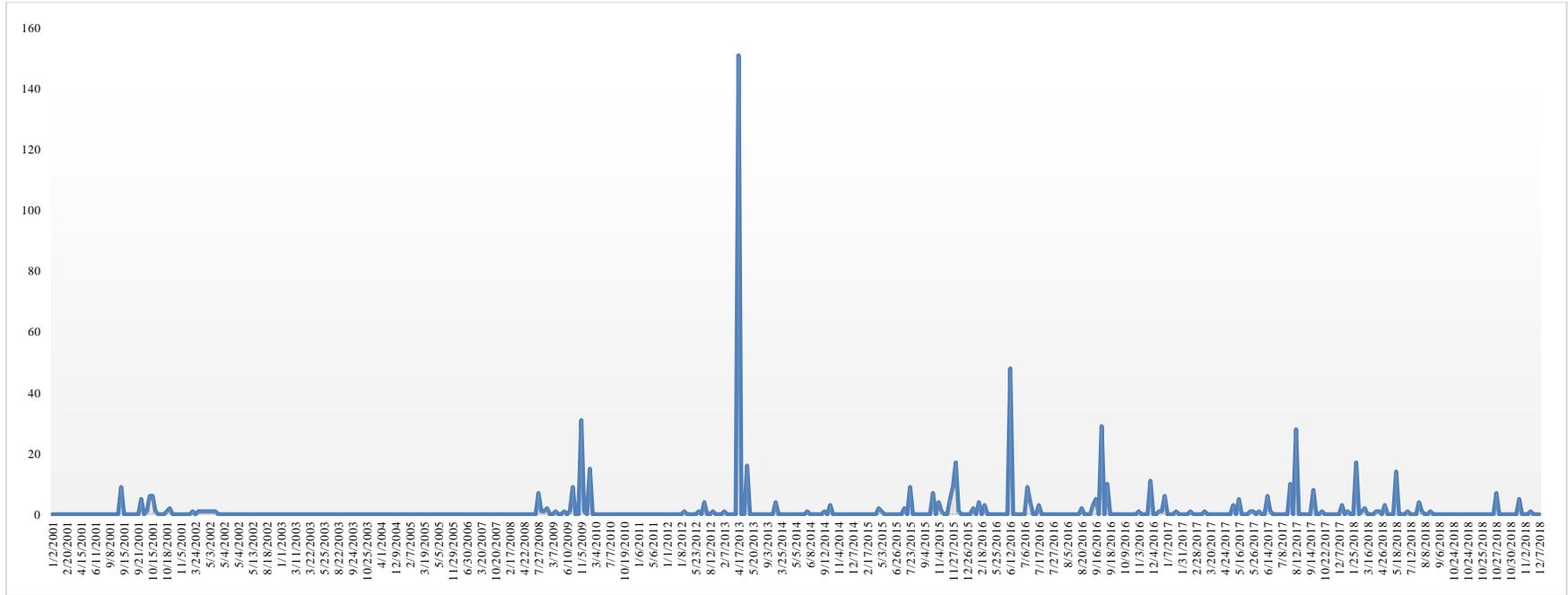
Figure 8

Number of Fatalities Across Time
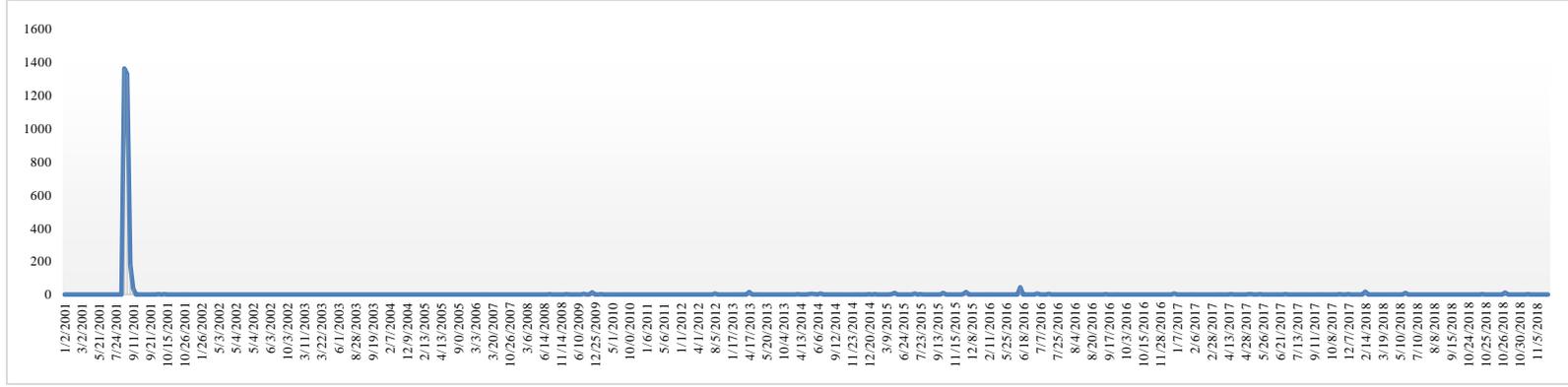
Research Question 2

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States by region?

Attacks

Due to the sparseness of terrorist-related attacks, injuries, and fatalities data by cities, regional data were used instead. As shown in Table 7, the total number of terrorist attacks between 2001 and 2018 was 531, the total number of injuries from these attacks was 23,686, and the total number of fatalities was 3,368. Excluding the 9/11 attacks, the number of terrorist attacks was greatest in the West (35.9%), followed by Midwest (17.8%), South Atlantic (17.8%), Northeast (16.5%), Southwest (8.2%), and Southeast (3.8%).

Table 7

Number of Incidents, Injuries, and Fatalities by Region Between 2001 and 2018

Region	Number of attacks	Number of injuries	Number of fatalities
Northeast	90	22,149	2,858
Southeast	20	24	12
Midwest	94	62	15
Southwest	43	243	62
West	189	948	126
South Atlantic	95	260	295
Grand total	531	23,686	3,368

Note. Northeast: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, Pennsylvania. Southeast: Alabama, Kentucky, Mississippi, Tennessee. Midwest: Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota. Southwest: Arkansas, Louisiana, Oklahoma, Texas. West: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Alaska, California, Hawaii, Oregon, and Washington. South Atlantic: Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia, and West Virginia.

Injuries

A chi-square analysis was used to compare region and number of injuries. It must be noted that injuries from the 9/11 attacks were excluded in the chi-square analysis, which reduced the number of injuries in the Northeast from 22,149 to 384. The results showed a significant difference between region and the number of injuries, $\chi^2(5) = 22.154$, $p < .05$. Across all terrorist attacks, 23.0% resulted in injuries, ranging from 14.3% to 34.5% across regions. Post-hoc analyses revealed significantly fewer injuries in West (14.3%) terrorist attacks compared to the other regions. In addition, terrorist attacks

in the Southwest (37.2%) and Northeast (34.5%) had significantly more injuries than the

other regions. The Midwest, Southeast, and South Atlantic did not differ in their

percentage fatalities from terrorist attacks ($ps > .05$). Table 8 presents the frequency of

injuries by region.

Table 8

Summary of Frequency of Injuries by Region Between 2001 and 2018

Region	No injuries	Yes injuries
Midwest	72 (76.7%)	22 (23.4%)
Northeast	57 (65.5%)	30 (34.5%)
Southeast	15 (75.0%)	21 (25.0%)
Southwest	27 (62.8%)	5 (37.2%)
West	162 (85.7%)	16 (14.3%)
South Atlantic	73 (77.7%)	27 (22.3%)
Grand total	406 (77.0%)	121 (23.0%)

Note. The four 9/11 attacks were excluded.

