

PRIORITIZING PREPAREDNESS: EXTREME HEAT AND CLIMATE CHANGE PREPARATION OF
MIDWESTERN HEALTH DEPARTMENTS

by

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A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
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Department of Health Education and Recreation
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DISSERTATION APPROVAL

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in the field of Health Education and Recreation

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AN ABSTRACT OF THE DISSERTATION OF

ALICIA B. WODIKA, for the Doctor of Philosophy degree in HEALTH EDUCATION AND RECREATION, presented on JUNE 26, 2013, at Southern Illinois University Carbondale.

TITLE: PRIORITIZING PREPAREDNESS: EXTREME HEAT AND CLIMATE CHANGE PREPARATION OF MIDWESTERN HEALTH DEPARTMENTS

MAJOR PROFESSOR: Dr. Kathleen Welshimer

This dissertation is about the factors that influence heat wave preparedness of Midwestern health departments, and the climate change perceptions of public health officials. Heat waves have historically impacted the Midwest and, due to the variable pattern of these events, are full of uncertainties. Climate change intensifies the threat of heat waves, therefore, it is important for public health officials to incorporate methods for addressing climate change into their short and long term plans and preparedness models. This study is unique, because it goes beyond previous work that has been done with heat wave preparedness by speaking with public health officials to understand the complexities of heat wave planning. Applying a comparative case study methodology to this study was important to see how three states, in varying stages of climate change preparedness, function regarding emergency planning, decision making, and collaboration. Further, interview discussions regarding climate change demonstrate the need to further assist public health with their mitigation and adaptation efforts.

Topics within Chapter One describe the study framework, study significance, discuss the incorporated methodology, and the dissemination of results. In Chapter Two, I construct the scholarly framework for this study by examining climate change and public health impacts, how policy shapes program planning with regard to heat waves, the sociological implications of heat waves including communicative properties and

community organizing, and heat wave preparedness plan evaluation. Chapter Three focuses on the methodology guiding this project as well as the research questions. Research questions focused on preparation for heat waves, communication among state and local health departments, climate change perceptions of health officials, and finally, the influence of grant funding on preparedness efforts. This study was constructed using an interpretive paradigm to guide a comparative case study framework for comparing heat wave preparedness of three Midwestern States. Using document analysis and semi-structured interviews, I was able to discuss the concept of preparedness with public health officials including emergency preparedness coordinators, environmental health directors, and emergency managers.

In Chapters Four and Five, I developed the uniqueness of each case, and then built a broader story by examining findings across the cases. I met with 22 individuals representing fourteen local health departments, two state health departments, one city health department, two emergency management agencies, and one state climatologist office. Analysis was threaded into both Chapters Four and Five by exploring within (locality, denialism, and camaraderie) and cross (leadership, transitions, expectations, imagery, and strategies) case themes. In Chapter Six, I discuss the study findings by incorporating the social ecological model as well as cited literature. Finally, Chapter Seven revisits the study significance and implications for best possible practices in health and public health education. Climate change is one of the greatest threats to public health, and heat waves are only one anticipated threat from enhanced warming. This study sheds light on the importance of climate literacy and preparedness for all hazards approaches in public health planning.

DEDICATION

For Avery (Turtle), of course.

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Giesler and brother, Jay Giesler. To my sister, Leah Johnson, I'm ever so grateful for you. Thank you for supporting me throughout all the avenues I've pursued in life! My grandmother, Carol "Gram" Stuart, was my source of support, wisdom, laughter, and encouragement. She fueled my passion for reading and initiated my educational quest. To the Wodika's, Phil, Lois, Dana, Sue, Sydney, and Katy, thank you for supporting all that I do.

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PREFACE

Before the age of 18, my maternal and paternal grandparents had passed away. Being very close to my maternal grandmother in particular, it was devastating to not have her in my life. In college, I began to volunteer at a nearby senior center and visited one woman in particular. Although I knew that I would not follow a path of gerontology, I knew that I would continue to work with the aging population throughout my life. Unfortunately, senior citizens are especially susceptible to many environmental health threats, as many live alone, are socially-isolated, and physically vulnerable from chronic illnesses. After reading *Heat wave: A social autopsy of disaster in Chicago* (Klinenberg, 2002), I became interested in this topic, as with climate change, heat waves may increase in severity and frequency in the future. Senior citizens who are socially-isolated are at greater risks for being impacted by a heat event. Before taking Climatology and reading Klinenberg's book, I had not correlated heat waves with the elderly. To be honest, I really did not give it much thought. However, the details that were shared regarding the situation in Chicago in 1995 really made me reflect on how the horrendous 1995 heat wave could and will occur again in the future. This topic area also combined multiple interests of mine including working with the elderly, health education, program planning, environmental health, and climate change. Although I am not directly working with the aging population at this point in my career, I hope to develop preparedness plans for urban and rural communities that encompass many types of strategies for different populations.

Understanding climate science and enhancing my teaching of climate change has also been a passion I have developed. With the assistance of passionate professors, I have constructed an appreciation for this important phenomenon. Climate change has immense

public health implications; health officials and educators need to have a working knowledge of climate change to educate the general public. Knowledge is most certainly not the only answer to lack of climate change mitigation and awareness. However, possessing *correct* knowledge about climate science is a step in the right direction. I am not naïve to think that this problem will be solved with this study; instead I think that I am adding to the pool of literature aimed at enhancing our public health infrastructure to enrich the wellbeing of the general public.

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CHAPTER 1

INTRODUCTION

PRIORITIZING PREPAREDNESS

“The heat wave of 2003 has already begun to fade in people’s memories, and the ‘normal’ summers of the following two years will have begun to soak up some of the extra carbon that entered the atmosphere during that deadly hot spell. But we forget at our peril. The summer of 2003 was a ‘natural experiment’ whose conclusions should be taken very seriously. This wasn’t just some output from a computer model, whose assumptions and projections can be legitimately challenged. It actually happened. Moreover, the near repeat of the 2003 heat wave in the summer of 2006 suggests that, if anything, the models are underestimating the likely frequency and severity of future heat waves. We have been warned.”

Mark Lynas (2008) *Six Degrees: Our Future on a Hotter Planet*

Background of the Problem

Before the events in Europe in 2003, one of the deadliest heat waves struck the Midwest United States in July 1995. The heat event is best summarized by Klinenberg (2002), in which the oppressiveness of the situation is depicted in his book, *Heat Wave: A Social Autopsy of Disaster*. In Chicago on July 12th through the 16th, the days were sweltering, as temperatures were steadily climbing into triple digits. With the hum of air conditioners working at maximum levels deafening the city, electrical failures were imminent. In several neighborhoods, power outages silenced any cooling devices that assisted to combat the heat. Depending on the location and the corresponding socioeconomic characteristics of Chicago neighborhoods, isolated residents were apprehensive to open their windows for any heat relief, afraid of potential burglars, petty thievery, or worse. Instead, some residents would turn on box and oscillating fans to disperse the heat, but with closed windows, this only exacerbated the temperatures inside homes and apartments. Some Chicagoans illegally opened water mains for relief in the

heat, but this would only be a short term event, as illegally opening these water storage units can have detrimental implications. Opening the water mains reduced the water pressure to nearby buildings, and in some cases, caused water flow to stop completely. The lack of running water was an accelerant for dehydration in affected residents.

Health and city officials were scrambling to assist with public outreach, manage water and sewer resources, and direct the crowds at nearby hospitals. Although the cool air of nightfall usually brings much needed relief, this heat wave was extreme. Minimum nighttime temperatures brought little, if any, heat relief, causing heat exhaustion, heat stroke, and in many cases, death. After several days of high temperatures, 739 Chicagoans succumbed to the intensity of the heat (Semenza et al., 1999; Hayhoe et al., 2010), which overcrowded city morgues. Massive cooling trucks were brought into the city and staged outside the morgues to contain individuals waiting to be examined by the city coroner. Forty-one bodies were never claimed; and instead were buried together in a continuous grave at the Homewood Memorial Cemetery (Klinenberg, 2002).

The July 1995 heat wave struck 19 Midwestern states with five day sustained temperatures of over 40°C (104°F) in some locations (Kunkel, Changnon, Reinke, & Arritt, 1996). Heat-related illnesses including heat stroke, dehydration, and heat exhaustion caused approximately 3,000 emergency room visits during the event (Semenza et al., 1996; Dematte et al., 1998; Vavrus & Van Dorn, 2009; Hayhoe et al., 2010). Four years later in 1999, another heat wave impacted the Midwest with 258 deaths, 110 were reported in Chicago and 36 were reported in St. Louis (Cook County Coroner, 1999; St. Louis City Health Department, 1999; Palecki, Changnon, & Kunkel, 2001).

In the 2003 heat wave in Europe, deaths were totaled to be around 30,000 to 40,000 individuals with some estimations as high as 70,000 (UNEP, 2004; Valleron & Boumendil, 2004; Robine et al., 2008; Hayhoe et al., 2010). Due to the inconsistencies of coroner reports and from research studies citing the event, the number of reported heat-related deaths fluctuates depending on the paper and/or author (Angel, Personal Communication, 2013). Heat deaths were thought to be underestimated in 1995, with newer analyses estimating at least 697 individuals perishing in the heat (Kaiser et al., 2007; Hayhoe et al., 2010). Contradictions are evident, however, as several articles report varying mortality numbers for the Chicago 1995 heat wave including 465 deaths (Brown, Baker, & Friday, 1995), 700 deaths (Whitman et al., 1997; EPA, 2006; Sheridan & Kalkstein, 2004), and 800 deaths (Kalkstein & Sheridan, 2007). After the 2003 heat wave in Europe, evaluations of the event unveiled negligent inaccuracies of reports including evidence of ten deaths being reported when almost 4,000 individuals had died (World Health Organization, 2004; Ebi & Schmier, 2005).

Recently, the summer of 2012 was one recorded as one of the hottest summers in U.S. history, setting records in multiple states across the country. The intense heat wave extended across the Midwest and through the Northeast United States lingering for weeks. Coupled with extreme temperatures, summer storms wiped out power to many cities and communities, causing residents to beat the heat without the most effective weapon for preventing heat stroke: Air conditioning (Semenza et al., 1996; Naughton et al., 2002; Yardley, Sigal, & Kenny, 2010). By July 12th 2012, thirty deaths across the county were linked to extreme heat including ten individuals in the Chicago area (The Associated Press, 2012). Built environments were also impacted, with roads and railways buckling in Illinois

and Wisconsin (The Associated Press, 2012). As Lynas (2008) stated in the beginning quotation, “we forget at our peril,” as extreme heat is not a new phenomenon.

Since 1979, about 380 Americans have died every year from heat-related weather events; which is more than tornadoes, hurricanes, floods, and earthquakes combined (National Center for Weather Statistics, 1997; Weisskopf, Anderson, Foldy, Hanrahan, Blair, Torok, & Rumm, 2002). In 2009, the Centers for Disease Control and Prevention estimated the annual mortality rate in the United States to be approximately 700 individuals per year. Without any mitigation efforts to reduce the current carbon emissions levels, by 2050, heat-related deaths could drastically increase from to 3,000 to 5,000 annually (CDC, 2009). Although heat-related weather events can impact all individuals, vulnerable populations including those with medical conditions, children, and the elderly are most at risk.

Heat waves, when exacerbated by climate change, may be more severe in the future (Kalkstein & Greene, 1997; Easterling, Horton, & Jones, 1997; Keatinge et al., 2000; Cubasch, Meehl, & Boer, 2001; Giorgi et al, 2001; Wigley & Raper, 2001; McGeehin & Mirabelli, 2001; Bernard & McGeehin, 2004; Patz, Campbell-Lendrum, Holloway, & Foley, 2005; Poumadere, Mays, Le Mer, & Blong, 2005; Ebi, Mills, Smith, & Grambsch, 2006; McMichael, Woodruff, & Hales, 2006; Luber & McGeehin, 2008; Kovats & Hajat, 2008; Hess, Heilpern, Davis, & Frumkin, 2009; Semenza & Menne, 2009; Qi, Tong, & Hu, 2009; Huang et al., 2011). Climate change is defined as “a significant and persistent change in the mean state of the climate or its variability” (U.S. Global Climate Change Research Program / Climate Change Science Program, 2009). Variations in climate can be attributed to Earth’s orbital position around the sun, plate tectonics, or anthropogenic influences (i.e. agriculture, fossil fuels) (U.S. Global Climate Change Research Program / Climate Change

Science Program, 2009). Heat waves have been occurring with more intensity over the last 50 years as documented in the 1966, 1980, and 2006 events in St. Louis and with the 1995 and 1999 heat events in Chicago (Hayhoe et al., 2010).

In a changing climate, heat waves are expected to become more variable (Vavrus & Van Dorn, 2009), thereby intensifying the risk for morbidity and mortality within vulnerable groups of individuals. Average summer temperatures are expected to increase 2.4°C to 5.8°C in the Chicago area by the end of the century (Vavrus & Van Dorn, 2009). In 2012, the Union of Concerned Scientists (2012) presented data trends demonstrating that very hot, humid days increased 200% (10 days) for St. Louis and Columbia, Missouri, 172% (3.5 days) for Detroit, Michigan, and 62% (2.5 days) from 1946-2011. Along with temperature increases, dew points are projected to be higher especially during nighttime hours, causing increases in mortality (Kalkstein & Davis, 1989; Vavrus & Van Dorn, 2009). Although climate models are essential to project future climate scenarios, these models are simplifications of Earth's extremely complex climate system. Therefore, a certain level of uncertainty should be acknowledged when using this information.

The heat index, a combination of relative humidity and temperature, is also important to assess. When the heat index is high, perspiration from the body is unable to dissipate to the surrounding saturated atmosphere, decreasing the body's ability to perform evaporative cooling. Instead, blood flushes to the skin dispersing heat in the process, leaving internal organs vulnerable and potentially causing cardiovascular damage, renal failure, and delirium (Stauss, Morgan, Anderson, Massett, & Kregel, 1997; Kenney & Fels, 2002; Leon & Helwig, 2010). While climate models have projected unchanging relative humidity levels, warmer air is able to hold more moisture causing the absolute

humidity level to potentially increase (Wentz, Ricciardulli, Hilburn, & Mears, 2007; Vavrus & Van Dorn, 2009). The human body can withstand intense heat for about 48 hours before body systems begin failing (Klinenberg, 2002).

In health education, program planning and interventions are integral components of the field that enhance our presence within communities, ultimately decreasing the likelihood of morbidity and mortality. Educational outreach among the general public regarding these issues is prudent to enhance preparedness actions in the event that a disaster and/or outbreak may occur. Understanding the current health infrastructure, communication channels, and decision making properties between state and local health departments also is an important step to enhance the filtration of pertinent health messages. Although climate change is not a new topic, it is an emerging topic of discussion and research within health education. Climate change is considered to be more of a public health issue, yet health educators have involvement in all dimensions of health including environmental. By ensuring that all future health officials are climate literate, mitigation and adaptation practices may be more likely to occur as well as the diffusion of knowledge and awareness to the general public.

Statement of the Problem

While the definition of a heat wave remains inconsistent, generally, the term heat wave implies “an extended period of unusually high atmosphere-related heat stress [causing] temporary modifications in lifestyle” (Robinson, 2001, p. 763). Issues including socio-cultural factors, political decisions, the physical environment, and climate change, can exacerbate morbidity of vulnerable groups to an extreme heat event. Heat waves, although very intense and deadly, lack the pictorial devastation of other natural disasters including

tornadoes, earthquakes, and hurricanes. Therefore, heat waves are less likely to be perceived as high risk.

Another example of dangerous situations with low perceived risk would be with carbon monoxide poisoning (Janis, 1962). Since carbon monoxide can cause ambiguous warning signs including dizziness and nausea, response time to the risk may be decreased because the symptoms mimic other ailments (Janis, 1962; Kalkstein & Sheridan, 2007). Similar to the low risk perception of carbon monoxide poisoning, vulnerable groups may downplay the dangers of heat and not take precautions during a heat event. A common hearsay includes, “my grandparents lived without air conditioning and they were fine.” Regardless of the historical time period (pre/post air conditioning) several days of intense humidity and heat can be physiologically damaging if efforts are not made to cool the body. Heat stroke is better prevented than treated, which merits the enhancement of preparedness strategies to increase awareness for heat-related illnesses (Leon & Helwig, 2010).

Although heat wave preparedness programs are advocated by the Environmental Protection Agency (U.S. EPA), the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Health and Human Services (U.S. DHHS), and the Centers for Disease Control and Prevention (CDC), many health departments are without adequate preparedness measures, if they have them at all. According to the Intergovernmental Panel on Climate Change (IPCC) (2007), heat waves are projected to increase in severity and intensity in the upcoming years (Reid et al., 2009). With increasing heat waves, mortality rates are also projected to increase (Hayhoe et al., 2010). These projections are

important to first mitigate for heat wave effects, and if not possible, increase our advisory effectiveness to these extreme weather events.

Need for the Study

While action plans exist to warn the general population about heat waves, the intended groups may not be reached, ultimately decreasing the effectiveness of the heat advisories (Delaroziere & Sanmarco, 2004; Semenza, Hall, & Wilson, 2008; Richard, Kosatsky, & Renouf, 2010). Millions of individuals can be impacted by a heat wave, yet vulnerable groups need more care and awareness during an event. Understanding the current perceptions of heat waves among leaders of state and local health departments can enhance action plans, possibly increasing their frequency of usage. O'Neill et al. (2009) described several adaptation strategies to heat waves including heat warning systems, air conditioning usage, increasing albedo (or reflectivity of solar input) of urban environments, and community collaboration to check on fellow constituents. Unfortunately, these strategies can be limited by problems, including power failures for air conditioners, insufficient warning systems and hospitals, and lack of ventilation (Changnon, Kunkel, & Reinke, 1996; Hayhoe et al., 2010). Even with reliable warning systems there are many associated problems.

According to Ebi and Schmier (2005), early warning systems should include strong public health and social infrastructures. Social components include creating buddy systems with friends and acquaintances for neighbor-checks, neighborhood watch programs, and awareness of/transporting seniors to cooling centers. Localities may not be prepared to handle such events. An assessment of networking capabilities of communities is important to ensure that communication efforts for preparedness are well established.

Since the Midwest heat wave in 1995 and the European heat wave of 2003, at least five (larger) city health departments have initiated heat wave preparedness plans. In 2004, Bernard and McGeehin assessed 18 U.S. cities' heat wave response plans. They discovered that 33% of cities in the study were without a written heat wave adaptation plan for their communities (Bernard & McGeehin, 2007). Results from other studies also confirmed a lack of heat wave preparedness of U.S. cities (O'Malley, 2007; Luber & McGeehin, 2008).

Climate change illiteracy among local health departments across the United States, especially among directors of the departments, has also been confirmed in research studies (Balbus, et al., 2008; Maibach et al., 2008; Bedsworth, 2009; Bell, 2011). An increase in the frequency and intensity of heat waves is imminent in a changing climate, yet in past studies, researchers chose to study public health officials' perception of heat waves and climate change as separate entities. Very few, if any, studies utilize the qualitative methodology of discussing climate change and preparedness with health department officials. Interviews provide descriptive narratives that offer more explanative properties than surveys can address. Rich, open ended answers from interviews dissect the hidden factors of policy change and decision making, which determine heat wave plans and climate change policy.

As stated previously, heat waves can affect multiple groups of people, but tend to place those who are health impaired, children, and older groups at higher risk. According to the CDC (2010), by 2060, 20% of the population will be greater than 65 years of age; an almost 8% increase since 2006. Many of these individuals may be susceptible to heat stresses, especially those who are isolated or who are living in impoverished conditions. Socioeconomic contextual factors also play a role in morbidity and mortality of heat wave

events, with those economically disadvantaged being at greater risk (CDC, 2010a). The threats are great for an uncertain future; it is imperative to have preparation, planning, and awareness of heat waves among our communities.

Purpose of the Study

The purpose of this dissertation was to understand the underlying factors that influence heat wave preparedness among Midwestern health departments. Studying preparedness for heat waves among public health officials is important, because health departments have goals of optimal health and wellness, and are the “first line of defense” within public health infrastructure (Balbus et al., 2008 p. iv). Health officials who show that heat waves and climate change are priorities may demonstrate higher levels of concern within the community. As I will demonstrate in upcoming chapters, the incorporation of logical, applicable preparedness plans proves to be essential in an era where funds are stretched, staff cuts are a reality, and time is limited. In addition, this study explored the communicative efforts among multiple levels of public health, ultimately seeking an understanding for the prioritization of preparedness within public health agendas. Finally, interviews were important to understand the climate change perspectives of health officials to explain the reasoning behind lack of documented preparedness efforts (Maibach et al., 2008; Bedsworth, 2009).

Research Questions

Throughout this study, the addition of new research questions remained a possibility. Towards the end of this study, I realized an additional question needed to be added regarding the importance of grant funding on levels of a state’s collective preparedness efforts for heat waves and climate change.

1. How are health departments preparing for heat waves?
 - a. How are established guidelines for heat wave preparedness met among state, city, and county health departments?
2. How do health departments communicate with each other, specifically as communication relates to heat wave preparedness and climate change mitigation and adaptation?
 - a. How are decisions made at the local level to encourage preparedness in communities?
 - b. How are threats to public health filtered in a world of competing priorities?
3. What are the perceptions of public health officials regarding climate change?
 - a. How do public health officials perceive climate change impacting the health of their communities?
 - b. How are public health officials acting on climate change initiatives in their communities?
4. How does grant funding, specifically for climate change, increase the collective preparedness efforts of states and communities?

Significance to Health Education

Outcomes from this study are important for planning and collaboration of strategies for state, city, and county health departments. According to Bernard and McGeehin (2007), plans to reduce morbidity and mortality from heat waves are absolutely vital for communities. It is important not only understand the preparedness of counties, but also the effectiveness of the preparation plan(s) as regarded by the general public. Outcomes from this project also can assist states, cities, and counties to determine their strengths and

areas of improvement regarding vulnerability mapping, networking, and community organizing techniques.

Results from this study are significant for planning and collaborating among multiple levels of health governance, while future outcomes from this study are important to thread within existing federal objectives (preparedness, public health infrastructure, and older adults). These objectives are listed by the United States Department of Health and Human Services, *Healthy People 2020* initiative (U.S. DHHS, 2011). *Healthy People 2020* includes “10-year national objectives for improving the health of all Americans” (U.S. DHHS, 2011). Particularly, this study addresses a focus on improving the country’s planning for natural disasters and major health threats (preparedness), ensuring that all municipal health agencies are providing effective health services (public health infrastructure), and improving the quality of life for the aging population (older adults) (U.S. DHHS, 2011).

This study has many possible outcomes for health education that center on informing current and future programs. Information could include the establishment of climate literacy workshops/trainings for health and public health educators, financially conscientious heat wave preparedness plans, and community organizing to enhance networking within urban and rural communities. Regarding climate change literacy, the CDC is currently working with several states to ensure that they are climate ready. This is a step toward state, city, and county public health officials becoming more prepared and knowledgeable about climate change. Although climate change is widely discussed within public health, only recently has gained popularity within health education. Health educators have important roles within multiple sectors of the community from schools, hospitals, academia, and local/state/federal government; we have the potential to

influence the development of curricula within these areas. Having educators that are cognizant of the importance and urgency of climate change mitigation may positively influence future agendas. Finally, emergency preparedness has foundational underpinnings including community organizing, coalition establishment, networking, program planning, and evaluation. By conducting assessments, we can “identify sub-populations most in need of services and determine the most acceptable way of services to be offered” (Eng & Blanchard, 1991, p. 93).

The goals of this project represent three main outcomes, including understanding how heat wave preparedness plans are constructed and communicated (short term), encouraging the development of preparedness programs that are tailored to the needs of urban and rural communities (intermediate) and, finally, decreasing morbidity and mortality from heat waves and encouraging more climate literate health communities (long term) (Appendix A). Project outcomes include an executive summary containing study results and recommendations for best possible practices that will be sent to all study participants (Appendix B). The summary will be tailored for health departments to see where they are going, and how they are going to get there with heat wave and climate change prevention. Suggestions for health educators and public health practitioners will be discussed in greater detail in Chapter Seven.

Research Design

With hopes of understanding the communicative efforts and preparedness practices of public health officials, this study was conducted with state, city, and local health department officials of three Midwestern states. A comparative case study method following an interpretive paradigm allowed for an in depth approach discerning the

current efforts of heat wave preparedness across multiple sectors (urban and rural, as well as state, city, and local). An interpretive paradigm was suitable for this project because of the epistemological perspective to describe and understand the experience, or differentiating factors of a particular occurrence (Merriam, 2009). A comparative or multi-case study method provided a framework to explore three unique cases that were in differing levels of heat wave and climate change preparedness.

Theoretical Framework

The social ecological model (SEM) was threaded throughout the entire study to explain the contextual factors influencing preparedness. SEM is based on the following principles:

1. There are multiple influences on specific health behaviors, including factors at the intrapersonal, interpersonal, organizational, community, and public policy levels;
2. Influences on behaviors interact across these different levels;
3. Ecological models should be behavior-specific, identifying the most relevant potential influences at each level; and
4. Multi-level interventions should be most effective in changing behavior.

(Sallis, Owen, & Fisher, 2008, p. 466).

SEM includes several constructs depending on the version that is utilized. This project followed the social ecological model of health promotion (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1992; Stokols, 2003) and included constructs of intra and interpersonal factors, institutional factors, community factors, public policy, as well as the physical environment (McLeroy et al., 1988). A study that focused on incorporating the social ecological model within a New York WIC (Women, Infants, and Children) training

program threaded the constructs of the model throughout the study by guiding the research questions, methodology, findings, and recommendations (Newes-Adeyi, Helitzer, Caulfield, & Bronner, 2000). Newes-Adeyi et al.'s (2000) study proved beneficial as a template for the incorporation of theory throughout the entire study.

Using a model with an ecological approach facilitates the wearing of several lenses for constant comparison of multiple influential levels. According to Yardley et al. (2011), heat wave planning and research should incorporate a social-ecological framework because it allows for an approach that identifies the interaction of multiple levels, while also reducing inconsistencies among studies (Yardley et al., 2011). The inner layers of examination include the intrapersonal level to assess the health status of vulnerable groups, interpersonal level to analyze the socio-economic status and cultural factors, and the community level to dissect the social networking and organizing characteristics that allow for connectivity, interaction, and collaboration. As for the outer layers of the model, policy and physical environment, these can provide a clearer picture of a state's collective preparedness efforts, depict contextual factors that affect the creation of public health plans, and observe the physical properties that enhance or decrease the heat effect.

Study Sample and Participants

In 2009, the CDC established the *Climate Ready-States and Cities Initiative*, a grant-based opportunity for states and cities to apply and receive funding to prepare for the negative health consequences of climate change. Three unique cases (states) were chosen for this study by selecting 1) a state health department that applied to the CDC *Climate Ready-States and Cities Initiative* and received funding, 2) a state health department that applied to the CDC *Climate Ready-States and Cities Initiative* but did not receive funding,

and 3) a state that did not apply for CDC funding. One Midwestern state in each category was chosen for the project. Local health departments were selected using a combination of three strategies: 1) document analysis that flagged cities/counties at multiple planning stages for heat waves and/or climate change; 2) maximum variation of rural and urban county locations; and/or 3) modified snowball technique of identifying potential interview sources from other interview participants. All three state health departments were invited for participation. It was originally planned for at least five health departments per state to be invited to participate in the study. The completion of document analysis for each state, however, identified more participants to contact than were originally planned. To ensure maximum variation was reached with participants, I spoke with both emergency preparedness and environmental health coordinators from participating departments. In one state, I also spoke with the state climatologist to assist with the accuracy of project recommendations.

Data Collection

After applying and receiving Human Subjects approval, document analysis commenced. Before I conducted interviews, I collected and analyzed documents for every health department in each case, which totaled 300 counties. These documents included heat wave advisories from health departments, heat wave and climate change outreach information, research studies conducted by health departments related to heat waves and/or climate change, the CDC *Climate Ready-States and Cities Initiative* grant applications, and CDC *Climate Ready-States and Cities Initiative* proposal evaluation guidelines for grants received. Once interview participants were identified, they were first contacted via email (Appendix C). If they were unresponsive, I phoned the health department seeking

participation. Interviews were conducted using in person and telephone methods. In three states, I spoke with 21 public health officials (emergency preparedness coordinators, health educators, emergency management agencies, and environmental health) representing 17 different health departments (state, city, and local) as well as one state climatologist. Although case studies typically follow an open ended format for interviews (Yin, 2003), I implemented a semi-structured interview format of questions and topics (Kvale & Brinkmann, 2009). All interviews were audio recorded for transcription of discussions.

Data Analysis

Documents were sorted by state, county, city, and then by content (i.e. CDC grant information versus heat wave information). Document analysis involved analyzing the text(s) for specific information including the author affiliation, heat wave advisory content, and health policy. Content for the heat wave preparedness evaluation followed a pre-made guideline sheet based on criteria established by prominent literature and leading organizations (NOAA, U.S. EPA, CDC). Once transcripts were typed from audio files, themes were constructed from “conceptual elements” in the data (Merriam, 2009, p. 181). Each case was transcribed, coded, and thematized before moving onto more complex forms of analysis in which comparisons across states was necessary. In order to build internal validity, peer review was implemented to clarify interview findings. External validity was maximized throughout the study by incorporating transferability enhanced with “thick description” (Ryle, 1949, Geertz, 1973; Maxwell, 2005; Merriam, 2009).

Assumptions

In this research study, I assumed the following:

- 1) I was able to obtain the contact information for health officials to participate in this study via the internet. During a pilot study, health department websites were checked for contact information. In all searches, contact information was found.
- 2) Local county health departments in the study had websites.
- 3) Local health departments existed for counties. In some states, public health is delineated in methods other than having county health departments.
- 4) Health departments have environmental health directors, emergency preparedness coordinators, or an area that deals with emergency preparedness.
- 5) Participants in this study were aware of climate change. While this assumption was set before the study was conducted, it should be modified to reflect that participants have an understanding of climate change.

Limitations

In many forms of research, not everything can be controlled or limited, and limits may be set by events or individuals other than the researcher (Neutens & Rubinson, 2002).

The limitations for this study included the following:

- 1) Due to the political overtones that have grown up around climate change and global warming, some participants did not understand and even refuted the existence of climate change which decreased the discussion of the topic and geared the conversation to follow political contexts. Regarding my own proactive thoughts supporting climate change policies, I monitored my subjectivities on this topic by journaling and reflecting before and after interviews.
- 2) Some health departments were unavailable for interviews due to their busy schedules.

3) Depending on variations in state, city, and local budgets, infrastructure, geographical location, and occurrence of heat waves, results from this study may not be applicable to other states. As with any qualitative study, being able to generalize the results is not a goal or product (Maxwell, 2005). With that being said, in all instances, I sought multiple agencies from different states, in different geographic locations, with rural and urban characteristics, therefore, outcomes from this study will be applicable for many types of health departments. Ultimately, my goal is for results and recommendations to be transferable to other settings.

4) Regarding participation, it is unknown if public health officials who agree to participate were systematically different from officials who actively or passively declined to participate.

Delimitations

Delimitations are those limits that are determined by the researcher (Neutens & Rubinson, 2002). The delimitations for this study included the following:

- 1) This study focused on three Midwestern states.
- 2) Interviews took place in August and lasted through January. Interviews that took place during summer months had the potential to bias participant awareness of heat waves.
- 3) Due to the nature of qualitative research methods, outcomes typically are not generalizable to the larger population. The cases in this study, however, have been carefully chosen to be representative of urban and rural communities all over the United States such that results that may be applicable to other counties, cities, or states.

Definition of Terms

Adaptation: “includes the strategies, policies, and measures undertaken now and in the future to reduce the burden of climate-sensitive health determinants and outcomes” (Ebi, Kovats, & Menne, 2006, p.1931).

Albedo: “the ratio of the shortwave energy reflected from a mass divided by the total shortwave energy incident on that mass” (Rohli & Vega, 2008, p. 394).

Anthropogenic: “human-induced” (Rohli & Vega, 2008, p. 395).

Climate Change: “refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer” (Intergovernmental Panel on Climate Change (a), 2007).

Community: “is defined as people living in close proximity to one another who have formed relationships through several overlapping and interacting social networks and through a shared sense of a local common good.” (Eng & Blanchard, 1991, p. 95).

Determinants of Health: “The range of personal, social, economic, and environmental factors that influence health status” (U.S. Department of Health and Human Services, 2011).

Dew point Temperature (T_d): “the temperature at which saturation occurs at a given place and time (Rohli & Vega, 2008, p. 402).

Document: “the umbrella term to refer to a wide range of written, visual, digital, and physical material relevant to the study at hand” (Merriam, 2009, p. 139).

Environmental Health: “comprises those aspects of human health, including the quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory of practice of assessing, correcting,

controlling, and preventing those factors in the environment that potentially can affect adversely the health of present and future generations” (Friis, 2007, p. 358).

External Forcing: “external forcing refers to a forcing outside the climate system causing a change in the climate system. Volcanic eruptions, solar variations and anthropogenic changes in the composition of the atmosphere and land-use change are external forcings (Baede, van der Linden, & Verbruggen, 2007, p. 81).

Fossil Fuels: “hydrocarbon deposit (primarily in the form of coal, oil, and natural gas) derived from formerly living matter, that releases carbon dioxide, methane, and other compounds to the atmosphere when burned” (Rohli & Vega, 2008, p. 405).

Greenhouse Gases: “an atmospheric pollutant that contributes to the greenhouse effect by enhancing the efficiency of absorption of long wave radiation emitted from the surface and reemitting radiation back downward effectively as counter-radiation” (Rohli & Vega, 2008, p. 407).

Heat Cramps: “muscular pains and spasms due to heavy exertion. Although heat cramps are less severe, they are often the first signal that the body is having trouble with heat” (FEMA, 2005).

Heat Exhaustion: “typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim’s condition will worsen. Body temperature will keep rising and the victim may suffer heat stroke” (FEMA, 2005).

Heat Index: “a number in degrees Fahrenheit (F) that tells how hot it feels when relative humidity is added to the air temperature. Exposure to full sunshine can increase the heat index by 15 degrees” (FEMA, 2005).

Heat Stroke: “has been defined by patient symptoms that present at the time of clinical admission, which include profound central nervous system (CNS) abnormalities (e.g., delirium, seizures, coma) and severe hypothermia” (Leon & Helwig, 2010, p. 1980).

*Heat Waves*¹: “an extended period of unusually high atmosphere-related heat stress, which causes temporary modifications in lifestyle and which may have adverse health consequences for the affected population” (Robinson, 2001, p. 763).

Humidity Index (HI): “in the Thornthwaite climatic classification system, the ratio of surplus to potential evapotranspiration in the monthly surface water balance at a location” (Rohli & Vega, 2008, p. 409).

Latent Heat Flux: “the convective transport of energy absorbed during evaporation and deposition, using from the surface upward” (Rohli & Vega, 2008, p. 432). Although a jargon-rich term, this is important to understand the urban heat island effect from a scientific perspective.

Mitigation: “Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce GHG [greenhouse gas] emissions and enhance sinks.” (Intergovernmental Panel on Climate Change (b), 2007). Mitigation efforts include green

¹ The definition of a heat wave is discussed and debated in greater detail in chapter two. Unless stated otherwise, Robinson’s definition will be used in this study.

and sustainable initiatives to reduce the enhanced greenhouse effect which ultimately causes an increase in the global temperature. This is more the precursor to reduce the likelihood of negative (or positive) health impacts from climate change.

Older Population: “persons 65 years or older” (U.S. Department of Health and Human Services, 2010 (a), p. 2).

Risk Communication: “is by definition, proactive and may involves many stakeholders and audiences, various levels of communication, and phases or stages of communication to accommodate the needs inherent in each step of the assessment” (Ebi, et al. 2006, p. 1933). Risk communication is a process that involves policy, health, and constituents in a dance of understanding the situation, how to react, and how the city/county/state is managing efforts. Poor communication can be detrimental on public trust of organizations/policy groups.

Rural: “consists of all territory, population, and housing units located outside of UAs (urbanized area) and UCs (urban cluster). The rural component contains both place and non-place territory.” (U.S. Census Bureau, 2011).

Sensible Heat Flux: “the convective transport of energy that can be felt as heat, usually from the surface upward” (Rohli & Vega, 2008, p. 432).

Sun Stroke: “another term for heat stroke” (FEMA, 2005).

Urban: “all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). The Census Bureau delineates UA and UC boundaries to encompass densely settled territory, which consists of: core census block groups or blocks that have a population density of at least 500 people per square mile [and] surrounding

census blocks that have an overall density of at least 500 people per square mile.” (U.S. Census Bureau, 2011).

Urban Heat Island: “an isolated zone of relatively high temperatures in built-up areas; caused by the lack of vegetation, decreased evaporative cooling, waste heat from domestic and industrial processes, and thermal properties of construction materials” (Rohli & Vega, 2008, p. 433).

Vulnerability: “determined by the level of exposure to a risk factor, sensitivity to that risk, and capacity to adapt to the risk factor” (Patz, Gibbs, Foley, Rogers, & Elm , 2007, p. 399).