Fatalities

A chi-square analysis was used to compare region and the number of fatalities. It

must be noted that the fatalities from the 9/11 attacks were excluded in the chi-square,

which reduced the number of fatalities from Northeast from 2,858 to 44. The results

revealed a significant difference between region and the number of fatalities, $\chi^2(5) =$

22.154, $p < .05$. Post-hoc analyses revealed significantly fewer fatalities in Midwest

(8.5%) and West (11.6%) terrorist attacks compared to the other regions. In addition,

terrorist attacks in the Southwest had significantly more fatalities (34.9%) than the other

regions. The Northeast, Southeast, and South Atlantic did not differ in their percentage

fatalities from terrorist attacks ($ps > .05$). Table 9 shows the frequency of fatalities by

region.

Table 9

Summary of Frequency of Fatalities by Region Between 2001 and 2018

Region	No fatalities	Yes fatalities
Midwest	86 (91.5%)	8 (8.5%)
Northeast	69 (79.3%)	18 (20.7%)
Southeast	15 (75.0%)	5 (25.0%)
Southwest	28 (65.1%)	15 (34.9%)
West	167 (88.4%)	22 (11.6%)
South Atlantic	73 (76.8%)	21 (23.2%)
Grand yotal	438 (83.1%)	89 (16.9%)

Note. The four 9/11 attacks were excluded.

Research Question 3

RQ3: What was the relationship between the region of the terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type)?

Weapon Used

Similar to the previous analysis, data were too sparse to compare by city or state; therefore, I used region to analyze the differences in weapons used and target type across terrorist attacks. A chi-square analysis allowed me to compare region and the weapon used. The *other* category includes melee, vehicle, fake weapons, and sabotage equipment. The fatalities from the 9/11 attacks were excluded in the chi-square analysis. The results revealed a significant difference between region and weapon used, $\chi^2(15) = 67.422$, $p < .05$.

Post-hoc analyses revealed that the use of explosives/biological/chemical (37.9%) weapons was significantly higher in the Northeast than in other regions. In addition, the use of firearms was significantly higher in the Southeast (50.0%) and Southwest (51.2%),

compared to the other regions. In contrast, use of incendiary weapons was significantly

lower in the Southwest (25.6%) and highest in Midwest (48.9%) in comparison to the

other regions. Table 10 presents the frequency of weapon used by region.

Table 10

Weapon Used by Region

State	Explosives/ biological/chemical	Firearms	Incendiary	Other
Midwest	24 (25.5%)	13 (13.8%)	46 (48.9%)	11 (11.7%)
Northeast	33 (37.9%)	17 (19.5%)	26 (29.9%)	11 (12.6%)
Southeast	1 (5.0%)	10 (50.0%)	8 (40.0%)	1 (5.0%)
Southwest	7 (16.3%)	22 (51.2%)	11 (25.6%)	3 (7.0%)
West	32 (16.9%)	29 (15.3%)	109 (57.7%)	19 (10.1%)
South Atlantic	29 (30.9%)	23 (24.5%)	34 (36.2%)	8 (8.5%)
Grand total	123 (23.9%)	114 (21.6%)	234 (44.1%)	53 (10.1%)

Target Type

A chi-square analysis was the statistic used to compare region and the target type.

The *other* category included journalist and media, utilities, transportation (including

airports), tourists, unknown, nongovernmental organization, terrorists, and

telecommunications. The results revealed a significant difference between region and the

target type, $\chi^2(20) = 53.090$, $p < .05$.

Post-hoc analyses showed that targets for education/business were significantly

higher in the West (37.0%) in comparison to other regions. In addition,

police/military/government targets were significantly higher in South Atlantic (28.7%)

and significantly lower in the Midwest (7.4%) and West (14.3%). Furthermore, targets

for religious/abortion were significantly higher in the Southeast (45.0%). However, there

were no significant differences across regions for private and citizen & property and

other target types ($p > .05$). Table 11 shows the frequency of target type by region.

Table 11

Target Type by Region

State	Education/ business	Police/ military/ government	Private citizens & property	Religious/ abortion	Other
Midwest	19 (20.2%)	7 (7.4%)	30 (31.9%)	28 (29.8%)	10 (10.6%)
Northeast	16 (18.4%)	21 (24.1%)	22 (25.3%)	17 (19.5%)	11 (12.6%)
Southeast	3 (15.0%)	4 (20.0%)	3 (15.0%)	9 (45.0%)	1 (5.0%)
Southwest	8 (18.6%)	10 (23.3%)	11 (25.6%)	11 (25.6%)	3 (7.0%)
West	70 (37.0%)	27 (14.3%)	47 (24.9%)	37 (19.6%)	8 (4.2%)
South Atlantic	13 (13.8%)	27 (28.7%)	21 (22.3%)	23 (24.5%)	10 (10.6%)
Grand total	129 (24.5%)	96 (18.2%)	134 (25.4%)	125 (23.7%)	43 (8.2%)

Summary

The purpose of this quantitative descriptive study was to examine trends in

terrorism attacks in the United States between 2001 and 2018 and determine whether any

statistical significance existed between the characteristics of the terrorism incidents

(weapon used and target type) and the region in which they occurred. Findings showed

that trends in terrorist attacks for injuries did not differ across time. However, trends in

terrorist attacks for fatalities decreased significantly over time. Excluding the 9/11

terrorist attacks, the majority of attacks occurred in the West, followed by the Midwest,

South Atlantic, Northeast, Southwest, and Southeast regions. Significant differences in

the number of injuries appeared across regions, with terrorist attacks in the Southwest and

Northeast regions having significantly more injuries than the other regions. However,

there were significant differences in fatalities by region. Specifically, terrorist attacks in the Southwest had significantly more fatalities (34.9%) than in the other regions.

In addition, the weapon used differed across region. Specifically, explosives/ biological/chemical weapons were significantly higher in the Northeast. The use of incendiary weapons in terrorist attacks was significantly less associated with the Southwest but significantly more associated with attacks in the Midwest. For the Southeast and Southwest, terrorist attacks were more highly associated with firearm use.

Last, for target type, education/business targets were significantly more associated with states in the West. In contrast, police/military/government targets were significantly higher in the South Atlantic and significantly lower in the Midwest and West. In addition, religious/abortion targets were significantly higher in the Southeast. There were no significant differences across regions for private and citizen & property and other types. Chapter 5 presents a detailed summary of the findings, contributions of this study, theoretical and practical implications, limitations, and future directions.

Chapter 5: Discussion, Conclusions, and Recommendations

The problem addressed in this study was that local officials are only modestly confident that their local communities and governments are prepared to adequately respond to a terrorist event based on analysis of multiple factors (Brandeau, 2019; David & Le Dévédec, 2018; Scott & Errett, 2018; Welby-Everard et al., 2020). Research has shown that the public is not properly prepared for terrorism, and the health care community lacks knowledge and the capacity for an effective response to a terrorist attack (Eto & Kanatani, 2018; Funk, 2018). Existing research has focused on state and federal levels of preparedness and not those at the local level (Grundmann, 2014). Currently, stakeholders do not consider terrorism a major threat, thereby limiting preparedness. Some government officials have deemed preparations for terrorist threats too expensive or complicated (Green et al., 2019; Tournier et al., 2019). Due to limited resources, government officials have examined terrorism through the lens of its potential impact as well as its likelihood of occurrence (Banerjee et al., 2017; Ryan, 2016). This is especially true at the CDC and county levels, where resources and funding are tight, leading to a lack of preparedness for terrorism (Zacchia & Schmitt, 2018).

The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. Due to limitations of the sample size, I examined differences across regions. The research questions for this study were:

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States?

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States by region?

RQ3: What was the relationship between the region of the terrorist attack and the characteristics of the terrorist attack (independent/predictor variables: weapon used and target type)?

The purpose of terrorism is to cause terror and panic in target populations (Barras & Greub, 2014). Although it is more statistically relevant to fear car accidents, people fear terrorism incidents in which they have no control. To combat terrorism, government agencies such as public health, national defense, security, and public relations must coordinate and be well prepared. Each of these teams should have their own plans and collaborate to ensure their communities are safe and organized for when a terrorist attack occurs (Bilala & Galamas, 2015; Pinto, 2013). An essential type of preparedness is in the medical field. It is vital that the health care community is aware and prepared for a terrorist event to manage the victims' health care needs. (Pinto, 2013; Tegos, 2013).

Even before September 11, 2001, the threat of a terrorist attack remained remote. However, there was an increased focus on terrorism after anthrax incidents and the rise of domestic terrorism (SteelFisher et al., 2012; Sun & Yang, 2017). Those committing these acts of terrorism attempted to create as much fear in the population as possible (Kar et al., 2012).

Preparedness is a comprehensive and vital concept that can include communication, infrastructure, education, and response (Arrazola et al., 2018; Manuell & Cukor, 2010; Poutanen, 2007; Smith & Davison, 2010; Waterer & Robertson, 2009). Two of the most important components of withstanding a terrorist attack are lockdowns and evacuation. However, there have been questions about whether a community is prepared enough for an attack. Ten percent of nurses in North Texas felt adequately prepared in case of an attack, 30% believed they needed to increase their collaboration with state and federal agencies, and 69% stated they still needed more training (Jacobson et al., 2010). These results are comparable to the awareness of the general public.

Scholars are concerned that the majority of the U.S. population cannot discern a terrorist attack from a regular attack (Etchegary et al., 2008). This lack of differentiation creates a murky perception in the public that leads to poor risk assessment and communication. Other scholars noted that while public health professionals must know what terrorism is, it is also essential to have uniform definitions of preparedness. In other forms of attacks, preparedness can prevent the incident or limit the number of casualties.

Based on the lack of literature, it appears that the public lacks preparedness for a terrorist threat. The public lacks education, preparedness, and awareness, while the health care community is without the necessary knowledge and ability for a quick and accurate response. Researchers showed that stakeholders, such as community leaders, do not think of themselves as prone to such an attack (Bilala & Galamas, 2015; Green et al., 2019; Pinto, 2013; Tournier et al., 2019). Therefore, resources devoted to a terrorist attack are minimal, and any plans developed lack depth. Thus, this study is significant in

highlighting the awareness of terrorism incidents between 2001 and 2018. Future planners can incorporate this uncovered knowledge about terrorist incidents. The study also showed trends and characteristics based on the region where attacks occurred within the selected time frame.

The results of this study were that injuries from terrorist attacks did not differ across time however terrorist attacks. Fatalities decreased significantly over time. In terms of region, the most attacks occurred in the West, followed by the Southeast, Northwest, and Midwest; the fewest occurred in the Southwest. The Southeast and Southwest saw the most injuries, while the Northeast, Midwest, and Western regions had fewer injuries. These figures differ from the number of fatalities regionally. Weapon types also differed across region. Explosive, biological, chemical weapons were higher in the Northeast, while incendiary weapons were more common in the West. Guns and firearms were used most in the Southeast and Southwest. Educational and business targets were more associated with states in the West, as well. In contrast, police, military, and government targets were higher in the Southeast. There were no differences between private property, religious, and abortion target types.

Interpretation of the Findings

Research Question 1

RQ1: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States?

I used time-series analysis to assess if there were trends in the number of injuries and fatalities in terrorist attacks from 2001 to 2018. The injuries time-series data set

indicated that time was a significant predictor of injuries associated with terror activities

(β = -0.513, p = 0.001), and fatalities was statistically significant (β = -0.51, p = 0.001),

suggesting a downward trend in injuries and fatalities likely to occur during terrorist

attacks in the United States between 2001 and 2018. Consequently, the first alternative

hypothesis—There were changes in terrorist attacks (number of incidents, injuries, and

fatalities) between 2001 and 2018 in the United States—was accepted.

To properly frame the statistics, it is important to note that the United States has

the lowest number of fatalities globally as of 2007 (LaFree & Dugan, 2007). Before

September 11, 2001, there was a decline in fatal attacks of terrorism, with only 580

compared to 832 in 1979. This means that terrorist attacks were the lowest they have

been in 20 years. However, fatal attacks have since considerably increased to the point

that, in 2007, they were back to the peak of 1992 (LaFree, 2010). The United States is a

perceived target of many terrorist attacks; however, these data were mainly based upon

attacks on Americans on foreign soil, not taking into account the terror that could occur

domestically. It is important to note that a single event accounts for the majority of

fatalities within the United States between 1970 and 2007: the 9/11 World Trade Center

attack. Before this incident, the U.S. fatality rate was closer to Canada and Greece.

Most terrorist attacks and fatalities are directed against non-U.S. targets, as it is

easier to strike foreign lands (LaFree, 2010). This aligns with the idea that the decisions

of anti-U.S. terrorist groups for domestic terrorism remain deliberate. Fatal attacks often

occur for ideological reasons to invoke specific emotions of the target audience of the

terrorist organizations. Fatalities in the United States often occur if domestic challengers

cannot succeed, thus expanding the geographical area of attack. When attacks are fatal, they influence American policies.

Silva et al. (2020) utilized the Extremist Crime Database and global terrorism base to demystify terrorism in the United States. The authors examined jihadist-inspired, far-right, and far-left terrorist attacks to understand the phenomenon within the last century. The researchers found that incidents, fatalities, and injuries are increasing. They are being committed internationally and are jihadist extremists, usually of Arab descent and working in organized groups. However, when examining domestic terrorism, the attackers are often White, far-right extremists who act alone.

The downward trend of injuries and fatalities between 2001 and 2018 suggests that the United States could comply with the different aspects of risk management stipulated in Grundmann's (2014) model. The lessening number of injuries and fatalities indicates that proper risk assessment, risk management, and risk communication are in place and appropriately implemented following a terrorist attack. The 9/11 attack was a surprise, which led to a large number of injuries and fatalities. However, although several terrorist attacks have happened after that, the injuries and fatalities recorded were few, which may indicate proper risk management on the part of the United States.

Research Question 2

RQ2: What were the trends in terrorist attacks between 2001 and 2018 (number of incidents, injuries, and fatalities) in the United States by region?

There were 531 terrorist attacks in the United States between 2001 and 2018, resulting in 23,686 injuries and 3,368 fatalities. The West had the greatest number of

attacks (35.5%), followed by the Midwest and the South Atlantic (17.8%). Therefore, the second alternative hypothesis is accepted: There were changes in terrorist attacks (number of incidents, injuries, and fatalities) between 2001 and 2018 in the United States by region.

Regardless of where the terroristic attack occurs, preparation is crucial at the local, regional, state, and national levels (Armstrong, 2012; Baldassare & Hoene, 2003; Donahue et al., 2013; Maor, 2010; Nilsson, 2010; Putzer, 2006; Zogby, 2012). Public perception is a key component of preparedness. However, the public is only 3% confident of federal officials, 16% of state officials, and 58% of local and regional officials in protecting them from a terrorist attack, demonstrating that the more local response, the safer the populace feels (Zogby, 2012).

Donahue et al. (2013) sought to determine if there was a link between individual perceptions of preparedness and a correlation with public officials' perceptions of preparedness. The author surveyed individuals and public decision-makers from four regions and 11 public officials in each region. Participants reported on their level of preparedness, what they had done to prepare, why they had or had not prepared, what their level of concern was, the ability to recover from the event, the likelihood of that event occurring, the likelihood of disaster, the advocacy prepared to spending, the degree to which residents were prepared, why residents did not prepare, on whom residents will rely in a disaster, how informed the residents actually were, and whether residents follow directions during a state of emergency.