Acronym Definitions

ARC	American Red Cross
ASTHO	Association of State and Territorial Health Officials
CDC	Centers for Disease Control and Prevention
EMA	Emergency Management Agency
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
HHWS	Heat Health Watch
HIA	Health Impact Assessment
HIPAA	Health Insurance Portability and Accountability Act
IPCC	Intergovernmental Panel on Climate Change
NACCHO	National Association of County and City Health Officials
NCEH	National Center for Environmental Health
NWS	National Weather Service
PODS	Point of Dispensing Units
PWWS	Philadelphia Hot Weather – Health Watch / Warning System
PPHR	Project Public Health Ready
SEM	Social Ecological Model

Summary

Heat waves have historically impacted the Midwest and, due to the variable pattern of these events, are full of uncertainties. With impending issues such as climate change intensifying the threat of heat waves, it is important for local health departments and public health officials to practice mitigation and adaptation methods into their preparedness plans. The question remains, how do we prioritize heat wave preparedness within an infrastructure negotiating competing priorities? Topics within Chapter One focused on building the framework for study significance, discussing the incorporated methodology, and dissemination of the study results. In Chapter Two, I will construct the scholarly framework for this study by examining climate change and public health impacts, how policy shapes program planning with regard to heat waves, the sociological implications of heat waves including communicative properties and community organizing, and heat wave preparedness plan evaluation. Chapter Three focuses on the methodology and research questions guiding this project. In Chapters Four and Five, I develop the uniqueness of each case and then build a broader story by examining the themes across the cases. Chapter Six discusses the findings from this study by incorporating literature and threading in the social ecological model. Finally, Chapter Seven revisits the study significance and implications for best possible practices in health and public health education.

CHAPTER TWO

REVIEW OF LITERATURE

Framework for Heat Waves and Climate Change

Although not pictorially devastating as other natural disasters such as hurricanes, tornadoes, or earthquakes, heat waves pose an immense amount of risks and have higher mortality rates than all of these disasters combined (Klinenberg, 2002). Every year, heat waves are estimated to cause hundreds of deaths across the nation (National Center for Weather Statistics, 1997; Weisskopf et al., 2002; Bernard & McGeehin, 2004; CDC, 2009a), with some estimations as high as approximately 680 to 700 deaths annually (Sanchez, Thomas, Malilay, & Annest, 2010; CDC, 2009a). This number is expected to increase in an uncertain future due to the anthropogenic influences on climate change (Lynas, 2008). Currently, there is a substantial amount of literature that focuses on human physiology and heat waves, the lack of awareness about and preparedness for heat waves, and guidelines for heat wave adaptation. Articles that focus on these topics are essential to explain how the body is impacted by heat waves and how age plays a key role in making individuals more vulnerable to such events (Argaud et al., 2007; Kovats & Hajat, 2007; Basu, 2009; Leon & Helwig, 2010).

A lack of heat wave preparedness and climate change awareness among health officials and municipalities has been documented in studies (Bernard & McGeehin, 2004; O'Malley, 2007; Luber & McGeehin, 2008; Maibach et al., 2008; Bedsworth, 2009). Understanding that there are weaknesses in health service infrastructure is the first step in identifying the holes in preparedness. Finally, several studies have developed guidelines and planning strategies for cities to implement to combat heat issues as well as climate

change (Greenough et al., 2001, Kalkstein, 2000; Bernard & McGeehin, 2004; Ebi & Schmier, 2005; U.S. EPA, 2006; Schwartz et al., 2006; Ebi, 2007; Jackson & Shields, 2008; Luber & McGeehin, 2008; Yardly et al., 2010; Bassil & Cole, 2010).

Although it is important for cities to take these preparedness initiatives, heat waves and climate change remain two of many competing public health priorities. This is the crux of why this study is so important. There are federal guidelines for heat wave preparedness, encouragement from state programs, and several funding opportunities, but existing tensions of prioritization, power, and politics may impede the filtration of such topics from the national level to the local level of health. My literature interests focus on heat wave definitions, climate change and public health impacts, political shaping of heat wave program planning, the sociological implications of heat waves including amount, ease, and type of communication, and heat wave preparedness plan comparison. How is the definition of a heat wave constructed and used for management? How does climate change impact public health? How does policy change influence preparedness plans? How do interactions among state and local health departments enhance their awareness of health threats? This literature review will funnel the issues that are broader, including climate change and policy to a narrower focus that investigates the social contexts of defining and preparing for a heat wave. In ending this review of literature, I will thread this information together using my chosen theoretical framework, the social ecological model.

Comparison of Heat Wave Definitions

Heat waves can impact all individuals and cause mortality especially among vulnerable groups. Historically, heat waves have caused an immense amount of devastation, and yet the definition of this occurrence is still published inconsistently. Due

to complex meteorological characteristics, past historical events, and sociological implications, standardizing the definition of a heat wave is a challenge (Table 1).

Historically, warnings for heat waves have been the responsibility of the National Weather Service, with increasing usage of heat wave and health warning systems (HHWS). A HHWS is structured to advise a population with meteorological information as well as effective measures to reduce any health impacts (Ebi & Schmier, 2005; Ebi, 2007). Prior to the existence of a HHWS, warning systems were based on temperature and relative humidity (Kalkstein, Jamason, Greene, Libby, & Robinson, 1996). According to Kalkstein et al. (1996), warning systems that are primarily based on the heat index are insufficient for several reasons. Deficits in a NWS type of system include the following:

1. People only respond to meteorological variables of temperature and relative humidity.
2. Lack of account for consecutive days of high heat as well as heat waves that happen earlier in the summer.
3. Lack of an empirical basis for estimating mortality.
4. Locality (in terms of which state/city) of a heat wave impacts the adaptive properties of individuals as those in warmer climates may be more acclimated to heat (Kalkstein & Valimont, 1986; Kalkstein et al., 1996).

In order to create a more comprehensive warning system, Kalkstein et al. (1996) developed the first HHWS in Philadelphia (called the Philadelphia Hot Weather-Health Watch/Warning System PWWS²). The PWWS includes identifying oppressive air masses which is an indicator of mortality (Kalkstein et al., 1996). While the NWS does not have

² The PWWS will be explained in more detail in this chapter under section, "Current Heat Wave Response Plans."

Table 1

Comparison of Heat Wave Definitions

Author/Organization and Year	Heat Wave Definition	Key Themes
Robinson (2001); Souch & Grimmond (2004)	An extended period of unusually high atmosphere-related heat stress, which causes temporary modifications in lifestyle and which may have adverse health consequences for the affected population.	Temperature, Health
FEMA (2005)	Prolonged period of excessive heat, often combined with excessive humidity.	Temperature, Humidity, Duration
EPA (2006)	Extreme heat events (EHE) are defined by summertime weather that is substantially hotter and/or more humid than average for a location at that time of year.	Temperature, Humidity
CDC (2009)	Heat waves, or extreme heat events, are characterized by several days of temperatures great than 90°F, stagnant air masses, and consecutive nights with higher-than-usual minimum temperatures.	Maximum and Minimum Temperature, Duration, Air Mass
NWS (2009)	A period of abnormally and uncomfortably hot and unusually humid weather. Typically a heat wave lasts two or more days.	Temperature, Humidity, Duration
Graber (2011)	Period of very hot and humid weather that can make people sick and even lead to death.	Temperature, Humidity, Health
IPCC (2012)	A period of abnormally hot weather.	Temperature
American Red Cross	Prolonged period of excessive heat,	Temperature,

(2013)	generally 10 degrees or more above average, often combined with excessive humidity	Humidity
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sole responsibility of initiating a HHWS, collaborative efforts from multiple levels including government and community interplay to spread awareness. By focusing on the operational purposes and public health, multiple definitions may be needed to gain perspective on this weather event. An operational definition includes all organizations that would be involved in a natural hazards plan including first responders, local health, the National Weather Service, emergency management, social services, and school districts. While a heat wave definition and warning initiation may be different per region, each municipality and partnering organization should have current working knowledge of definitions and strategies to ensure accuracy, timing, and coordination (Ebi & Schmier, 2005; Ebi, 2007).

From a public health perspective, it is important to note the needs of communities with attention to vulnerable populations. Depending on the area, excessive heat can also exacerbate air pollution levels which can directly affect the air quality leading to an increase in asthma conditions (Ebi, 2007). Messaging for a heat wave can be both seasonal as well as updating to inform of impending weather events. Seasonal health messaging for heat stress can incorporate special messages for parents keeping them abreast of the risks of heat for their children playing outside or those involved in sports activities. Seasonal messages are also important for outdoor workers and any other group/person identified as a potential vulnerability for heat stress. Applying a multiple perspective approach in defining a heat wave has been researched and documented by climatologists (Robinson, 2001; Souch & Grimmond, 2004). According to Robinson (2001), there are three barriers

to the production of a heat wave description including the lack of rigor in a definition, absence of a meteorological measure for the complex relationships of human physiology and environment, and finally, lack of a homogeneous time series for weather events. An abnormally hot temperature in Michigan may be a baseline temperature for Florida; therefore, creating a standardized definition is difficult due to variations in geographical climate characteristics (Ebi, 2007).

Climate Change and Preparedness

According to the U.S. Global Change Research Program / Climate Change Science Program (2009, p. 12) climate is defined as the “long term pattern of temperature and precipitation averages and extremes at a location”, with location referring to local, regional, or global areas. Although Earth’s temperature has been relatively constant for the last 100,000 years, average temperatures in the last 50 years have increased (U.S. Global Change Research Program / Climate Change Science Program, 2009). While both natural and anthropogenic forcings influence the Earth’s climate, the enhanced greenhouse effect is strongly manipulating climatic conditions (McMichael et al., 2006). The greenhouse effect is a phenomenon in which the atmosphere is warmed by greenhouse gases (carbon dioxide, water vapor, and methane) that absorb and emit long wave (terrestrial) radiation. Absorption is possible, because Earth emits energy at a wavelength of $10\mu\text{m}$, which is in the infrared radiation spectrum. Atmospheric gases absorb in the spectrum of 1.5 to $100\mu\text{m}$, which falls within long wave (infrared) radiation. Greenhouses gases thus warm the atmosphere. The enhanced greenhouse effect is different, because in this situation, there is an *excess* of greenhouse gases that have been emitted due to anthropogenic influences (fossil fuel usage, agriculture, livestock, energy, etc.). Constant emissions of greenhouse

gases emitted to the atmosphere ultimately cause an increase in global warming from the excess absorption of terrestrial (long wave) radiation. A working knowledge of the enhanced greenhouse effect is essential to understand the larger forces impacting climate change. Climate literacy is established when an individual can:

1. Understand the essential principles of Earth's climate system,
2. Know how to assess scientifically credible information about climate,
3. Communicate about climate and climate change in a meaningful way, and
4. Make informed and responsible decisions with regard to actions that may affect climate (U.S. Global Change Research Program / Climate Change Science Program, 2009, p. 3).

A working knowledge of the enhanced greenhouse effect builds an understanding of the broader forces impacting climate change. Previous studies have identified three out of four adults in the U.S. cannot pass a science literacy exam (Miller, 2007; Hobson, 2008; McCaffrey & Rosenau, 2012). Science illiteracy correlates to a misunderstanding of climate-related science, ultimately causing confusion and lack of ability to have educated conversations about climate change (McCaffrey & Rosenau, 2012). If possessing a minute form of climate literacy is not deemed valuable by public health officials, efforts for mitigation will be futile.

In 2006, McMichael et al. discussed the present and future risks to human health caused by climate change. In discussing the variability in climate modeling, the authors quoted the Intergovernmental Panel on Climate Change by stating that "estimates of climate changes over coming decades are indicative rather than predictive." When the

majority of scientists publishing peer-reviewed articles discussing climate change indicate that overwhelming influence(s) are due to anthropogenic disturbances, we can collectively infer that future planning to reduce morbidity and mortality is imperative (U.S. Global Change Research Program / Climate Change Science Program, 2009). Climate change can cause and exacerbate health conditions, including heat shock and stress (Kalkstein & Greene, 1997; McGeehin & Mirabelli, 2001; Poumadere et al., 2005; Kovats & Hajat, 2008; Hess et al., 2009), pulmonary ailments including chronic obstructive pulmonary disease (COPD) and asthma (Kalkstein & Greene, 1997; Poumadere et al., 2005; Kovats & Hajat, 2008; Beggs, 2004; Hess et al., 2009), increases in vector-borne disease including Lyme disease and malaria (Epstein, 2001; Hunter, 2003; Ogden et al., 2006; Patz & Olson, 2006; Ebi et al., 2006; Hurtado-Diaz, Riojas-Rodriguez, Rothenberg, Gomez-Dantes, & Cifuentes, 2007; Gage, Burkot, Eisen, & Hayes, 2008; Hess et al., 2009), and unintentional injuries and mortality from natural disasters (Greenough et al., 2001; Mitchell, Lowe, Wood, & Vellinga, 2006; Hess et al., 2009).

How severe are the consequences of an accelerated change in climate? In the 20th century, the global temperature increased by 1.08°F, and scientists expect this to continue into throughout 21st century (U.S. Global Change Research Program / Climate Change Science Program, 2009). Although this does not sound like a significant threat, unanticipated increases in temperature can cause a rise in sea level, stronger heat waves, as well as the potential for droughts and floods in certain areas of the world (U.S. Global Change Research Program / Climate Change Science Program, 2009). A rise of the global temperature by a mere 6°F can have massive implications for anthropogenic environments, surrounding ecology, and the world. The buffering capacity of a community, state, country

is an issue that has immense implications on equality and equity; usually with health disparities left to suffer.

To expound on the potential scenario, in 2008, 3.3 billion people were living in an urban area and by 2030, about 5 billion people are projected to become urban residents (United Nations Population Fund, 2007). This has consequences on our current adaptation plans, already strained community resources, and ecosystem services. Although heat waves can affect multiple areas, they are particularly dangerous in urban communities. The physical environment of an urban microclimate exacerbates temperatures during heat waves due components to such as buildings, blacktop, less vegetation, and human body-mass. In these environments, temperatures are warmer because the sensible heat flux warms the surrounding area due to less available water for evaporation. In urban areas, water does not normally pool after rain events; instead, water is collected via storm run-off collection systems. This causes the sensible heat flux to warm the surroundings (pavement etc.) instead of having the evaporation of water. Temperatures then increase from the surrounding amplification of warming of pavement, blacktop, and other anthropogenic structures. In rural environments, these areas usually have higher moisture contents allowing the latent heat flux to evaporate more water that is less able to escape to water draining systems resulting in cooler temperatures.

Although the 1995 heat wave impacted many states and cities including Missouri (St. Louis) and Wisconsin (Milwaukee), more fatalities occurred in Chicago than other localities due to many variables, including poor communication from city and public health officials and lack of knowledge about the severity of the situation. In Chicago from 1961-1990, there were an annual average of 16 days of overwhelming heat events (Hayhoe et al.,

2010). Models have indicated that oppressive heat waves might be on a scale of 30 days annually or even as high as 50 days by 2050 for Chicago (this based on low and high greenhouse gas emissions) (Hayhoe et al., 2010). With a small percentage of the world population living in a developed nation, we feel very few burdens of climate change. The planet is warming; however, it is not equal nor is it equitable per region. Patz et al. (2007) displayed the incredible imbalance of global warming impacts in different countries (Figure 1) across the world.

Depending on the region, climate shifts can cause agricultural deserts, increases in the prevalence of vector-borne diseases (i.e. Dengue fever, Malaria), and devastating extreme weather events. Why do we not see a lot of these events in the United States or other developed nations? Humans, by nature, are highly adaptable and can temporarily buffer against the effects of climate change (McMichael et al., 2006). In the United States, we have public health services, outreach efforts, tolerable and hygienic living conditions, and most importantly, financial stability. Although adaptation may elude to the idea that developed nations are not at risk for health impacts from climate change, these nations have experienced intense droughts causing billions of dollars in crop damage, outbreaks of vector-borne disease, heat waves, and issues with fresh water availability. Ultimately, while developing nations are more at risk for negative consequences from climate change, the world collectively faces one of the greatest threats to public health (Benjamin, 2008).

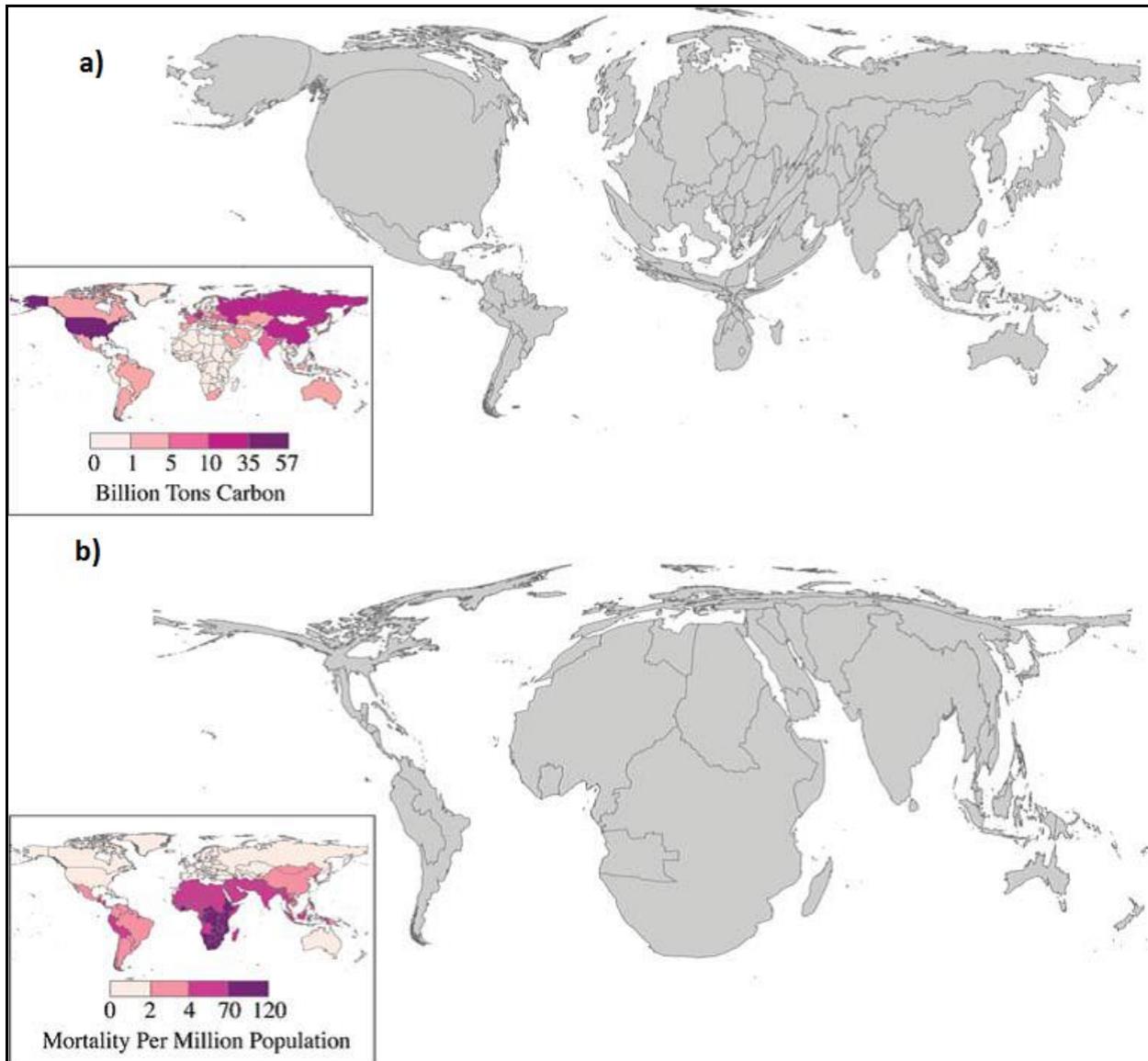


Figure 1. Equal and equitable? a. Comparison of carbon emissions by country and b) Estimation of public health impacts from carbon emissions and climate change (Bottom). (Figure printed with permission from Patz et al., 2007).

The United States is one of the leading nations accountable for the most greenhouse gas emissions. In 2010, U.S. emissions were 6.8 million metric tons of carbon dioxide, which was an increase of 10.5% since 1990 (U.S. EPA, 2012). Although the United States has been responsible for a majority of the greenhouse gas emissions, a staggering “99% of

the disease burden from climate change has been occurring in developing countries” (Patz et al., 2007).

Fortunately, there are many co-benefits of creating sustainable living conditions which would lower greenhouse gas emissions, and ultimately reduce morbidity and mortality for all individuals living in developed or developing nations. Although the representation is anecdotal, Patz, Campbell-Lendrum, Gibbs, and Woodruff (2008) depicted several examples of health benefits of climate change mitigation (Table 2). Benefits can include reducing the reliance on fossil-fueled vehicles for transportation. In the United States, a sedentary lifestyle is one of the ten leading causes of death (Patz et al., 2007); encouraging other modes of travel would benefit multiple individuals. Reducing the cap for carbon emissions by limiting the amount that could be released to the atmosphere would also lower air pollution deaths, which equate to approximately 2.4 million every year (WHO, 2002; Ezzati, Lopez, Rodgers, & Murray, 2004; Patz et al., 2007).

Climate change enhances the likelihood of heat wave occurrences. Every year, hundreds of deaths are either explicitly linked to heat or due to a heat-related complication of diseases/chronic ailments (i.e. cardiovascular disease, asthma) (CDC, 1995; Luber & McGeehin, 2008; Hess et al., 2009). Between the 1940’s and 1995 the eastern and western portions of the United States experienced a 20% increase in heat waves (Gaffen & Ross, 1998; Luber & McGeehin, 2008). From 2070 to 2099, climate models projected that cities will experience a 25% increase in heat waves (Chicago) or 44-95% increase (Los Angeles) (Meehl & Tebaldi, 2004; Hayhoe et al., 2004; Luber & McGeehin, 2008).

Table 2

Health Benefits from the Reduction of Greenhouse Gases¹

	Reduced fossil fuel usage	Preserving forests and CO2 sinks	Urban heat-island reduction	Sustainable urban design	Improved mass transportation systems
Cerebrovascular disease	**		***	***	**
Respiratory Disease	***	*	**	***	**
Obesity, Diabetes, and Cancer(s)				***	**
Mental Health		**		***	**
Infectious Disease		***		*	

¹ Printed from Patz et al., 2008; * some evidence, ** good evidence, *** very good evidence

With the current rates of greenhouse gas emissions and rising temperatures, general circulation models estimate that mortality across the U.S. from heat waves will increase from 1,840 deaths to up to 4,100 in a summer season (Kalkstein & Greene, 1997; Luber & McGeehin, 2008).

Only within the last five years have studies focused on the knowledge and awareness of health officials regarding climate change. In a study by Bedsworth (2009), local public health officials were surveyed in California to ascertain their concerns regarding climate change mitigation and adaptation efforts of the facilities in which they work. Although high numbers of public health officials were aware of the threats of climate change, very few of their facilities or communities were prepared to handle such threats including air pollution and wildfires (Bedsworth, 2009). In a similar study by Maibach et al. (2008), 217 local public health officials were contacted across the United States via

telephone interviews to discuss their preparedness for climate change. Predictably, very few health departments included mitigation programs that focused on reduction of fossil fuels (6%), promoted sustainable efforts (i.e. purchasing local foods) (33.8%), offered public education regarding climate change (8.3%), and/or encouraged the reduction of greenhouse gas emissions (5.3%) (Maibach et al., 2008). These two studies are important to document the lack of preparedness for climate change among local municipalities and plan future programs that are meeting these research recommendations.

Policy and Heat Waves

During the 1970's, there were many changes to the structure of governmental health and safety services provided to urban and rural areas in order to decrease the socioeconomic disparities among locations (Mitchell-Weaver, Miller, & Deal, 2000; Koh, Elqura, Judge, & Stoto, 2008). Many services, including waste water treatment, police, fire, and education, became regionalized. Benefits of regionalizing public health services have been discussed in research studies spanning the last decade (Bravata et al., 2004; Katz, Staiti, & McKenzie, 2006; Salinsky, 2006; Koh et al, 2008). The predicament of managing the outreach for victims of Hurricane Katrina exemplifies the consequences of jurisdictional fragmentation among levels of government (Salinsky, 2006; Koh et al., 2008). Too many jurisdictional boundaries and not enough cooperation (regionalization) among local, state, and federal agencies was a problem during this time. Hurricane Katrina can be equated to the issue of heat waves, because like hurricanes, heat waves are examples of extreme weather and are a case for emergency preparedness that crosses jurisdictional boundaries of local governments. Unlike hurricanes however, heat waves do not leave paths of memorable destruction, where collaborative efforts (if any) might be more

obvious to plan. For heat waves, negotiation and communication among all levels of government are essential for smooth and swift outreach efforts.

Depending on the state and local health department, heat wave planning usually falls under emergency preparedness. Responsibilities for emergency preparedness vary depending on the level of government, with local parties at the first line of response (McLoughlin, 1985). Usually, local governments are micromanaged and only rely on state and federal help with emergencies when severe damage has been caused (McLoughlin, 1985). The state can be responsible for constituent guidance, communication, and often help channel federal support to local health departments (McLoughlin, 1985). Preparing for emergencies in communities should include ten guidelines (Table 3), all of which should be flexible and ready for change (Perry & Lindell, 2003). Emergency planning and management are different in functionality with planning being part of preparedness and “requiring [the] identification of hazards to which the community is vulnerable, the nature of the impacts, and the geographical areas at risk” whereas management involves “meeting the emergency demands by implementing the assessment, corrective, protective and coordinating actions identified by the planning stage” (Perry & Lindell, 2003, p. 347).

Table 3

Framing the Emergency Response Plan¹

Guidelines for Emergency Planning
1. Reflect accurate knowledge of the threat
2. Encourage appropriate actions by managers
3. Be flexible to threats
4. Include inter-organizational coordination
5. Be comprehensive for multi-hazard management
6. Include training components
7. Provide piloting and testing of response operations

8. Should be a continuing process
9. Conducted during conflict and resistance
10. Emphasize the difference between emergency planning and management

¹Cited from Perry & Lindell, 2003

The National Association of County and City Health Officials (NACCHO) developed a program entitled *Project Public Health Ready* (PPHR) in which they describe various strategies that health departments should employ to be prepared (Koh et al., 2008). These include networking among constituents and organizations, coordination of departments, standardizing to enhance the uniformity of services, and finally the centralization of resources (NACCHO, 2007; Koh et al., 2008). Although this is a general document for preparedness, four aspects are applicable to heat wave preparedness. An example of using the PPHR program for state and local health departments with heat waves could be as follows:

1. Networking: Share resources available, weather information, locate cooling centers, discuss transportation, vulnerability mapping, etc.
2. Coordinating: Travel to cooling centers, outreach to media and constituents, press conferences, phone line support, etc.
3. Standardizing: Establish trainings, adoption of particular outreach methods.
4. Centralizing: Establishing individuals in charge, resources, shelters.

Bell (2011) suggested that health services be enhanced by developing frameworks to prepare health departments for climate change. Focusing on a whole-systems approach, multiple areas including governance and culture, service delivery, workforce development, material infrastructure, and finance, allow health departments, regardless of location, to prepare for multiple events and health threats. Collaboration among multiple agencies is

essential to ensure that preparedness plans are smoothly executed to decrease morbidity or mortality.

In public health government, there exists a level of organization of professional and working relations among local and state institutions (Miller et al., 1977; DeFriese et al., 1981). In a pilot study focusing on heat wave preparedness of local county health departments, I learned that there are health priorities that govern how programs are initiated and funded. Partially dependent on federal and/or state mandates and constituent need, many local health departments have to locate funds themselves in order to serve their communities. Importantly, the microsystem of the public health infrastructure governs the performance of the department (Lawrence & Lorsch, 1969; DeFriese et al., 1981). The relationship between state and local health departments indicates that the state has an immense amount of control over local municipalities, especially towards certain programs or concerns (DeFriese et al., 1981). This notion was discussed by one of my pilot study participants, in which he discussed how the state may provide grants and funding, but the local health department is actually doing most of the work and interaction with the community. This similar finding was also discussed with several participants in this study as well.

Several studies have described generic guidelines for the public health sector to respond to heat waves. Historically, these systems include multiple levels or tiers from one to three danger levels (Koppe et al., 2004). Usually, extreme weather plans in the United States include 2-3 tiered components of 'watches' or 'warnings' to demonstrate the severity of the incoming event (Koppe et al., 2004). From here, passive responses include the utilization of external factors (mass media) to disseminate heat warning risks (Koppe et al.,

2004). Although this is still commonly used to spread awareness, active outreach plans are encouraged by multiple federal experts (i.e. U.S. EPA, CDC, NIH, NOAA). Active plans include the usage of neighbor checks, heat awareness phone-lines, home visits, periodical cease of utility (i.e. water, electricity) suspension, and the community mapping of vulnerable populations (Koppe et al., 2004). Although general guidelines exist, communities need to develop preparedness plans that suit their specific needs (Koppe et al., 2004), as each will be different in structure and culture.

Regarding the policies of weather and climate extremes, as far back as the 1800's, the government has expanded research and funding for one of the most destructive natural disasters: flooding (Kunkel, Pielke, & Changnon, 1999; Changnon & Easterling, 2000). Since then, the government has spent billions of dollars in the payout of natural disasters, as well as the adaptive efforts of building of levees and reservoirs (Changnon & Easterling, 2000). What is interesting is that many policies are in place to positively reinforce the public to build places of residence outside of floodplains or purchase the proper insurance if they reside in areas prone to disaster (Wright, 1996; Changnon & Easterling, 2000). Although federal policies have been in place for some natural disasters, we still have yet to achieve set policies for heat waves and/or climate change mitigation.

Sociological implications of Heat Waves

The socio-cultural aspects of heat wave preparedness are incredibly diverse, and can include socioeconomic status, social networking within a particular county/city/town, ethnicity, and community characteristics (Yardley et al., 2011).

Socioeconomic Status

Regarding socioeconomic status, heat wave mortality disproportionately affects individuals who are living in impoverished conditions, as well as vulnerable populations including the elderly, those with mental and physical conditions, and children (Ebi, 2007). Income disparities can also affect awareness of heat wave warning systems. In their study of the Phoenix Metropolitan Area, Kalkstein and Sheridan (2007) found that 35% of individuals who make less than \$20,000 were unaware of such warning systems, as compared to less than 10% of individuals who make \$60-80,000 (Kalkstein & Sheridan, 2007). Although federal agencies including the National Weather Service are working to disseminate information to all groups of people, minority groups are more likely to make less than \$20,000 (Kalkstein & Sheridan, 2007). Therefore, the NWS needs to implement extra care and caution to groups that may not receive such information (Kalkstein & Sheridan, 2007).

Warning systems are incredibly variable depending on the city/county/state issuing the warning. They can include safety tips for remaining healthy during a heat wave, meteorological information including heat wave duration, and where to go and/or who to call for help. Several studies have demonstrated that minority populations have intensified risks of heat wave morbidity and mortality as compared with other populations (Henschel, Burton, Margolies, & Elm, 1969; Schuman, 1972; Ellis, 1972; Jones et al., 1982; Greenberg, Bromberg, Reed, Gustafson, & Beauchamp, 1983; Schwartz, 2005; Kalkstein & Sheridan, 2007; Yardley et al., 2011). In the 1966 St. Louis heat wave, 25 per 100,000 white individuals experienced heat deaths whereas 32 per 100,000 black individuals experienced mortality (Henschel et al., 1969; Yardley et al., 2011). It is important to note however, that

socioeconomic status is a more reliable predictor for heat wave mortality as opposed to ethnicity (Jones et al., 1982; O'Neill, Zanobetti, & Schwartz, 2003; Yardley et al., 2011). The usage of air conditioning is a protective factor that is used among individuals of a higher socioeconomic status (Semenza et al., 1996; Naughton et al., 2002; Yardley et al., 2011). This is one of the most effective mitigation techniques for heat waves.

Gender and Age

Gender and age also play important roles in the awareness of heat wave warning systems. Kalkstein and Sheridan (2007) assessed responses to heat wave warning systems and found that 90.2% of females were aware of the existence of warning systems while 75.3% of males were aware. In other epidemiological studies of heat waves, males were more likely to be victims of heat as well as more likely to be living alone. Age also plays a key role in determining heat wave advisory awareness, as well as vulnerability to heat stress. The aging population is more susceptible to heat stress because of the physiological condition of the body's homeostasis mechanisms ultimately causing mixed messages for temperature regulation (Thomas & Soliman, 2002; Koppe et al., 2004; Flynn, McGreevy, & Mulkerrin, 2005; Grundy, 2006; Ebi, 2007; Kovats & Hajat, 2008).

The elderly are also faced with higher probabilities of having disabilities, chronic illnesses, reduced mobility, and medication dependency (Ebi, 2007), which can worsen heat stress conditions. In a heat event, an increase in temperature can put a strain on the cardiovascular system causing complications for individuals who already may have chronic conditions of the heart (Kovats & Hajat, 2008). Many medications also interfere with the body's physiological responses and can decrease the likelihood for sweating (anticholinergics) or even cause dehydration (diuretics) (Ellis, 1976; Kilborne, Choi, Jones,

& Thacker, 1982; Dixit, Bushara, & Brooks, 1997; Kovats & Hajat, 2008). Although not one single group or population exists that is entirely acclimatized to extreme heat, many epidemiological studies (Smoyer, 1998; Cadot, Rodwin, & Spira, 2007; van Iersel & Bi, 2009) have demonstrated that the aging population has a much greater risk for mortality and morbidity by heat (Ebi, 2007), especially those over 50 years of age (Kovats & Hajat, 2008).

Isolation

In his book *Heat Wave: A Social Autopsy of Disaster in Chicago*, Klinenberg (2002) discussed several cases in which individuals who were living alone or were socially isolated perished in the stifling heat during the 1995 Chicago heat wave. In a study by Bouchama et al. (2007), it was found that a significant risk factor for heat wave deaths was not making daily trips from the home. This has also been confirmed in several other studies (Semenza et al., 1996; Klinenberg, 2002; Naughton et al., 2002). In contrast, having a pet, air conditioning in the home, being involved in social activities, and being socially competent were identified as protective factors (Semenza et al., 1996; Naughton et al., 2002; Yardley et al., 2011). Social isolation is also a reason for the lack of awareness of the intensity of heat wave events because individuals are less likely to associate with friends/family/neighbors who may discuss the current weather event (Klinenberg, 2002; Yardley et al., 2011). Socially isolated citizens live hidden in the cracks of the community, and do not participate in events, socialize, or have other associations within their neighborhood. Although living alone and social isolation are not the same thing, there is an increased number of individuals who are living alone and socially isolated (Yardley et al., 2011). The exacerbation and constant portrayal of crime and violence displayed in the

media may also play a role within the risk factors for heat wave mortality. News reports about crime levels in neighborhoods causes individuals to stay isolated in their homes, as well as not opening their windows because they are afraid of becoming a crime statistic (Klinenberg, 2002; Yardley et al., 2011).

Community Structure

According to Eng and Blanchard (1991), a community is defined as “people living in close proximity to one another who have formed relationships through several overlapping and interacting social networks and through a shared sense of a local common good” (p. 95). Community closeness and neighborhood infrastructure are crucial for physical, mental, and emotional health of the residents. In close examination of the environment that communities offer, characteristics including density, population turnover, socioeconomic status, the relationships of neighbors, as well as vegetation and physical structure (Yardley et al., 2011) all play important roles regarding heat wave outreach and awareness. Concerning outreach plans specifically, communication is an essential component of plans and for warnings of an event because it allows for trust, the exchange of ideas, and the spread of awareness within communities (Smoyer-Tomic & Rainham, 2001). Having strong outreach plans at the community level has been extremely effective in reducing heat wave mortality (Sanchez et al., 2010). Within community organization, grassroots organizations, including coalitions, are integral components of outreach and awareness methods with key community leaders initiating the cause (Kaye, 2001). Coalitions can be essential players in the establishment of identifying the issues of the community, defining objectives and goals, and locating the resources available (Kaye, 2001). Until now, coalitions have not been previously discussed in literature for heat wave

outreach plans. Creating heat wave coalitions would be a cost-effective way to enhance the awareness of heat waves while initiating programs to carry out heat wave warnings.

Although risk communication is not a focal point for neighborhood discussions, it is an essential communicative front for the exchange of pertinent health information. From natural disasters to terrorism, risk communication with the general public is essential. The public's level of awareness is built on several key factors including memories of past events, trustworthiness of individuals proposing the risk, responsiveness of their government, and the characteristics of natural (heat waves, tornadoes, hurricanes) vs. manmade hazards (terrorism, nuclear disasters) (Maxwell, 2003). According to Covello and Allen (1988), the general public places a much greater value on the risk characteristics of credibility and reliability of the information source as opposed to the perceived competence of the source when evaluating a threatening event (Maxwell, 2003). Guidelines have been developed by multiple sources for discussing emergency events with the public and include building trust with the community before an event occurs, disclosing the events in an honest manner, and modeling behavior of safe practices (Chartier & Gabler, 2001; Mullin, 2002; Maxwell, 2003). These guidelines, however, are not standardized to be incorporated by different public health institutions.