Donahue et al. (2013) found that public officials are more able and prepared than private citizens when coping with disasters such as terrorist threats. However, in terms of crisis management, local elected officials tended to see natural disasters of biggest risk while citizens felt that terrorism was a greater threat. No matter the region, public officials were surprised when residents announced that they would be eager to follow government instructions at the regional level. Citizens and local governments did not feel a need to rely on state and federal agencies. Ultimately, however, Donahue found that the responses between citizens and public officials remained different.

Another difficulty involving regional acts of terrorism is the lack of resources at the local level. These differences often cause local governments to rely on each other rather than just state or federal agencies (Canós & Piedrahita, 2017). Regions of limited resources, especially rural areas, have found it better to share authority and resources during an emergency. However, sharing can result in misunderstandings. Therefore, there should be a strong architecture for community response planning to address this problem (Canós & Piedrahita, 2017).

Local preparedness is especially important regarding a terrorist attack, as stressed in Grundmann's (2014) model of risk management. Many cities took their biggest step toward combating terrorism and terrorism preparedness post-9/11 (Medina, 2016). Cities combined risk assessment, risk management, and risk communication, which are all aspects of Grundmann's model, resulting in a better response to terrorist attacks. However, security differs significantly across regions. While city officials are concerned about homeland security issues, such as biological and chemical attacks and

cyberterrorism, most of their focus is on crime and economic issues. Baldassare and

Hoene (2003) found that only 50% of officials were concerned about attacks. Florida and

Texas were at 56% and 54%, respectively, much lower than the North or East at 72%.

Lastly, officials in Western cities were the least likely to have cooperation levels with

federal agencies compared to the Northeast and Midwest.

Research Question 3

RQ3: What was the relationship between the region of the terrorist attack and the

characteristics of the terrorist attack (independent/predictor variables: weapon used and

target type)?

Data analysis indicated a significant difference between region and weapon type.

Explosive/biological/chemical weapons were higher in the Northeast, whereas incendiary

weapons was lower in the Southeast compared to other regions. Firearms was

significantly higher in the West and Southwest compared to other regions; incendiary

weapons were highest in the West. There was also a significant relationship between

target type and regional area. Therefore, the third alternative hypothesis—There was a

statistically significant relationship between the region of terrorist attack and the

characteristics of the terrorist attack (independent/predictor variables: weapon used and

target type) for one or more regions and one or more characteristic of terrorist attack—

was accepted. Target types, including educational institutions and businesses, was higher

in the West, while police, military, and government targets were higher in the West and

South Atlantic. Attacks on private property and religious/abortion targets were higher in

the West and Midwest and lowest in the Southeast. The literature review did not provide

information about targets or weapon types, thereby creating an opportunity for future research.

Limitations of the Study

There were numerous limitations to the study, including methodology, available data, and data omission. The study was limited to the available secondary data. There was no account for personal, firsthand perspectives on the subject of terrorism. Utilizing a qualitative methodology would have allowed for interviews with experts to provide greater insight into the phenomenon. Additionally, using a qualitative approach could have answered questions of how or why these terrorist attacks occur.

Perhaps the greatest limitation of the study was the data set. I used only publicly available data, which indicated when, where, and the type of weapons used in terrorist attacks in the United States. Other details about the terrorism or effect of terrorism, such as the type of attack, residency status of attackers, and economic impact, were unavailable and limited the analysis in this study.

Recommendations

This study created recommendations for further research and positive social change. Future researchers should expand the view of terrorism to include the entire globe. Because there have been limited terrorist attacks within the United States, it was difficult to obtain a comprehensive view of events. Including other countries could better illuminate preparedness and the results of such incidences. Terrorism is a threat, and it does occur internationally; therefore, an extensive look at terrorism on a global scale could provide significantly more knowledge of the phenomenon.

Additionally, future scholars could expand this study to include terrorist attacks that occurred on foreign soil. Before domestic terrorism occurs within the United States, terrorists try to attack targets closer to them, such as embassies and State Departments. Understanding broader terrorist trends against the United States could offer insight into when domestic terrorism occurs and why.

Another recommendation for future research would be to repeat the study using a qualitative approach. The researcher could interview experts, policymakers, and officials at the forefront of terrorism and preparedness. These officials could be at the local, regional, state, or federal levels. Understanding their perceptions of terrorism would provide further insight into the phenomenon.

The data analyzed in this study excluded the terrorist event of September 11, 2001. This attack yielded the most significant number of fatalities within the United States. Removing this statistic could provide better insight into the trends of the phenomenon, especially among fatalities and injuries.

Another recommendation for future research would be to investigate who the attackers are. This study did not distinguish international from national terrorists or left-wing from right-wing terrorists. Understanding what the trends are among types of terrorists can provide better insight into the phenomena. Identifying the perpetrators of domestic terrorist attacks versus international terrorist attacks could provide policymakers with recommendations for practice and preparation. Additional information would come from examining the weapons used for each type of attack.

Positive Social Change

The study also has implications for positive social change. Through time-series

analysis, answering RQ showed no relationship between injuries and time, but there is

one between fatalities and time. Since 9/11, there has been greater protection against

domestic terrorist threats. Therefore, government officials should continue to use all tools

available to help prevent domestic terrorist threats and continue reducing fatalities.

The results of RQ2 showed that the greatest number of attacks occurred in the

West, followed by the Southeast, Northeast, Midwest, and Southwest. These statistics

could be useful to guide national intelligence on where the next threat will likely be as it

is important to understand where the high-profile targets are. Targets could include theme

parks, government buildings, media centers, or abortion clinics. By focusing on where

terrorist attacks are most likely to occur, government officials can distribute resources to

help combat domestic terrorism.

Policymakers can also use the results of RQ3 to improve preparedness.

Explosives/biological/chemical weapons use was higher in the Northeast, while firearms

were significantly more common in the Southeast and Southwest. Last, incendiary

weapons were highest in the West. Utilizing these statistics, policymakers at the local,

regional, state, and federal levels could better understand what types of weapons terrorists

will use and where. The study also showed that education institutes and businesses were

targeted significantly higher in the West, while police, military, and government targets

were higher in the Southeast. These results can help policymakers identify the next target

for domestic terrorism. By utilizing these results, policymakers can improve their preparedness, reducing injuries and death.

Conclusion

The problem addressed was that local officials are only modestly confident that their local communities and governments are prepared to adequately respond to a terrorist event based on analysis of multiple factors (Brandeau, 2019; David & Le Dévédec, 2018; Scott & Errett, 2018; Welby-Everard et al., 2020). The purpose of this quantitative descriptive study was to examine trends in terrorism attacks in the United States between 2001 and 2018 and determine whether any statistical significance existed between the characteristics of the terrorism incidents (weapon used and target type) and the region in which they occurred. Due to the limitations of the sample, I examined differences across regions. This study was significant because there was a lack of data on terrorism incidents regarding fatalities and injuries, region, weapon type, and target. Findings showed that trends in terrorist attacks for injuries did not differ across time. However, trends in terrorist attacks for fatalities decreased significantly over time. The majority of attacks occurred in the West, followed by the Southeast, Northeast, and Midwest, with the lowest number of attacks occurring in Southwest states.

In addition, the weapon type differed across region. Specifically, explosives/biological/chemical weapons were significantly higher in the Northeast. In contrast, the use of incendiary weapons in terrorist attacks was significantly less associated with the Northeast but significantly more associated with the West. For the Southeast and Southwest, terrorist attacks were more highly associated with firearm use. Finally, for

target type, education/business targets were significantly more associated with states in the West, while police/military/government targets were significantly higher in the Southeast and lower in the Midwest and West. One recommendation is for future researchers to use different data sets to better understand the phenomenon. Also, policymakers should be aware of these trends in terrorist incidents to be adequately prepared.

References

Adams, R. M., Prelip, M. L., Glik, D. C., Donatello, I., & Eisenman, D. P. (2017).

Facilitating partnerships with community- and faith-based organizations for

disaster preparedness and response: Results of a national survey of public health

departments. *Disaster Medicine and Public Health Preparedness*, *12*(1), 57–66.

https://doi.org/10.1017/dmp.2017.36

Ahmed, R. (2018). Terrorist group types and tactic choice. *Journal of Applied Security

Research*, *13*(1), 89–110. https://doi.org/10.1080/19361610.2018.1387842

Alba, D. J., & Gable, R. K. (2011, October 19). *Crisis preparedness: Do school

administrators and first responders feel ready to act?* NERA Conference

Proceedings 2011. University of Connecticut OpenCommons@UConn.

https://scholarsarchive.jwu.edu/k12_ed/5/

Aldhous, P. (2012). One slip up could spell disaster. *New Scientist*, (2847), 1–3.

Ali, R., Jan, I., & Malik, M. (2020). Emerging health security threats and impact of

bioterrorism on the U.S. national security. *Global Political Review*, *V*(I), 94–103.

https://doi.org/10.31703/gpr.2020(v-i).11

American Public Health Association (n.d.). *Bioterrorism Preparedness.*

https://richlandhealth.org/wp-

content/uploads/2018/04/bioterrorismonlinefactsheet.pdf

Arani, L. S., Moghaddasi, H., Zarghi, A., & Rahimi, F. (2019). Bioterrorism information system as the most effective tool in management of bioterrorism. *Biomedical Journal of Scientific & Technical Research*, *16*(4), 12227–12234. https://doi.org/10.26717/bjstr.2019.16.002887

Armstrong, M. (2012). Rehearsing for the plague: Citizens, security, and simulation. *Canadian Review of American Studies*, *42*(1), 105–120. https://doi.org/10.3138/cras.42.1.105

Arrazola, J., Binkin, N., Israel, M., Fleischauer, A., Daly, E. R., Harrison, R., & Engel, J. (2018). Assessment of epidemiology capacity in state health departments—United States, 2017. *MMWR. Morbidity and Mortality Weekly Report*, *67*(33), 935–939. https://doi.org/10.15585/mmwr.mm6733a5

Baldassare, M., & Hoene, C. (2003). *Coping with homeland security: Perceptions of city officials in California and the United States*. Public Policy Institute of California. https://www.ppic.org/content/pubs/op/OP_1002MBOP.pdf

Baldwin, K., LaMantia, J., & Proziack, L. (2005). Emergency preparedness and bioterrorism response: Development of an educational program for public health personnel. *Public Health Nursing, 22*(3), 248–253. https://doi.org/10.1111/j.0737-1209.2005.220308.x

Banerjee, D., Chakraborty, B., & Chakraborty, B. (2017). Anthrax: Where margins are merging between emerging threats and bioterrorism. *Indian Journal of Dermatology*, *62*(5), 456–458. https://www/doi.org/10.4103/ijd.IJD_378_17

Barnes, M. D., Hanson, C. L., Novilla, L. B., Meacham, A. T., McIntyre, E., & Erickson,

B. C. (2008). Analysis of media agenda setting during and after hurricane Katrina:

Implications for emergency preparedness, disaster response, and disaster policy.

American Journal of Public Health, *98*(4), 604–612.

https://doi.org/10.2105/ajph.2007.112235

Barras, V., & Greub, G. (2014). History of biological warfare and bioterrorism. *Clinical

Microbiology and Infection*, *20*(6), 497–502. https://doi.org/10.1111/1469-

0691.12706

Beam, E. L., Boulter, K. C., Freihaut, F., Schwedhelm, S., & Smith, P. W. (2010). The

Nebraska experience in biocontainment patient care. *Public Health Nursing*,

27(2), 140–147. https://doi.org/10.1111/j.1525-1446.2010.00837.x

Bezek, S., Jaung, M., & Mackey, J. (2020). Emergency triage of highly infectious

diseases and bioterrorism. In J. Hildago & L. Woc-Colburn (Eds.), *Highly

infectious diseases in critical care* (pp. 23–36). Springer International Publishing.

https://doi.org/10.1007/978-3-030-33803-9_3

Bilala, A.-Y., & Galamas, F. (2015). A bioterrorism prevention initiative. *The

Nonproliferation Review*, *22*(1), 83–92.

https://doi.org/10.1080/10736700.2015.1070016

Brandeau, M. L. (2019). Or forum—public health preparedness: Answering (largely

unanswerable) questions with operations research—The 2016–2017 Philip

McCord Morse lecture. *Operations Research*, *67*(3), 700–710.

https://doi.org/10.1287/opre.2019.1844

Bravata, D. M., Zaric, G. S., Holty, J. E. C., Brandeau, M. L., Wilhelm, E. R., McDonald, K. M., & Owens, D. K. (2006). Reducing mortality from anthrax bioterrorism: Strategies for stockpiling and dispensing medical and pharmaceutical supplies. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, *4*(3), 244–262. https://doi.org/10.1089/bsp.2006.4.244

Bush, L. M., & Perez, M. T. (2012). The anthrax attacks 10 years later. *Annals of Internal Medicine, 156*(1_Part_1), 41–44. https://doi.org/10.7326/0003-4819-155-12-201112200-00373

California State Auditor. (2006, September). *Emergency preparedness: California's administration of federal grants for homeland security and bioterrorism preparedness is hampered by inefficiencies and ambiguity*. https://www.bsa.ca.gov/pdfs/reports/2005-118.pdf

Canós, J. H., & Piedrahita, D. (2017, May 21–24). Emergency plans are software, too. In T. Comes, F. Bénaben, C. Hanachi, M. Lauras, & A. Montarnal (Eds.), *Proceedings of the 14th International Conference on Information Systems for Crisis Response and Management* (pp. 374–379).

Casadevall, A. (2012). The future of biological warfare. *Microbial Biotechnology*, *5*(5), 584–587. https://doi.org/10.1111/j.1751-7915.2012.00340.x

Centers for Disease Control and Prevention. (2008). *Public health preparedness: Mobilizing state by state*. https://www.cdc.gov/cpr/publications/2008/report_2008.pdf

Centers for Disease Control and Prevention. (2018). *Bioterrorism agents/diseases*.

https://emergency.cdc.gov/agent/agentlist-category.asp

Chaliand, G. (Ed.). (2019). *The history of terrorism: From antiquity to ISIS*. University of

California Press.

Choi, S. O. (2009). *Improving the effectiveness of local emergency management*

networks: Focus on H1N1 (swine flu) virus outbreaks in California.

https://hazards.colorado.edu/uploads/quick_report/choi_2009.pdf

Clarke, C. P., & Moghadam, A. (2018). Mapping today's Jihadi landscape and threat.

Orbis, *62*(3), 347–371. https://doi.org/10.1016/j.orbis.2018.05.006

D'Arcangelis, G. (2016). Reframing the 'securitization of public health': A critical race

perspective on post-9/11 bioterrorism preparedness in the US. *Critical Public*

Health, *27*(2), 275–284. https://doi.org/10.1080/09581596.2016.1209299

David, P.-M., & Le Dévédec, N. (2018). Preparedness for the next epidemic: Health and

political issues of an emerging paradigm. *Critical Public Health*, *29*(3), 363–369.

https://doi.org/10.1080/09581596.2018.1447646

Donahue, A. K., Eckel, C. C., & Wilson, R. K. (2013). Ready or not? How citizens and

public officials perceive risk and preparedness. *The American Review of Public*

Administration, *44*(4_suppl), 89S–111S.

https://doi.org/10.1177/0275074013506517

Ejike, N. C. (2019). *Bioterrorism hardening: An exploratory study of EMTs preparedness*

and practices (Publication No. 13897522) [Doctoral dissertation, Walden

University]. ProQuest Dissertations and Theses Global.