Current Heat Wave Preparedness Plans

A heat wave warning system is defined as "a system that uses meteorological forecasts to initiate public health interventions designed to reduce heat-related impacts on human health during atypically hot weather (Kovats & Ebi, 2006; O'Neill et al., 2009). Two years prior to the 1995 heat wave, in 1993, the Philadelphia, PA coroner listed the cause of death for over 100 people as dying from heat-related causes (Ebi, Teisberg, Kalkstein,

Robinson, & Weiher, 2004). In order to adapt to future heat waves, in 1995 a heat warning system was enacted by the city called, *Philadelphia Hot Weather – Health Watch / Warning System* (PWWS) (Kalkstein et al., 1996; Mirchandani, McDonald, Hood, & Fonseca, 1996; Sheridan & Kalkstein, 1998; Ebi, et al., 2004). The PWWS is a model that predicts heat wave air masses for current and subsequent days using maritime tropical or dry tropical air mass types (Kalkstein et al., 1996; Ebi et al., 2004). Before this plan was established, heat wave warnings were announced by the National Weather Service which was mandated by the government to send out heat warnings (Ebi et al., 2004).

Since the development of this system, the NWS has incorporated the PWWS into the communication and decision making process of heat wave warnings and advisories. Although this model successfully predicted nine of the 15 days of oppressive heat in the 1995 heat wave, few measures were actually taken to reduce morbidity and mortality in this event (Ebi et al., 2004). Along with the predictive model of the actual duration of the heat wave event by the PWWS, a chain reaction of outreach is initiated by the city and agencies in Philadelphia during an actual heat event. This includes mass media campaigns, buddy checks of elderly constituents, phone lines for counsel, suspension of utilities including electricity and water, and outreach for vulnerable groups including the homeless (Ebi et al., 2004). Some individuals cannot afford to pay their utilities; it is pertinent to ensure that these individuals have a suspension on service removal during a heat event. It has been estimated that the PWWS saved approximately 117 individuals over a three year time span, or 2.6 lives per day during the summer months (Ebi et al., 2004). Due to the successes of this model, it has been foundational for the establishment of approximately 20

heat warning systems throughout the world (Sheridan & Kalkstein, 1998; Kalkstein, 2003; Ebi et al., 2004).

Although warning systems include useful methods for cities/counties to adopt, other practical measures should also be included to tailor to multiple locations. Localities will be different based on their geographic location (i.e. California wildfires); therefore, it is important to have warning systems that are developed for specific communities. O'Neill et al. (2009) described four preventive measures for cities to adopt. These include (1) reverse-911 systems, in which an automated phone call is placed to every constituent notifying them of a severe weather emergency (in this case, oppressive heat). This could also be utilized as mass texting to residents. (2) Access to air conditioning lowered morbidity by 70% in the 1995 Chicago heat wave (Semenza et al., 1996; O'Neill et al., 2009). Access to air conditioning is essential for all members of a community. According to Kilborne (2002), air conditioners reduce the ambient temperature of an environment and also decrease humidity which allows the body to perform evaporative cooling. Unfortunately, an immense amount of heat and fossil fuels are generated from these cooling devices, thus becoming a catch-22 of sustainability. O'Neill et al. (2009) suggests having centralized air conditioning locations (i.e. cooling shelters) would enhance mitigation and adaptation strategies, thereby offering co-benefits to reduce the carbon foot-print for air conditioning usage and allow residents to cool themselves. (3) The third strategy O'Neill et al. (2009) suggests is concept of reflectivity (albedo) of urban environments. As previously discussed, urban heat islands can be 1 to 5 degrees warmer than surrounding locations (O'Neill et al., 2009). Cities need to mitigate for heat by reinforcing green roofs (Rosenzweig, Gaffin, & Parshall, 2006; O'Neill et al., 2010),

increasing tree canopy (Taha, 1996; Akbari, 2002; O'Neill et al., 2009), and enhancing energy usage of buildings (Rosenzweig et al., 2006; O'Neill et al., 2009). Lastly, (4) local action of government, communities, and decision-makers is stressed as being crucial in effective risk communication of heat events (O'Neill et al., 2009). The establishment of key leaders in cities and counties regarding heat waves is dynamic for outreach and awareness for heat waves. Collaboration among multiple groups (i.e. NWS, American Red Cross, health departments, etc.) allows for communication to be more effective and precise as residents may be informed by different municipal agencies.

A multi-phase study was developed to measure current mitigation strategies and heat wave advisories for cities across the United States. O'Neill et al., (2010) surveyed 95 cities and received a low response of 13%. They revised their instrument and redistributed the survey to include 184 local governments and increased their response rate to 25%. The most common method of outreach confirmed by participating cities included distributing tips on how to stay cool in the heat (31%) followed by shelter designation (30%). Approximately 9% identified greenhouse gas mitigation as a driving factor for the establishment of adaptation programs for heat. This means that many participants in the study are not taking appropriate measures to reduce their city's carbon foot-print. This study demonstrates two important notions: (1) that quantitative measures using surveys produce such low response rates that it calls into question a study's validity; and (2) although participants in their study indicated interest in heat wave warning systems, approximately 61 out of 70 participants lacked interest for climate change mitigation.

Social Ecological Model

Ecological-based models are not new frameworks; instead, these models have evolved depending on the discipline in which they have been used (psychology, social psychology, health education, public health). Within the last twenty years, interest in applying the social ecological model (SEM) has increased dramatically (Sallis et al., 2008). The guiding principle for this model is that multiple interacting social levels influence behavior. Many diagrams have depicted such models in a circular shape with constructs (beginning at the inside of the circle) of intrapersonal (biological, psychological), interpersonal (social, cultural), organizational, community, policy, and physical environment (Sallis et al., 2008). The idea behind the framework is that by identifying interacting health determinants, programs are developed more comprehensively because each level is targeted to have a role in the intervention plan (Sallis et al., 2008). The principles behind the social ecological model include:

1. Multiple levels of factors influence health behaviors. This is a distinguishing factor from other theories in that interactions of multiple levels impacts health behaviors.
2. Influences interact across levels. Interaction is key to the success of many intervention plans; assuming the many variables work together.
3. Multi-level interventions should be most effective in changing behavior. Strategies to enhance health and behavior change are more likely to work if all levels support a given initiative.
4. Ecological models are most powerful when they are behavior specific. When used for to enhance/prevent certain behaviors the model becomes more useful.

(Sallis et al., 2008, p. 470).

The social ecological model has evolved, following the influences of culture and politics, within the social sciences. Originally, the model began as a framework to explain individual behavior (Lewin & Cartwright, 1951; Barker, 1968; Bronfenbrenner, 1979; Moos, 1980; Glass & McAtee, 2006). Concurrently, the model also was developed by researchers to enhance behavioral interventions (Skinner, 1953; Bandura, 1986; McLeroy et al., 1988; Stokols, 1992; Stokols et al., 2003; Flay & Petraitis, 1994; Cohen, Scribner, & Farley, 2000; Glanz, Sallis, Saelens, & Frank, 2005; Fisher et al., 2005). This study is following a social-ecological model of health promotion (McLeroy et al., 1988) in which intrapersonal, interpersonal, organizational, community, political factors, and the physical environment are guiding the understanding of heat wave preparedness and ultimately for the intended development of heat wave and climate literacy interventions.

The United States Department of Health and Human Services has incorporated SEM in the development of prevention programs. The CDC has also used an ecological model for violence prevention and for programs aimed at enhancing men's health. Regarding violence prevention, they used a four – level model with individual, relationship, community, and societal constructs (CDC, 2009b). In their version of the model, the individual level examined genetic and psychological characteristics that increased the chance for victims or perpetrators of violence. The relationship level identified individuals' social networks and familial patterns. The third level examined different settings in which individuals interact on a daily basis. This can include work settings, educational settings, homes, neighborhoods etc. The last health determinant used for this particular prevention framework was societal. It is here where social and cultural norms were incorporated to explain the socio-economic, socio-political, and socio-cultural policies (CDC, 2009b). For

each level discussed, specific methods to reduce the likelihood of violence were developed to comply with each particular level (health determinant).

Healthy People 2020 also incorporates the social-ecological model as the guiding theoretical framework for the nation's health objectives. *Healthy People* has been established since the late 1970's, with the aim of the framework changing drastically from focusing on the individual to a more community-based approach. O'Rourke (2006) explained this historical shift from a micro (individualistic) perspective to a more macro (community-based) perspective. Discussing the evolution of *Healthy People*, O'Rourke described in his article, *Philosophical Reflection on Health Education and Health Promotion: Shifting Sands and Ebbing Tides*, health education should instead "influence the health of entire communities and not rely on the 'one person at a time' model of improving health through individual responsibility" (p.8-9). Originally, the foundation of *Healthy People* was based on four determinants of health from the La Londe report (1974), which was a document that described the health of Canadians. The four determinants include lifestyle (60%), human biology (15%), environment (15%), and health care organization (10%), with the percentages referring to the amount of influence on individual health (La Londe, 1974). The report still serves as the guiding principle for the current health promotion strategies of the decade. The health determinants fall under five categories that are guided by the social ecological model. These include policy making (i.e. establishing laws for seat belts, tobacco regulations etc.), social factors (i.e. equality and equity of services, culture), health services (i.e. cost, access), individual behavior (i.e. diet, exercise), and genetics and biology (i.e. age, sex) (U.S. DHHS, 2011). From these categories, it is the "interrelationships

that determine individual and population health” (U.S. Department of Health and Human Services, 2011).

Heat wave preparedness plans are impacted by contextual factors including “political, social, and cultural settings in which the system operates, as well as the specifics of the event” (Glantz, 2004; Ebi & Schmier, 2005, p. 118). In order for warning systems to be enacted efficiently all key players need to invest in the event and ensure that all contextual influences are targeted (Glantz, 2004; Ebi & Schmier, 2005). One of the most influential factors of heat warning systems is the solidity of a public health and social structure of a community (Ebi & Schmier, 2005). In threading the concepts discussed in this review of literature, policy and community factors are essential components of both the ecological model and explanatory factors of heat wave preparedness. Climate change, policy change, social underpinnings of heat waves, and preparedness plans impact all levels of the model, and interventions tailored for preparedness and climate literacy need to intersect and interact with all levels to be effective.

Summary

Heat waves have been occurring for centuries, and yet we are still unprepared to handle these events. As the climate continues to warm, weather patterns may become more variable and more intense. Although the human population can acclimate to different climatic situations, being ill-prepared for a severe heat wave event is common among rural and city dwellers. To complicate this scenario further, many individuals do not identify as being vulnerable to health consequences of heat waves, and therefore, may not take the correct precautions to beat the heat. I began this review with literature that examined the notion of climate change and the connectedness to public health. Several studies discussed

the notion that health departments are aware of the knowledge that climate change is eminent on this planet, not many departments are actually applying this concept into their preparedness plans (Maibach et al., 2008; Bedsworth 2009).

The literature then shifted to explore how policy impacts agency collaboration, and ultimately the development of heat wave plans among local health departments. A brief examination of the social underpinnings of heat waves was important to discover how characteristics of social isolation, socioeconomic status, and networking capabilities in communities' impacts heat wave preparedness and awareness. I also discussed existing heat wave preparedness plans to allow for a better understanding of what is currently being implemented, and what aspects of preparedness planning need to be enhanced or modified. Finally, I threaded in components of the social ecological model to build support for and construct the foundation for the study. Chapter three will discuss the method used to guide data collection, analysis, and study trustworthiness.

CHAPTER THREE

METHODOLOGY: DEFINING THE CASE

Qualitative Design

In qualitative research, participants and researchers can engage in a social connection to further understand the phenomenon or process (Maxwell, 2005; Lassiter, 2005; Flick, 2006; Agee, 2009). Researchers “are interested in understanding how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences” (Merriam, 2009, p. 5). There are six characteristics of qualitative research, which include the following:

1. The researcher is the primary instrument;
2. The qualitative process is an inductive one;
3. Understanding participants’ perspectives is essential;
4. Inquiry is based on rich descriptions;
5. Application of theoretical lenses; and
6. Developing a picture or holistic description of the study.

(Creswell, 2007; Merriam, 2009).

This project was suited for a qualitative methodology because it allows for a more descriptive and personal account of preparedness among individuals who make important political and practical decisions at the local, state, and federal levels. Interviews permitted a dissection of the complexities that follow the decision making and communication characteristics of emergency preparedness issues. In an interview setting, a closer examination of the existing tensions, if any, provided an understanding of the real persisting issues. Although surveys are the data collection method of choice among other

researchers studying heat waves and climate change (Maibach et al, 2008; Bedsworth, 2009), it is important to gain a deeper understanding of preparedness by speaking with individuals who can attest to how decisions are made. Document analysis of pertinent official documents is also important to understand the paper trail of communication across and within state, city, and county health departments. Documents shed light on what has already been achieved in terms of preparedness, and enhance the development of meaningful interview questions.

Research Questions

According to Agee (2009), in the process of writing research questions, it is important to have the question “so what” in the back of one’s mind. She continued, “[w]hat difference will this inquiry make in the field of study in which a researcher is working? The importance of the questions to the field should help to shape the writing of research questions” (Agee, 2009, p. 442). Originally, my research questions focused on successful program plans for heat waves. However, I came to realize that it would be quite challenging to describe the characteristics that make heat wave plans *successful*. Instead, my research questions were redirected to understand how the social ecological factors of policy, sociability and community organizing, and physical environment influence preparedness plans. To paint a clearer picture of the factors that constitute preparedness, I focused on how social components of outreach play in the preparedness levels of the community and also examined the perceptions of climate change among public health officials. For this study, the research questions included the following:

1. How are health departments preparing for heat waves?
 - a. How are established guidelines for heat wave preparedness met among state, city, and county health departments?
2. How do health departments communicate with each other, specifically as communication relates to heat wave preparedness and climate change mitigation/adaptation?
 - a. How are decisions made at the local level to encourage preparedness in communities?
 - b. How are threats to public health filtered in a world of competing priorities?
3. What are the perceptions of public health officials regarding climate change?
 - a. How do public health officials perceive climate change impacting the health of their communities?
 - b. How are public health officials acting on climate change initiatives in their communities?
4. How does grant funding, specifically for climate change, increase the collective preparedness efforts of states and communities?

Pilot Study

During the months of March and April 2012, I conducted a pilot study to explore how socio-ecological factors influence heat wave preparedness of local health departments in two states. Before I recruited any participants, approval for the project was received from the Southern Illinois University Human Subjects Internal Review Board. Three health departments within Illinois and one health department in Missouri were contacted to seek interview participation. In order to obtain a better picture of how preparedness plans are established, participation was sought from multiple individuals at health departments,

including administrators/directors of the health department, environmental health directors, and emergency preparedness coordinators. All interviews were conducted with health officials from mostly rural areas. Much of the literature has focused on city officials only, ultimately missing the perspectives from rural health officials. Participants were contacted via email and /or, if an email address was not available, by telephone. Every county health department is different, some email contacts were sent directly to the director/administrator while other departments may have more specialized email settings for distinct divisions available on their webpage. Interviews were conducted at three health departments, with a total of six participants. In all instances, I traveled to the health departments to observe the city in which the department was located and visit participants in their work-settings.

Participants were given a pseudonym for the project. Interviews averaged an hour and always began with participants discussing how they became involved in their particular field. All interviews were also audio recorded. After interviews were completed, I privately discussed my experiences in a recordable device. It was here, where my subjectivities on the issues of climate change and my passion regarding heat wave preparedness really were evident. I ensured these biases were acknowledged and discussed within my journals and later within my findings. During the entirety of the pilot study, data analysis was a continuous process. After all interviews were transcribed, I explored for codes, categories, and ultimately themes to answer my research

From 13 initial categories, four key themes emerged from the data: (1) partnership establishment determined event preparedness, (2) negotiation of trust was built on

community interactions, (3) availability of credible information determined the acceptance of climate change, and (4) priorities were filtered through a hierarchical governmental structure. The pilot study shed light on the importance of writing respectfully and objectively regarding public health officials, this was not anticipated as a barrier, but did cause complications of being a potential ethical dilemma. Finally, I realized I need to fully disclose the purpose of the interview by revealing my intentions to discuss climate change as to not catch participants off guard. At the state level, many decisions are made and disseminated to their local departments for implementation. The questions that remained were how much of policy is actually implemented?; If the state sends out a warning about a heat wave, when do health departments decide to act...if they do anything at all?; What is the state's perspective on this matter?; On the climate change front, are states progressive or reactive in their understanding of this phenomenon?; and Do they assume that their local health departments are under a similar mind set? These questions, which emerged from the pilot study, ultimately became the guiding force of my dissertation research design.

Design of Methodology

A comparative case study method following an interpretive paradigm allowed for an in-depth, yet transferrable view on the current efforts of heat wave preparedness across multiple sectors: urban and rural, as well as state, city, and local. An interpretive paradigm was suitable for this project, because of its epistemological perspectives that aim to describe and understand the experience, perspective, or differentiating factors of a particular occurrence (Merriam, 2009). A comparative case study method was carefully chosen to interpret preparedness as depicted by selecting three bounded states. This study

featured document analysis, broad approaches for comparing three unique cases, and strategic sampling selection that allows, not only a rich description of a phenomenon, but also an in depth understanding of heat wave preparedness (Merriam, 2009).

According to Yin (2003), there are five components to a case study research design.

These include:

1. A study's questions
2. Its propositions, if any
3. Its unit(s) of analysis
4. The logic linking the data to the propositions
5. The criteria for interpreting the findings

(Yin, 2003, p. 21).

The research questions for this study ultimately guide the intentions. Although three research questions were constructed at beginning stages of this study, a fourth research question was added during analysis to ensure preliminary findings were being addressed. For this particular case, the propositions were nestled within the social ecological model to discern and highlight current preparedness strategies. To tailor future messages and projects, it is important to know how local health departments communicate with each other as well as with higher levels of government. Ascertaining the propositions is important because although I am asking 'how' questions, these questions are not telling me what my study should entail (Yin, 2003). Wanting to understand communicative efforts, I built evidence for this phenomenon using interviews and ensuring my questions focused on aspects of communication (Yin, 2003). In regards to the preparation for heat

waves, my propositions for this area of study weighed heavily in document analysis and interviews. By sifting through past and current documentation on advisories, warnings, and federal/state instructions for health officials regarding heat waves, interview questions were developed to highlight specifics about a particular state or case.

The cases for this study included three Midwestern states. Although each state could be evaluated as a single case study, a multi-case or comparative case study approach allowed for a more robust understanding from three unique states each at different levels of preparedness. Multi-case studies consist of single cases that have commonalities and are categorically linked (Stake, 2006; Merriam, 2009). Each state is different in how they operate politically regarding the provision of funding and mandates, how they practice and follow social norms, their structure and cultural diversity, and past historical events that affected the regions. The cases in this study were carefully selected to provide input on how preparedness is communicated, developed, and understood among public health officials. This study was also influenced by the *CDC Climate-Ready States and Cities Initiative* in which each state had either received funding, was unfunded, or did not apply. The grant status was a guiding post in the theoretical assumptions behind each states level of preparedness for climate change.

The social ecological model for health promotion was the theoretical framework ultimately shaping the research questions and study design. This model provides a multi-dimensional approach to broaden my understanding of how public health officials plan for heat waves, and the factors that influence the filtering of communication through the public health hierarchy (local, state, and federal). Finally, coding, categorizing, and thematizing data were used to look for patterns to construct meanings of how these particular states

were collectively prepared for heat waves and what, if any, adaptive efforts are utilized for climate change.

Data Collection

This study included two essential pieces of data collection including the mining of pertinent documents illuminating preparedness strategies, as well as interviewing public health officials. Before any data was collected, this study was approved by the Southern Illinois University Institutional Review Board (Appendix D).

Sample and Participant Selection

In 2009, the CDC established the *Climate Ready-States and Cities Initiative*, which was a grant-based opportunity for states and cities to apply and receive funding allowing for the adaptation of the negative health consequences of climate change. The CDC received 25 applications, and chose ten cities and states to receive funding in one of two categories: (1) Assessment and Planning to Develop Climate Change Programs and (2) Building Capacity to Implement Climate Change Programs and Adaptations (CDC, Personal Communication, 2012). Cities and states were awarded \$80,000-120,000 for category I and \$150,000-250,000 for category II to “assess threats, make plans and develop programs to meet public health challenges” for a one year period and extendable for three years based on the availability of funds (CDC, 2012a).

Three states were chosen for this current study. The first criterion was being a state in the Midwest. The remaining criteria were based on a funding category. These included: 1) a state that applied to the CDC *Climate Ready-States and Cities Initiative* and received funding, 2) a state that applied to the CDC *Climate Ready-States and Cities Initiative* and did not receive funding, and 3) a state that did not apply. The funding categories proved

important as it was an underlying assumption that funded state(s) demonstrated more outreach for climate change and heat waves as opposed to states that have not received funding. A lack of funding, however, did not imply that states did not care, or were uninformed about climate change and/or heat waves. While funding categories enhance the case comparison, broader theoretical questions threading social ecological factors ultimately guided project objectives.

Health departments were selected using three directorial principles including 1) document analysis that flagged cities/counties within multiple planning stages for heat waves and climate change, 2) maximum variation of rural and urban county locations and, 3) using a modified snowball technique of asking for recommendations or listening for identified individuals from interview participants. Since there is only one state health department per state, each state department was invited for participation. Due to characteristics such as population density and socioeconomics, city and county health departments can vary in their practice and resources. Therefore, city and county departments were sampled. In the beginning stages of this project, it was planned for at least five health departments per state to be invited to participate in the study. The completion of document analysis for each state, however, identified more participants to contact than were originally planned. Heat waves and climate change can be both emergency preparedness and environmental health issues; therefore it was ambiguous as to the appropriate contact within the department. I remained open to interview both emergency preparedness and environmental health coordinators from participating departments.

Email addresses for all contacts were obtained from departmental websites or collected documents, with each participant being sent a brief description of the project. If email responses were not received within one week, I phoned the department for participation. After two weeks of invitation, if no response was obtained, the department was removed from the contact list. Following the advice in Bogdan and Biklen (2007), I completed the field work for each case one at a time. Rose, the state that has received funding, was the first case analyzed, followed by Aves, the state that did not receive funding, and finally, Oak, the state that did not apply for funding³. All participants and their corresponding health department name were given pseudonyms to protect their identity. In all cases, I strived to achieve confidentiality of my participants and their place of employment; however, some descriptions of departments may lead to identifiable characteristics. Therefore, I cannot guarantee total confidentiality.

Field Work Activities

Starting in July 2012 and before interviews commenced, I collected pertinent documents for each case. According to Yin (2003), documents are essential to almost every case study. Although I did not seek contact with every county in each state, documentation regarding heat waves and climate change was analyzed for every county per state for a more comprehensive understanding of the states' collective preparedness. Official documents were important for this study, and included heat wave advisories from health departments, heat wave outreach information for each state and local health department, policy documentation from regarding heat wave/climate change, heat wave preparedness

³ Oak State applied to the CDC Building Resistance Against Climate Effects Framework (BRACE) Framework during the data collection phase of this project and was funded. At the time of this study, Oak was not implementing and programs/projects. They currently are in the process of planning with multiple partners in the state.

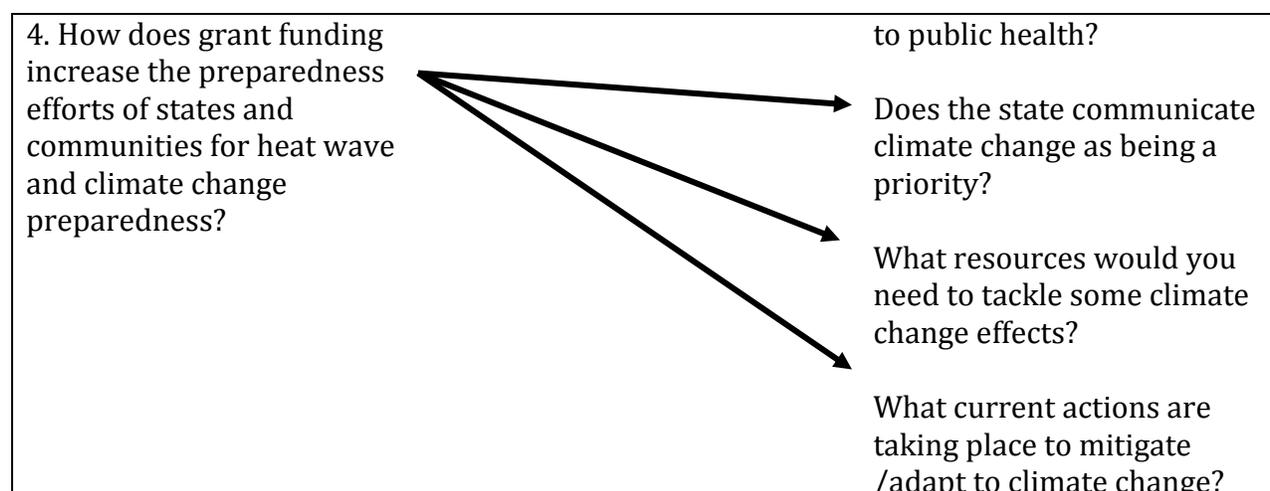
plans, conducted research studies, and the CDC *Climate Ready-States and Cities Initiative* grant application. By collecting and analyzing this information before interviews were conducted, I used important persons/places during the interview process as well as validated data that had been collected from the additional sources (Yin, 2003). This data collection method has many advantages, but some disadvantages were also apparent. Documents are known as being constant and can be viewed multiple times (Yin, 2003). They also provide exact detail (names/dates), are unobtrusive, and can be relatively broad in nature (Yin, 2003). Documents, however, can be difficult to locate and access and interpretation may be biased during analysis (Yin, 2003). For the timing of this study, document analysis began for Rose in July. By the time documents were collected for Oak it was October. Due to the seasonality of the year, health departments in Oak may have removed their heat wave information from their websites or even from their main page of current news. While this was not confirmed, the lack of heat wave awareness material on a website did not necessarily denote the lack of awareness for the department altogether.

Although case studies typically follow an open-ended layout for interviews (Yin, 2003), interviews were organized using a semi-structured framework (Kvale & Brinkmann, 2009) (Table 4). The purpose of the interview was to construct a clearer picture of preparedness among health departments and ultimately became a “powerful tool for charting the mental and emotional landscapes of human knowing and learning” (Neumann, 2006, p. 389). Before interviews were conducted, participants signed two forms (1) a consent form to participate in the interview (Appendix E), and (2) a consent form to be audio-recorded (Appendix F). Interview questions were developed and tested during the

Table 4

Research and Interview Questions

Research Questions	Potential Interview Questions
1. How are state and local health departments preparing for heat waves? a. How are guidelines for heat wave preparedness met among state, city, and county health departments?	How would you define a heat wave in a public health sense? What components do you think should be included in a heat wave preparedness plan for your county/state? In your opinion, are heat waves a threat for residents of your county/state?
2. How do state and local health departments communicate with each other? a. How are decisions made to encourage preparedness in communities? b. How are threats to public health filtered in a world of competing priorities?	Take me through the initiation of a heat warning for the state. How are advisories released? Who makes decisions to initiate? How are programs established in your county/state?
3. How do state and local health departments perceive climate change impacting the health of their communities?	How would you describe the communication between the local health department and the state? How would you describe the organization's relationship with the residents? Changing topics, how would you describe climate change? What are your thoughts and feelings about the topics of climate change as it relates



Note. Table adapted from Kvale and Brinkmann (2009) p. 132 Table, 7.1

pilot study, as well as constructed throughout the entire research process to fit the needs of participants.

According to Kvale & Brinkmann (2009), interview questions can be characterized in two categories, 1) 'thematic' which becomes the 'what' of the interview and incorporates theory and analysis, and 2) 'dynamic' or the nuts and bolts of an interview. Dynamic questions include feeling the pulse of the interview for how it is going, the interactions of the interviewer and participant, and the sensing the emotions of the participant (Kvale & Brinkmann, 2009). I used multiple types of questions (follow-up, probing, specifying, and direct) during the interview process (Kvale & Brinkmann, 2009). It was anticipated that questions would continue to evolve, especially during the document analysis phase of this project, as each department may have had distinct questions that were discussed. Although in-person interviews were preferred, three phone interviews took place due to preference of the health department or due to geographical distances. My conversation with the Oak State Health Department was via phone and email with the participant emailing me answers to questions I had emailed him previously. While the participant did not refuse an

in-person formal interview, he only completed questions and sent them electronically via email and avoided my request. Interviews lasted approximately 47 minutes on average with the longest being 67 minutes. Interviews always began with a brief introduction about the project, participant roles, and by answering any lingering questions (Kvale & Brinkmann, 2009). In order to enhance the rapport of the interview, I engaged in conversational dialogue asking about their careers in public health (Bogdan & Biklen, 2007, p. 103).

The interview design followed Neumann's (2006) six protocols of effective interviews:

- a. Balance a sample size for depth and breadth
- b. Maximize variation of study participants
- c. Judicious use of overlapping interview questions
- d. Continue interviews for vague responses
- e. Pretest of interview questions
- f. Follow the purpose of the study, while being open to change

(Neumann, 2006, p. 390).

Breadth and depth of interviews was established by structuring places during the interview for probing questions to enhance the dialogue, as well as securing a sampling size that allowed for data saturation (Neumann, 2006). This study recruited health departments at varying levels of government, in various geographical locations, and at varying levels of preparedness. Including a diverse group of health departments enhanced maximum variation of participants. Overlapping interview questions were cautiously used, unless responses to questions were vague. I sought ongoing level of communication with public health officials to continue interviews if responses were deemed as unclear. Finally,

although the study purpose guided the research design, as data was collected, the purpose shifted to suit the directionality of the study.

Interviews involve the use of practiced questioning and listening skills. This includes being reflective about your stance before the interview (Kvale & Brinkmann, 2009; Wilson, 2012). *What do you bring to the discussion table? What are your expectations of the interview?* Active listening also is a skill that becomes enhanced through practice. This can include restating the participant's answer to ensure you understood what he/she was saying. Being cognizant of the "A-ha" moment (Kvale & Brinkmann, 2009; Wilson, 2012) is also important for breakthroughs and may guide questions in an alternate path than was intended. Finally, being aware of non-verbal communication (i.e. body language) is a key skill for active listening. These findings were documented in notes during and after the interview. Although answers to the proposed research questions could be ascertained using other methods of collection (i.e. focus groups, surveys), personal interviews allowed for an explicit discussion with one participant.

In an interview setting, it is a crucial point to establish a trusting and open relationship between myself and my research participant. One-person interviews allowed for the perspectives from one individual to be stated as opposed to many opinions (i.e. focus group). During my pilot study I interviewed three people at once. I was not aware in advance of how this particular interview would be structured, and thought that I was interviewing the director only. Although I received some great information, it was extremely difficult to transcribe the interview and I constantly wondered if the other participants were not stating their *true* perspectives on issues because they were sitting in the same room with their boss (the director). This also occurred in this study as well

during my interview with the Cardinal County Health Department in which I interviewed two public health officials and an official in the Cardinal's Emergency Management Agency.

Field notes of my subjectivities, experiences, research sites, and other pertinent information were imperative to gather during the interviewing process. Wolfinger (2002) describes two strategies for writing effective field notes, which include determining what is salient about the experience and how to make notes comprehensive. Comprehensive note taking includes describing everything that takes place during a data collection period. Following Spradley (1980), this can include looking at "space, the actors, activity, object, act, event, time, goal, and feeling" (p. 78). I ensured to make note of my experience during the interview as well as a clear picture of the salient properties of the experience for a more comprehensive viewpoint.

Data Management

For document analysis, collected items were sorted by state and then by county/city. Documents were managed with two forms; one form (document analysis form) was constructed to dissect website information (Appendix G) while the other form provided a more in-depth means of analyzing heat wave preparedness plans (Appendix H). For interviews, audio files were stored on a digital recorder until files could be transferred to a computer and transcribed. Within two weeks of completing an interview, the audio files were transcribed verbatim. This piece of advice was given by Laureu (2000), in which she discussed only completing interviews if you actually have the time to transcribe them afterwards. Interviews were transcribed into Microsoft Word © and saved until data analysis began. In order to ensure accuracy of a transcribed interview, each audio file was

listened to at least twice. Field notes were transcribed (if they were dictated into an audio devise) or re-typed (if hand written) the same day as the interview.

In my pilot study, I completed field notes for all interviews but one. In that particular interview, I waited a few days later to write down notes from recalling the experience. I found myself searching for interview details that were lost. This lesson alone will motivate me to write field notes early on in my collection process. Lareau (2000) discussed this same concept during her research by stating, “missing sessions of writing field notes can, like skipping piano practice, get quickly out of hand...exponentially, in fact” (p. 206). During data collection and analysis, a log was kept documenting the number of hours for which my field work is based as well as my contacts with health departments (Lubeck, 1984, 1985; Lareau, 2000). This will be accomplished by keeping a journal to log my time for data collection, specifically a log for interviews, transcriptions, and analysis. This is an important component of trustworthiness of this study. I also maintained a journal for before and after interviews, and maintained a journal of my subjectivities and positionality throughout the project.

Data Analysis

“You are not putting together a puzzle, whose pictures you already know. You are constructing a picture that takes shape as you collect and examine the parts” (Bogdan & Biklen, 1992, p. 29)

Documents are a source of information that are “easily accessible to the imaginative and resourceful researcher” (Merriam, 2009, p. 139). Analysis of documents took place before interviews occurred. As official documents were collected, each text was explored for content, planning characteristics for heat waves, organization of health departments, and informative level of the document (Rapley, 2007). For heat wave warnings, I explored

what was being said, how it was stated, the recommendations for adaptation, and contact information. Regarding the CDC *Climate-Ready State and Cities Initiative*, I collected and analyzed the grant application, heat wave outreach information, and any other pertinent information sent to states/local health departments regarding heat waves/ and climate change. Many documents that were open to the public still contained sensitive information, especially in the case of reporting or discussing the source. Therefore, whenever possible, pseudonyms were used for these instances.

Following the framework for “coding a case study” (Creswell, 2007, p. 172), the project incorporated a cohesive flow of analysis by including within-case and cross-case theme analyses (Figure 2). After all interviews were transcribed, they were explored for

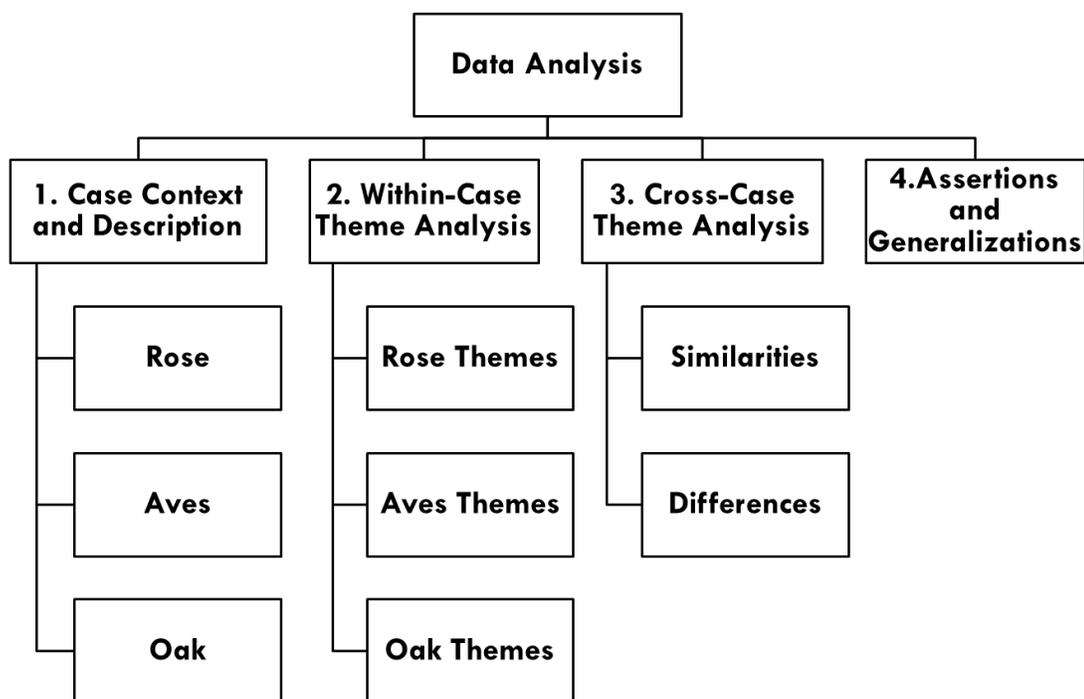


Figure 2. Template for case study analysis. Modified from Creswell (2007).

codes, categories, and ultimately themes to answer my research questions. Starting with Rose State, each case was analyzed independently. Once thematic analysis was complete within-cases, cross-case analysis involved drawing conclusions across all three states, incorporating the social ecological model, and developing themes from similar codes and categories between Rose, Aves, and Oak (Yin, 2003). Codes were identified by words or patterns that were similar throughout the text, and therefore were designated a tag or sign (Bogdan & Biklen, 2007). Codes can be of several types including setting, situation, process, event, activity, and strategy (Bogdan & Biklen, 2007). The coding process should “spark your thinking and allow new ideas to emerge” (Charmaz, 2003, p. 48). Charmaz (2003) offers tips to ‘code for codes’ including remaining open, staying close to the data, keeping codes simple, and comparing data with data (p. 49). After coding all interviews, categories were established to draw out specific themes. Categories are a method of managing or holding codes to be more logical and provide a means of sorting (Bogdan & Biklen, 2007).

For case studies, two strategies proved important during data analysis: case description and theoretical reflection (Yin, 2003). By starting with the case context and description and gradually moving into more rigorous forms of analysis, a template provides consistency by pictorially showing appropriate locations for continuative threading of themes and theory. Theoretical reflection guided my research questions, interview questions, and collection procedures. The social ecological model enhanced the assertions and generalizations by incorporating multiple levels (intrapersonal, interpersonal, community, and policy) of influence on preparedness strategies, decision making of priorities, and communication. Constant comparisons of all transcripts involved comparing

cases as they are being analyzed for similarities/differences (Corbin & Strauss, 2008). This enhanced the categorization process by ensuring patterns/findings are specific to that category (Corbin & Strauss, 2008). Theoretical comparisons were important to build meaning from patterns and properties that do not fit other codes and categories (Corbin & Strauss, 2008). Themes offered understandings of how heat wave preparedness is constructed for state and local health departments, and ultimately, how, if at all, health departments are contemplating notions of climate change.

Reflexivity, Subjectivity, and Positionality

Throughout my graduate experience, I have had the opportunity to reflect on my positionality, subjectivity, and reflexivity within my research topic. As Peshkin (1988) poignantly stated, “subjectivity is not a badge of honor, something earned like a merit badge and paraded around on special occasions for all to see”; instead, it is “like a garment of clothing that cannot be removed” (p. 17). In order to build the credibility and validity of my study, Peshkin’s advice echoed during my writing, data collection, and analysis.

Positionality

Examination of researcher positionality is important not only because it allows an investigation of the biases and accusations that may be hidden within the project framework, but may pose a threat to the validity of the qualitative study (Maxwell, 2005; Merriam, 2009). It is here, where the philosophical assumption guiding the researcher’s values is examined (Creswell, 2007). My interviews featured mostly conversations with emergency preparedness coordinators, 12 male and 10 female participants. Since I commenced my interviews with Rose, most of which (5 out of 6) were with female health officials. In this situation, I was completely comfortable speaking with all participants. I

never felt a power differential from neither myself nor the participant. This level of comfort did not travel to Aves, as almost all participants were male, and in one particular interview I was unaware I would be meeting with three individuals at once.

At this particular interview in Aves, I was aware that I was meeting with both the epidemiologist and the emergency preparedness coordinator, however, I was unaware they had also asked their colleague and friend, an EMA specialist to attend as well. All three men were close to my age, and knew each other very well. As I walked into the meeting room of Cardinal County Health Department, I was greeted by two seated men, both of which were extremely friendly and courteous to my questions. However, after the doors were shut, we were isolated in a common room shut off from the rest of the department, and I felt insecure interviewing them. I felt as if I was interviewing members belonging to a special club, as they had inside jokes with each other, laughed frequently at their idiosyncrasies, and was the only interview in which they made a mockery of the science behind climate change. I found myself giggling and joking with them, but inside, was ashamed at my performance during the interview, as my stance on climate change, positionality as an academician, and facilitator were all challenged from the moment I stepped into the office.

In all interviews, I tried to create an environment where I established a rapport with the participant of respect and trust. I found it quite challenging to ensure that my non-verbal communication (i.e. facial expressions) did not demonstrate shock or audacity if interviewees stated they did not agree with climate change. However, this was only the case for the interview at Cardinal Health Department, in which the participants turned my interview questions back at me and wanted to know my take on the issues. While stumbling to assemble my thoughts, I was completely unprepared for such an event. I did

not want to bias the interview, nor did I want to completely disclose my thoughts on such an important and debatable topic. In this particular case, I used terminology that coincided with the American Public Health Association's (APHA) stance on climate change to convey climate change information. By associating climate change with APHA, I was hoping they would be less forceful in their denial tactics. After the interview, I listened to the audio recording, not once, but twice, with a knot in my stomach signaling the complete destruction of this interview. I was blindsided by their answers and was dumbfounded at how to proceed or even how to end the interview, or even more importantly, how to write it objectively.

Subjectivity

Subjectivities will always remain ever present in our lives, research and non-research alike (Peshkin, 1988). Although in my past reflections I was being conscious of my biases, I lacked explanation of how I would constantly monitor, adjust, and understand them throughout the process of my dissertation. Initially, I made a note to ensure that my interview questions would be geared towards understanding the notions why public health officials may be unprepared to handle heat waves/climate change and not draw a premature conclusion that it is a function of a departmental inadequacy. Amazingly, my eyes were opened to the complexities of program planning and preparation for emergencies. The politics, community characteristics, and geographic location, not to mention background and practice of participants shed light on how preparedness occurs with or without written heat wave plans. This experience truly demonstrated how inaccurate my assumptions were about public health officials, the funding sources, and also

the channels and funneling of communication among levels of government as well as the media.

My third research question focuses on the perceptions of climate change awareness and the impact that an impending change in climate has on health directors' preparedness plans. It is here where a strong subjectivity of mine plays a role. I learned about the importance of climate change during my master's degree and I have always been ready to defend my stance regarding climate change. Climate change is a politically charged and sensitive issue, but it is a truly a scientific concept swept into the political arena. I spent the better part of a semester learning how to confidently discuss climate change topics and also understand the tactics of denialists. This allowed me to assert my stance with gumption while also conceptualizing the importance of healthy skepticism.

Climate change is only one component of my dissertation, but it has large consequences for the subject matter of environmental health threats I researched. Due to the existing tensions surrounding climate change topics, I found it a daunting task to actually answer my research question without blatantly asking the actual question! I think that it is important to identify the elephant in the room of my positionality on the issue of climate change, but at the same time, assert that it is a scientific topic of importance. Whenever I knew the conversation was approaching the trajectory of climate change, I felt a lump in my throat and my heart race with anticipation. *What would they think of the question? How would they respond?* Interview questions that were themed around climate change evolved from Rose to Oak. Depending on the previous research completed on the participant and their representing health department, I may have already known they were advocates of climate change planning. For example, the Rose State Health Department was

actively working on initiatives for climate change adaptation in their state; therefore my questions were guided to follow up on their practice as opposed to inquire about their stance. In other instances where I was unsure, I began with a question stating, “what are your thoughts about the topic of climate change as it relates to public health?” This particular question was changed for counties in Aves, due to the fact that it has an inherent assumption that the participant agreed that climate change was occurring. It was modified to be, “what are your thoughts on climate change?” This was again modified in Oak, as in one particular instance at Alder County, the participant had a confused and disgruntled look on his face as if I had asked who he voted for president. I immediately realized that the question was worded inappropriately, as it invokes individual opinions as opposed to departmental understanding, application, and practice.

Imbedded within my previous discussion, are several subjectivities including my strong support of science and the importance of public health. Without strong foundations in the sciences, many of the issues we discuss, prepare for, and plan become obsolete. I think it is essential to explore and explain scientific information before personal connotations are applied to the situation. In order to ensure that I am constantly monitoring my subjectivities, I privately disclosed these before and after every interview either via journaling or discussing via an audiotape.

Reflexivity

Reflexivity is defined as “the process of reflecting critically on the self as the researcher, the ‘human as instrument’” (Lincoln and Guba, 2000, p. 183). Since I was the primary individual collecting all the data, it was imperative to be cognizant of this influence on the data. My very position in formulating and asking questions influenced the

discussions with study participants. As demonstrated, reflecting on my positionality, reflexivity, and subjectivity allow me to examine my personal stance on the project instead of ignoring these influences on my writings and in my data collection. Within qualitative research it is inevitable that the researcher will have certain positions and biases, however it is important to “understand how you are influencing what the informant says, and how this affects the validity of the inferences you can draw from the interview” (Maxwell, 2005, p. 109) or from the study itself.

Ethical Considerations

During my pilot study, I found a majority of my writings portray health departments in a negative manner, especially in discussions regarding climate change. One thing that I did not stress in my pilot study was that these departments are staples of their communities, in which they tirelessly work to enhance the health of their residents. This was evident in their examples of community activities and in their descriptions of what lead them into a public health career. Throughout this particular study, I struggled with the notion of ensuring I report the findings in a factual yet objective manner. I have the utmost respect for these institutions and find myself caught in an ethical crux. How do you objectively report the facts without painting the health department in a negative light?

Also worth concern, are the ethical dimensions involved in discussing climate change. Although this topic has a solid basis in scientific evidence, it has been plagued by political connotations. In my short experience, I noticed that some participants were more comfortable discussing this topic than others. To make sure that participants were informed about the potential interview questions, I highlighted the term ‘climate change’ in

the recruitment email and/or phone call. This decreased the likelihood for participants to be caught off guard; shying away from this topic.

Depending on the type of qualitative study, member checking of the interview can be an important research step for participants to check over their dialogue transcript. This, however, may lead to participants realizing they would not like something shared and/or changing their answer. For this project, I remained open to providing a copy of the transcript to participants but only for two particular instances: 1) a phone interview, and 2) participant request. For a phone interview, I was unable to meet face to face with participants and wanted them to feel comfortable with what they were saying and also feel a sense of ownership of the material. Ultimately for all participants, I wanted them to feel like the experience was mutually shared as opposed to not allowing them the opportunity to reflect on our interview discussion.

Trustworthiness

Within the social sciences, multiple check points of are built into research to ensure the quality of a study (Yin, 2003). Credibility, transferability, and consistency measures will be included to enhance study validity. According to Maxwell (2005), “validity is a goal rather than a product; it is never something that can be proven or taken for granted” (p. 105). This quotation eloquently states the qualitative assertion that you do not ‘achieve’ validity; instead it is built using specific measures. In this study, there were two very real threats to validity: my subjectivities and reactivity (Maxwell, 2005).

Credibility is an assessment of the reality of a study, or did I measure what actually was there? (Merriam, 2009). Reactivity is ultimately the influence I have on the study. This can also be referred to as reflexivity. By journaling before and after interviews, my

reactivity is always present, but at the same time I was cognizant of my influence. In order to discern this, I continued to be reflexive and performed member checks of my interview transcriptions. If a member check was necessary, I sent transcripts to the participant within two weeks of the interview. Participants had approximately two weeks to review the transcript to ensure it is an accurate portrayal of our discussion. If they wanted anything revised or changed, this was the opportunity for modification. I did not however, receive any such requests.

Transferability essentially equates to the external generalizability of a research study, or can these findings be transferable (Merriam, 2009). Instead, transferability was asserted by providing a sufficient amount of data (Lincoln & Guba, 1985; Merriam, 2009) or precise documentation of field work and transcriptions (Bogdan & Biklen, 2007). This will be constructed with “thick description” (Ryle, 1949, Geertz, 1973; Maxwell, 2005; Merriam, 2009) that allows for the interpretation of the “emic or insider’s account” (Maxwell, 2005, p. 116) of all interviews. This can also be referred to as ‘showing not telling’ in my writings. Thick description can refer to a quotation, emotion, body language, tone of voice, and other forms of non-verbal communication. It can also refer to the physical description of an environment to get a sense of the ‘how’ and ‘why’ within a particular situation. For this study, I used purposeful sampling to ensure that interviews were meaningful, that they represented all regions of the state, and were in multiple planning stages of heat wave preparedness.

Consistency implies the repeatability of research. However, in order to be repeated, there is an assumption that one reality remains (Merriam, 2009). In qualitative research, there are multiple realities that are constructed. Instead of creating a study that can be

replicated, I am building a study that “describes and explains the world as those in the world experience it” (Merriam, 2009, p. 220). Two separate qualitative researchers can thematize two separate yet accurate findings in a study, and ultimately, both could be reliable. Instead it is important to ensure they are not contradictory which then would question the study’s findings (Bogdan & Biklen, 2007). In order to fully understand how state and local health departments prepare for heat waves, I describe in deep account how this occurs from the experts themselves. Although my interpretation guided the formation of research themes, the findings remain consistent with participant discussions. The methods that I used to build consistency included peer examination, triangulation, and audit trail. For peer examination, this provided an opportunity to discuss my findings with others including my colleagues and committee members to ensure the patterns I recognized were sensible. Triangulation is using multiple sources of data to demonstrate the findings (Merriam, 2009). Here, I used both interviews as well as document analysis to construct understanding from my cases. Finally, a research log of my collection and analyzing hours builds the documentation of my findings. Also known as an audit trail, I kept an accurate record of interview visits and documentation research.

Summary

Chapter Three provided a detailed account of my research design and data collection procedures for understanding heat wave preparedness in three Midwestern states. This project used an interpretive paradigm guiding a comparative case study of three specific cases: state and local health departments in Rose, Aves, and Oak States. Within each state, I performed document analysis on every county in each case and completed 18 interviews. In order to ensure the results are valid, I discussed three

important measures for building the credibility, transferability, and consistency of my study. In Chapter Four, I will depict each Midwestern state in this study, as they each demonstrate a unique case.

CHAPTER FOUR

Three Midwestern States – Each Unique Case

The beginning chapters of this dissertation set the stage by depicting the existing tensions for climate change awareness, discussing current heat wave preparedness guidelines, as well as the political and sociological implications on heat wave preparedness. Chapter Four highlights the characteristics of each specific case by using the interviews and documents from the study to paint a picture of the states' preparedness. In this chapter, a brief description of each participating health department as well as a depiction of their heat wave planning will address first research question of the study: How are state and local health departments preparing for heat waves?

Starting in July 2012 and ending in March 2013, a total of 41⁴ state and local public health officials in the three study states were contacted to participate (19 in Rose, 12 in Aves, 10 in Oak), as well as one state climatologist from Oak. Twenty two officials agreed to participate in the study (Table 5). Most of those who declined (19 total) were passive in nature; in which I never received an answer via email or phone; or after an initial contact was made, never received a response to set a date for an interview. Only four individuals actively declined to participate. I conducted all but four interviews in person, driving approximately 5,000 miles across three states. Meeting with public health officials broadened my perspective of preparedness, specifically the inner workings of the public health system that functions with limited budgets and staff, as well as increasing pressures

⁴ In every instance, I contacted one person to interview. In two instances, however, I met with multiple individuals as suggested by my participants (Chestnut County I met with two people, and Cardinal County I met with three).

Table 5

Interview Participants

State	County / Health Department	Title	Training and Experience	Name
Rose	Rose State Health Department	Environmental Health Epidemiologist	Biology and Public Health	Debby
	Rose State Health Department	Health Educator	Health Education	Florence
	Laurel <i>Contains city of Skylar</i>	Public Health Preparedness Administrator	Environmental Health	Helene
	Aster District	Emergency Preparedness Coordinator	Environmental Health	Vince
	Lavender <i>Contains city of Rowton</i>	Environmental Health Director	Environmental Health	Leslie
	Violet	Emergency Preparedness Coordinator	Dental Hygiene and Health Education	Nadine
Aves	Wren	Emergency Preparedness Manager	Infection Control	Gordon
	Cardinal	Epidemiologist / Bio Planner / EMA	Biology / Marine Corps and Crisis & Disaster Management / Law Enforcement and Crisis & Disaster Management	Isaac / Kirk / Michael
	Heron	Emergency Preparedness Coordinator	Biochemical Engineering and Nursing	Patty
	Lark	Emergency Response Planner /	Law Enforcement and	Lee

		Epidemiological Specialist	Armed Forces	
	Kestrel Metro	Program Manager for Health and Social Marketing / Heat Mitigation Coordinator	Unknown	Don
Oak	Oak State Health Department	Environmental Health Specialist	Unknown	Tomas
	Elm	Chief of Office of Risk and Emergency Management	Corrections	Harvey
	Alder	Emergency Preparedness Coordinator	Biology and Health Education	Nate
	Pecan	Emergency Preparedness and Environmental Health Coordinator	Environmental Health	Sean
	Maple	Emergency Preparedness Coordinator	Animal Control	Rina
	Cypress <i>Contains City of Allium</i>	Interim Director Community Preparedness and Coordination Unit	Public Health	Whitney
	Chestnut	Emergency Preparedness Coordinator / Director of EMA	Unknown	Emily/Cindy
	Oak State Water Survey located at University of Oak Campus	Oak State Climatologist	Climatology	Walter

from federal, state, and community expectations. While there are key deliverables that all health departments have to produce, each health department is different. They represent unique counties, are funded to meet differing priorities, and operate in states with different demands and expectations. Starting with Rose, I will describe the characteristics of each state, its' participating health departments, and public health officials interviewed.

Rose State

In 2010, the population in Rose was 9.8 million, with approximately 706,000 residents living in the industrialized and history-rich city of Rowton (U.S. Census Bureau, 2012). Like other states, Rose has both affluent and impoverished communities, with its largest city of Rowton experiencing financial hardships. In Rowton, 34% of the population is living below the poverty level (U.S. Census Bureau, 2012). Rose has 83 counties, with 47 local health departments. Fourteen health departments serve multiple counties, ranging from two to ten. Four health departments, from different corners of the state agreed to participate in the study. They were Laurel, Aster, Lavender, and Violet County Health Departments (Figure 3).

Violet County Health Department is seated in the southwestern area of the state and has approximately 254,000 residents (U.S. Census Bureau, 2013). There are two well-known institutions of higher education including Western Rose University and a private college. Western Rose has a partnership with the Violet County Health Department in which internships are made available for students. Nadine, the Emergency Preparedness Coordinator of Violet, was the only official in Rose to provide a plan for me to review. Laurel County Health Department, in the southeastern portion of the state, has a population of approximately 350,000 (U.S. Census Bureau, 2013). Laurel County includes Skylar,

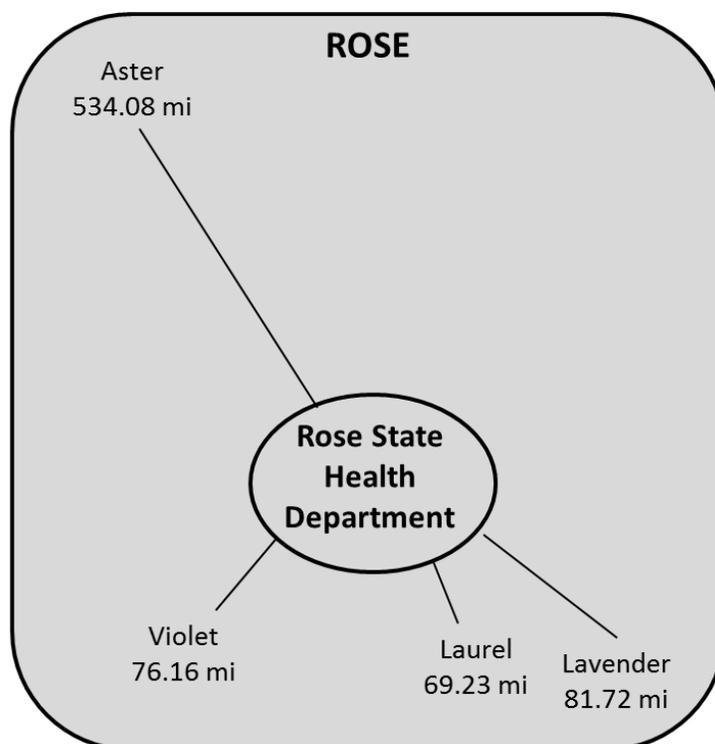


Figure 3. Rose participant locations and distance from the State Health Department in miles

which is home to a very large and prestigious public university (University of Rose).

Helene, the Public Health Preparedness Administrator of Laurel, was the only participant in the study that was involved in researching heat waves and climate change in her community. Recently, she received about \$12,000⁵ from the state to implement a survey addressing the gaps in their heat wave preparedness for heat in Laurel, including the identification of social economic barriers.

Aster District Health Department, located in the Northwestern portion of the state, has one Emergency Preparedness Coordinator (Vince) in charge of its multiple counties.

Vince has a jurisdiction of over 5,000 square miles, and serves approximately 71,000

⁵ Helene received \$12,000 from the state via the CDC Climate Initiative monies. The entire project amount was around \$40,000 to complete the survey work in Laurel County. More on Helene and Rose State will be discussed in Chapter Five under the leadership theme.

residents. Aster District is the furthest from the Rose State Health Department at approximately 530 miles away, and is mostly rural. Aster District has lake-effect weather patterns from three of the great lakes, and a colder climate than any other participating location in the study.

Lavender County is the home to the City of Rowton, which has its own public health department. Leslie, the Lavender Environmental Health Director, discussed the borders of the Lavender Health Department and stated, “our jurisdiction is what a lot of people like to easily just say, ‘out Rowton County.’ It’s like that circle around the city of Rowton.” She went on to say that Lavender County and Rowton City Health Departments collaborate extensively. Lavender is industrialized, with several large car manufacturing facilities in the county and some isolated pockets of farm land.

The Rose State Health Department applied for and received funding from the CDC’s *Climate-Ready States and Cities Initiative* which had a funding period from 2009 to 2012. At the Rose State Health Department, I met with Debby, an Environmental Epidemiologist. It was here where I learned that the *Climate-Ready States and Cities Initiative* was the second such grant they received to fund climate-related issues. The first grant was a one year funding opportunity in 2009 offered through the Association of State and Territorial Health Officials (ASTHO) and the National Center for Environmental Health (NCEH) at the CDC. While grant announcements, climate change educational tools, and peer discussions were essential motivating factors to apply for the *Climate-Ready States and Cities Initiative*, Debby’s personal interests in environmental health were a key factor in applying for both grants. With funding for the first grant they received, the Rose State Health Department, along with local partners across the state, including several universities, local health

departments, and public organizations, conducted a needs assessment and developed plans that highlighted three priority areas: Heat illnesses, respiratory disease, and water availability (CDC, 2012). These three areas set the stage for the second grant, the CDC *Climate-Ready States and Cities Initiative*, by incorporating them in three broad principles:

1. Adapting climate change into public health practice;
2. Providing resources to assist public health agencies respond to climate change and;
3. Address the need of vulnerable populations (Rose State Health Department, 2013).

Aves State

Aves has a total population of six million, with 998,000 living in Wren County and 463,000 living in Kestrel Metro, the largest city in the state (U.S. Census Bureau, 2013). Aves has 115 counties with a 115 health departments. There are seven city health departments in Aves, with 108 county health departments. Two large cities in Aves, including Kestrel Metro and Wren City have their own health department. In the case of Kestrel, the city lies within four bordering counties in the Northwest part of the state. Wren City is next to Wren County, but they each function separately. In Aves, I met with 7 participants representing four counties and one city, including three counties in the Southeastern portion of the state (Wren, Cardinal, and Heron), a city in the Northwest (Kestrel Metro), and one in the West-central portion (Lark) (Figure 4). Several heat waves have impacted Aves, including events in 1980 and 1995, and they continue to occur every year. In 1980, 157 deaths occurred in Kestrel Metro (City of Kestrel, 2012). Since 1980, Kestrel Metro and the Aves State Health Department have been proactive with promoting

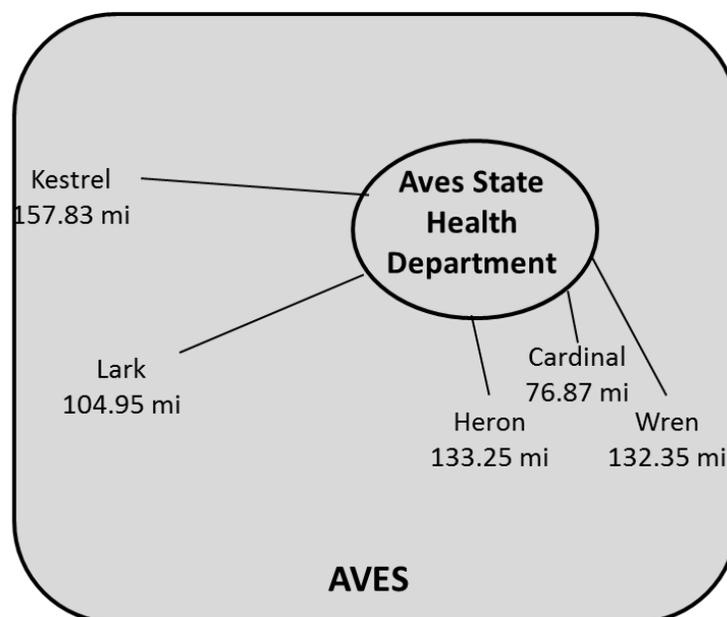


Figure 4. Aves participant locations and distance from the State Health Department in miles

heat wave preparedness techniques for Aves residents, especially urban dwellers. Kestrel Metro was the only health department in the entire study to have a designated Heat Mitigation Coordinator (Don).

Lark County, with a population of 22,000 was one of the least populated counties in the study. Lee, the Emergency Preparedness Coordinator who also functioned as an Epidemiologist for the Lark County Health Department, described early in the interview the roles of the public health department and the Lark County EMA. He indicated that the EMA's role is more tactical stating, "the emergency management director (EMD) is responsible for every citizen in their county." The health department takes on a more supportive role, advising about health issues and providing residents outreach in an emergency. Lee performed a variety of functions at the health department, partly because the EMA had mostly part-time employees and he wanted to help decrease the load of the

EMD; and partly because he had a genuine interest in many different topics. Lee laughed as he said “the activity in our county isn’t very high,” referring to the rate of emergencies.

Wren County surrounded the city of Wren, and maintained a separate health department from the city. The population of Wren County is approximately one million residents and Wren City is about 318, 000 (U.S. Census Bureau, 2013). Historically, heat waves are no stranger to Wren County, as three people recently died in the July 2012 heat event. In the context of collaboration or potential merger, the Wren County Health Department Emergency Preparedness Manager, Gordon, described the tensions with the neighboring city of Wren.

The county folks don’t want to take on the city; they have a lot of issues and they don’t have a lot of money. Um, and anytime anybody mentions it, everybody in the county just freaks out because they think it would like be taking on something that’s just going to drag us down. You know..? [10.19.2012]

The differences between Wren City and Wren County are glaring, as the county has a state-wide health ranking of 20 (out of 115) with the city ranking 110 (Robert Wood Johnson Foundation, 2013). Wren City has the worst socioeconomic ranking in the state, which includes areas including school graduation, unemployment, poverty, and violence in the State. Although there is continuing discussion to merge the county and city as one, they currently have duplication of all services (health, recreation, government). City and county officials frequently work together on public health issues, but this collaboration does not extend to other issues, as “some departments [just] do not get along that well” stated Gordon.

Cardinal County is located about 45 miles Southwest of Wren County and has a population of 101,000 (U.S. Census Bureau, 2013). At Cardinal, I met with three participants, two who worked at the health department (Isaac and Kirk), as well as the

emergency manager for the county (Michael). Isaac has been with the department for over nine years, and serves as the Epidemiologist. Kirk had four years of experience in the Marine Corps and obtained a degree in crisis and disaster management before beginning as the health department's Bio-planner. Isaac, Kirk, and Michael had a good rapport with each other, giving the impression they had worked together for years. They would often joke and make fun of each other during the interview, and seemed to have many inside jokes. Kirk and Michael would often repeat my questions to me as if to check their answers. This occurred for defining a heat wave, as well as my thoughts on climate change.

The Heron County Health Department is in the Southeastern part of Aves, serves approximately 65,000 residents (U.S. Census Bureau, 2013). Patty, the Heron County Emergency Preparedness Coordinator, who was also trained as a registered nurse, advocates for preparedness with all of her health department staff. Patty described Heron as being spread out, with four larger cities sporadically established as well as pockets of smaller communities in the county. Patty attributed poverty as being their main issue during a heat wave, as several residents do not have air conditioning, or possibly even fans.

The Aves State Health Department applied for the *CDC Climate-Ready States and Cities Initiative*, but did not receive funding. Aves must have had an interest in climate change, or they would not have applied to the grant. Yet, gaining access and building rapport with the Aves State Health Department was extremely difficult, as I was sent in different directions from three contacts affiliated with different offices of the Health Department. Initially, I contacted the state via a general email address. After five days, I received feedback from the department stating they did not have any dealings with climate change. Regarding my additional request to discuss their heat wave preparedness, I was

told to contact either Kestrel Metro or Wren County instead. Aves has an established preparedness program titled, *Ready in 3* in which they advocate creating a plan, preparing a kit, and listening for information (Aves State Health Department, 2013). The Ready in 3 program is designed to incorporate various disasters and preparedness events.

Skeptical from the email I was sent, I phoned the Emergency Preparedness Unit of the Aves State Health Department to inquire further. I was put in contact with two individuals, one from preparedness who declined participation, as well as an individual in epidemiology. The first individual, who declined, had done so after I sent the transcript of our conversation discussing the *Ready in 3* Program. The other individual, the epidemiologist from the state, said the original email denying state involvement with climate mitigation was interesting because Aves was “doing things for climate change” and others in her building should be “made aware.” She was unable to find anyone I could speak with at the department, however, and even declined to participate herself. The web of communication with Aves was filled with mixed messages and confusion. Ultimately, little information was obtained regarding how they develop and communicate their heat wave preparedness plans, their relationships with their local health departments, and any mitigating actions they are taking in Aves for climate change.

Oak State

Oak had a 2011 population of 12.8 million, and has 102 counties with 95 health departments (U.S. Census Bureau, 2013). Seven health departments agreed to participate including Elm, Alder, and Cypress Counties (Northeastern Oak), Chestnut County (Northwestern Oak), Maple County (Midwestern Oak), and Pecan County in the southern portion of the state (Figure 5). In Oak, I also spoke with the state Climatologist, Walter,

who was important in discussing the trends of climate change preparedness and the roles of public health. Walter is employed by the Oak State Water Survey which is housed at the University of Oak campus, 85 miles from the Oak State Health Department.

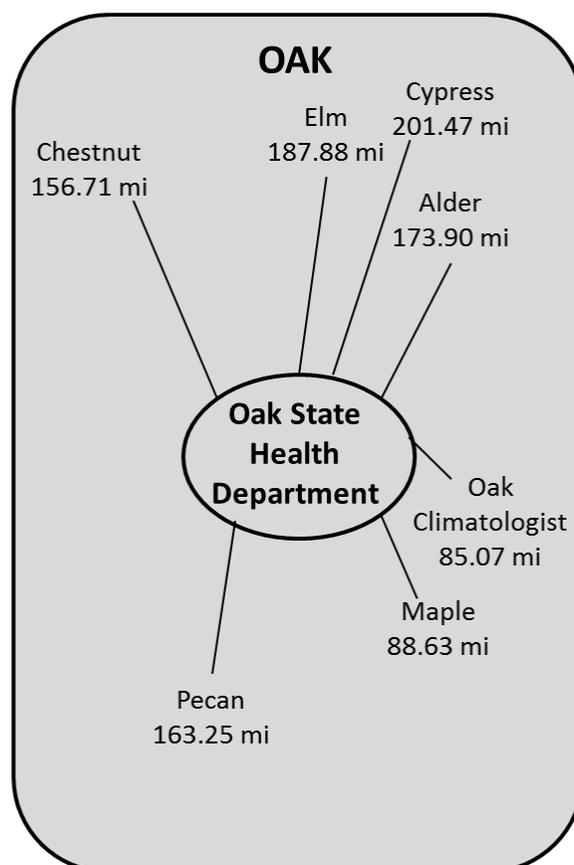


Figure 5. Oak participant locations and distance from the State Health Department in miles

Cypress is the most heavily populated county in Oak, with 5.2 million residents in 2011 (U.S. Census Bureau, 2013), 2.5 million of whom, were the responsibility of the Cypress County Health Department. Within Cypress County is Allium, the largest city in Oak state with 2.7 million residents (U.S. Census Bureau, 2013). Allium is a separate governmental entity from Cypress, and has its own health department. Cypress County has experienced intense heat waves over the last thirty years (1980, 1995, 1999, and 2012),

with Allium implementing a climate action plan to mitigate for heat waves and other forms of extreme weather.

Elm County is a neighbor to Cypress County, and has a fluid population of 926,000 residents. Harvey, the Chief Office Risk and Emergency Management for Elm County, described the population as fluid because many individuals work in the county during the day and leave at night. This required the Elm County Health Department to have two different emergency plans depending on the time of day and day of the week. Harvey also described the county as housing “critical infrastructures,” including several large scale research and manufacturing laboratories, and a major international airport. Housing these infrastructures elevates the potential for risk in the county, making preparedness planning especially important. Other counties in the study (i.e. Cypress, Lavender, and Kestrel Metro) all included critical infrastructures as well, but Harvey was the only individual to discuss them as being a part of their emergency planning.

Alder County, also located in the Northeast portion of Oak, borders Elm County. Alder contains suburban municipalities, as well as rural pockets scattered throughout the county. The population in Alder County was approximately 522,000 in 2012 (U.S. Census Bureau, 2013). Nate, the Alder Health Department Emergency Preparedness Coordinator, had done some previous work in health education and had an internship to work in emergency management. These experiences were important for him and allowed him to “marry two great interests” for public health emergency management. Nate was one of the few to provide a heat wave preparedness plan for review.

Chestnut County Health Department serves a population of 16,000 (U.S. Census Bureau, 2013), and was described as being very rural by my informants. The participants

from Chestnut County were Emily, the Emergency Preparedness Coordinator, and Cindy, the Emergency Management Director. Chestnut County Health Department was one of six health departments in the United States who received funding from NACCHO and the CDC to implement a demonstration project focusing on bridging the gap between climate change and human health. The demonstration project was not part of the CDC *Climate-Ready Initiative*. When asked what made them begin a climate action plan, Emily stated, “the main catalyst here was the extreme weather that we had been experiencing.” Chestnut is located in the Northwest part of Oak State, and has experienced devastating flooding over the last couple of years. Chestnut is the only county in the state of Oak to explicitly incorporate climate change issues, specifically extreme weather, into their community. Their experiences will be explained in more detail in Chapter Five.

Maple and Pecan County Health Departments are located in the middle and southern portions of the state, respectively. Maple County was described by Rina as being comprised of a “transplant group of people,” that is, a large number of residents did not have deep familial roots in the area. Rina is the Emergency Preparedness Coordinator for Maple County. Maple has a population of 36,000 and is located in an area with intersecting interstates, making the need to prepare for special types of emergencies important. With highways brings the possibility of trucks hauling toxic chemicals, gasoline, oil, etc., all of which could be spilled in Maple County if an accident occurred.

In Pecan County, I met with Sean, the only participant who served as both the Emergency Preparedness Coordinator and Environmental Health Coordinator for his county. Pecan also has a fluid population (approximately 60,000) as it contains 18,000 students from a University within its boundaries, many of whom leave during the summer

and holiday season. In Pecan County, a strong partnership exists with the Health Department and University for health fairs, internships, and community outreach events.

The Oak State Health Department has eleven offices and over 200 programs for various health issues. The Oak State Health Department participated in the study via an informal interview, in which I spoke via telephone and email with Tomas, an Environmental Health Specialist. Primarily, climate change was the main topic that was discussed with Tomas. He stated that Oak recently began formulating interest for climate change topics when a University in Oak contacted them to partner and apply for the CDC's funding opportunity *Building Resistance Against Climate Effects in State, Territorial, and Tribal Health Departments* (BRACE). Tomas stated, "no formal programs address climate change and health" and that the funding opportunity will allow Oak to "be better able to prioritize ways to address impacts with our limited resources."

Finally, in Oak State, I interviewed Walter, the Oak State Climatologist located at the University of Oak campus. Walter, who has been working for the state since 1997, has been doing research related to climatology since 1984. Walter gives a few talks yearly on climatological issues, and stated that even when talks are on unrelated topics to climate change, "I'll still get a question from the audience about it." It was important to speak with Walter, as the state climatologist plays an important partner in climate change awareness.

State Heat Wave Preparedness

Public health preparedness efforts were born after the events of 9/11. Immediately after 2001, most preparedness initiatives focused on bioterrorism, and in the last ten years, preparedness has shifted to a more "all hazards" approach. All hazards is based on regionalization of public health efforts with the *Project Public Health Ready* (PPHR)

program allowing maximum preparedness functioning (NACCHO, 2007; Koh et al., 2008).

According to Waugh (2004),

'All hazards' does not literally mean being prepared for any and all hazards that might manifest themselves in a particular community, state, or nation. What it does mean is that there are things that commonly occur in many kinds of disasters, such as the need for emergency warning or mass evacuation, that can be addressed in a general plan and that that plan can provide the basis for responding to unexpected events.

The above quotation by Waugh, is a good distinction of the characteristics of an all hazards plan. While all hazards planning provides a baseline for different emergencies, it is a framework meant to be adaptable (Waugh, 2004). Nine health departments stated they use an all hazards preparedness model as opposed to more specific plans for single events. All hazards was described by participants as being a way to incorporate many events together reducing the resources needed to plan for multiple events.

Although only five health departments had written plans specifically for heat waves (Laurel County and Violet County in Rose, Kestrel Metro and Wren County in Aves, and Alder County in Oak), every participating health official could verbally discuss what procedures would occur should a heat wave be forecasted for their area. Federal guidelines are suggested by the National Weather Service, Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, and Federal Emergency Management Agency for health officials to include in their heat wave response plans, should health departments choose to develop them. Guidelines include the establishment of warning procedures, cooling centers, community education and outreach, establishing partners for implantation tasks, identifying vulnerable groups, and media involvement. This portion of

the chapter will report the practice of the suggested guidelines as demonstrated by health departments in this study.