Etchegary, H., Lee, J., Lemyre, L., & Krewski, D. (2008). Canadians' representation of chemical, biological, radiological, nuclear, and explosive (CBRNE) terrorism: A content analysis. *Human and Ecological Risk Assessment: An International Journal*, *14*(3), 479–494. https://doi.org/10.1080/10807030802073776

Eto, A., & Kanatani, Y. (2018). Countering bioterrorism: current status and challenges: A focus on pharmaceutical products and vaccines. *ADC Letter for Infectious Disease Control*, *5*(2), 50–22. https://doi.org/10.20814/adc.5.2_50

Evans, S., Kleinman, K., & Pagano, M. (2018). *Statistics in defense and national security: Bioterrorism and biosurveillance.* American Statistical Association.

Felthous, A. R. (2014). Bias in behavioral study and analysis of international and domestic terrorism: An editorial introduction. *Behavioral Sciences & the Law, 32*(3), 263–268. https://doi.org/10.1002/bsl.2125

Ferguson, R. W., Kiernan, S., Spannhake, E. W., & Schwartz, B. (2019). Evaluating perceived emergency preparedness and household preparedness behaviors: Results from a Casper survey in Fairfax, Virginia. *Disaster Medicine and Public Health Preparedness*, *14*(2), 222–228. https://doi.org/10.1017/dmp.2019.48

Finley, M. (2018). *Biohazard identification: The first step in biological risk analysis* (No. SAND2018-11152C). Sandia National Lab (SNL-NM).

Fricker, R. D., Stoto, M. A., Jain, A., Diamond, A., Davies-Cole, J. O., Glymph, C.,

    Kidane, G., Lum, G., Jones, L., Dehan, K., & Yuan, C. (2007). Evaluating

    statistical methods for syndromic surveillance. In *Statistical methods in*

    counterterrorism (pp. 141–172). Springer. https://doi.org/10.1007/0-387-35209-

    0_9

Friedman, D., Rager-Zisman, B., Bibi, E., & Keynan, A. (2008). The bioterrorism threat

    and dual-use biotechnological research: An Israeli perspective. *Science and*

    Engineering Ethics, *16*(1), 85–97. https://doi.org/10.1007/s11948-008-9075-4

Friedman, D., Rager-Zisman, B., Bibi, E., & Keynan, A. (2010). The bioterrorism threat

    and dual-use biotechnological research: An Israeli perspective. *Science and*

    Engineering Ethics, *16*(1), 85–97. https://doi.org/10.1007/s11948-008-9075-4

Funk, C. (2018). America's state of readiness against bioterrorism. *Pepperdine Policy*

    Review, *10*(1), Article 5.

Garbutt, S. J., Peltier, J. W., & Fitzpatrick, J. J. (2008). Evaluation of an instrument to

    measure nurses' familiarity with emergency preparedness. *Military Medicine,*

    173(11), 1073–1077. https://doi.org/10.7205/milmed.173.11.1073

Gay, L.R., Mills, G.E., & Airasian, P. (2009). *Educational Research: Competencies for*

    analysis and applications. Pearson Education

General Functions, 28 C.F.R. § 0.85 (1965).

Global Terrorism Database. (2019). *Codebook: Inclusion criteria and variables*.

    https://www.start.umd.edu/gtd/downloads/Codebook.pdf

Green, L. W., Ottoson, J. M., García, C., & Hiatt, R. A. (2009). Diffusion theory and

    knowledge dissemination, utilization, and integration in public health. *Annual*

    Review of Public Health, *30*(1), 151–174.

    https://doi.org/10.1146/annurev.publhealth.031308.100049

Green, M. S., LeDuc, J., Cohen, D., & Franz, D. R. (2019). Confronting the threat of

    bioterrorism: Realities, challenges, and defensive strategies. *The Lancet Infectious*

    Diseases, *19*(1), e2–e13. https://doi.org/10.1016/s1473-3099(18)30298-6

Greub, G., & Grobusch, M. (2014). Bioterrorism: Myth or reality? *Clinical Microbiology*

    and Infection, *20*(6), 485–487. https://doi.org/10.1111/1469-0691.12713

Grundmann, O. (2014). The current state of bioterrorist attack surveillance and

    preparedness in the us. *Risk Management and Healthcare Policy, 2014*(7), 177–

    187. https://doi.org/10.2147/rmhp.s56047

Hojman, H., Rattan, R., Osgood, R., Yao, M., & Bugaev, N. (2019). Securing the

    emergency department during terrorism incidents: Lessons learned from the

    Boston Marathon bombings. *Disaster Medicine and Public Health Preparedness*,

    13(4), 791–798. https://doi.org/10.1017/dmp.2018.148

Hong, Y., Lee, T., & Kim, J.-S. (2019). Serial multiple mediation analyses: How to

    enhance individual public health emergency preparedness and response to

    environmental disasters. *International Journal of Environmental Research and*

    Public Health, *16*(2), Article 223. https://doi.org/10.3390/ijerph16020223

Huff, C., & Kertzer, J. D. (2018). How the public defines terrorism. *American Journal of*

    Political Science, *62*(1), 55–71. https://doi.org/10.1111/ajps.12329

Jacobson, H. E., Soto Mas, F., Hsu, C., Turley, J. P., Miller, J., & Kim, M. (2010). Self-assessed emergency readiness and training needs of nurses in rural Texas. *Public Health Nursing*, *27*(1), 41–48. https://doi.org/10.1111/j.1525-1446.2009.00825.x

Jansen, H., Breeveld, F., Stijnis, C., & Grobusch, M. (2014). Biological warfare, bioterrorism, and biocrime. *Clinical Microbiology and Infection, 20*(6), 488–496. https://doi.org/10.1111/1469-0691.12699

Jones, S. G. (2018). *Rise of far-right extremism in the United States*. Center for Strategic and International Studies (CSIS).

Jones, S. G., Doxsee, C., & Harrington, N. (2020, June). *The escalating terrorism problem in the United States*. https://apo.org.au/node/306395

Jorgenson-Rathke, D. T. (2018). *Smallpox bioterrorism preparedness: The importance of technology and education for early detection and response* [Master's thesis, Augsburg University]. Theses and Graduate Projects. https://idun.augsburg.edu/etd/370

Kar, S., Pradhan, H., & Pattnaik, B. (2012). Bioterrorism: How prepared are we? *Indian Journal of Medical Specialities*, *3*(1), 43–48. https://doi.org/10.7713/ijms.2012.0010

Katz, A., Staiti, A. B., & McKenzie, K. L. (2006). Preparing for the unknown, responding to the known: Communities and public health preparedness. *Health Affairs*, *25*(4), 946–957. https://doi.org/10.1377/hlthaff.25.4.946

LaFree, G., & Dugan, L. (2007). Introducing the global terrorism database. *Terrorism and Political Violence*, *19*(2), 181–204. https://doi.org/10.1080/09546550701246817

Lansford, T. (2018). *All for one: Terrorism, NATO and the United States*. Routledge.

Long, J. (2014). Regression models for nominal and ordinal outcomes. In H. Best & C. Wolf (Eds.), *The SAGE handbook of regression analysis and causal inference* (pp. 173–204). SAGE Publications. https://doi.org/10.4135/9781446288146.n9

Lowry, K. (2018). Responding to the challenges of violent extremism/terrorism cases for United States probation and pretrial services. *Journal for Deradicalization, 2018*(17), 28–88. https://journals.sfu.ca/jd/index.php/jd/article/view/175

Lu, X. (2017). The U.S. federal emergency management agency and the 2005 great New Orleans flood: A deinstitutionalized response organization facing unknown unknowns. In X. Lu, *Managing uncertainty in crisis: Exploring the impact of institutionalization on organizational sensemaking* (pp. 51–84). Springer. https://doi.org/10.1007/978-981-10-3990-4_4

Mackenzie, C., Shackelford, S., Tisherman, S., Yang, S., Puche, A., Elster, E., Bowyer, M., Anazodo, A., Bonds, B., Granite, G., Hagegeorge, G., Holmes, M., Hu, P., Jessie, E., Longinaker, N., Monoson, A., Narayan, M., Pasley, J., Pielago, J., Robinson, E., Romagnoli, A., Sarani, B., Squyres, N., & Teeter, W. (2019) Critical errors in infrequently performed trauma procedures after training. *Surgery, 166*(5), 835-943. https://dx.doi.org/10.1016/j.surg.2019.05.031

Malmin, N. P. (2020). Historical disaster exposure and household preparedness across the

    United States. *Disaster Medicine and Public Health Preparedness, 15*(1), 58–64.

    https://doi.org/10.1017/dmp.2019.123

Manuell, M.-E., & Cukor, J. (2010). Mother nature versus human nature: Public

    compliance with evacuation and quarantine. *Disasters*, *35*(2), 417–442.

    https://doi.org/10.1111/j.1467-7717.2010.01219.x

Maor, M. (2010). Emergency preparedness consultants at the local government level: The

    Israeli experience. *Disasters*, *34*(4), 955–972. https://doi.org/10.1111/j.1467-

    7717.2010.01177.x

Medina, A. (2016). Promoting a culture of disaster preparedness. *Journal of Business

    Continuity & Emergency Planning*, *9*(3), 281–290.

Mertler, C.A., (2014) *Introduction to educational research* (8th ed.)*. Pearson.

Mertler, C.A., (2016) *Introduction to educational research* (new ed.)*. Sage Publications.

Mishra, D. K. (2016). Bioterrorism from a public health perspective. *Counter Terrorists

    Trends and Analyses*, *8*(2), 24–30. https://www.jstor.org/stable/26369588

Mitchell-Blackwood, J., Gurian, P. L., & O'Donnell, C. (2011). Finding risk-based

    switchover points for response decisions for environmental exposure tobacillus

    anthracis. *Human and Ecological Risk Assessment: An International Journal,

    17*(2), 489–509. https://doi.org/10.1080/10807039.2011.552401

Morrison, A., & Catanzaro, A. (2010). High-fidelity simulation and emergency

    preparedness. *Public Health Nursing*, *27*(2), 164–173.

    https://doi.org/10.1111/j.1525-1446.2010.00838.x

Morse, S. S. (2018). Reflecting on bioterrorism. *The Lancet Infectious Diseases*, *18*(12), 1317. https://doi.org/10.1016/s1473-3099(18)30645-5

Murthy, B., Molinari, N.-A. M., LeBlanc, T. T., Vagi, S. J., & Avchen, R. N. (2017). Progress in public health emergency preparedness—United States, 2001–2016. *American Journal of Public Health*, *107*(S2), S180–S185. https://doi.org/10.2105/ajph.2017.304038

National Consortium for the Study of Terrorism and Responses to Terrorism. (2020). *Global terrorism database*. https://www.start.umd/edu/gtd/

Nilsson, J. (2010). What's the problem? Local officials' conceptions of weaknesses in their municipalities' crisis management capabilities. *Journal of Contingencies and Crisis Management*, *18*(2), 83–95. https://doi.org/10.1111/j.1468-5973.2010.00607.x

Nordin, J. D., Kasimow, S., Levitt, M., & Goodman, M. J. (2008). Bioterrorism surveillance and privacy: Intersection of HIPPA, the common rule, and public health law. *American Journal of Public Health*, *98*(5), 802–807. https://doi.org/10.2105/ajph.2007.113332

Oliveira, M., Mason-Buck, G., Ballard, D., Branicki, W., & Amorim, A. (2020). Biowarfare, bioterrorism and biocrime: A historical overview on microbial harmful applications. *Forensic Science International*, *314*, Article 110366. https://doi.org/10.1016/j.forsciint.2020.110366

Pal, M., Tsegaye, M., Girzaw, F., Bedada, H., Godishala, V., & Kandi, V. (2017). An

overview on biological weapons and bioterrorism. *American Journal of*

Biomedical Research, *5*(2), 24–34. https://doi.org/10.12691/ajbr-5-2-2

Pinto, V. (2013). Bioterrorism: Health sector alertness. *Journal of Natural Science,*

Biology and Medicine, *4*(1), 24–28. https://doi.org/10.4103/0976-9668.107256

Poutanen, S. M. (2007). Do your biohazard, bioterror, and emergency planning NOW.

Medical Laboratory Observer, *39*(2), 39–43.

Putzer, G. J. (2006). *Perceived bioterrorism preparedness and the impediments to*

bioterrorism preparedness of rural areas (Publication No. 3228812) [Doctoral

dissertation, University of Florida]. ProQuest Dissertations and Theses Global.

Rathert, C., Williams, E. S., Lawrence, E. R., & Halbesleben, J. R. (2012). Emotional

exhaustion and workarounds in acute care: Cross sectional tests of a theoretical

framework. *International Journal of Nursing Studies*, *49*(8), 969–977.

https://doi.org/10.1016/j.ijnurstu.2012.02.011

Robson, C. (2002). *Real world research: A resource for social scientists and*

practitioner-researchers (regional surveys of the world) (2nd ed.). Wiley-

Blackwell.

Rodriguez, G. (2007). *Multinomial response models*.

https://data.princeton.edu/wws509/notes/c6.pdf

Rokach, A., Cohen, R., Shapira, N., Einav, S., Mandibura, A., & Bar-Dayan, Y. (2010). Preparedness for anthrax attack: The effect of knowledge on the willingness to treat patients. *Disasters, 34*(3), 637–643. https://doi.org/10.1111/j.1467-7717.2010.01161.x

Romano, D., Rowe, S., Phelps, R., & Simons, G. (2019). Correlates of terror: Trends in types of terrorist groups and fatalities inflicted. *Cogent Social Sciences*, *5*(1), Article 1584957. https://doi.org/10.1080/23311886.2019.1584957

Roof, K., & Oleru, N. (2008). Public health: Seattle and King County's push for the built environment. *Journal of Environmental Health*, *71*(1), 24-27. https://www.cdc.gov/nceh/ehs/Docs/JEH/2008/july-aug_w_case_studies/JEH_Jul-Aug_08_Seattle.pdf

Ryan, J. (2016). *Biosecurity and bioterrorism: Containing and preventing biological threats* (2nd ed.). Butterworth-Heinemann.