Heat Warning Initiation

As discussed in Chapter Two, the definition of a heat wave is inconsistently used among researchers and practitioners. There are also variations in the warning process, depending on the state, county, and city. In this study, most health departments used the NWS terminology, specifically, a heat outlook, watch, and warning (Table 6).

Table 6

National Weather Service Heat-Related Conditions and Outlooks¹

Issuance	Time Frame Before Impact	Information
Excessive Heat Outlooks <i>Potential Exists</i>	3-7 Days	Provides information to officials to prepare for the event ahead of time and update public utility staff, emergency management, and public health
Excessive Heat Watches <i>Conditions are Favorable</i>	24-72 Hours	Risk factors are imminent but timing is uncertain. Provides municipalities lead time to prepared heat event mitigation plans.
Excessive Heat Warning/Advisory <i>Expected</i>	36 Hours	Warning for conditions that pose a threat to life or property. Advisories are less serious and elude to conditions that can cause discomfort and, if precautions are not taken, threat to life.

¹Information obtained from (NOAA, 2012)

For this study, I was able to obtain and review heat wave warning preparedness plans for residents from both Violet and Alder Counties. Their procedures were similar, each with four distinct phases. Violet followed the NWS approach, naming the phases: excessive heat outlook, heat advisory, excessive heat watch, and excessive heat warning. The plan

followed the heat index and had a specific procedure to follow in each alert phase. The Alder County heat plan included seasonal, watch, outreach and action phase(s), with a specific set of procedures at each stage for coordination, outreach, triage, and implementation. Alder County also used a decision tree for operating the task flow of heat wave operations.

An issuance of a National Weather Service heat outlook for the region was consistently the catalyst for health departments to take action. While there is not a standardized protocol for beginning the procedures, all individuals discussed that they obtain the information on their own or through a warning alert from a registered emergency site (i.e. Health Alert Network), rather than through their state health department. All state health departments provided resources on their websites including 'beat the heat' tips as well as state wide press releases on impending heat threats; however, it was up to a county to initiate a watch or warning. In each case, the state health department had information obtainable via websites or press releases for heat waves, but was not involved in executing plans. Instead, plan execution was made at the local level with established partners.

Emergency management agencies (EMA) are key players within the warning process. Usually, the EMA and public health departments work together on preparedness plans; however, depending on the disaster or event, the agency in charge can vary. Public health is usually responsible for the outreach and educational side of the action plan, while emergency management agencies are responsible for initiating the opening of cooling shelters and other emergency planning efforts with first responders. Regardless of who is in the leadership role, the process is a collaborative one, with all preparedness partners

consulting on the development and delivery of press releases, opening cooling centers, and ultimately, preparing their county. In Aster District, while heat waves are infrequent weather phenomena, during periods of warm weather, Vince still monitors hospital emergency room records for the occurrence of heat-related illnesses.

We get strings of 90 degree days and it's hot and people are uncomfortable and I know we have people going into the ER's. I can check some of the ER records just from my office that heat-related illnesses will bump up a little bit, but it's nothing where we're seeing people showing up in groves [9.14.2012].

Health departments in all three states listed ways in which they incorporate heat-related illness information in their seasonal awareness campaigns. For example, from May through September they would be notifying their communities about the potential threats that the summer season might bring.

A complex interplay of temperature, resources, and decision making strategies in heat wave planning was illustrated by several participants. In Laurel County, their heat wave plans are initiated when the heat index is above 105°F. Their health department is open as a cooling center any day when temperatures are 90°F or above, with the atrium designated as a center for residents to cool themselves. If the temperature is above 90°F, the department also offers cool water for any resident who visits the department. Other participants also described their health departments as being fully capable of handling a heat event *unless* their county was without electricity. Rina, the Emergency Preparedness Coordinator at Maple Health Department, and Lee, the Emergency Response Planner/Epidemiological Specialist at Lark Health Department, indicated that a power outage was the ultimate “game changer.” In discussing his county’s readiness, Lee’s voice was calm and reassuring as he went through the procedures. When he reached the point in his sentence discussing the possibility of a power outage, his voice became slightly

apprehensive at the endless possibilities of disaster, “say a storm went through and it’s knocked out power to half the county, *and* we’ve got a heat wave. Now we’ve got a situation.” Lee would look at me intently as he described how dangerous such a situation could truly be. Although health departments realize this is an issue, only two participants actually experienced a power outage during a heat wave. The other health departments verbally described heat wave planning events, yet did not discuss any details of what they would do if a power outage occurred during an intense heat event.

In her description of the watch and warning process, Nadine, the Emergency Preparedness Coordinator of Violet Health Department, discussed events in sequence. The first step would be to write a press release, which would be approved by a health officer or director of the health department. Prevention is the theme of the first press release during the beginning days of heat wave. In describing her press release, Nadine listed the heat index, prevention tips, and cooling center locations as the key contents of the article.

We don’t have cooling centers open yet, because the Red Cross, at least around here, is very reluctant in opening up um cooling centers until we’ve had like two or three days into it. Because most people aren’t really affected until that second or third day when the temperature doesn’t go down at night. [9.26.2012]

The third day of a heat event is where secondary and tertiary prevention strategies are set into action. Here, another press statement is released but focuses on cooling centers, and how they can be accessed by residents. The hesitancy to open cooling shelters may have been experienced by other study participants, but this was the only time it was stated in the study.

Cooling Centers

Designating cooling locations is a well-documented secondary prevention strategy for heat stroke. In this study, cooling centers were typically described as being unneeded

or not used if they were offered. The difference between a cooling 'center' versus a 'shelter' is that a center is usually a public establishment open during business hours only for short term relief, whereas a shelter can provide more long-term overnight housing, and usually is equipped to care for displaced individuals. In actuality though, participants used the terms 'center' and 'shelter' interchangeably.

Press releases from collected documents in this study indicated that public buildings such as libraries, police departments, fire departments, city halls, shopping malls, schools, churches, and senior centers were the main locations used as cooling centers. Cooling centers are usually maintained by municipalities, with cooling shelters established and maintained by the American Red Cross. The decision to open a cooling center is initiated by collective actions of the Emergency Management Agency and the Health Department. Since cooling centers are public buildings, it can be difficult to monitor the flow of traffic unless there are active measures taken to assess the demographics of individuals using the building and their purpose for visiting. For this reason, the use of cooling centers is rarely assessed.

Impoverished individuals are more likely to need public services (i.e. cooling centers) because they are less likely to have air conditioning or be prepared for emergencies. This finding was confirmed when Laurel County Health Department in Rose distributed a *Hot Weather and Health Survey* in 2011 to approximately 1,300 residents in the county. Their findings indicated that individuals making less than \$20,000 were more likely to use a cooling center or social service agency, as well as not have a fan or air

conditioning or be prepared for an emergency in general (Laurel County Health Department, 2011⁶).

In rural areas, the need for formally designated cooling centers may decrease. According to Rina, who described Maple County as being relatively rural, they have opened warming shelters but have not opened cooling centers for their residents. Said with a chuckle, she stated, “with smaller towns, they just kind of open up their civic centers and just say, ‘hey, we’re doing a potluck you can come out and play cards and stay cool!’” Rural towns tend to have an independent, yet community driven spirit, in which they look after each other. In fact, Rina tended to chuckle throughout our conversation, as she recollected stories of speaking with her colleagues who were from larger cities and were unable to get connected with partners such as the police sergeant. This was mind boggling to her, that her colleagues could not speak with or, in certain cases, didn’t even *know* prominent members of the health community including the coroner. Laughing, she exclaimed she saw the coroner and even sat by him in the local pizza establishment. In urban areas, the way cooling centers were discussed seemed the antithesis of the community-based picture painted in Maple County.

When speaking with Debby from the Rose State Health Department, she depicted urban cooling centers as having many barriers, describing confused residents who assumed centers and shelters were for “homeless people,” and avoiding them if at all possible. Urban localities would be more likely to have established cooling centers in places people use regularly (i.e. public libraries); therefore, the apprehensiveness seems to stem primarily from the notion of using a shelter, which people associate with homeless

⁶ Citation has been changed to match pseudonym.

individuals. Barriers to using cooling centers and shelters included behavioral and physical contexts. With behavioral barriers, Debby discussed the notion that people do not want to be “exposed to undesirables” if they attend a cooling center or shelter. The “undesirables” term was an association to individuals who are impoverished and/or homeless, with a fear that people will be around threatening individuals if they attend a center.

Physical barriers include lack of transportation and apprehension about leaving pets. During heat events, health departments in urban areas can coordinate with partners such as bus transit services to take individuals free of charge to their destinations. Free bus service on hot days is an ongoing activity at the Rose State capital; however, Debby stated some residents are still unaware of this service. Helene, from Laurel County, described the pet abandonment phenomenon as a barrier in her community. Helene works in a county that features more affluent communities due to the influence of a major university residing in the county. In describing an emergency situation, Helene stated she would not leave her pet at home to attend a cooling center, demonstrating empathy for other residents who would not leave their pets behind. Nadine, from Violet County, also listed pets as being a barrier to attending cooling centers in her county. Focusing on this issue, pets are unable to attend public places designated as cooling centers, and cannot attend cooling shelters due to potential allergies and possible tensions from other pets.

During a heat event in 2012 in Laurel County, a cooling center was designated in the administration building in Skylar, the location of the large and prominent University of Rose. The Laurel County Health Department, located in a different part of the county, also opened their doors for constituents to use their building to beat the heat and have cool

water available to them. Helene described the differences between the two cooling center locations with confusion.

Our health department, which is located in Buela, than um, Skylar, which is located with more resources. They could go to a restaurant or bar, get some water, get some refreshments, get some food. But in Buela, there really are no malls, restaurants, they can only sit for a couple hours....Our administration building (in Skylar) has a huge atrium and waiting area where people come in and conduct business. *Nobody came in.* [8.3.2012]

Since Buela is more rural in nature than Skylar, the university town, Helene was shocked at the fact that more people did not utilize the administrative building as a cooling shelter. She assumed that more people might be downtown to utilize the facilities of shopping, restaurants, etc., which might lead to residents using the atrium as a cooling center as well. In fact, the opposite occurred, with more individuals, 20 per day during July 5-7th, coming to her health department instead. Since Laurel began opening their health department in Buela as a cooling shelter in 2011, they have had numerous community members attend, with over 100 people visiting the department on one hot day in the summer of 2011. The lack of cooling center usage in Skylar was disappointing, but nonetheless, is a point of interest with Helene and her colleagues to investigate in the future. In fact, this is also an interest of the Rose State Health Department, as Debby expressed they are looking into addressing cooling center barriers as well. Nadine highlighted how perplexed she and her colleagues were regarding the complexities of cooling center management. Ultimately, she said whether it is a heat or ice event, people will not attend shelters. Reflecting on the process, Nadine looked at me with amazement and stated, "it's just *incredible*; the dynamics sometimes are just incredible."

In any event where sheltering is needed, schools become ideal. Schools are prominent focal points in a community, therefore, they are likely to be found and accessed

by residents. Schools also have multiple restrooms, kitchens, handicapped entrances, and larger facilities to fit many people. The importance of having school districts as partners was a key discussion point for Leslie, the Environmental Health Director of Lavender County Health Department. In Leslie's experience, schools were essential meeting points because many people without access to a vehicle can easily walk to them.

It feels very comfortable, it feels very safe. I know how to get to..um...[names school]. We've been to the high school many times and get a great turn out because *people know the school*. They know the parking, they know how to get in and out of the gym. It feels very friendly and familiar to them and also we know the school. You've got restroom facilities, you've got handicapped entrances. You've got...I mean schools are just...they're wonderful in these events [laughs] because they come with all that! [9.25.2012]

She emphasized, "people *know* the school," she shrugged her shoulders and changed the tone of her voice, displaying her understanding of what the county residents need.

Leslie was very familiar with preparedness topics even though her job was as the department's Environmental Health Director. She joked as she discussed a time when she was planning an event with her partners and colleagues. As they continued to discuss where to have an H1N1 influenza vaccine clinic, Leslie looked at her colleagues as she stated, "you're gonna need port-o-potties." With confused looks, they stared at her as she explained, "you're talking thousands lined up, you're going to need Port-o-Potties." Her colleagues were unsure of where to get this resource, which is where Leslie informed them she could help. She laughed as she told this story and was shocked that, "they didn't even really think about" the logistics of planning that type of event.

Education and Outreach

As part of preparedness efforts, health departments release seasonal press releases containing information regarding resident health and safety. This information can be sent

to local media sources, posted on departmental websites, and sent via Facebook© or Twitter© to followers. Seasonal information includes heat basics including tips to stay cool (hydration, clothing, medications/foods to avoid) and terms such as heat exhaustion and heat stroke as well as their warning signs. Seasonal press releases also highlight older adults and children as vulnerable groups. Every county in all three states was researched for heat wave information on their health departments' website (Table 7). In all three cases, the State Health Department included heat illness mitigation information on their website(s). Cypress and Heron Health Departments stated they use their website as the main resource for outreach and education. In Maple and Alder Counties, technologies are in place on websites to monitor the flow of traffic; the actual numbers, however, were unavailable at the time of my interviews.

While many similarities exist with heat wave preparedness, Rose had the most local health departments with heat wave information included on their websites. In Rose, 26 health departments provided information for heat waves on their websites. Due to the fact that many of the counties in Rose are represented by one health department in a region (i.e. some health departments represent ten, five, three, two counties etc.), a total of 55 counties were represented. Even in counties (such as Aster District) where heat is not an immediate threat, they still included heat in their emergency preparedness efforts.

There was a lot of overlap across states on their websites including press releases discussing the summer season or for an impending heat wave, locations of cooling centers in the county, how to recognize a heat illness including terminology and suggested treatment options, risk groups associated with heat waves, and fact sheets that provided general information on heat waves. In Aves and Oak, roughly 18% of health departments

Table 7

Heat Wave Website Information by State

	Rose	Aves	Oak
Number of Counties	83	115	102
Number of Health Departments	47	115 7 City/County and 108 County	96 Serving 100 counties
Health Departments with Heat Wave Information Present on Website	26 (representing 55 counties)	21	17
Information Included from State	Seasonal Information Heat Hazard Terminology Risk Groups Press Releases Tips for avoiding heat illness Understanding heat illness	Hyperthermia Information Heat Hazard Terminology Heat Wave Preparedness Tips Mortality Statistics State-wide Cooling Center Locations	Press Releases School Prevention Tips for Heat-Related Illness Signs of Heat Emergencies Heat Bulletin: Heat Index Medication Risk Risk Groups Tips to Avoid Heat Illness

<p>Information Included from Local Health Departments</p>	<p>Press Releases</p> <p>Cooling Center Locations</p> <p>Hot Weather FAQ</p> <p style="padding-left: 40px;">Recognizing heat exhaustion, heat stroke, and heat cramps</p> <p style="padding-left: 40px;">Treatment options</p> <p>Heat-Illness Prevention</p> <p>Survey Reports</p> <p>Extreme Heat Fact Sheets</p> <p>Summer Safety Tips</p>	<p>Press Releases</p> <p>Cooling Center Locations</p> <p>Heat Surveillance</p> <p>Heat Preparedness Tips</p> <p>Risk Groups</p> <p>Summer Safety Tips</p>	<p>Press Releases</p> <p>Cooling Center Locations</p> <p>Heat wave Safety</p> <p>Preparedness Guidelines</p> <p>Summer Safety Tips</p>
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included heat wave information on their websites. Only Rose had two local health departments that completed research in their counties regarding heat and climate change. Laurel County Health Department was one of the two health departments that developed and disseminated a survey about heat waves to their residents. The results are available in an executive summary on their departmental website.

In Aves, Heron County Health Department had a website stockpiled with information about earthquakes, cooling and warming centers, child emergency, and extreme hot and cold weather, fires, floods, pandemic flu, power outages, terrorism, and tornadoes, all of which were listed under emergencies and disasters. Patty, the Heron Emergency Preparedness Coordinator, described the website as “providing something for everyone.” When I asked if her residents were responsive to the website, without hesitation, she exclaimed, “absolutely!” Teachers and educators in her county frequently call to obtain information about a certain health topic, in which Patty also directs them to the website for more information. With the median income⁷ of \$37,000 for residents (U.S. Census Bureau, 2013), Patty depicted Heron County as being impoverished, with some residents living without fans, air conditioning, or in extreme cases, running water. How can such an impoverished area have access to computers to use the website? Patty answered my question by stating, “it doesn’t depend on what economic level you’re in, someone still has a smart phone.”

All counties interviewed in this study included heat wave outreach press releases and heat wave resources available on their websites with the exception of Pecan and

⁷ Patty stated that the median income was \$15,000 for her residents. I thought this was so shocking that I repeated the number just to confirm I heard correctly. The number she provided, however, did not match the census reporting for the county.

Chestnut County Health Departments. Chestnut Health Department was without a website entirely, but instead uses a Facebook page. Pecan County Health Department has a website, but does not include any information on heat waves.

Partners

Establishing relationships and partners was an essential discussion point among all individuals who participated in the study. From the information expressed by study participants, partners are essential not just for heat wave preparedness, but for all of emergency planning, as they help decrease the work load of public health while increasing accessibility for health education and health care. Each partner was used for different reasons (Table 8), with first responders listed as the most common partners.

Although not directly related to heat waves, PODS (point of dispensing units to distribute medicine) were frequently discussed by health department officials as being an essential partnering activity. In the event of a disaster or bioterrorist attack, PODS are important to provide mass amounts of medicine to residents of a county. As part of the services that emergency preparedness coordinators are to provide to their residents, PODS have been established as a priority for all health departments across the country. In a bioterrorist situation (i.e. Anthrax outbreak) health departments are charged with providing medication to all residents in a particular time frame (usually less than 48 hours). To give context, in Wren County in Aves has a population of approximately 998,000; the roughly 40 health department employees, by themselves could not serve all the residents in a timely fashion. Therefore, multiple partners including large factories and corporations can act as closed POD units in which health departments can drop off medication, vaccines, etc. for individuals who work at the factory and their families.

Table 8

Health Department Partners for Heat Waves

Partner		Preparedness Activity			
Partner	Cooling centers / shelters	Awareness	Outreach and education	Warnings	Epidemiology
EMA	X	X		X	X
First Responders • Police, Fire, EMS	X			X	
Hospitals				X	X
County Administration		X	X		
School(s) • Primary/Secondary • Colleges/Universities	X X	X X	X X		
Public Health Nursing	X	X	X		X
Medical Examiners / Coroner					X
Animal Groups • Humane Society • Animal Control	X X	X X	X X	X X	
Faith-based /Clergy	X	X	X		
American Red Cross	X	X	X	X	
Park Districts	X	X	X		
Senior Centers	X	X	X		
Assisted Living	X	X	X		

As opposed to the closed POD, an open pod is for the general public; there can be multiple open PODS all over a county. While PODS are not used for heat events, they demonstrate the need for multiple types of partners depending on the emergency situation.

Heat Vulnerabilities

In literature, it has been well-documented that older individuals, young children and infants, people with chronic diseases, individuals on certain medications, and the impoverished are more susceptible to a heat event. Health departments in this study also confirmed that these are their target groups with the exception of Kestrel Metro. In 2011, Kestrel had 21 heat deaths and 52% were under the age of 64. According to Kestrel's website, five key concepts are to blame for heat deaths: 1) Refusal to leave home for a cooling shelter, 2) keeping windows closed in the home due to fears of robberies, 3) reducing air conditioning use due to costs, 4) inadequate fluid intake, and 5) furnace effect (City of Kestrel, 2012). The furnace effect was something described as broiling the body from fans circulating warm air in inside a residence (City of Kestrel, 2012). Kestrel Metro still advocates that vulnerable populations, including those listed above, should be cautious during a heat event. However, Kestrel wanted to ensure they were including all individuals in their heat wave awareness campaigns and not just vulnerable populations. To be more all-encompassing, Kestrel tailored their heat outreach and communications by asking the public, "who are you, what are you doing, and what are you putting into your body?" With this type of open-ended strategy, Don stated the general public is less likely to tune out health officials.

We've found that's more palatable, cause it makes them ponder. They still may make a choice that is not in their best interest, but they've stopped, they've listened, they haven't dismissed me. [11.2.2012]

Don, who is experienced in heat communications, was very animated about this topic. He spoke by varying the pitch levels of his voice to suit the sarcasm he frequently used to describe the situation within Kestrel. Unlike any other health department, Kestrel has had a history of dealing with heat-related illness and therefore is accustomed to dealing with such issues in their city and surrounding suburbs.

Assisted living centers, nursing homes, and long-term care facilities were described as being the holes in their emergency preparedness planning for counties in both Oak and Rose States. Assisted living centers are not mandated to have emergency preparedness plans, decreasing their likelihood of being prepared for a disaster. Although at least two other participants mentioned assisted living, my conversation with Nadine still resonates as she discussed one particular incident. On July 3rd 2012 in Violet County, Nadine, was preparing for a brief holiday break for the Fourth of July. At 3:30 p.m., an assisted living facility in the Violet County phoned Nadine and sought help for a potentially dangerous situation. The caller's assisted living center, which was host to independent apartments, assisted living quarters, and healthcare facilities, was at least 80% capacity, and their medical facility had lost electricity. The heat index was forecasted to be 120°F for the Fourth of July holiday, and the assisted facility center was without a generator. In her dramatic description of the phone call, I could hear the apprehension in Nadine's voice as she was recalling the moment when the caller asked, "What do we do?" Before she answered the nervous caller, she thought to herself, "oh my gosh! What *do* we do?!" If they had phoned just 30 minutes later, Nadine would have been out of the office for two days. Fortunately, Nadine and a local hospital administrator worked together to acquire a

generator for the assisted living center. After the incident, Nadine worked with the assisted living center to develop an emergency plan for the future.

In recalling the same heat event in a different part of the state, Debby stated that the city of Rowton had assisted living centers phone the state for assistance during the heat wave. Similar to Nadine's story, they were without electricity and did not have a generator. In all cases, the state was able to provide assistance, but the uncertainty remains a concern that needs to be addressed. Unfortunately, this story was all too similar with that of other health departments regarding preparedness efforts of assisted living centers. In describing the preparedness of his county, Harvey, the Chief of the Office of Emergency Management for Elm County, graded multiple areas of outreach.

It's a group where we're really struggling, and we're trying to bring it in. But right now, it's a D if you're going to score A through F. Public safety to me is an A, education is an A...you know? B+....A- somewhere in there. Long-term care...it's a D, D- [11.16.2012].

The confidence and boldness in Harvey's voice was prominent in all aspects of our conversation. He had a presence about him that symbolized his audacity and experience in the field of preparedness. In our conversation, he would frequently end his statements with a question as to elicit a response of agreement on my end.

Media and Communications

In regards to vulnerabilities to heat waves, communication was a key factor for all departments. In fact, every health department stated the communicative properties of heat wave outreach as being essential components to any plan, written or unwritten. Heat waves were described as being a "communications event" by Don of Kestrel Metro. Don, who was the Program Manager for Health and Social Marketing, as well as the Heat Mitigation Coordinator for Kestrel Metro, filtered incoming and outgoing messages and

addressed inquiries from the surrounding media in the city. As someone who was proficient in discussing heat waves, heat history, and unfortunately, heat deaths, Don was well-versed in his practice and messaging strategies. Don depicted a scenario in which the health department and the media, or “double agents” as he referred to them, were involved in a complex interplay of sensationalism. As a health agency, public health officials are charged with protecting and enhancing the health of their communities. In Kestrel, the area was accustomed to heat deaths every season; therefore, the health departments has the challenge of calmly and accurately educating the public about the seasonal, inevitable effects of heat waves, while also battling the exaggeration and drama the media would use in its feature stories.

In Kestrel, the medical examiner, located in a neighboring county, is responsible for examining cases within 6 different jurisdictions (2 cities and 4 counties). If a heat death occurs in one of the six locations, Don is charged with reporting the public content of the case. What is made public? This notion of public versus private is an issue in and of itself. According to HIPAA laws, the only two pieces of information that can be made public are gender and year of birth. Jurisdiction, or area in which a body is found, is not released to the public, as this is an identifier and an invasion of privacy. Law suits are a predictable practice in which Don is experienced. In Kestrel, the media, not interested in the preventive actions for heat waves, are instead, interested in the details, or juicy tidbits of an individual dying from a heat event. In describing the roles of the media, Don stated, “You, you don’t ever want to feed the beast. Um, because then they swarm, and they’re sharks.” He went on describing in detail, and changed his voice to suit the needs of the characters in his story.

'THIS PERSON HAS *DIED* CAUSE OF THE HEAT'! They believe it was showing impact, and when you have visuals then they'll be able to get the next of kin, the neighbor; so they'll all be talking 'I didn't know, it was hot and they didn't want to do anything!' They want to tell that story. [11.2.012].

Don's voice echoed in his office as he yelled the first line as if he was reading the title of a newspaper. As he acted like a 'neighbor' in the story, he depicted their voice to sound aloof and unassuming. The media, in Don's experience(s), was after one thing, the story. If the media were unable to obtain information they wanted, they would sue the health department, and Don in particular. Until this point, the media was described by all other health departments as being a team player, an advocate, or partner.

Whitney, the Interim Emergency Preparedness Coordinator at Cypress County, was also accustomed to working in a large urbanized area. Cypress County includes Allium, the largest city in Oak State, and has 2.4 million residents. Throughout our conversation, Whitney would succinctly and eloquently characterize her county and responsibilities. Although it was a telephone interview, her voice was strong and through her enunciation I could feel the tensions she would describe, or by the way she would discuss a point and then add my name as if to really hit home the meaning of what she was saying. For example, when describing a relationship, she would state, "I think our biggest weakness, Alicia, is" and go on with her sentence. Although it was something as small as mentioning my name when she spoke, it symbolized her interest and intensity in the conversation. Similar to Kestrel County Metro, Whitney described the media as sometimes sensational, adding "sometimes they get it right, sometimes they don't." She spoke in a matter of fact way, as though this was just part of the job.

Managing the media was the responsibility of Cypress County Health Department's public information officer (PIO). Whitney described her as being excellent at her job

because the PIO was always available and provided information quickly and accurately. Reflecting on this further she stated, “we really stress getting...being accurate. You know, accuracy is important to us.” Whitney worked in a particularly challenging area of the state, in which her county was accustomed to intense and historical divisions between more affluent northern suburbs with more impoverished southern residences.

The negative view of the media as depicted by Don and Whitney was in contrast to every other participating health department. Most health departments described the media in terms of promoting the health department’s activities. In Pecan County, Sean stated the local television station would frequently feature stories about the Pecan Health Department and would even come to the department to view their exercises and trainings. Sean described his county as being one with slow news stories, in which the local media share educational information about the health department to the general public. Airing a story on the happenings of the health department would not be a routine practice up in northern Oak State. Realizing how fortunate he was, Sean described with a slight tone of humility and wit, the idea that health departments “up north would kill” for the time Pecan County receives on television stations.

Social networking is a newer area health departments are utilizing to get out important public health messages. In fact, every health department in this study, with the exception of Aster District, incorporates social networking (Facebook© and Twitter©) into their communications and outreach. At Heron County Health Department, a designated individual maintains an elaborate departmental website as well as the social networking pages. In other counties, the public information officer (PIO) was in charge of maintaining communication with the general public through various channels. In general, the media

sources used in Aster are more traditional and include using newspaper, radio, and television. A majority of the population in Aster is older; therefore, Vince stated that the radio is the most important mode of dissemination for outreach. The other health departments in this study believed that social networking provided a means to get an immense amount of information out quickly to the general public, all without causing fatigue from too many messages.

During the H1N1 outbreak in 2009, health departments increasingly saw the potential for social networking. Lee, Lark County's emergency preparedness coordinator, wished he had started a social networking page for his department at that time.

In those days, you really didn't know about it, you know? And that would have been the perfect time to build a Facebook community around the health department, 'cause everybody was interested during H1N1.

Although some participants described social networking as the ultimate messaging tool, the devotion needed to maintain a networking site was seen as intense, perhaps even a full time job.

Summary

This chapter included the initial results for the three cases in this study, including a brief description of each health department and state. I also explored the categories of heat wave preparedness plans including heat warning initiation, cooling centers, education and outreach, heat vulnerabilities, partners, and media and communication. These categories, suggested by literature and federal organizations (U.S. EPA, CDC, and FEMA) provide communities and agencies with guidelines of what to incorporate in a preparedness plan. Chapter Five will highlight how preparedness plans are shifting to follow an all hazards structure in which more can be accomplished with less money, time, and planning. In

Chapter Five, the following research questions will be addressed: How do health departments communicate with each other? How do health departments perceive climate change impacting the health of their communities? As it will be demonstrated, theme development within and across cases unveils the complexities of emergency preparedness, and ultimately the strain public health is experiencing.

CHAPTER FIVE

THE BROADER CONTEXT

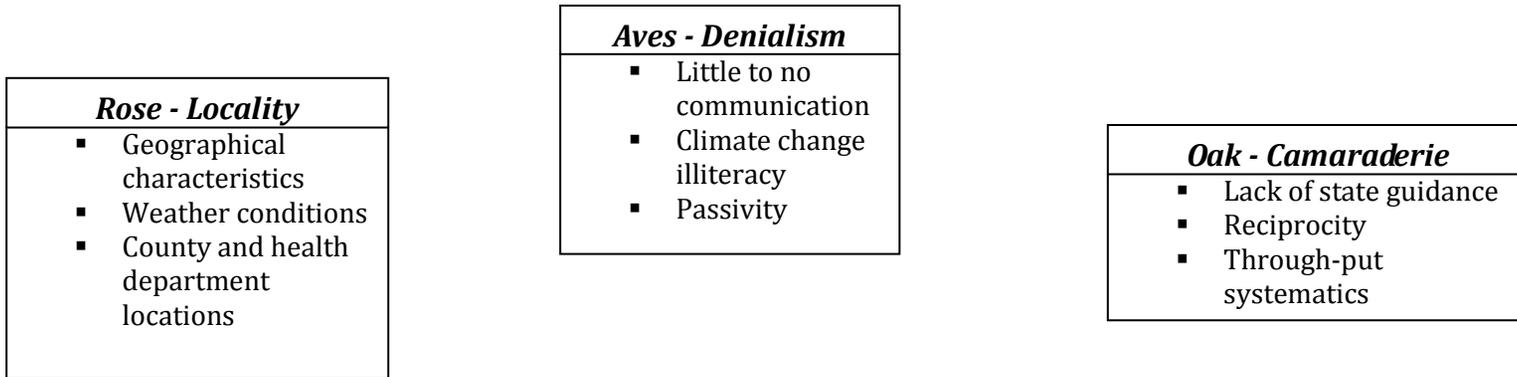
Thematic Concepts

This study followed a comparative methodology in which three states were analyzed for similarities and differences in the way health departments prepare for heat waves and climate change. This chapter will present two levels of themes: Within-case themes (Locality, Denialism, and Camaraderie) and cross-case themes (Leadership, Transitions, Expectations, Imagery, and Strategies). Within-case themes shed light on the preparedness efforts and uniqueness of each state. While the within-case themes could be applicable to other regions, in this study, they represented Rose, Aves, and Oak. Cross-case themes are commonalities across states regarding preparedness, heat waves, and climate change (Figure 6). While cross-case themes demonstrated cohesive examples throughout the states in this study, they may not be applicable to all Midwestern States. Starting by describing the within-case themes, each theme will be depicted by a word, followed by a brief description, and finally supporting examples.

Within-Case Themes: Rose

1. Locality: Geographical characteristics affect extreme weather outcomes and preparedness. It was apparent from documents and interviews that priorities depended on the weather most likely to be experienced by a locality.

Location, location, location. The locality and surrounding geography of a city or community influences the planning for emergency events, as well as for a hazard vulnerability plan. In Rose, a large portion of the state experiences lake-effect weather patterns that either buffer or exaggerate many natural weather phenomena.



Heat Wave Preparedness and Climate Change Mitigation & Adaptation

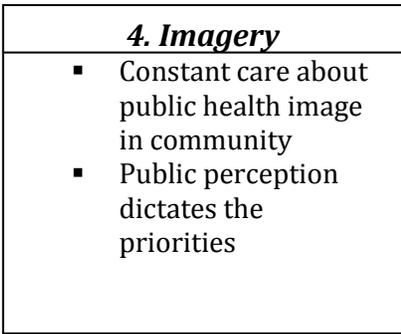
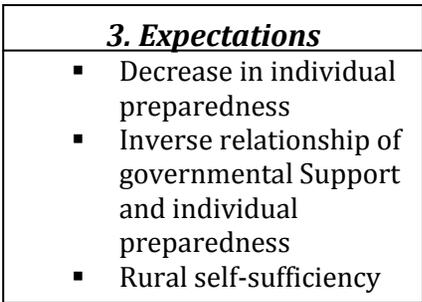
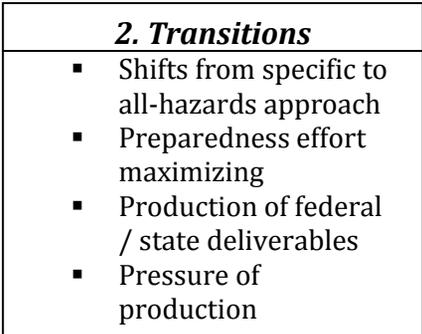
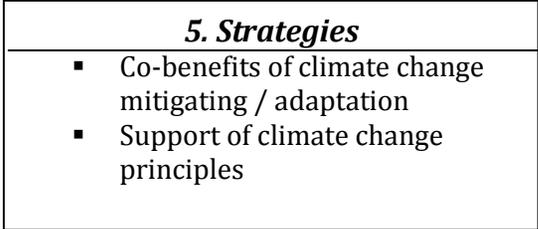
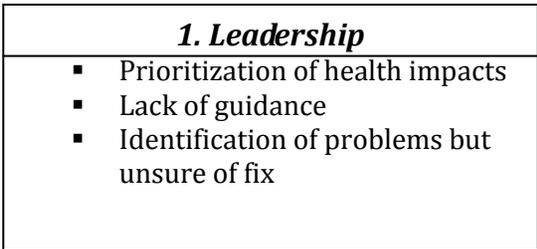


Figure 6. Thematic mapping of heat wave preparedness and climate change mitigation / adaptation of cases.

When discussing the geography and density of Rose, Debby described two larger cities in Rose (Rowton and Riverside) as being vulnerable to heat waves because of the urban heat island effect, but that Riverside had “different weather because of the lake, perhaps.” Other cities in the state, including Monton in northern Rose, had different experiences during heat waves. Monton is near to Aster District, and has experienced heat events but they are less likely to be intense because of the buffering effects from the influence of a Great Lake.

In discussing this further with Vince, I asked him if heat waves were a threat for Aster.

I don't think that we see um, near the uh, the effects that the other places do. Just because our climate and you know, with the moderating effect of Lake Superior on our temperatures is pretty incredible. [9.14.2012]

In the Aster District, even if summer temperatures escalate, the nighttime temperatures allow residents to cool down. This nighttime decrease in temperature is different from urban heat islands in Rose, especially in cities such as Rowton. Urban heat islands have more blacktop, buildings, and density, absorbing more heat and increasing the surrounding temperature. Aster District is relatively rural, and covers an immense amount of geography. Regarding heat wave preparedness, Vince stated that they did not have a plan for a heat event, and that their primary mode of communication with residents (should they have a heat event) would be via press releases or public service announcements (PSA's). Vince linked the lack of preparedness to the climate. If Vince were to be quantitatively assessed on his heat wave preparedness, without a written plan, he would look relatively unprepared. As I observed from our conversation, his understanding of summer emergency room records, high levels of communication with his residents, and

ability to quickly create and broadcast PSA's for his community, demonstrates his good working relationship with his partners and readiness for a heat wave.

Violet County, which is about 560 miles from Aster District, is also impacted by the effects of a different Great Lake. In their case, however, their location was, "perfectly perched" to receive all of the negative effects from extreme weather, according to Nadine. In contrast to Aster, this phenomenon encouraged them to be more prepared for both heat events and winter storms. Due to the fact that Violet was accustomed to intense heat, Nadine shared her concerns for residents that may be without air conditioning in the summer. Nadine had an immense amount of information regarding heat wave preparedness on Violet Health Department's website. She explicitly associated the department's preparedness to two things: Global warming and their location. When she spoke of global warming, she strained her neck and jaw as if to whisper her thoughts about climate change.

I think, and talking about global warming, *it's just me*, I think Rose has seen its share of summers with some horrendous heat waves that come through. What was it...a couple of years ago in Allium? I mean whatever happens in Allium it comes over the lake and it's here. [9.26.2012]

Nadine's beliefs and actions on emergency preparedness and climate change were influenced by personal motivation and her experiences with extreme weather at her current geographical location.

Within-Case Themes – Aves

1. Denialism: Climate change principles are misunderstood, and instead, participants developed their own understanding of climate science based on anecdotal information, the current political climate, and from beliefs of their families. Lack of communication and

assistance from the state health department only reinforces the idea that climate change is unimportant, and therefore, not a priority.

In all but one interview in Aves, every public health official was at least skeptical about climate change. Some officials were astonished that climate change was even a public health topic. During my interview with Cardinal County Health Department, all three officials (Isaac, Kirk, and Michael) denied any anthropogenic influence on climate change. Their understanding of climate change was incorrect, and as they tried to defend their answers they would laugh at each other. As I asked a question regarding their thoughts on climate change as it relates to public health, I had no idea I had opened Pandora's Box.

A: So now I'm going to change gears a little bit, well a lot, and talk about climate change. And kind of get your thoughts on that.

I: These are opinions?

A: The...I.....

K: The health department doesn't have an official opinion on global climate change, um...so

A: Okay.

M: We've heard ...

A: Um, well you can give me your personal opinion but I'm kind of just looking at your thoughts on climate change as it relates to public health or what you think about climate ch...

K: Do you guys have an official position? [turning to Isaac and Michael]

I: I don't think you're going to get a governmental agency to have an opinion on climate change.

M: I think it changes every year, spring, summer, fall,...winter. [voice trails off]

I: I don't think *they are aware* global warming is happening.

K: I think there are extremes and we need to be aware of them for either.

M: Right.

K: I don't think that...personally, I don't think there's anybody that can determine. We just don't have the ability...with the weather and to determine...

M: What's your official position?! [to A] You're not allowed to say that because of the...the...

A: the..?

M: This, board...[he looked down at the consent form in front of him referring to Human subjects Committee] I'm just curious.

A: I...I mean I'm not here to influence your interview but,

I: I mean the health department doesn't have an official position, I mean I can give you my own opinions all day long.

K: [interrupts to ask Isaac] Let's hear yours, yeah... What do you think?

I: I don't think global warming is happening. You can listen to 50 scientists and some say it does and some say it doesn't.

K: That's what I mean, there's no way to determine.

I: We don't know. We're goin' off what these experts...*think*.

M: Right.

K: It could be a million year long trend that heats up and then cools down. I don't stare at rocks. Maybe I should go stare at rocks. [laughter in the room] What are they that stare at layers...?

M: [laughs] Geologists! [10.24.2012]

There are many misconceptions regarding climate change in the above dialogue set.

Isaac thought it was absurd that a governmental agency actually would think climate change was a health issue. Michael made jokes about the issue by adding that climate change happens every season, which confused climate and weather. Isaac, Michael, and Kirk were also intrigued by my positionality on the subject, something that I was not prepared to answer, or in their case, debate. Their most inaccurate assumption was when Isaac stated that we are, "goin' off what these experts...*think*." This was something very new to me. I have dealt with the politics of climate change, but not such a gross skepticism about scientists or scientific findings from public health professionals. What made the interview more striking, was that Isaac, Michael, and Kirk did not realize that Aves had applied for the CDC *Climate-Initiative*. Contrary to their perceptions, the state did have a stance on climate change; however, every local health official I spoke with in Aves remarked that the state did not communicate anything regarding awareness or mitigation.

Lee linked climate change to being primarily a natural occurrence and described himself as "not a global warming person." Throughout our conversation on the subject, he merely stated his opinion in an assertive, genuine fashion. Like all Aves participants before him, he revealed that he had never heard about anything regarding the effects on climate

change on human health through the state, professional public health organizations, or his colleagues. When I asked about activities he would do in the community about climate change preparedness he described this as very challenging because of the many opinions associated with climate change. Lee said that if he gave a presentation on climate he would only report it in an “informational format without leaning either way.” He would give some facts about current warming trends then let residents draw their own conclusions, ensuring to state, “it’s a natural occurrence as part of a cyclic...cyclic thing. And then, is it a...or it’s a manmade thing.” Should he ever do a presentation on climate change, he wanted to follow up with participants to see what they thought of the presentation.

My final interview in Aves was with Don, who was so animated and expressive regarding heat wave communication, I was sure we would have a professional discussion about climate change. Don stated that he has been witnessing more heat events in Kestrel but he described current changes as “an acceleration of change that may have [been] predestined.” He continued by saying, he did not consider himself a “denialist,” but that many of his views on climate change were the way they were because of his father’s (a climate denialist) beliefs.

Within-Case Themes – Oak

1. Camaraderie: In the absence of state guidance, reciprocity occurs between local health departments for emergencies, program sharing, and support.

In all of my discussions with health departments in Oak, collaboration and partnership among local health departments were key strategies for all preparedness plans. It is rare for weather emergencies to impact only one area or county; instead, they cross jurisdictions, demonstrating the importance of mutual support. Nate, from Alder

County, observed that residents do not care what county they are in, because people usually do not confront the logistics of their county on a daily basis as they are traveling in and out of Alder and it's neighboring counties.

We want to make sure that we're coordinated. If Elm [County] is saying, 'shelter in place, don't move! Duct tape your windows as soon as possible!' And Alder is saying, 'go out and play! Hit as hard as you can!' There is a lot of work being done to coordinate those efforts. [11.15.2012]

Keeping messages similar was also stressed by Harvey from Elm County as well, in which he discussed the importance of everyone being on the same page during an emergency. Confusion can spread quickly among residents and emergency responders; therefore, health departments in close proximity need to come together to ensure they are relaying similar messages and being consistent with their municipalities.

In Maple County, a rural area in the southern to middle portion of Oak State, Rina also described how her partners and neighboring counties are likeminded in regards to support. Everything about Rina was practical as she stated, "we work very well because we know we're going to have to depend on each other." She went on to discuss the mutual aid agreement that all health departments sign in Oak, and was quite proud of the fact that Maple County was one of the first to sign. The mutual aid agreement contains a database with administrative and health officials that would be available for deployment allowing a rapid response to emergencies across the state. In 2007, the mutual aid system was essential during an incident in Alder County in which residents were potentially exposed to Hepatitis A from a restaurant. Fourteen health departments in Oak assisted Alder County Health Department in administering preventive medication to over 1,700 exposed individuals (Oak State Health Department, 2007).

Cross-Case Themes

Five themes transcended the three cases. Cross-case themes include the *leadership* of across local, state, and federal entities, the *transitions* from planning methods from a focus on singular events to a more all hazards approach, the perceived *expectations* of residents and their county, state, and federal health officials, *imagery* for how the health departments are viewed within their communities, and *strategies* for incorporating climate change into communities. The five cross-case themes will be explained, by first listing the theme, defining it, and finally, providing examples from the project.

1. Leadership: Whether it is from the state to the local public health level or local health to their community, leadership was lacking among all levels of public health. Identifying the gaps within both climate change mitigation and preparedness planning was relatively easy for officials in this study, but actually making the next step towards action was an issue.

The Rose State Health Department was aware of the daily pressures demanded on local public health in their state. Two key issues including funding reductions and existing relationship tensions were linked to the fact that local health feels, as Debby described, “unloved.” Where the state seems unclear is how to improve the situation. In order to reduce these tensions so that both local health and the state can operate more cohesively, Debby described specific strategies.

They’re really unhappy, as I mentioned, with any mandates because they feel really resource poor. But, they are, they will react in a positive way if the state comes in and provides guidance, we’ll provide resources and that’s really what came out of our needs assessment. They would say, ‘well we don’t know what to do, but you figure it out for us...and help us.’ [8.1.2012].

Although providing resources and guidance seems like the answer, tensions among state and local health departments can harm relationships. Debby described an example

regarding a local health department in her state and a lead poisoning abatement follow up for a child in one of the counties. What happened next involved a cascade of events from the local health department stating they could not do their work without resources, which led to negligence from not following protocols, causing local health to lose funding in the future, and harbor negative emotions towards the state. From a local health perspective regarding state communication in general, Helene described Rose as not being at fault a communication disconnect, and made it seem more like an inevitable occurrence.

With the CDC *Climate Initiative*, Rose State was a Category Two recipient, which included the following objectives: developing strategies for conducting health impact assessments and action plans, enhancing the infrastructure in their state to respond to climate change, develop interventions to reduce the human health impact, create a three year evaluation plan, collaborate with multiple partners, and to present findings at national conferences (CDC, 2010b). While document analysis of their website and interviews with state officials including Debby and Florence, indicated that the Rose State Health Department had percolated climate change awareness and education to the county level, my interviews and document analysis at the county level suggests otherwise. With the exception of Helene, the other three participants were unaware of the CDC *Climate Initiative* grant the state had received. Helene's knowledge of the grant only was evident after she heard the information from the CDC officials themselves while at a conference; she did not hear directly about her potential involvement from her state.

'Cause once the state got the money, I said 'I would like to apply for that grant' and they said 'that is for the state', and I said 'well the CDC and NACCHO said we could apply to you.' And they said, 'what would you like to do and I said, 'I would like to come up with a survey see how people in our county are prepared for an extreme heat event.' And I just had to write a small proposal and send it up there and they

thought that was really interesting so myself and Sage County [neighbors the State Health Department] were like 'okay, we'll do it!' [8.3.2013]

Although the Rose State Health Department website is teeming with an immense amount of information, information may not be flowing down to the local public health officials.

Helene was able to obtain monies from the CDC grant only after she actively made attempts to seek funding from the state. If Rose is doing all the work without collaborative efforts from the local health departments, little can be learned and actually disseminated for long term sustainability.

Regarding the relationship of the Oak State Health Department and local health departments, Harvey and Whitney were of the opinion that the state was lacking in their communication, and ultimately their leadership with local health departments during emergencies. Whitney described the relationship between Oak state and Cypress County as good, but she saw the lack of guidance as being their main weakness.

During H1N1 for example, we were able to talk with them [the State] and outreach to them but they were using an old contact list that we had. And we send them quarterly contacts as part of our deliverables, and they wouldn't give us certain guidance on things. You know, they had to get their lawyers involved and all this stuff...and I understand, but we're sitting here in a face of a pandemic! You know? It's not them that's going to be on the evening news, it's us! You know and I think that's the important thing. [1.15.2013]

Although she was expressing frustration, Whitney's tone demonstrated disappointment as opposed to anger. According to Harvey, the federal government (or "feds" as Harvey referred to them) was more important, but in order to get through to the feds, it was necessary to work through the state. Harvey said there are two important things to ask for from the state: guidance and requests for resources. Ultimately, Harvey described the Oak State Health Department as primarily being the "pass through to the feds for resources." As

stated before, the state is the primary conduit of communication between local and federal health levels, and is the coordination center of messaging and resource administration.

Regarding the leadership needed for climate change principles, if it was brought up at all, it was passive in nature. Patty from Heron County in Aves, was an experienced practitioner with both preparedness and nursing skills. She described herself as “ready for everything.” Patty described climate change as “being in spurts”, equating it to really bad winter storms or summer heat and some years just mild. Patty stated that she was unsure that meteorologists could predict anything related to climate. Her opinion was more passive than Cardinal County as she stated, “I just go with the flow. I’m prepared to do anything.” Patty was not proactive in the way she described Aves communicating climate change information, however.

We’re more I guess a reactive versus proactive...kinda community, and the state is too sometimes. They can try to prepare us ahead of time for stuff and sometimes I think that’s where they slack off just a little bit. [10.31.2012].

The lack of leadership that was demonstrated from the Aves State Health Department was apparent in Patty’s lack of excitement over the issue. Although Patty was relatively prepared for any type of emergency, ‘the reactive versus proactive’ nature of her community and state suggests lack of leadership throughout multiple public health levels.

Similar to the lack of leadership on climatological principles in Heron County, in Violet County, one of the local farms was feeling the effects of the 2012 drought, which caused devastation to their apple crop. Nadine highlighted this as an example for her community members to make the connection between climate change and the impact on the local food economy. I am unsure, however, if Nadine assisted in making these

connections for her residents, or if she assumed that they should be able to figure this out on their own.

2. Transitions: Emergency preparedness is evolving from focusing on separate plans for specific situations into an all-hazards approach. All hazards planning incorporates the usage of multiple roles and priorities, while using similar resources. By focusing on all hazards, local health departments can be prepared for more types of emergencies by reducing the funding, time, and staff needed to plan multiple events.

While only five health departments in this study had written plans specifically for heat waves, all health departments were able to describe the steps they would take should a heat wave occur for their region based on their all hazards plans. In many situations, the resources that would be needed for emergencies are similar. For example, in a winter storm with freezing temperatures or a heat wave with high temperatures people need shelter for warmth or cooling. The press releases and outreach would also be similar, and therefore, could be tailored from a template to the specific threat. The term “all hazards” was not a favorite of Harvey, who observed that “everyone has their own definition for it,” and ultimately, all hazards should mean, “how we prepare and how we train...should be the same for every single emergency.” According to Harvey, the Elm County preparedness plan for a heat wave would be similar to that of a county-wide power outage or a nuclear bomb. Without hesitation, Harvey listed the executive steps to be taken in case of a disaster, including activation of a BioWatch⁸ sensor system, notification of key staff, and ensuring that emergency contact lines to the health department are open. Designated leadership

⁸ BioWatch is a term in which public health officials, “monitor traces of dangerous pathogens in public places where large groups of people gather” (U.S. Department of Homeland Security, n.d.).

depends on the situation and may be emergency management, health department directors, or the emergency preparedness coordinator. The identification of roles is also dependent on the capabilities of a particular agency, or what they are particularly stronger in addressing.

For public health, the “capabilities” discussed in the previous paragraph can be determined from health department deliverables. Local health departments produce ‘deliverables’ or concrete products for the counties they serve as instructed by their funding sources: the CDC and State Health Departments. The CDC has cultivated public health emergency preparedness capabilities, yet most of the communication that local health departments have regarding deliverables is with the state health department. Ultimately, health departments feel the pressure of producing deliverables, and ultimately prioritize their work load accordingly.

In 2011, the CDC established 15 capabilities that local health departments should deliver in public health emergency preparedness (CDC, 2012c). These capabilities are divided into six categories and are placed within either two tiers which determine their prioritization. For example, information sharing, bio surveillance, and community resilience and preparedness are all under “tier 1” categories, while community recovery, fatality management, and volunteer management are “tier 2” priorities (CDC, 2012c). Sean explained that his department’s number one priority is to meet the deliverables of the state and then, “comply with everything the state wants out of us for funding the program.” Health departments also complete Hazard Vulnerability Assessments in which they determine the threats that are most likely to impact their communities. For example, at Cypress Health Department, three priority areas were determined by their vulnerability

assessment for their county including, epidemics, hazardous material, and cyber security. These assessments also highlight specific characteristics of a county including their location and specific risks that require them to prepare differently from other counties or regions. At the time of this study, two health departments had recently completed this process and therefore, were able to tailor their preparedness efforts to meet these needs.

Helene described the vulnerability assessment(s) she was required to complete as being a tedious, one-size fits all format. Assessments were also an issue with Aster District as well, which provides services to a large area in the upper portion of Rose. Although Vince serves a 5,000 square mile area, the population density in Aster is smaller and therefore, receives less funding. As Vince was explaining this concept, I could sense how there were many things he wanted to do in his community, but the limitations he faced were plentiful.

I'm a one person show, I'm it. I'm the coordinator, I'm the staff, I'm the secretary. And I uh...I basically get the work time down and anything that is on top of that is kind of...gravy. The work plan keeps you pretty busy. [9.14.2012]

In Wren County, Gordon's department focuses on all hazards and bioterrorism responses, and when he described his preparedness for these events, described them separately. Having separate preparedness responses for bioterrorism and all hazard events was also the case for Rina from Maple County. She described the history of all hazards in a monotone voice, as it seemed she's explained this concept to many individuals in the past.

[A]fter 9/11, um....the CDC and Congress recognized that public health um...had a major role after the anthrax incident in emergency preparedness and we weren't prepared at all, there was no infrastructure, there was nothing. So...um, they actually started a grant, a public health emergency preparedness grant, it started out just focusing on bioterrorism, and so, for the first three or four years it was primarily bioterrorism and then after natural disaster and then after natural

disaster, and um...local responders at the state and federal realized that local response had a...you know a role in all those then they kind of changed to focus to an all hazards approach. [12.6.2012].

Rina was one of the only individuals who took time to explain the historical context of both the emergency preparedness expansion in public health planning, and also the shift from bioterrorism to an all-hazards approach. While a majority of preparedness dollars are earmarked for bioterrorism planning (i.e. PODS), weather-related emergencies are more likely to occur. Gordon, in Wren County, asserted that while his county represented a relatively large population, the likelihood of a bioterrorism attack was very small. Instead, they were prepared for all disasters including weather-related events and epidemics including H1N1. Since Cardinal County is relatively close to Wren County, they too, operate under an all-hazards approach, and include in their plans the neighboring counties surrounding the large metro area in which they live. The emergency manager for Cardinal County stated that there was a regional response plan involving, coordination with EMA's, haz-mat (hazardous material) teams, and resources, should an incident occur within one of seven counties around Wren County.

In some instances, all hazards preparation extended to all individuals employed and volunteering with the health department. In Heron and Elm Counties, the preparedness coordinators discussed how everyone knew what to do in case of any emergency. For example, at Heron County Health Department, all employees were equipped with "go bags" in case of a disaster. Patty was previously trained as a registered nurse and felt that preparedness among her staff was important. She also sent monthly emails to everyone in the health department suggesting more items to their go bags and home preparedness kits. In the case of an emergency situation, health departments need to have all staff members

ready to report for service during an emergency. Patty shed light on this topic by stating, “no one is going to come into work unless their family is taken care of, so I want them to come into work, ‘cause I don’t want to work 24 hour days!” Patty felt that if the health department employees were prepared at home with kits and plans, they would be less likely to worry about their family’s needs during an emergency, and ultimately, be ready to work for their county. Harvey observed, “if there is an emergency, it is an agency issue.” So while specific units exist in health departments, everyone still plays a role during a threatening situation. Agency preparedness was linked to what Harvey described as a “culture for preparedness.” The Director of Elm County Health Department was supportive of this notion; therefore, all staff members attend five day preparedness trainings when they are new employees.

3. Expectations: Expectations exist at multiple levels and are featured as four distinct subthemes. Individuals in the community need access to resources from the government during emergencies. They also expect safety nets to be casted by the government during emergencies. Unrealistic expectations exist, however, from public health officials who assume individuals should be prepared for emergencies using primitive plans and necessities. Finally, an expectation of self-sufficiency was an expectation held by public health participants serving rural communities.

Access to Resources

Individual preparedness was a priority for at least five of the health officials in this study. In Rose, an non-profit initiative entitled *Do 1 Thing*, has been developed by state-wide partners including state police, universities, local health departments, and EMA as a way to decrease the burden of assembling a preparedness kit by having residents “do one

thing” every month. Monthly focus points include topics such as making a plan (January), saving water (February), locating shelter (March), and saving food (April). For example, June is the “unique family needs month” in which a special items are listed and/ or stored for individuals including those with medical conditions, infants and children, and pets (Do 1 Thing, 2013). The whole notion is to build strong communities that are prepared for any type of emergency.

Nadine, from Violet County Health Department, has taken *Do 1 Thing* and adapted it to the needs of her county. This campaign was one of the first items Nadine and I discussed during our interview. She beamed with pride as she displayed magnets, calendars, and other items that brightly displayed the *Do 1 Thing* logo. Her mission was to get her residents to know the brand of the campaign so that “when they see that they know immediately what it is.” Nadine mentioned *Do 1 Thing* was well received in the community by residents, as people frequently call the health department for more educational information on preparedness. Nadine was one of the most passionate educators for preparedness. Her motto was, “we need to prepare people, and have people understand that chances are very remote, but what’s wrong with being prepared?”

The amount of money needed to prepare an emergency preparedness kit as suggested by FEMA is very expensive, more than the average consumer is probably willing to spend. FEMA guidelines include a three day period of supplies including food and water. It is suggested to have at least one gallon of water per person per day. If there is a family of four then this would be at least 12 gallons of water, excluding for pets. While water is inexpensive, food is not. Many individuals cannot afford groceries to sustain their families for the week, let alone for a time in the future that may or may not happen. Helene

discovered this first hand when she went to a local store to purchase all the items. She only included the basic items suggested for a kit, and her total amount was over \$200.00.

Helene discussed that some of her residents made less than \$20,000 a year. Helene asked with astonishment, “how are you supposed to say, ‘yeah I got three days’ worth of stuff” and still feed your family?”

In Cypress County, Whitney described a lack of response from some of her residents. This lack of preparedness however, was not due to negligence by the health department; it was due to socioeconomic characteristics of poverty and location between the northern and southern regions of Cypress. In Cypress County, the Northern suburbs are typically more affluent, and the southern suburbs are more impoverished and have more violence and lack of resources. Whitney stated the Southern residents are less likely to accept the model of preparedness used by Cypress Health Department because they have other priorities. Cypress County uses a coordinated approach with community partners including first responders, schools, and hospitals, to develop and test plans for emergencies (Cypress County Health Department, n.d.). They incorporate three strategies during an emergency including 1) surveillance, 2) disease prevention and control, and 3) the sharing of health information (Cypress County Health Department, n.d.).

Similar to the *Ready in 3* Program in Aves, Cypress County Health Department encourages families and individuals to have a three day supply of basic necessities (food, water, etc.), an evacuation plan, and designating a meeting place in the event of an emergency (Cypress County Health Department, n.d.). Whitney stated that the southern areas needed “extra attention,” and expressed the difficulties she has in helping them thread in preparedness with other competing priorities.

Safety Net

Kirk and Isaac from Cardinal County both expressed their frustrations with individual preparedness efforts. At times, they would interrupt each other with different opinions on the matter. Isaac, who had worked with the department for almost ten years, stated that the health department had a table at the annual county fair offering education and outreach; no one would visit the table. Isaac assumed that people do not care about preparedness until an event occurs. Kirk was quick to jump in, “they don’t have the funds to spend when you can’t show a return for right away.” Kirk and Isaac seemed resentful that many residents only turn to the department when they are in need. Michael, who is Cardinal County’s emergency manager, was listening to Kirk and Isaac. He was a police officer before moving to the EMA, and added his perspective.

A lot of times...emergency services in general, whether it be public health, police, emergency management, it’s one of those where ‘we want to you know that you are there, but we don’t want to hear from you or see from you. *But* when we need ya’, you better be there.” [10.24.2012]

Michael paused as he said, “you better be there” all while lightly tapping his fingers on the table for each word. Evident from Michael’s frustrated tone and expression, the expectations for the county to provide a safety net appeared to be a frequent occurrence in Cardinal County.

Unrealistic Expectations

Harvey made similar observations across the United States as Kirk and Isaac, but came up with his own ideas to explain the shift in individual preparedness efforts. In discussing the readiness efforts of individuals from the early 1900’s, Harvey brought up an article that had been published in an emergency management journal depicting the shifts we see in self-sufficiency. Earlier in history, “people chopped their own wood, and canned

all their own food, so when the flood came, nobody cared.” His voice changed to a more somber tone as he added, “now, everyone’s just waiting with their hands out.” We really need to “affect this culture” and increase self-sufficiency; this was the ultimate message Harvey discussed as being the most effective mitigation strategy. Harvey’s point about self-sufficiency is important, but constructed around a different time period, as the current culture has deep roots in technological practices and advances.

Self-Sufficiency

While individual preparedness in urban areas was depicted by Elm, Violet, Cardinal, Cypress, and Alder Counties as lacking, preparedness in rural communities was described by Lark, Heron, Pecan, and Maple Counties as strong. Sean linked this to the fact that Pecan County was rural, and not like urban areas such as Allium, “we have lots of green space, so that helps negate the impacts of heat in a community like ours.” Sean also observed the fact that rural county residents may have larger support systems that are ready to assist in an emergency.

Lee serves Lark County in Aves, a rural county with a total population of 22,000. Like Harvey, he described individual preparedness as generally weak across the United States, but in general, rural areas are more likely to be prepared. He described his residents as being “self-sufficient.” Even if rural residents are lacking family, they seemed to “develop an infrastructure” of support and assistance with each other, he observed. In regards to the preparing for an emergency, Lee mentioned that even the health department was accustomed to being independent in their planning, “when you’re rural like that, you pride yourself on self-sufficiency. You figure it out.”

4. Imagery: The image of the health department in their community was very important, impacting the acceptance of public health principles, campaigns, and over all trust of public health endeavors.

In preparing for a heat wave, there are inherent assumptions that public health will be stating the obvious. In Alder County, Nate said one of the challenges was with tailoring preparedness messages to both urban and rural county residents. In discussing his rural residents, Nate exclaimed, “they don’t care what we are saying. If we put out a message that says ‘it’s hot,’ they think we’re idiots, [we know it’s hot] ‘what are you wasting your breath for?’” Maintaining similar messages with both rural and urban communities seemed like a daunting task, as the image of the health department, and ultimately, the trust from the community members would be vastly different.

Focusing on Aster District, when we discussed climate change preparedness for his community, it was nonexistent. When discussing the likelihood of including climate change mitigation efforts into the health department’s planning, Vince described the hypothetical reaction of the community members.

I’ve lived in this community; I grew up here. Um, so I know it very well. They would likely look at it as a waste of money and time. To be frank [chuckles], cause our climate is different. It’s colder, colder climate. So they would be looking at me like I’m crazy! [9.14.2012]

As my interview with Vince was via the phone, but I could sense the sincerity in his voice regarding these issues. Vince did not directly state his own opinion on climate change, and in the above quotation, I am unsure if he would have been proactive within his community even if he was an advocate for climate change mitigation and adaptation. The politics surrounding climate change never were discussed in our conversation. Instead, the reasoning behind the lack of climate change awareness in his community was because of

the current “colder climate.” Ultimately, Vince’s deep roots in the community, and his relationship with the older members of Aster, directed the programs that are incorporated into the preparedness priorities.

In another area of Rose, when Nadine discussed ‘global warming,’ she made a point to state that her stance on climate change was her opinion only. She attributed her beliefs to the fact that she had grown up on the eastern side of the state, which was more progressive as opposed to her current location. When discussing the diffusion and acceptance of climate change awareness into her community she seemed unsure of how the information would be perceived.

[whisper] I don’t know. I don’t know I really don’t. It’s really interesting...we’re [Violet County] Dutch. West Rose is Dutch reformed, very conservative...so yeah...I’m not sure how much people really think this is something we really need to do. All I’m going to say is that I came from the east side of the state and I thought, oh man, these people are really conservative! Very opinionated in their thoughts. But it’s all good! They have me bashing continually! [9.26.2012]

Although Nadine seemed relatively proactive in her thoughts on climate change, her discussion of the topic was contradictory because she would often whisper certain words (including global warming). Her apprehension to adamantly state certain words may be linked to the fact that she was at work, and wanted to be more passive in her climate change stance.

Trust and public image was very important during the 2009 H1N1 flu pandemic. H1N1 was discussed by several participants as being a great example of testing community preparedness, because residents took it seriously, and the event was not as severe as it had been predicted. In Lark County, Lee described communication barriers with the state about when the flu vaccine would be available. Lee described the state as “overly optimistic,” and that their information was directly from the federal government. By the

time the vaccine was delivered to the county, the interest and need for the vaccine had “crested wasting over 2,000 doses.” In Lee’s specific example, the reputation of the Lark County Health Department was at stake, not to mention the loss of monies to produce, ship, and distribute the vaccine.

Regarding the general image of the health department among community members, Kirk and Isaac from Cardinal County in Aves, explained that it is hard to have a positive image in the community. They felt the health department dealt with more unpleasant topics and programs from communicable disease to restaurant inspections. Michael continued the conversation by stating they usually “never hear the good” regarding their job performance. Instead, they often hear criticism from their community members.

So if we did a good job, our bosses hear about it ‘cause they’re the elected officials saying ‘How did we do?’ [laughs] So then we hear all the complaints saying [laughs] ‘You didn’t do it right,’and like Kirk said, it’s hard. [10.24.2012]

5. Strategies: Introducing climate change mitigation or adaption planning requires an immense amount of work and preparation from local health. By strategizing how to incorporate climate change principles into their communities, local health departments were demonstrating their support and preparation for climate change impacts.

In describing the priorities of his health department, Nate stated that “99% [are] geared towards reducing chronic disease and obesity.” Although his health department was not directly doing any actions to mitigate climate change, he discussed strategies public health could implement in the future. From a social marketing perspective, public health officials need to “connect the dots for people” Nate observed, “allowing people to realize that one person can make a difference.” For example, “if we want people to walk 30 more minutes a day, how does that relate to driving less and how many fewer pounds of

carbon [are] in the atmosphere?” There are 200,000 residents in a city in Alder County, “start multiplying,” Nate said. Sean from Pecan County similarly observed the application of climate change into current practices of health departments.

I think..trying to tie climate change, um...into other types of programing whether it's just general uh...air pollution reduction uh, anti-smoking...tie...tying climate change into all these other programs that we might be getting funding for is a way to kind of help bring it into the public health [11.29.2012].

It is unknown if Sean tried to implement these methods into his preparedness model at Pecan.

In 2010, Chestnut County Health Department, with the help of NACCHO and several community partners, developed a plan to improve their strategies aimed at climate change and extreme weather (NACCHO, 2012b). From start to finish, their entire project budget was \$50,000, and was in addition to their other preparedness priorities. Chestnut is a rural county of approximately 16,000 residents, and has faced devastating flooding over a 25 year period (NACCHO, 2012b). Chestnut County is unique because they were part of a demonstration project to implement a needs assessment and strategic plan for climate change. When speaking with Emily, the Emergency Preparedness Coordinator, and Cindy, the Director of the EMA, they noted the motivating factor to take action and apply for the NACCHO grant was all the extreme weather their community had experienced. Planning efforts involved multiple partners serving on the Climate Change Action Committee (CCAC), and included the National Weather Service, the Oak State EPA, the state climatologist, the Chestnut County Board, Chestnut County Farm Bureau, first responders, and several churches (NACCHO, 2012b). When asked about involving the Oak State Health Department, Cindy stated that they did not reach out to connect with the state as a partner

because “at that time [Oak State] wasn’t doing anything that kind of followed along with what we were doing.”

Chestnut County Health Department also had several community partners involved including city officials, the Department of Transportation, churches, city officials, media outlets, first responders, and a state representative. With a focus on extreme weather events including tornadoes, flooding, and winter storms, they included six target groups in their planning efforts. As part of their outreach, the CCAC team within Chestnut created posters featuring climate and extreme weather to educate the community. They created four posters, three with a focus on specific extreme weather events (flooding, tornadoes, and winter storms) and one on climate change and rural communities. The extreme weather posters contained information including pictures, statistics, and the effects of the event(s) with the proposed public health response. The poster with climatological information featured two definitions (climate and climate change), and identified the roles and abilities of the health department for climate change adaptation. The goals of the posters were to increase the climate change knowledge of the community, all while developing a strategic plan for extreme weather events, and promoting communication between advocating agencies.

Community residents displayed mixed reactions to Chestnut Health Department’s efforts, but overall, Emily reported a successful planning effort.

Right at the time the grant was funded, there was a farmer displaying a billboard outside his driveway saying bad things about global warming! [laughs] So...I mean it’s just kind of a misconception here...so Cindy and I were talking before you called..is it the right to present this by saying you can have your opinion either way on global warming and climate change? But, extreme weather in our area is undisputed. [1.9.2013]

One of the many reasons behind their project successes is because they used the term, 'extreme weather.' As Emily stated in the above quote, they were unsure if it was the right thing to do in regards to the credibility of climate science, but for their community it was the right thing to do in order to enhance the acceptability of the initiative. The main goals of the CCAC were to increase knowledge and communication as well as to gauge the county's collective ability to address effects from climate change (NACCHO, 2012b).

Summary

Chapter Five continued analysis by exploring within (locality, denialism, and camaraderie) and cross (leadership, transitions, expectations, imagery, and strategies) case themes. In Rose, the position and geographic location of a health department impacts the preparedness for specific events and ultimately influences the culture of the region. In Aves, skepticism and denialism about climate change caused health officials to have assumptions about the science involved, the state's position, and ultimately, decreased the occurrence of any mitigation for climate change. Within Oak, local health departments created strong partnerships, ultimately establishing a sense of camaraderie among health officials for idea sharing and during emergencies.

Across the cases, lack of leadership inhibits program directions and goals. Funding can vary per state and county, but ultimately, the state becomes the "through put" for the federal government to local government and vice versa. While planning programs for specific events still exists, a transition to all hazards planning allows for resource and program sharing. Within every state, there exists as small battle between local health and their residents to become better prepared for emergencies. With governmental support, residents tend to expect more assistance during emergencies, and are less likely to be self-

sustaining. The image of the health department can influence public health official's morale about their job performance, as well as the types of programs and activities they initiate in their communities. Finally, climate change is an area in which half of participants agreed they would like to address, but with budget cuts, attrition, and staff reductions, it is hard to manage daily activities let alone, as Cindy stated, "going above and beyond." By introducing climate change mitigation efforts into areas that are already established (air quality, water quality, vector-control, etc.) co-benefits of climate action reduce the strain on our health officials while making it a priority among residents. Chapter Six will next focus on themes by threading them into the social ecological model and explaining them further by incorporating literature support.

CHAPTER SIX

CONCLUSIONS, DISCUSSION, AND LIMITATIONS

Communicating Change: “A Hard Sell”

“I think that the only way to get through to people are mandates. Whether funded or unfunded, it’s mandates. So for example, if CDC says have this grant or whatever, the mandate that we have to do in order to keep funding, the mandate we have to do in order to do what is that we do as a health department--is the only way people are going to open their eyes” – *Whitney, Cypress County Health Department*

Personal motives, individual background, state support, and federal mandates are all factors in that enhance preparedness. What do we need to do to enhance our collective emergency preparedness efforts? As demonstrated from this study, a combination of competing priorities makes preparedness a daunting task. Add in the mitigation and adaptive efforts for climate change, and we have quite a challenge. Compound the above information with the staggering statistic of 15%; this is the percentage of attrition, layoffs, and position elimination we have seen in public health since 2008 (NACCHO, 2010). In order to begin discussing the next step in preparedness, the research questions will be restated and threaded into the conclusions. A discussion will follow of preparedness for heat waves and climate change by comparing and contrasting the study findings with current and past literature.

The research questions for this study were built and modified to address the “so what” (Agee, 2009) of the study purpose, objectives, and outcomes. Research questions included the following:

1. How are health departments preparing for heat waves?
 - a. How are established guidelines for heat wave preparedness met among state, city, and county health departments?

2. How do health departments communicate with each other, specifically as communication relates to heat wave preparedness and climate change mitigation and adaptation?
 - a. How are decisions made at the local level to encourage preparedness in communities?
 - b. How are threats to public health filtered in a world of competing priorities?
3. What are the perceptions of public health officials regarding climate change?
 - a. How do public health officials perceive climate change impacting the health of their communities?
 - b. How are public health officials acting on climate change initiatives in their communities?
4. How does grant funding, specifically for climate change, increase the collective preparedness efforts of states and communities?

Conclusions, Generalizations, and Assertions

Rose State was a recipient of the *CDC Climate-Ready States and Cities Initiative* from 2009 through 2012. Analyses of Rose revealed that more local health departments promoted awareness for thermal stress among their residents, and had more available resources on their websites. The Rose State Health Department provided funding for health departments to perform local research projects to enhance their states' collective climate readiness. Although Rose was more proactive for climate initiatives than both Aves and Oak states, only one study participant was aware of the funding that was received by the health department. Helene received funding from Rose state for a climate-related study, but this was after significant efforts on her part. Other participants were unaware of the climate initiative, including the opportunities for local health to obtain money for

planning and research in their communities. Outcomes from this study elude to the fact that the Rose State Health department could be more proactive and involved with their county public health officials.

Although the Aves State Health Department has an immense amount of materials available for heat waves on their website, they provide few (if any) resources and guidance for climate change. Public health officials in Aves, are skeptical and in some cases denying the occurrence of climate change, and unsure about the role of public health regarding mitigation and adaption efforts. As of July, 2012, Oak began developing a state wide strategy for climate change using the CDC's *Building Resistance Against Climate Effects* (BRACE) funding opportunity. During data collection, however, Oak State was only in beginning stages of planning. Oak local health departments were strongly in support of a climate change initiative for the state, but are unsure of steps to take and if it should be mandated by the federal government.

Local health is feeling the pressure of meeting their state and federal priorities and is recommending and requesting more guidance from the state, especially during emergencies. Particularly true in Oak, public health officials feel a lack of guidance from their state health department and rely on the state as a throughput to the federal government for resources. They are experiencing attrition and layoffs, with understaffing a reality. With these negative connotations in mind, leadership is lacking in all levels that were studied. In Rose, the State Health Department is taking great strides in climate change preparedness; however, their trepidation to really involve local health departments inhibited the diffusion throughout the state. Ignoring the imagery associated with being proactive about climate change was also an important hurdle for health officials. At least

three participants discussed the idea around ‘what their residents would think’ if the health department took a firm stance in climate change mitigation or adaptation.

Health departments are prepared for heat waves by providing outreach for residents on ways to be safe in the heat, establishing cooling centers (and if necessary, shelters), maintaining relationships with partners and ensuring that each organization’s roles are understood. Only five health departments in the study had written heat wave plans, while nine health departments discussed their all-hazards approach to heat wave preparedness. Specific program plans are shifting to incorporate more of an all-hazards approach, to reduce the redundancy of planning, resources, money, and time.