Sandrock, C. (2016). Bioterrorism. In R. J. Mason, A. Slutsky, J. F. Murray, J. A. Nadel, M. Gotway, V. C. Broaddus, J. D Ernst, T. E King, Jr., & K. F. Sarmiento (Eds.), *Murray and Nadel's textbook of respiratory medicine* (6th ed., pp. 699–712). Elsevier. https://doi.org/10.1016/b978-1-4557-3383-5.00040-3

Saul, B. (2006). Defining terrorism. In E. Chenoweth, R. English, A. Gofas, & S. N. Kalyvas (Eds.), *The Oxford handbook of terrorism* (pp. 34–49). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198732914.001.0001

Scott, K. K., & Errett, N. A. (2018). Content, accessibility, and dissemination of disaster

information via social media during the 2016 Louisiana floods. *Journal of Public*

Health Management and Practice, *24*(4), 370–379.

https://doi.org/10.1097/phh.0000000000000708

Sharma, M., Dixon, J. K., Carter, E. J., & McCorkle, R. (2019). Essential evidence-based

introductory bioterrorism content for practicing nurses. *Nurse Education in*

Practice, 34, 104–110. https://doi.org/10.1016/j.nepr.2018.10.006

Silva, J. R., Duran, C., Freilich, J. D., & Chermak, S. M. (2020). Addressing the myths of

terrorism in America. *International Criminal Justice Review*, *30*(3), 302–324.

https://doi.org/10.1177/1057567719833139

Simeon, J. C. (2019). The evolving common law jurisprudence combatting the threat of

terrorism in the United Kingdom, United States, and Canada. *Laws*, *8*(1), Article

5. https://doi.org/10.3390/laws8010005

Smith, G. L., & Davison, N. (2010). Assessing the spectrum of biological risks. *Bulletin*

of the Atomic Scientists, *66*(1), 1–11. https://doi.org/10.2968/066001001

Stanford Center for Definitive and Curative Medicine. (2008). *Standford Medicine.*

Center for Definitive and Curative Medicine.

https://med.stanford.edu/cdcm/about.html

SteelFisher, G. K., Blendon, R. J., Brulé, A. S., Ben-Porath, E. N., Ross, L. J., & Atkins,

B. M. (2012). Public response to an anthrax attack: A multiethnic perspective.

Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, *10*(4),

401–411. https://doi.org/10.1089/bsp.2012.0041

Stoto, M. A., Fricker, R. D., Jain, A., Diamond, A., Davies-Cole, J. O., Glymph, C.,

    Kidane, G., Lum, G., Jones, L., Dehan, K., & Yuan, C. (2006). Evaluating

    statistical methods for syndromic surveillance. In A. G. Wilson, G. D. Wilson, &

    D. H. Olwell (Eds.), *Statistical methods in counterterrorism* (pp. 141–172).

    Springer.

Sun, L., & Yang, C. H. (2017). United States bioterror attacks and laboratory accidents in

    recent years and the impact on its policy-making. *Military Medical Sciences,*

    41(11), 923–928.

    http://wprim.whocc.org.cn/admin/article/articleDetail?WPRIMID=694282&articl

    eId=694767

Taylor, H. (2019). Domestic terrorism and hate crimes: legal definitions and media

    framing of mass shootings in the United States. *Journal of Policing, Intelligence*

    and Counter Terrorism, *14*(3), 227–244.

    https://doi.org/10.1080/18335330.2019.1667012

Tegos, G. P. (2013). Biodefense. *Virulence*, *4*(8), 740–744.

    https://doi.org/10.4161/viru.27170

Thomas, M. J., Yoon, P. W., Collins, J. M., Davidson, A. J., & Mac Kenzie, W. R.

    (2018). Evaluation of syndromic surveillance systems in 6 US state and local

    health departments. *Journal of Public Health Management and Practice*, *24*(3),

    235–240. https://doi.org/10.1097/phh.0000000000000679

Thorne, C. D., Levitin, H., Oliver, M., Losch-Skidmore, S., Neiley, B. A., Socher, M. M., & Gucer, P. W. (2006). A pilot assessment of hospital preparedness for bioterrorism events. *Prehospital and Disaster Medicine*, *21*(6), 414–422. https://doi.org/10.1017/s1049023x0000412x

Tomuzia, K., Menrath, A., Frentzel, H., Filter, M., Weiser, A. A., Bräunig, J., Buschulte, A., & Appel, B. (2013). Development of a comparative risk ranking system for agents posing a bioterrorism threat to human or animal populations. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, *11*(S1), S3–S16. https://doi.org/10.1089/bsp.2012.0070

Tournier, J.-N., Peyrefitte, C. N., Biot, F., Merens, A., & Simon, F. (2019). The threat of bioterrorism. *The Lancet Infectious Diseases*, *19*(1), 18–19. https://doi.org/10.1016/s1473-3099(18)30709-6

United Nations International Strategy for Disaster Reduction, (n.d.). *Disaster preparedness.* http://www.unisdr.org/who-we-are/what-is-DRR

United Nations Office of Disaster Risk Reduction. (n.d.). *About UNDRR*. https://www.undrr.org/about-undrr

Vargo, M. E. (2017). *The weaponizing of biology: Bioterrorism, biocrime and biohacking*. McFarland.

Vartti, A.-M., Aro, A. R., Jormanainen, V., Henriksson, M., & Nikkari, S. (2010). Confidence in biopreparedness authorities among Finnish conscripts. *Military Medicine*, *175*(8), 607–611. https://doi.org/10.7205/milmed-d-09-00239

Vedula, N., & Shalin, V. L. (2017). Predicting trust relations within a social network: A case study on emergency response. In P. Boldi (Ed.), *Proceedings of the 2017 ACM on Web Science Conference* (pp. 53–62). https://dl.acm.org/doi/pdf/10.1145/3091478.3091494

Walsh, P. F. (2018). The biosecurity threat environment. In P. F. Walsh, *Intelligence, biosecurity and bioterrorism* (pp. 21–57). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-51700-5_2

Waterer, G. W., & Robertson, H. (2009). Bioterrorism for the respiratory physician. *Respirology*, *14*(1), 5–11. https://doi.org/10.1111/j.1440-1843.2008.01446.x

Watson, C. R., Watson, M. C., Ackerman, G., & Gronvall, G. (2017). Expert views on biological threat characterization for the U.S. government: A Delphi study. *Risk Analysis*, *37*(12), 2389–2404. https://doi.org/10.1111/risa.12787

Welby-Everard, P., Quantick, O., & Green, A. (2020). Emergency preparedness, resilience and response to a biological outbreak. *BMJ Military Health*, *166*(1), 37–41. https://doi.org/10.1136/jramc-2019-001323

Zacchia, N. A., & Schmitt, K. (2018). Medical spending for the 2001 anthrax letter attacks. *Disaster Medicine and Public Health Preparedness*, *13*(3), 539–546. https://doi.org/10.1017/dmp.2018.113

Zogby International. (2012). *Revealing America's awareness and preparedness surrounding emergency situations: 2012 Third Annual Public Safety Survey*. Federal Signal Safety and Security Systems. http://www.alertnotification.com/pdf/ANS104_2012_Survey-lowRes.pdf

Zulli, D., Coe, K., Isaacs, Z., & Summers, I. (2021). Media coverage of the unfolding

   crisis of domestic terrorism in the United States, 1990–2020. *Public Relations*

   Inquiry, Article 2046147X21996015. https://doi.org/10.1177/2046147X21996015

Appendix A: Permission to Use

Dear Trebor Yocum

Thank you for your below enquiry.

I am pleased to confirm that we grant permission to use table 1 and figures 1 & 2 for your dissertation and at no cost.

The current state of bioterrorist attack surveillance and preparedness in the US
Grundmann Oliver
Risk Management and Healthcare Policy 2014 7 177-187

Please note:
•	The figures and table must be fully cited
•	Dove Medical Press must be acknowledged as the original publisher
•	Any other re-use in the future will require separate permission to be requested
•	No transfer of copyright should be inferred or implied

Please let me know should you have any further questions and I wish you all the best with your dissertation and studies.

Best Regards

Shannon

Shannon Ainsworth
Reprints Team
Dove Medical Press Limited

Beechfield House,
Winterton Way,
Macclesfield SK11 0LP
United Kingdom
www.dovepress.com