In all states, risk and emergency preparedness is perceived to be low among community residents due to socioeconomic characteristics including income level, rural vs. urban environments, and personal motivation. Although health departments in rural areas experience have less resources and funding, they have a tradeoff with their residents’ ability to be more self-sustaining and independent. Public health imagery was important to the officials in the study, as it determined their priorities. While Oak demonstrated climate change knowledge in their state, as a whole, mitigation and adaptation is lacking among all local health departments in the study with contributing factors including budgetary constraints, lack of expertise and training, lack of staff, decreased personal interests, and time.

Discussion

Dissecting the Heat Wave Response Plan

Warning: Planning and initiation

Bernard and McGeehin's study of *Municipal Heat Wave Response Plans* (2004) is heavily cited in articles discussing heat wave planning. Their study assessed and evaluated 18 U.S. cities and determined that one-third of cities were without response plans, with ten cities having cursory planning efforts (Bernard & McGeehin, 2004). In reviewing their study, two findings need to be addressed. Their analyses of heat wave plans was completed over ten years ago, yet their findings are still cited as to suggest a lack of preparedness of municipalities (Ebi, 2007; O'Neill et al., 2010; Yardley et al., 2010). Second, the idea of having a specific heat wave response plan is redundant when all hazards planning could be evaluated for efficiency in heat wave planning (Bernard & McGeehin, 2004; Ebi & Schmier, 2005).

As discussed, studies have suggested that municipalities, as well as the health sector, are unprepared for heat waves and climate change (Bernard & McGeehin, 2004; Ebi, 2007; Maibach et al., 2008; Bedsworth, 2009; Yardley et al., 2010), and yet, written plans do not define preparedness. I met with 17 health departments, and five had heat wave preparedness plans; two of which, provided them to me for evaluation. Harvey had previously met with a researcher wanting to know more about Elm County's specific plan for heat wave preparedness. Harvey described his experience to me in a tone of annoyance.

We don't plan or prepare for a heat wave. We don't plan or prepare for a snowstorm. We don't plan or prepare for a...um...power outage. What..what ..we do here is we have plans that say, when there is an emergency at hand... something..... somebody has identified a threat. Here's what we do, to us, and this is what we

went through with the other gentleman, was,what they were looking for was...what's your heat wave preparedness plan...? We don't have a heat wave preparedness plan. We have a preparedness plan...we do the same thing for a heat wave that we would do for a county-wide power outage [11.16.2012].

While I would disagree with Harvey, and argue that written plans enhance preparedness, assuming municipalities and health departments are *completely* unprepared due to lack of a written plan is inaccurate. From geography to socioeconomics there are many contexts that explain the absence of heat waves specifically, county and community location, socioeconomic status, and education level.

All hazard planning is part of the current response to include multiple threats in a more comprehensive program planning effort. NACCHO (2007) identified four levels of achievement with the *Project Public Health Ready* (PPHR) including networking, coordinating, standardizing, and centralizing within public health. The area of standardizing allows uniformity with “mutual adoption of emergency preparedness functions” including things such as program plans (NACCHO, 2007; Koh et al., 2008 p. 209). Nine health departments in this study were incorporating all hazards frameworks into their preparedness plans. All hazards planning can be effective for multiple threats, and can include overlap using similar partners, sheltering methods, and outreach.

Outreach and Communication

Studies including Ebi (2006), Bassil and Cole (2010), and Yardley et al. (2010) discuss the lack of outreach to vulnerable groups during a heat wave. While lack of outreach is a critical issue that should have more attention and action, previous studies have listed shortcomings in heat wave outreach without discussing the root causes. As demonstrated in this study, smaller communities are more likely to have supportive social networks, whereas in larger cities and counties, high population density can inhibit strong

social networks. Providing door to door outreach strategies can be costly in any type of community, particularly in urban areas with high densities. My interview with Nate shed light on this topic as he mentioned the logistics of a heat event.

Where it gets tricky is when it gets extremely hot, and we have people go door to door to check on individuals to find out if they are okay or not... or wellbeing checks. And we do that through volunteer groups and some staff if it's really bad. But there are gaps, if it was really bad, we would not be able to go door to door to every house or every high rise. So we need some way to support getting people out there.
[11.15.2012]

Developing outreach and volunteer groups is a good idea in theory, but difficult to maintain in practice. Nate mentioned that his health department would "not be able to go door to door" for every at risk individual during a heat wave. With limited man power, how do health departments prioritize the neighborhoods and homes to visit during this type of event?

There are bigger issues here including the management of local, state, and federal spending for emergency preparedness, the lack of staff needed to employ such an effort, and also the culture we instill in our communities for preparedness and networking. In May 2013, budget cuts to many federal programs including *Meals on Wheels*, which provides meals and home visitation to individuals over age 60, were put in place (Sahadi, 2013). The *Meals on Wheels* program is particularly important because the program reaches socially isolated individuals who remain in their homes (Sahadi, 2013). While there are not direct links to heat wave mitigation with *Meals on Wheels*, this program was important to check on vulnerable individuals to ensure they are living in habitable conditions. The reduction in funding to *Meals on Wheels* is just another example of how programs are being forced to proceed without proper monetary support.

Due to the nature of a heat wave, they are considered less threatening (Kalkstein & Sheridan, 2007), with many at risk populations dismissing the educational outreach messages. Although Kestrel Metro was the only health department that discussed middle-aged populations as being identified as a heat wave risk in their county, their messaging strategy targets all individuals by asking them to think about, “who you are, what are you doing, and what are you putting in your body.” Don felt this message technique allowed people to identify with a situation as opposed to opting out. Heat waves pose a threat to at risk populations, because illnesses, such as heat stroke, can occur very quickly and can be very dangerous with lasting effects on the body if the individual survives (Ebi, 2007).

Heat Vulnerabilities

Assisted living centers were identified as being one of the gaps in emergency planning. In a study by Mackenbach, Borst, & Schols (1997), data collected from nursing homes in the Netherlands was used to determine the mortality rate of the elderly during a heat event. They found that mortality rates increased by 50% during periods of high temperatures (70-85°F) (Mackenbach et al., 1997). Gender (with women more susceptible) and level of dependence were determined to be risk factors associated with mortality caused by thermal stress (Mackenbach et al., 1997). Lack of air conditioning was also noted in the 2003 European heat wave, with the mortality rate doubling in France for individuals (older than age 75) living in nursing homes (Kovats & Hajat, 2008). Increased mortality rates among nursing home patients was also noted in England, with people living at home having a lower risk of death (Hajat, Kovats, & Lachowycz, 2007; Kovats & Hajat, 2008).

In the United States, little evidence of heat-related mortality exists in nursing homes, *except* when power failures occur (Sullivan-Bolyai et al., 1979; Kovats & Hajat, 2008). In this study, only two participants discussed having experienced a power outage during a heat wave. In 2010, there were 15,690 nursing homes in the United States with 428 in Rose, 514 in Aves, and 787 in Oak (National Center for Health Statistics, 2012). Nadine's recollection of the assisted-living center phoning her for help is only one sobering example of the gaps in preparedness among these residential areas.

Cooling Centers

Cooling centers are discussed among literature as being a viable option for at risk individuals during a heat wave (EPA, 2006; Ebi, 2007; Luber & McGeehin, 2008). Participants in this study including Nadine, Rina, Debby, Lee, and Helene, all described cooling centers by saying they were "not needed," "unused," or "surrounded by barriers." Similar to these participants, studies have discussed a lack of support for cooling centers by stating they were ineffective for targeting at risk groups (Palecki et al., 2001; Naughton et al., 2002; Bernard & McGeehin, 2004). There are disagreeing opinions about the effectiveness of cooling centers, but inevitably, they seem to be one of the most widely suggested forms of adaptation during heat waves. Rina, Sean, and Lee, who serve rural communities, mentioned that cooling centers were unnecessary. The issue of cooling centers and vulnerable older individuals is addressed later in this chapter, under political factors.

Media Influence

With the exception of Don and Whitney, not one participant discussed the media in a negative tone. Vince stated his supportive newspaper establishments, and Sean discussed

how a local news station would frequently air outreach and health information for his county residents. Don and Whitney were different from the other participants in that they both worked for health departments in densely populated areas. Don dramatically described the media as being a “double agent” in which media reporters would act like a partner, but were only out to get the story.

They're a double agent. That's the thing, you will see, um,..... public health, practitioners or people who are in academia who are not PIO's, but do communications or public health, spout these things about....*the media and they're your friend*; they're high. They're a double agent. [11.2.2012].

Don's stories and experiences with the media were the minority in the study. His experiences shed light the notion that not everyone may have good experiences with the media, especially urban communities. Ultimately, Don depicted the media as being highly aggressive, with little regard towards relaying educational information to city residents.

In an account of the 1995 heat wave, Klinenberg (1999) stated, “the heat turned deadly on July 13, and local media stepped up their coverage of the morbid outcome the next day” (p240). Klinenberg does not state if the media coverage improved the situation or only added to the lack of understanding of the event. The media can be a great resource, providing health outreach messages to all demographics, yet also a deterrent because of their ability to excite and confuse masses of people instantly. Especially for isolated individuals, media coverage could be their link to the outside world; however, if the media coverage is only telling the morbid story, they are only adding to the problem. Waugh (2004) coins this phenomenon, “the CNN effect” in which the media dramatizes the reality of the situation. Due to several factors including, the cultural and political powers of their organization, competition with other media sources, and the influence of social powers, the media might be “restrained in their responses” (Maxwell, 2003, p. 237) during an

emergency (Hallin, 1989; Pew Research Center; 2000; Carruthers, 2000; Maxwell, 2003).

According to Maxwell (2003), the media does the following:

Attempt[s] to personalize risk stories to identify heroes and villains; maximizing[es] claims of risk and minimizing safety claims; paying[s] more attention to the politics rather than science of a situation; focusing[es] more on viewpoints rather than truths; and attempting[s] to reduce issues to dichotomies as opposed to probabilities (Sandman, 1986; Maxwell, 2003, p. 237).

In regards to news stories, a simple educational piece is uninteresting to the general public, and does not promise the competitive edge that media stations may desire. A study by Blendon, Benson, DesRoches, and Herrmann (2001) studying responses to bioterrorism, found that 40% of respondents felt the media overestimated threats, whereas only 11% felt they underestimated the threat (Maxwell, 2003).

Social Ecological Influence for Heat Wave and Climate Change Preparedness

Multiple levels of influence impact preparedness planning including the individual and interpersonal levels, community and organizational level, the political level, and also the physical environment. By applying the social ecological model, this section will follow an approach that teases out multiple layers influencing heat wave and climate change preparedness.

Intrapersonal and Interpersonal Preparedness

As discussed by public health officials from every state, citizens are unprepared for natural disasters. These efforts are influenced by personal motivations, culture, location, and socioeconomic level; all which can enhance or decrease an individual's preparedness. Socioeconomic level of residents, in particular, is an essential point for readiness efforts and planning. As Whitney described, her residents were divided by an imaginary line between prosperity and poverty. Her Northern residents had more resources, greater

access to health care, and ultimately, were more likely to accept Cypress County Health Department's preparedness model of coordinated response efforts in communities. The Southern portion of Cypress County required more attention and support from the health department, and had other issues including violence and poverty clouding their activities of daily living. Harvey stated, "we need to foster a culture of preparedness" involving all levels of government and individuals regardless of socio-economic status.

With individual preparedness there is an inherent assumption that residents and communities understand the messages that we (media, government, academicians, health educators, public health officials) are communicating to them, however, there are many characteristics that guide proper communication. In heat wave outreach, the National Weather Service provides guidelines for an excessive heat outlook, excessive heat watch, and an excessive heat warning and advisory. In the article, *Towards an Early Warning System for Heat Events*, Ebi (2007) stated that Americans comprehend the NWS's heat wave system because it has associations with other weather events (i.e. tornadoes). While Americans are for the most part aware of the watch and warning system, individuals can still confuse or mistake the meanings of each warning level. Confusion for these systems was discussed in this study by Helene.

We do want to work with them to do more messaging or explain the difference between extreme heat waves and warnings things like that and heat indices, because right now there are still people confused about tornado watch and tornado warnings [8.3.2012].

The three individuals I spoke with at Cardinal County also discussed the problems with the typical NWS's warning system (i.e. outlook, watch, and warning). It is an incorrect assumption that citizens understand of the watch and warning system. Confusion for a watch and warning can mean life or death during natural disasters.

Communicating with individuals about preparedness also requires understanding and practice. In the document, *A New Way to Talk about the Social Determinants of Health* (2010), the Robert Wood Johnson Foundation (RWJF) created different strategies of conveying health messages within target groups, providing deeper impacts and understanding. This document provides tangible guidelines on how to avoid politically loaded statements, include solutions, specificity in describing expert credibility, and providing a personal picture to the message (RWJF, 2010). Although the RWJF (2010) is quick to admit, “there is no silver bullet, no single word or fact that will suddenly transform how people think about health” (p. 4), there are ways to practice and develop language that is palatable for the general public. Examples include messages that allow for audiences to make personal, emotional connections, and messages that focus on all Americans and not just one specific group (RWJF, 2010).

Organizational and Community Preparedness

Community and organizational constructs were most influential in this study with resources, partnerships, municipality and health department competency and practice, and social climate representing a strong focus. The most effective response plan has identified a lead agency to carry out the mission be the central hub of communication (Bernard & McGeehin, 2004; Ebi, 2007). Previous studies have assessed the municipality and health department role in heat wave and climate change preparedness. In this study, the primary focus was health department preparedness; however, I quickly learned that in all cases, multiple partners were essential in emergency planning. These partners included first responders, emergency management, municipality leaders, non-profit groups, and social service agencies.

Heat planning requires conscious efforts of multiple groups, and as this and other studies have demonstrated, lead agencies for heat planning including EMA, health departments, and first responders (Bernard & McGeehin, 2004). If health departments were not the lead agency for initiating heat wave planning efforts, they had a more supportive role involving education and outreach with residents. Many times, municipalities are the leaders in opening and maintaining cooling centers, with the EMA guiding the emergency planning efforts. With this in mind, identifying the roles and responsibilities of specific partners during a heat wave or other type of emergency should be a main priority.

There are three main components to community preparedness (Nelson et al., 2007), 1) preplanned and coordinated rapid response capability, 2) an expert and fully staffed workforce, and 3) accountability and quality improvement. With preplanned and coordinated responses, this includes things such as performing risk assessments, mining the legal climate, using an incident command system (ICS), delegating roles and responsibilities, maintaining communication, creating mitigation strategies, and a using robust supply chain (Nelson et al., 2007). Many of these expectations in community preparedness were discussed by participants including barriers to each level. Regarding component two, “fully staffed workforce,” all participants were well experienced in emergency preparedness efforts, yet the numbers of staff for each area were lacking. In Aster District, one individual was in charge of a 5,000 square mile radius that included multiple counties (71,000 residents). This is similar to Whitney, as she had what she called, “a small and mighty team” of six individuals to conduct emergency planning and preparedness for over 2 million residents in Cypress County.

Establishing a “culture of preparedness” was described by Harvey as being a priority. At Elm County Health Department, all employees undergo training for emergencies. These trainings are established as soon as they are new employees, all of whom are under “probation” until they complete the FEMA requirements. Harvey has a good relationship with the director of the health department because the director allows him to establish a five day training exercise for all new Elm County Health Department employees. In reflecting on this topic, Harvey listed multiple reasons why establishing a culture of preparedness is difficult.

It becomes a hard sell and I think this is kind of the same way....you know, yeah, climate’s changing, yeah there’s gonna be more heat, the biggest thing you can do is prepare your communication strategy. People in operations they think it’s sexy. Recovery is hard work. Preparedness is nonexistent in most places because even politically, you go buy two cars...new cars... you see two new cars with your county logo and stuff...well you talk about preparedness, I want to take your staff for an 8 hour training on what to do during a heat wave and develop communication messages it’s a hard sell...it’s a hard sell. But that’s...that’s we build a preparedness culture. [11.15.2012]

This culture of preparedness is also indoctrinated at Heron County Health Department where Patty has go bags for all employees. These go bags are equipped with tools and resources needed in any type of emergency. Patty also encourages the employees of the health department to ensure they are prepared at home. In Rose State, and Violet County in particular, *Do 1 Thing* is the campaign to encourage individuals, communities, and organizations to take time to prepare for emergencies. The *Do 1 Thing* campaign provides options for people to slowly accumulate a preparedness kit, as opposed to feeling the pressure and burden of having to purchase all the items at once. Establishing a culture of preparedness is important, because it not only demonstrates that we need to prioritize

emergencies, but it demonstrates that everyone has an important role with preparedness efforts.

Political Factors

Healthy People 2020 includes goals and objectives aimed at increasing the overall health of the United States. This study highlights three *HP2020* focal areas including 1) public health infrastructure, 2) preparedness, and 3) older adults. Public health infrastructure has emerging issues including public health systems research, which strives to incorporate research initiatives that add to the pool of information about these critical community structures (U.S. DHHS, 2012). Findings from this study are important to highlight the gaps in communication among state and local health departments, resources for specialty based projects (including expertise in climate change), and most importantly, an appropriate amount of staff to plan and implement health programs. In the second focal area, preparedness, emerging issues include building resilient communities that are informed, robust, and capable of social competence (U.S. DHHS, 2012). Regardless of the health event, ten participants in this study highlighted the lack of individual preparedness in their communities. While participants are trying to address this deficit, it remains a high priority.

Part of the *HP2020* objectives for the third focal area, older adults, includes emerging issues of “coordinating care, helping manage their care, establishing quality measures, identifying minimum levels of training for caregivers of older adults, and incorporating research that demonstrates if their needs are being met” (U.S.DHHS, 2012). In identifying needs of older adults, cooling centers were discussed as not being needed in a rural setting because people are more likely to depend on each other, check on their

neighbors, or perhaps attend a “potluck” as opposed to a center. Rina, from Maple county, depicted the potluck scenario, but this seemed more anecdotal than concrete. How can they be sure that the needs of vulnerable groups in their communities are being met during a heat event? Individuals most likely to be affected by a heat event are those that do not associate with friends, family, and/or neighbors (Klinenberg, 2002; Yardley et al., 2011). Socially isolated individuals, regardless if they reside in a rural or urban community, need to have extra care and outreach in all types of emergencies, and most importantly with heat waves.

Politics surround the entirety of climate change, including the communication and action of any directives for mitigation. As evident in Aves, health officials from Cardinal County and Kestrel Metro were unable to discuss climate change without teasing out the politics. According to Don, climate change is not discussed by many in government because they “deal with a fiscal year.” He went on to say that if a fiscal year was longer we would be discussing climate change more as a nation. Don stated that it is easier to discuss weather, as opposed to climate change, because it is more palatable and it deals with the here and now.

Other obstacles identified in this study for any climate change action included the lack of resources needed to tackle some of the effects of climate change. As confirmed in other studies (Maibach et al., 2008; Bedsworth, 2009), health officials from this study specified the following resources were needed, support (monetary), staff, training, and guidance from climate experts. In the end, the question still remains, how do we ensure that public health officials are preparing for climate change? As Harvey discussed, it is a “hard sell” to pitch to some of the busiest individuals in the health care system. Before

Whitney and I ended our conversation, she wanted to share more information on how to get things done.

So the thing is, people look, they open their eyes when someone says, 'look we're not asking you, we're telling you'. [laughs] And it's kind of like, 'I'm telling you to do this for your own good.' And they may hate it! People may hate it, Alicia, people may hate it! People may be like, 'I can't believe you're giving me more work to do..blah blah blah.' But if you'reclimate change and addressing the fundamental issues around it are an issue,...a priority in this nation and in the state, then the only way to get people to do things is to mandate them [1.15.2013].

I was surprised by the audacity of her statement. Whitney was one of several emergency preparedness coordinators who served over one million residents. Mandating such initiatives seemed like the last tangible scenario for emergency preparedness coordinators, yet someone as busy as Whitney was in full support of this notion. Do the current and impending health impacts of climate change challenge the job duties of our public health workers, or interlace into their existing deliverables? Although some of these counties are serving large populations, are battling poverty, communicable disease, and other health issues that threaten activities of daily living, public officials are supportive of climate change mitigation. Climate change is an issue that warrants reciprocal discussion by all members of the health community – local, state, and federal. To achieve this, Frumkin et al. (2008), discussed several techniques that public health can use to incorporate climate change into the health setting including the usage of prevention (primary, secondary, tertiary) with mitigation and adaptation (Figure 7).

Jackson and Shields (2008), suggest several recommendations for preparing local health for climate change including, planning in a timely fashion (Anderson et al., 2005), continuing and improving heat warning systems (Kalkstein, 2003; Tan et al., 2004; Ebi & Schmier, 2005; Ebi, Elm , & Burton, 2005; Pascal et al., 2006; Kalkstein & Sheridan, 2007),

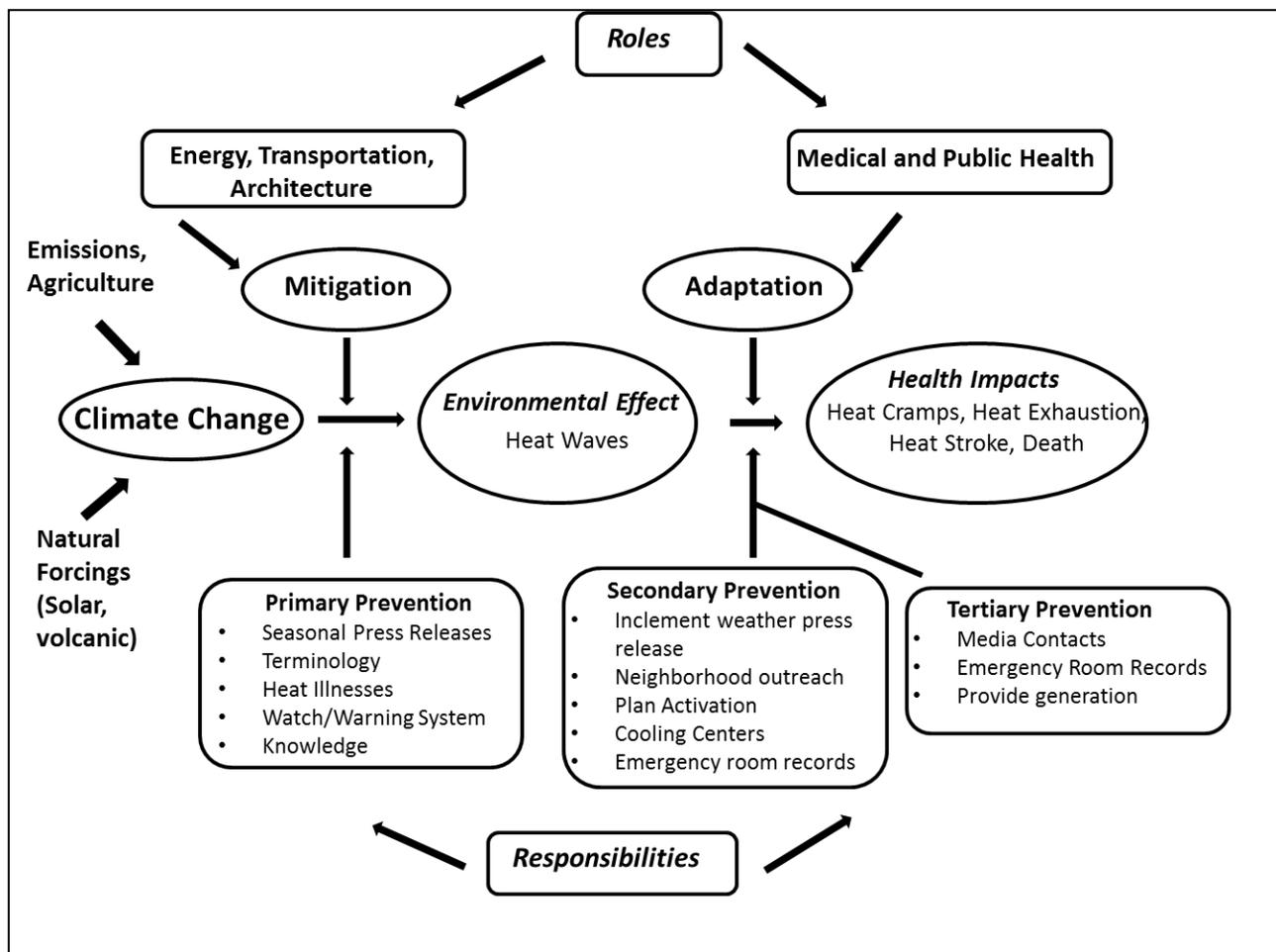


Figure 7. Roles and responsibilities of the public health sector with climate change prevention. Adapted from Frumkin et al. (2008) and McMichael et al. (2006).

working with social service agencies, producing incentives for sustainable practices, increasing public education (Bostrom, Morgan, Fischhoff, & Read, 1994; Dempsey & Fisher, 2005; Leiserowitz, 2005; Smith, 2006), and enforcing energy codes (Greenough et al., 2001; Kilbourne, 2002; IPCC, 2007). Health departments have opportunities to work directly with communities by enhancing their preparedness. They are the “first line of defense” (Balbus et al., 2008), and provide several services that offer strategies that co-benefit multiple health causes.

At Chestnut County Health Department, Emily, the Emergency Preparedness Coordinator, and Cindy, the Director of Chestnut EMA, were part of a demonstration project in Chestnut that led the path for climate change adaptation planning in Oak State. Part of their project recommendations included using language such as, “extreme weather,” as opposed to “global warming” or “climate change” (NACCHO, 2012). The reasoning behind using different terminology was to allow the community to “better understand the project” (NACCHO, 2012, p.4). In thinking about this further, by not using scientifically, and politically-motivated, terms such as global warming and climate change are we providing a disservice to our community members? Is it better to shy away from the inevitable hostility of public perception for climate change for the greater good of getting things done? According to Cindy and Emily, the answer was yes. This is an important notion in discussing the credibility and accuracy of climate change, and how the presentation is important for public acceptance.

Co-benefits of mitigating climate change have been documented in literature (Frumkin et al., 2008; St. Louis and Hess, 2008; Younger et al., 2008; Shindell et al., 2012). Depending on the planning and organization of the health department, they usually incorporate or advocate for air quality, vector control, recycling and waste reduction, physical activity, and healthy homes. Co-benefits can include encouraging residents to grow their own produce or purchase from local sources, while simultaneously reducing their risk for chronic disease, healthy eating, and stimulating the local economy. Co-benefits of climate change action (Table 9) can include reducing emissions, thereby improving air quality which can reduce asthma or other respiratory ailments (Frumkin et al., 2008). Another co-benefit includes reducing individual means of vehicular

Table 9

Co-Benefits to Public Health when Mitigating/Adapting to Climate Change

Health Area	Public Health Issue / Disease Focus	Target Behavior to Reduce	Climate Change Link	Health Promotion Strategy	Mitigation Techniques
Physical Health	<ul style="list-style-type: none"> ✓ Cardiovascular Disease ✓ Obesity ✓ Diabetes ✓ Stroke ✓ Asthma ✓ Pulmonary Disease 	<ul style="list-style-type: none"> ▪ Driving of personal vehicles ▪ Stationary lifestyle 	<ul style="list-style-type: none"> • Carbon emissions • Greenhouse gases from personal vehicles • Air Quality from vehicle exhaust 	<ul style="list-style-type: none"> • Built Environment (Green spaces / parks, safe places) • Sidewalks • Bike Lanes • Health promotion activities (job incentives) • Mass Transportation 	
Healthy Living	<ul style="list-style-type: none"> ✓ Sustainability 	<ul style="list-style-type: none"> ▪ Purchase of non-sustainable foods / goods ▪ Purchase of non-local foods / goods ▪ Not Recycling 	<ul style="list-style-type: none"> • Carbon emissions • Greenhouse gases • Excessive waste and production of more materials 	<ul style="list-style-type: none"> • Community Gardens • CSA's • Seasonable eating • Local purchases • Chemical Collections • City-wide Recycling 	
Mental Health	<ul style="list-style-type: none"> ✓ Anxiety ✓ Depression 	<ul style="list-style-type: none"> ▪ Excessive Worry ▪ Fear 	<ul style="list-style-type: none"> • Extreme weather can cause fear and anxiety during and after events • Lack of green space in urban environments 	<ul style="list-style-type: none"> • Planning for emergencies to reduce anxiety/fear • Urban planting • Counseling during emergencies 	

<p>Environmental Health</p>	<ul style="list-style-type: none"> ✓ West Nile Virus ✓ Lyme Disease 	<ul style="list-style-type: none"> ▪ Unsafe practices from being outside ▪ Reducing breeding grounds for hosts (tires/bird baths, stagnant water pools) 	<ul style="list-style-type: none"> • Vectors are likely to spread as the climate changes – including to areas previously unknown to the vector. • Variability exists with flooding/drought conditions during spring and summer potentially increasing likelihood of proliferation of vector 	<ul style="list-style-type: none"> • Safe practices for being in the woods • Limiting outside exposure to daylight hours during summer and avoiding dawn/dusk 	<p>Adaptation Techniques</p>
<p>Emergency Preparedness</p>	<ul style="list-style-type: none"> ✓ Lack of Individual and / or Community Preparedness for Disasters 	<ul style="list-style-type: none"> ▪ Lack of Care ▪ Resource Availability ▪ Motivation 	<ul style="list-style-type: none"> • Extreme weather events are likely with climate variability • Depending on the geographic location weather events include: Heat Waves, Tornadoes, Hurricanes, Flooding, Drought, Winter Storms 	<ul style="list-style-type: none"> • Preparedness Campaigns • All Hazards Planning 	

transportation with mass transportation and encouraging walking or cycling which can assist public health efforts with the obesity epidemic (Cifuentes, Borja-Aburto, Gouveia, Thurston, & Davis, 2001; Besser & Dannenberg, 2005; Aunan, Fang, Hu, Seip, Vennemo, 2006; West, Fiore, Horowitz, & Mauzerall, 2006; Frumkin et al., 2008). Regarding transportation and carbon emissions, health marketing needs to focus on: “vehicle fuel efficiency, carbon content of fuel, and vehicle miles traveled” (p.518) (Ewing et al., 2007; Younger, Morrow-Almeida, Vindigni, & Dannenberg, 2008). Studies have shown that individual monetary costs are significantly reduced when engaging in more physical activity and less with vehicular transportation (Wang et al., 2004; Younger et al., 2008).

As Nate mentioned, co-benefit planning would be most effective for his department and his residents by providing them tangible information including, the costs to their personal and community health. As demonstrated in previous research studies, climate change adaptation areas are already incorporated into existing health department areas including emergency preparedness, vector-borne disease, and water-food borne disease (Maibach et al., 2008). Also discussed in previous research is the advocacy for social support of neighbors, friends, and family by encouraging residents to interact more with their community. Strong social circles can enhance mental and social health and can indirectly decrease heat wave illnesses by decreasing the isolation barrier (Klinenberg, 2002; Poumadere et al., 2005; Kawachi, Subramanian, & Kim, 2007; Frumkin et al., 2008).

Physical Environment

At least six of the local health departments in this study were located in urban environments, and have to consider the urban heat island effect. In more rural environments, like Pecan County, Sean made a point to discuss the fact that his region is

several degrees cooler than some of the larger cities like Allium. In Aster District, Vince mentioned that while Roses' southern counties were more likely to experience high minimum temperatures, his region had a cooling effect from a nearby Great Lake. The Great Lakes can influence a nearby location considerably by regulating the maximum and minimum temperatures, increasing the precipitation in winter, and potentially the precipitation in the summer time (Strommen & Harman, 1978; Braham & Dungey, 1984; Scott & Huff, 1996; Vavrus & Van Dorn, 2009). After my interview with Vince, I found myself questioning my climatological science and understanding. The Great Lakes can influence a particular region impacting their current climate, but how long with these buffering capabilities reduce the effects of climate change? Should Aster be more prepared for strong heat events to occur?

A location similar to Aster District is important to consider when tailoring social marketing strategies, as messages should not have a one size fits all focus. According to McMichael et al. (2006), "people in hotter cities are more affected by colder temperatures, and people in colder cities are more affected by warmer temperatures" (Keatinge et al., 2000; Curriero et al., 2002, p.861). Currently, Aster District is not having an increase in heat waves, however, future temperatures could be more extreme than health officials and the public are used to experiencing. Not all of the residents in Aster have air conditioning (although more recently they are getting access), and a large portion of the population is elderly; therefore, an intense and long lasting heat wave in the area could be very dangerous for Aster District residents.

O'Neill et al. (2009) discusses "long-term infrastructural improvements [can] lower heat in communities" (p.4), thereby reducing the urban heat island effect. Increasing

albedo (i.e. reflectivity) of an area can be implemented using different avenues, one of which is by planting trees to reduce the amount of unused pavement. Debby, from Rose State Health Department, stated that some of the local health departments in her state are currently working on these very projects. Not only can plants reduce temperatures in an urban area, they also add to the “community cohesion because it’s nicer out and people can go outside and hangout” stated Debby. There are at least three health benefits here including, 1) physical health by increasing the built environment, 2) mental and emotional health to add to the aesthetics of a community, and 3) environmental health to reduce heat within an area. Due to the adaptable nature of the human culture, many communities can temporarily buffer themselves from climate change effects (McMichael et al., 2006). In the end, the resiliency of a given area is dependent on the resources and economic capacity of the residents and region, with those most impoverished likely to experience most of the climate change burden (Cazorla & Toman, 2000; Claussen & McNeilly, 2001; Jamieson, 2001; Adger, Paavola, Huq, & Mace, 2006; Revkin, 2007a; Revkin, 2007b; Frumkin et al., 2008).

Study Limitations

Study limitations were briefly addressed in Chapter One, however, this section highlights ongoing limitations I experienced throughout the study. During document analysis, two barriers need to be addressed: Lack of a website to obtain documents, and the time of year for the search for documents was conducted. Fourteen health departments (12 in Aves and 2 in Oak) were without websites and two health departments’ websites were under construction (one each in Oak and Aves). Since these health departments were not contacted, and also were without online access, it cannot be concluded if the health

department had any information to prepare for heat waves or climate change. The time of year in which documents were collected also impacted the study. Documents for Rose were collected in July and August when heat events can be particularly devastating. Document collection and analysis occurred later in the year (September and October) for both Aves and Oak. Ultimately, it is difficult to determine if health departments lacking heat wave information removed it since it was no longer pertinent to the season, or if they were without information on their websites entirely.

Another limitation of this study was the inability to meet with all three state health departments. Although the Oak State Health Department provided answers to questions via email and telephone, a face to face interview would have been more informative on Oak's collective preparedness efforts. Due to frequent calls, confusion, and misinformation, I also was unable to meet with the Aves State Health Department. An interview with Aves State would really have shed light on the local health department misinformation about climate change, and therefore, I think this is a detrimental limitation to the study.

As an outcome in this study, the Rose State Health Department was depicted as not very proactive at the local level in percolating the CDC *Climate-Initiative*. In Rose, only four interviews took place at the local level, therefore, it may be an assumption that Rose was not providing leadership to their local health departments for the CDC grant. I do think, however, that their lack of action speaks loudly from the participants I did interview. One of their grant objectives was to involve the county level, and health departments in surrounding counties to the state health department seemed to be the only active participants with the state.

In the case of Cardinal County, their lack of knowledge on the subject of climate change decreased their ability to discuss the topic in a professional manner. Interviewing in Aves was enlightening, sobering, and allowed me to recognize how my assumptions led me astray. Similar to an interview in my pilot study, and in the same state, all participants joked with each other at what they thought was a trivial topic for health departments to ponder. As I was interviewing Isaac, Kirk, and Michael, I sat frozen, with my stomach churning from feeling inadequate about the situation. On my drive home, our climate change discussion played over again in my mind. Control was not established in the room, and it *should* have been. The conversation could have been guided to a more professional trajectory. If Aves would have received funding for climate change, I wonder how different my conversation would have been with Isaac, Kirk, and Michael.

Finally, I wish to reflect on my experience and limitations as an interviewer. From start to finish, my interviews collectively grew stronger as I was learning the art of asking questions and (most importantly) listening. However, even after listening to the final interview it was apparent that I was (as a friend described) standing at the plate with the bat poised to hit the perfect pitch while all the fast balls kept flying past. The fast balls in this scenario were the discussions that I had with participants. While listening to my interviews, I would think to myself, “why did I not ask a follow up question to their answer!?” I would internally vow to rectify this situation during my next interview, and yet the fast balls would continue to strike. The art of listening is something that was described to me as a three-way process in which the interviewer is listening to themselves asking the question, while also listening to the participant’s answer, and finally also being ever present between both conversations as if you were watching it externally. Mastering this

process does not happen overnight; it takes practice and reflection. Although some interviews were stronger than others, the journey from start to finish made me realize the importance of enhancing my craft and experiences for the future.

Summary

Chapter Six addressed the research questions by incorporating them into the study conclusions and generalizations. Chapter Six dissected the within and cross-case themes by first discussing heat wave preparedness planning, and then incorporating the social ecological model across the cases. Preparedness plans for heat events were investigated further by discussing the planning and initiating of warning systems, outreach and communication of heat events, addressing heat vulnerabilities, examining cooling shelters, and depicting the media's influence in preparedness. The social ecological model provided a framework to highlight the variables that enhanced or decreased preparedness for heat waves and climate change. Finally, study limitations were addressed to shed light on areas that could be avoided or enhanced in future research. Chapter Seven will focus on the implications of the study, including the idea of sustainability and what it means for public health. Chapter Seven coalesces to address recommendations for health educators, public health policy, and in future research.

CHAPTER SEVEN

IMPLICATIONS, RECOMMENDATIONS, AND REFLECTIONS

A Piece of the Sustainability Pie

During my interview with Sean, he discussed the issue of sustainability and how certain locations are in varying stages of the crafting, what he named, “the sustainability pie.” Sean discussed the recycling program in Pecan County, and how that was only one slice of the pie that was addressed. But, as he continued his discussion, it was evident that Pecan, like many other counties, has a lot of work to do.

If you look at all the other pieces of the pie from climate, energy efficiency, transportation planning, um..uh sustainable agriculture, local foods, uh you can slice that pie up a zillion different ways and...um..and a lot of those things just aren’t getting addressed [11.29.2012].

Discussing the “sustainability pie” was a pivotal moment in my data collection and for this project. While this study researched one slice of the pie, in order for a change to occur within our culture, we need to address *all areas* of sustainability. Climate change communication is an important slice to address within many sectors of health, academia, and government.

On a podcast titled, *When Heat Kills: Global Warming as Public Health Threat*, the poster child for global warming was discussed as being a polar bear. George Luber, a CDC scientist featured on the podcast, continued to discuss that this notion caused people to disassociate themselves from the problem of climate change (Luber, 2012). Instead, we need to bring the focus to health, as climate change may have more appeal if it resonates as issues that impacts their lives and communities (Luber, 2012). Climate change is a relatively new topic within public health, “largely as a result that the scientific evidence

around climate change has matured to a place where public health feels confident in engaging the science” (Luber, 2012). Public health officials have an important role in communicating the health effects of climate change, because they are a trusted source as opposed to journalists and politicians (Luber, 2012). Previous studies have addressed this issue as well, stating that linking personal, family, and communities to climate change and health are more likely to leave lasting impressions on individuals (Maibach et al., 2009).

Recommendations

The recommendations for this project are multifaceted and incorporate different fields and research techniques.

Recommendations for Health Education

1. Health educators have a great role in educating the general public, including at risk populations, the dangers of heat waves. According to Kovats & Hajat (2008), education on heat waves should be repeated every season. Health educators should work together with cooling centers by offering health events, screenings, or fairs to provide information to people who are already gathered together. Having an event might also encourage people to visit cooler locations during a heat wave. Events could include:
 - a. Keeping safe during a specific natural disaster (i.e. heat events, winter storms, tornadoes etc.). Providing safety tips as well as signs and symptoms of ailments associated with weather events (heat stroke, heat exhaustion, heat cramps, frost bite, and hypothermia).
 - b. Screening events (cholesterol, blood pressure, blood sugar) with volunteers from local health centers, hospitals, etc.

c. Information on seasonal summer issues including vector-borne illnesses such as Lyme disease and West Nile Virus.

2. In this study, public health officials with the most knowledge and application to heat wave planning were those with a major and/or focus in health education. This has great implications for marketing the profession, and can be taken into preparedness contexts.
3. In my interview with Patty from Heron County Health Department, she mentioned the establishment of programs that provided preparedness education to WIC mothers. This is a great prevention effort and should be expanded to multiple locations and states.
4. Climate change is not a major focus in health education, and truly is an area that should be addressed in our Environmental Health and Contemporary Health courses. By examining the differences between weather and climate, defining climate change, discerning the greenhouse effect versus the enhanced greenhouse effect, discussing climate change misconceptions and examining credible research, examining how climate change can impact our health, communicating about climate change in ways that will diffuse throughout communities, and finally, making informed decisions as consumers and educators about sustainability, we are enhancing climate literacy among our students.
5. As health educators, just as we communicate and advocate for health education, we need to advocate and empower for climate change education, mitigation, and adaptation. While Americans are likely to worry about climate change, only 1 in 5 individuals understand the complexities of the climate issue (Frumkin et al., 2008). Enhancing

our communication on this subject is a step in the right direction to reduce this deficit.

6. Public health roles have been established for climate change mitigation by incorporating the *Ten Essential Services of Public Health* (Frumkin et al., 2008). We should also develop roles and responsibilities of health educators regarding climate change adaptation strategies.

Recommendations for Public Health Policy

1. One of the largest gaps in heat wave and/or emergency planning was with assisted-living centers. All educators in the health sector should prioritize this group of individuals, as senior citizens continue to be vulnerable to many diseases and natural disasters. Recommendations include:
 - a. Working with assisted-living and nursing home staff regarding preparedness planning.
 - b. Discussing preparedness planning and implanting planning events for senior residents of assisted-living centers.
2. State health departments should evaluate their relationship with their local health constituents. There are mixed messages with local health departments citing a lack of guidance from the state, but the state mentioning they do not want to be too intrusive with local health.
3. The topic of mandating climate change was brought up by Whitney from Cypress County Health Department. While this is an important area of discussion, the nation cannot collectively discuss climate change mitigation without intense political discussion.

4. Staff and funding pools are limited; therefore, researchers and academicians need to develop practical approaches to battle the climate issue at the local level (Bedsworth, 2009) that involve the community members themselves.
5. In order to plan mitigation strategies for climate change, it was recommended by Don from Kestrel Metro, that our government plan events in periods longer than a fiscal year. Although we cannot singlehandedly change the way government functions, I do think this brings up an important notion about climate change awareness.
6. In addressing both climate change mitigation and adaptation, we need to shift to a culture of sustainability. Not one local health department in the study was implementing anything for climate change mitigation. By focusing more on sustainability, communities can change their behaviors to be more environmentally friendly; all while using more palatable language for individuals to ponder. Sugarcoating scientifically accurate climate terms (and replacing them with terms such as 'extreme weather,' 'sustainability,' etc.), brings up issues of credibility and accuracy, do we want to dance around the issue to make an impact or continue and debate the causes of climate change?

Recommendations for Public Health Practice

1. A gap in preparedness for heat waves was with power outages. Participants mentioned they would be prepared for a heat wave, *unless* they were without electricity for extended periods of time. As a technologically driven culture, we rely heavily on electricity in our preparedness plans for any emergency. Without electricity, people may be without air conditioning, internet, phone usage, etc. Preparedness plans

should include caveats for power outages and even practice these plans in the event of an extreme heat event.

2. MAPP – *Mobilizing for Action through Planning and Partnerships* is an existing model developed by NACCHO for local health departments to incorporate and enhance community health. MAPP would also provide an excellent framework for developing climate change and heat wave preparedness strategies without reinventing the wheel.
3. Experts on climate change should work with local health on local and state projects, training seminars, and by providing pertinent information for both sectors (health and climate science). We need to discern what our roles are in the health sector for disseminating climate information which can ultimately lead to more action (O’Neill et al., 2010). Walter, the Oak State climatologist interviewed in this study, mentioned that the conversation should go both ways in that, “it’s a driving back and forth conversation, it’s not all one way where climate scientists are saying ‘this is what you need to do for adaptation or mitigation.’”
4. While it is important that public health officials are knowledgeable about climate change, what do they need to know? Public health officials should be able to make connections between weather and the actual problem. This topic of climate change knowledge was discussed in my interview with Walter, who mentioned that health officials should be aware of the current trends as well. Although it is important to understand the impacts of our future climate 100 years from now, the public health community needs to know what is going to happen presently where the payoff is immediate.

5. Studies need to be implemented to create social marketing for climate change adaptation co-benefits within existing public health areas. An immense amount of research exists on co-benefits but not in a method that is easy for local health to immediately use and incorporate.
6. Individual preparedness is severely lacking across the nation, with some regions less prepared than others. Practice should focus on strategies that enhance this area, including what local health is currently utilizing to reach out to their residents.
7. When discussing climate change or global warming, focus groups should be implemented among many different groups of individuals (democrats, republicans, independents, academicians, scientists, conservative and liberal groups) to craft more palatable messaging strategies about climate. In my interview with Don, he suggested that I (and any health official) read The Robert Wood Johnson Foundation article entitled, *A New Way to Talk about the Social Determinants of Health*. This publication discusses strategies that are important to use with social marketing and public health messaging.

Recommendations for Research

1. Studies, including this project, have previously analyzed heat wave plans for their content (verbal and written) as opposed to the plan execution. Future studies need to be evaluative and address the following:
 - a. What are the differences between written and verbal preparedness plans?
Are written preparedness plans more effective?
 - b. What are the differences between all hazards plans and specific event plans?

c. How are heat wave preparedness plans applicable to vulnerable populations.

2. Previous research has discussed the response of the public regarding media influences on disasters (Blendon et al., 2001; Maxwell, 2003), however, I propose to also address the media influence on climate change literacy, media literacy, and disaster preparedness. As I previously discussed, the media can have powerful roles in communicating emergencies / disasters, and therefore, research studies that emphasize public perception during emergencies should be implemented.

3. Using critical theory, future studies can look at the health disparities in preparedness, communication, and outreach. This type of theoretical lens can also be applied to the injustices of climate change health effects with the disadvantaged and impoverished more likely to experience the burden. The following examples could be incorporated:

a. Critical ethnography to study Chicago, and in particular, St. Louis to address the issues of disparities during heat waves and other natural disasters.

b. Participatory action research (PAR) to discern the barriers to preparedness, more specifically, incorporating community members in building a culture of preparedness by active participation in the research process.

Final Reflections: The Invisibility of Public Health

From start to finish this project captured my interest for heat waves, climate change, and policy change. What started out as a dissertation project, began the initiation of my research agenda, leaving me asking many questions for future research. How will local health add and maintain climate initiatives in their current models of preparedness? How is local health engaging residents for individual preparedness? What can be done to minimize preparedness costs while maximizing readiness? I find myself wanting to remain connected to my interview participants to make this project beneficial to them and their practice. During one of my interviews, I was told that we (institutions of higher education) are not preparing our public health students in a way that is practical for them in the workforce. Instead, we are teaching them as Harvey stated, “pie in the sky FEMA models” that, in practice, are not tangible. I think of this interview frequently, and even want to pursue an evaluation study down this path of how to make our students more marketable while enhancing our health care infrastructure.

When writing my recommendations, I thought of Whitney’s quotation regarding health department staff as being, “stretched to the max.” I have learned a lot about the importance of practicality and approachability with health messaging, as well as how to include the right target audience. Using a social ecological approach, I was able to shed light on the reasons why local health has been unproductive with climate change mitigation and adaptation strategies, and able to refute previous claims that local health and municipalities are unprepared for heat waves.

Public health has been described as being invisible to the public. As a society, we do not acknowledge the ways in which public health has enriched our lives on a daily basis.

Instead, we ensure to highlight the problems in our public health system, and are quick to blame them if something goes wrong during a disaster. People want as little government in their lives as possible, yet when disaster strikes they want assistance – and they want it immediately. The same idea can be threaded to climate change mitigation. Will we be able to see immediate results if we reduce carbon emissions, and live more sustainably? If our public health systems take a proactive stance on climate change, how will this impact our lives presently *and* in the future? While there are definitely areas within heat wave planning and climate change education that need enhancing, it is important to highlight where we are and where we are going. George Benjamin, the Executive Director of the American Public Health Association, described climate change as,

One of the most serious public health threats facing our nation. Yet few Americans are aware of the very real consequences of climate change on the health of our communities, our families and our children (2008).

Just as health educators strive to make health a priority for all individuals and not just the absence of disease (WHO, 1948), I challenge that we incorporate climate change in a similar approach. Incorporating climate change preparedness will not occur until we affect the culture of preparedness, and the solutions to these issues will never surface without collaboration from every level: Individual, community, local, state, and federal.

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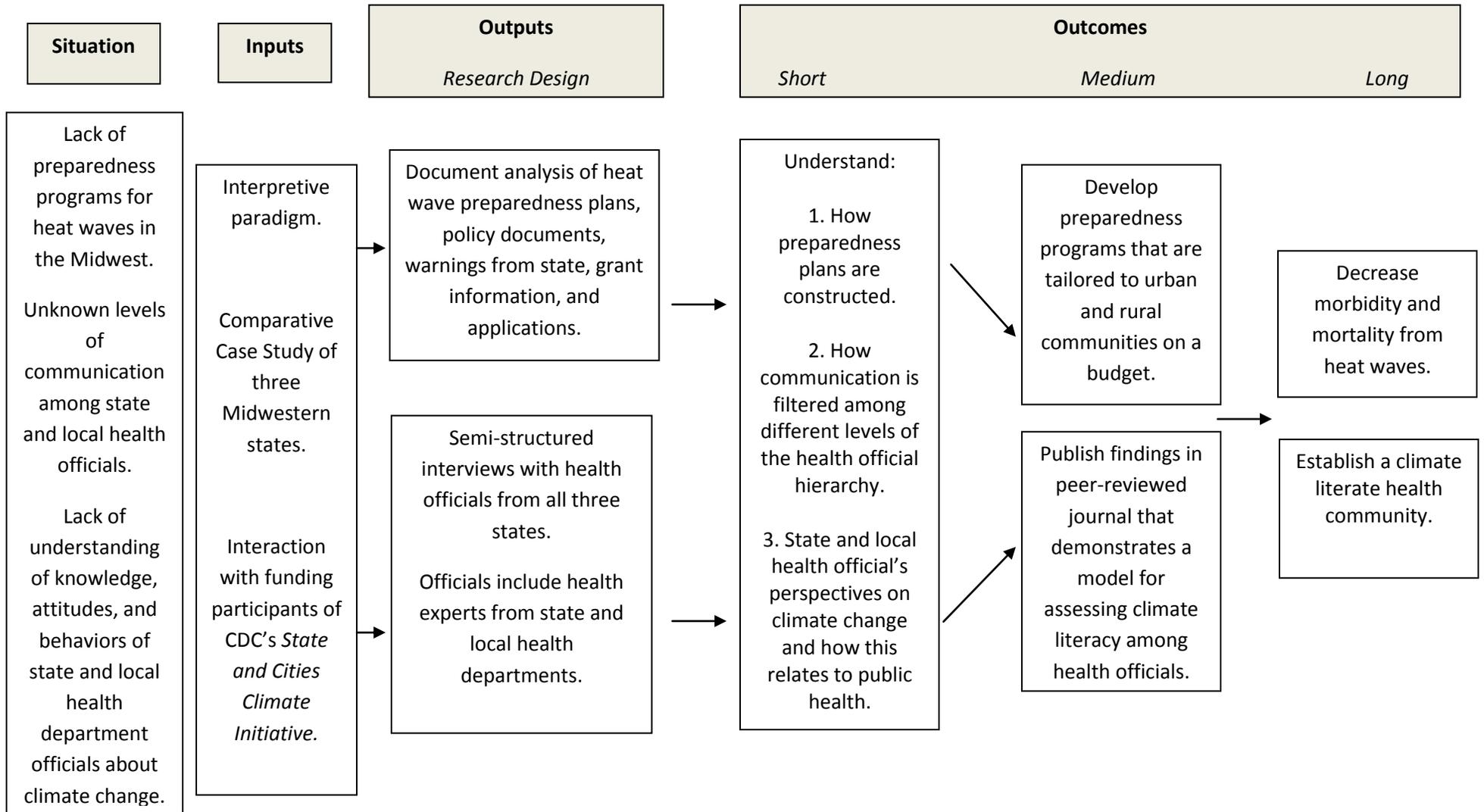
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APPENDICES



Assumptions

(1) I am able to obtain the contact information for health officials to participate in this study via the internet; (2) Local county health departments in the study have websites; (3) Local county health departments in Illinois, Missouri, and Michigan have environmental health directors, emergency preparedness coordinators, or an area that deals with emergency preparedness; and (4) participants of this study have heard of climate change.

Appendix B. Executive Summary

[Current Date]

Address of Participant

Dear [Name of Participant],

Enclosed in this package is an executive summary of my project titled, "Prioritizing Preparedness." The executive summary contains a background, purpose, method, results, and recommendations sections with the concluding pages focusing on best practices in public health. While the suggested practices may or may not be applicable to you and your field, they summarize the potential for public health efforts with climate change mitigation / adaptation.

This project not only taught me a lot about the practice of public health, but also the everyday challenges that public health officials are faced with daily. I plan on pursuing my recommendations for this project and continuing to work on these areas of heat waves and climate change in the future.

This project would not have been completed without your participation and for that I am extremely grateful. If you have any questions / concerns / comments about the project, please do not hesitate to contact me!

Kind Regards,

Alicia Wodika, M.S.
Southern Illinois University Carbondale
Pulliam Hall
475 Clock Tower Drive
MC# 4632
Carbondale, IL. 62901
618-453-2777 (Work)

Executive Summary

II. Background

Since 1979, approximately 380 Americans have died every year from heat-related weather events; a mortality rate higher than tornadoes, hurricanes, floods, and earthquakes combined (National Center for Weather Statistics, 1997; Weisskopf et al., 2002). In 2009, the Centers for Disease Control and Prevention estimated the annual mortality rate from thermal stress in the United States to be approximately 700 individuals per year. According to the Intergovernmental Panel on Climate Change (IPCC) (2007a), heat waves are projected to increase in severity and intensity in the upcoming years (as cited in Reid et al., 2009). With increasing heat waves, mortality rates are also projected to increase (Hayhoe et al., 2010). With little political appetite for reduction of greenhouse gases (i.e. mitigation), it is important to focus on adaptive measures.

II. Purpose

This project was about the underlying factors that influence preparedness for heat waves among local and state health departments. Studying preparedness among public health officials is important, because health departments have goals of optimal health and wellness, and are the “first line of defense” within public health infrastructure (Balbus et al., 2008 p. iv). In addition, this study explored the communicative efforts among multiple levels of public health, ultimately seeking an understanding for the prioritization of preparedness within public health agendas. Following broader contexts, interviews were aimed at discussing climate change perspectives of health officials to ultimately explain the reasoning behind lack of documented preparedness efforts (Maibach et al., 2008; Bedsworth, 2009).

III. Methodology

- ✓ Case Study of Three States
- ✓ Performed document analysis on every county in each state
- ✓ Interviewed the following:
 - Rose State: 1 state health department, 4 local health departments
 - Received CDC funding from the *Climate-Ready States and Cities Initiative*
 - Oak State: 1 state, 6 local health departments, 1 EMA, 1 state climatologist
 - Aves State: 1 city health department, 4 local health departments, 1 EMA

VI. Key Findings

ROSE

- In Rose, more local health departments were aware of the dangers of heat waves, promoted awareness for thermal stress among their residents, and had more resources available on their websites.
- Resources were plentiful from the state health department and included many publications for guidance, newsletters updating about current/future projects, and general information about climate change.
- Funding was provided (when sought) from the state health department to local health for climate-based research and projects.

AVES

- Had an immense amount of materials related to heat waves on their state health department, but provided few, if any, resources and guidance for climate change.
- Local health departments here were confused and unsure about the State's stance on climate change or what the next steps are if they proceed in the future with mitigation or adaptation strategies.

OAK

- Oak is currently developing a state-wide strategy for climate change using the CDC's *Building Resistance Against Climate Effects* (BRACE). During data collection, the state was only in the beginning stages of the project.
- Health departments in Oak felt a lack of guidance from their state health department and rely on the state as a throughput to the federal government for resources.
- All interviewed health departments were in support of a climate change initiative for the state, but were unsure of the steps to take.

Overall Findings

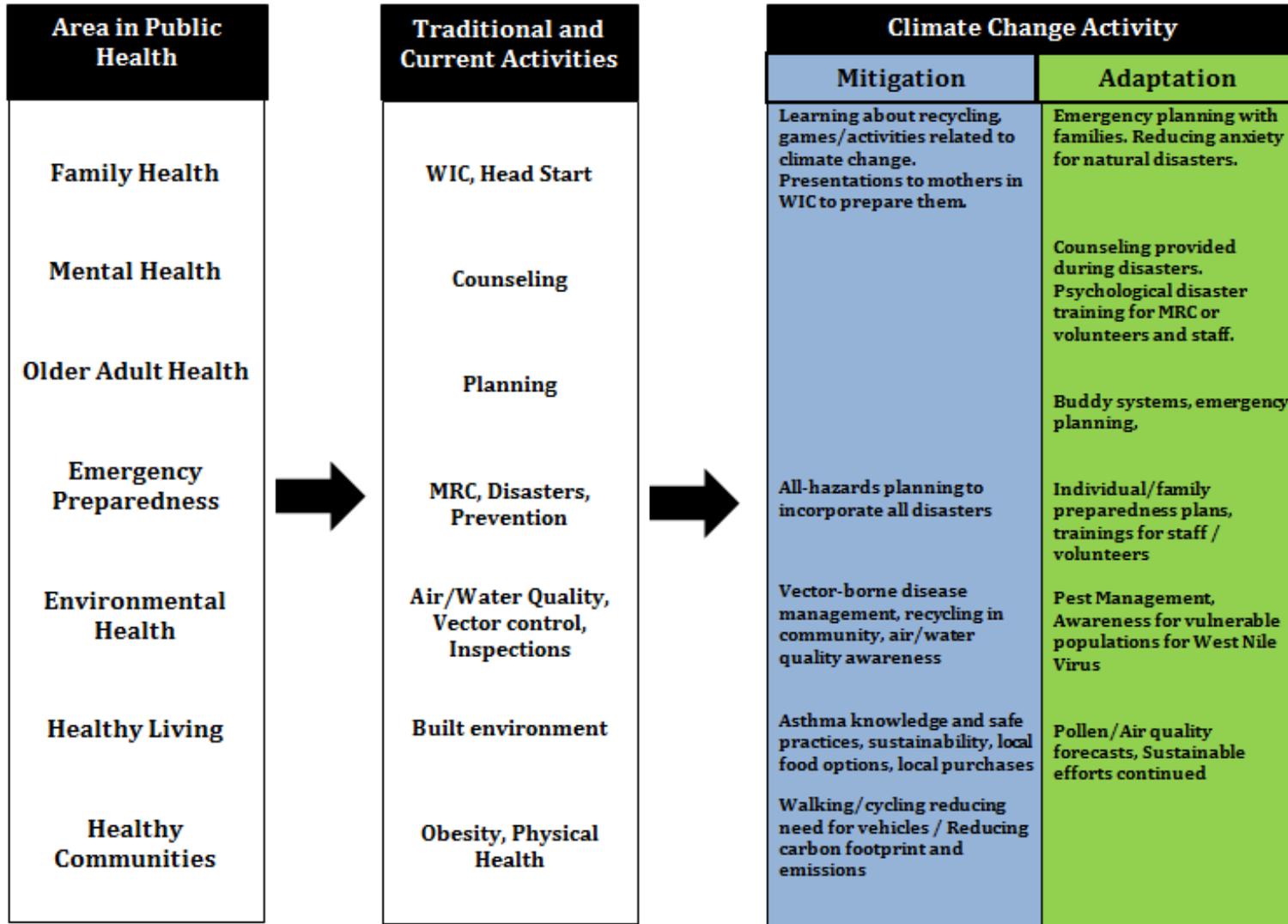
- Local health departments are feeling the pressure of meeting priorities and feel more guidance is needed from the state level.
- The State understands the pressures local health is under, but does not want to add to their daily stresses by interfering.
- Previous studies have documented that cities are unprepared for heat waves because they lack specific plans for heat wave events. This study found that plans are evolving to be more comprehensive and incorporate an all hazards approach.
- In all states, emergency preparedness is perceived to be low among community residents due to socioeconomic characteristics including income level, environment, and personal motivation.
- Health departments in more rural locations were more self-sustaining and independent during emergency situations. This observation is likely due to stronger social networks that exist in rural communities.
- While some interest and application existed for climate change in the study, overall, mitigation and/or adaptation was lacking among all local health departments in the study with contributing factors including budgetary constraints, lack of expertise and training, lack of staff, decreased personal motivations, and time.

VI. Project Recommendations for Public Health Practitioners

1. State health departments need to provide opportunities for evaluation of their relationship with their local health constituents. There are mixed-messages with the state not wanting to be too intrusive with local health and thereby decreasing the guidance, whereas the locals want more guidance from their state departments.
2. MAPP – *Mobilizing for Action through Planning and Partnerships* is an existing model developed by NACCHO for local health departments to utilize. This model provides an excellent framework for developing climate change and heat wave preparedness strategies without reinventing the wheel.
3. Staff and funding pools are limited; therefore, researchers and academicians need to develop practical approaches to battle the climate issue at the local level (Bedsworth, 2009) that involve the community members themselves.
4. Experts on climate change need to provide more guidance to local health. We need to discern what our roles are in the health sector for disseminating climate information which can ultimately lead to more action (O'Neill et al., 2010). The conversation should also go both ways, in that, "it's a driving back and forth conversation, it's not all one way where climate scientists are saying 'this is what you need to do for adaptation or mitigation.'" – Walter Study Participant
5. While it is important that public health officials are knowledgeable about climate change, what do they need to know? Public health officials should be able to make connections between weather and the actual problem. Although it is important to understand the impacts of our future climate 100 years from now, the public health community needs to know what is going to happen presently for planning and budget purposes; and ultimately, where the payoff is immediate.
6. Cooling centers and shelters would be great opportunities to offer health events, screenings, or fairs to provide information to people who are already gathered together.

VII. Suggested Strategies and Activities

- Climate Change Mitigation / Adaptation with what we are currently doing in public health.
- Co-Benefits to public health and climate change mitigation efforts.



Co-Benefits to Public Health when Mitigating/Adapting to Climate Change

Health Area	Public Health Issue / Disease Focus	Target Behavior to Reduce	Climate Change Link	Health Promotion Strategy	Mitigation Techniques
Physical Health	<ul style="list-style-type: none"> ✓ Cardiovascular Disease ✓ Obesity ✓ Diabetes ✓ Stroke ✓ Asthma ✓ Pulmonary Disease 	<ul style="list-style-type: none"> ▪ Driving of personal vehicles ▪ Stationary lifestyle 	<ul style="list-style-type: none"> • Carbon emissions • Greenhouse gases from personal vehicles • Air Quality from vehicle exhaust 	<ul style="list-style-type: none"> • Built Environment (Green spaces / parks, safe places) • Sidewalks • Bike Lanes • Health promotion activities (job incentives) • Mass Transportation 	
Healthy Living	<ul style="list-style-type: none"> ✓ Sustainability 	<ul style="list-style-type: none"> ▪ Purchase of non-sustainable foods / goods ▪ Purchase of non-local foods / goods ▪ Not Recycling 	<ul style="list-style-type: none"> • Carbon emissions • Greenhouse gases • Excessive waste and production of more materials 	<ul style="list-style-type: none"> • Community Gardens • CSA's • Seasonable eating • Local purchases • Chemical Collections • City-wide Recycling 	
Mental Health	<ul style="list-style-type: none"> ✓ Anxiety ✓ Depression 	<ul style="list-style-type: none"> ▪ Excessive Worry ▪ Fear 	<ul style="list-style-type: none"> • Extreme weather can cause fear and anxiety during and after events • Lack of green 	<ul style="list-style-type: none"> • Planning for emergencies to reduce anxiety/fear • Urban planting • Counseling 	

			space in urban environments	during emergencies	
Environmental Health	<ul style="list-style-type: none"> ✓ West Nile Virus ✓ Lyme Disease 	<ul style="list-style-type: none"> ▪ Unsafe practices from being outside ▪ Reducing breeding grounds for hosts (tires/bird baths, stagnant water pools) 	<ul style="list-style-type: none"> • Vectors are likely to spread as the climate changes – including to areas previously unknown to the vector. • Variability exists with flooding/drought conditions during spring and summer potentially increasing likelihood of proliferation of vector 	<ul style="list-style-type: none"> • Safe practices for being in the woods • Limiting outside exposure to daylight hours during summer and avoiding dawn/dusk 	Adaptation Techniques
Emergency Preparedness	<ul style="list-style-type: none"> ✓ Lack of Individual and / or Community Preparedness for Disasters 	<ul style="list-style-type: none"> ▪ Lack of Care ▪ Resource Availability ▪ Motivation 	<ul style="list-style-type: none"> • Extreme weather events are likely with climate variability • Depending on the geographic location weather events include: Heat Waves Tornadoes Hurricanes Flooding 	<ul style="list-style-type: none"> • Preparedness Campaigns • All-Hazards Planning 	

Appendix C. Email Invitation to Participate

From: Alicia Wodika (awodika@siu.edu)

Subject: Research Request

Dear [Name of Health Department Participant],

My name is Alicia Wodika and I am a doctoral candidate at Southern Illinois University in Carbondale Illinois. I am currently working on my dissertation in Health Education and Recreation. My study is an attempt to understand the factors that influence heat wave preparedness among Midwestern local and state health departments. I also want to investigate the climate change perspectives among state and local health department health officials. This is important because an uninformed county, state, and region can ultimately contribute to the morbidity and mortality caused by heat waves.

Your name and email was obtained from your local county health department website [Name of website]. I am requesting your participation for an interview regarding your expertise in the area of environmental health specifically targeting preparedness of environmental health threats, specifically heat waves.

Criteria for interview selection are 1) being a department administrator/director, an environmental health director, or an emergency preparedness coordinator for the health department; and 2) being at least 18 years old.

Your participation in an interview is completely voluntary, and you may withdraw at any time. Interviews will be conducted at your leisure, and I will come to your health department for the interview. Interviews should last no longer than 60 minutes. I will take all steps to ensure our conversations are kept confidential. Your name, department name, and county will never be released in my dissertation or any publications that come from this study. You and your department will also be given a pseudonym as to not link your answers with data.

If you do not respond to this email request, you will be contacted again one more time via email or telephone during the next two weeks. If you state that you would not like to participate, your name will be removed from any future mailings. If you are willing to participate, I will contact you further to set up meeting times and dates.

If you have any questions or comments about the research being conducted, please feel free to contact me or my advisors. I look forward to hearing from you and understanding more about your health department!

Researcher

Alicia Wodika, M.S.

awodika@siu.edu

618-453-2777

Advisor

Kathleen Welshimer, Ph.D.

welshime@siu.edu

618-453-1862

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

Appendix D. Human Subjects Approval Form

SIU Southern Illinois University
CARBONDALE

HUMAN SUBJECTS COMMITTEE
OFFICE OF SPONSORED PROJECTS
ADMINISTRATION
WOODY HALL - MAIL CODE 4709
900 SOUTH NORMAL AVENUE
CARBONDALE, ILLINOIS 62901
siuhsc@siu.edu
618/453-4533
618/453-8038 FAX
ospa.siu.edu/human

HSC Approval letter (exempt)

To: Alicia Wodika

From: Jane L. Swanson, Ph.D.
Chair, SIUC Human Subjects Committee



Date: July 11, 2012

RE: Protocol 12313

Title: *An examination of the social ecological factors influencing heat wave preparedness among state, city, and local county health departments in the Midwest: A comparative case study*

The above referenced study has been approved by the SIUC Human Subjects Committee. The study is determined to be exempt according to 45 CFR 46.101(b)2. This approval does not have an expiration date; however, any future modifications to your protocol must be submitted to the Committee for review and approval prior to their implementation.

Your Form A approval is enclosed.

This institution has an Assurance on file with the USDHHS Office of Human Research Protection. The Assurance number is FWA00005334.

JS:kr

Cc: Kathleen Welshimer

SIU.EDU

Appendix E. Participant Consent Form

Dear Interview Participant,

Thank you for agreeing to participate in my research study. This study attempts to understand the factors that influence heat wave preparedness among Midwestern local and state health departments. I also want to investigate the climate change perspectives among state and local health department health officials. This is important because an uninformed county, state, and region can ultimately contribute to the morbidity and mortality caused by heat waves.

Interviews should take approximately 60 minutes, although at any time, you may withdraw without prejudice. All interviews will be audio-recorded for several reasons including the enhancement of my understanding of the interview, to clarify important topics, to assist in data collection, and to ensure discussions are accurate.

After our interview, I will contact you within two weeks by sending you an email and provide an attachment of the interview transcript. Since I will be recording and transcribing the interviews, having the interviewee read over notes assists in the validation of the information.

I will take all steps to ensure our conversations are kept confidential. Your name, department name, and county will never be released in my dissertation or any publications that come from this study. A copy of this form will be made available to you containing relevant information about the study and important contact numbers.

Please verify that you I have read the material above, and any questions I asked have been answered to my satisfaction _____ (initials).

Interviewee Signature

Date

Researcher Signature

Date

Researcher

Alicia Wodika, M.S.
618-453-2777
awodika@siu.edu

Advisor

Kathleen Welshimer, Ph.D.
618-453-1862
welshime@siu.edu

Thank you for your participation in this research study! *Alicia Wodika, M.S.*

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

Appendix F. Audio Tape Consent Form

Dear Interview Participant,

Thank you for your participation in my dissertation that seeks to understand heat wave preparedness of state and local health departments.

All interviews will be audio-recorded for several reasons including the enhancement of my understanding of the interview, to clarify important topics, to assist in data collection, and to ensure discussions are accurate.

All files will be kept confidential; only I will be listening to the audio files for purposes of data collection. After the completion of the research project, files will be destroyed and deleted from the researcher's computer software. I will take all reasonable steps to protect your identity. This includes giving you and your health department a pseudonym and never linking data with your name.

If you agree to participate in this interview please read and sign below.

I, _____ (initials), agree to participate in this activity and know that my responses will be recorded via audio file.

I, _____ (initials), agree that Alicia Wodika may quote me in her dissertation and any pertinent research articles.

Name (please print): _____

Signature: _____ Date: _____

If you have any questions or comments about the research being conducted, please contact the researcher or her advisors:

Researcher
Alicia B. Wodika, M.S.
618-453-2777
awodika@siu.edu

Advisor
Kathleen Welshimer, Ph.D.
618-453-1862
welshime@siu.edu

Thank you for your participation in this research study! *Alicia Wodika, M.S.*

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

Appendix G. Document Analysis Sheet

Name of Agency:

Name of Website:

Website Information for Heat Waves

Heat Waves Mentioned

 Yes NoWhat included:

- Heat Wave Response Plan (Fill out HWRP Sheet)
- External Links for Resources
 - CDC
 - FEMA
 - State Health Department
 - Other: _____
- Information for Senior Citizens
- Press Release forecasting heat wave

Where Listed Under:

- Environmental Health
- Emergency Preparedness
- N/A

Potential Contacts:

Name:

Phone:

Email:

Contacted: Yes No

Website Information for Climate Change

Climate Change Mentioned

- Yes No

Where Listed Under:

- Environmental Health
 Emergency Preparedness
 N/A

What Included:

- Information on Mitigation
 Information on Adaptation
 Sustainability
 Health Information
 Tips for Reducing Impact
 External Links for more information
 IPCC
 EPA
 State Health Department
 Other: _____
 Other: _____

Notes:

Appendix H. Heat Wave Analysis Sheet

Name of Agency: _____

Partners: _____

Written Plan: Yes No

Description of Plan:

Time for Warning

Terminology used? _____

What is Catalyst?

Evaluation Yes No

When Last Evaluated? _____

Outreach and Education

Education Included:

-
-
-
-
-
-

Population Described:

*Cooling Centers*Listed Yes No

When Open: _____

How Often: _____

Location(s) Provided? Yes NoHours Provided? Yes NoPets? Yes No**Links Provided (if website)**

-
-
-
-

Other:

VITA
Graduate School
Southern Illinois University

Alicia B. Wodika
abgiesler@gmail.com

Aurora University
Bachelor of Arts, Biological Sciences, December 2005

Western Illinois University
Master of Science, Biological Sciences, July 2009

Special Honors and Awards:

- Southern Illinois University Carbondale, College of Education and Human Services Graduate Teaching Assistant of the Year (2012)
- Southern Illinois University Carbondale, Dissertation Research Assistant Award (2012)
- SIUC Nominee for MAGS Excellence in Teaching Award (2012)
- Southern Illinois University Carbondale, Donald N. Boydston Graduate Scholarship (2011)
- Phi Kappa Phi (2011)
- Western Illinois University Graduate Student Research and Professional Development Fund (2009)
- Western Illinois University Department of Biological Sciences Scholarship (2007)
- Aurora University Summa Cum Laude (2005)
- Omicron Delta Kappa National Honor Leadership Honor Society (2005)
- Alpha Chi National Honor Society (2005)
- Aurora University Dean's List Golden Ivy Leaf (2002-2005)

Dissertation Title:

PRIORITIZING PREPAREDNESS: EXTREME HEAT AND CLIMATE CHANGE PREPARATION OF MIDWESTERN LOCAL HEALTH DEPARTMENTS

Major Professor: Kathleen Welshimer

Publications:

- Ratnapradipa, D., Brown, S.L., Middleton, W.K., & Wodika, A.B. (2011). Measuring environmental health perception among college students. *The Health Educator*, 43(2), 13-20.
- Ratnapradipa, D., Brown, S.L., & Wodika, A.B. (2011). Examining the breadth and depth of environmental health through a modified Delphi technique. *American Journal of Health Education*, 42(1), 50-57.
- Ratnapradipa, D., Getz, T., Zarcadoolas, C., Panzara, A., Esposito, V., Wodika, A., Caron, C., Migliore, B., Quilliam, D. (2010). Environmental health risk communication: Assessing levels of fish consumption literacy among selected Southeast Asians. *Journal of Applied Environmental Education and Communication*, 9(4), 251-261.