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Natural Disaster Crisis Communication by FEMA and Red Cross Via Twitter During Hurricanes
Harvey, Irma, Lane, Matthew, and Michael

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Kelly Denise Jones
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Natural Disaster Crisis Communication by FEMA and Red Cross Via Twitter During Hurricanes Harvey, Irma, Lane, Matthew, and Michael

A THESIS APPROVED FOR THE

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY

BY

Dr. Darren Purcell, Chair

Dr. Jensen Moore

Dr. Mark Shafer

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Abstract

This thesis examined the way disaster relief agencies, FEMA and Red Cross, communicated during natural hazards at the national and regional levels. Using tweets from the weeks of hurricanes Harvey, Irma, Lane, Matthew, and Michael, I assessed how well the agencies communicated with the public in the wake of a storm. This research utilized crisis communication theory and disaster management theory. The tweets were coded according to a standard model of crisis communication and analyzed using SPSS software. The results found that FEMA national was the agency that followed the crisis communication model the best, while Red Cross national had the least content in line with the model.

Introduction

The National Oceanic and Atmospheric Administration defines a hurricane as "a type of storm, called a tropical cyclone, which forms over tropical or subtropical waters" (NOAA , 2013). Once a tropical storm reaches maximum sustained winds of at least 74 mph, it is called a hurricane. Often times with more severe storms devastation follows suit, especially for cities located near a coast. The Saffir-Simpson Hurricane Wind Scale provides a 1 to 5 rating for hurricanes, with a higher rating meaning higher winds and more risk to property damage and loss of life. NOAA estimates that over the past 30 years, hurricanes have caused an average of 46 fatalities per year in the United States alone ("Summary of Natural Hazard Statistics for 2016 in the United States," 2017). Hurricanes usually strike in a period known as hurricane season, which is from June 1 to November 30. Annually, an average of 12 massive storm systems a year appear in the Atlantic Basin, composed of the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico (NOAA , 2013). During the 2016 - 2018 hurricane seasons there were several high strength storms that impacted areas along the southeastern coast of the United States as well as several Caribbean islands. The term crisis can "encompass a variety of different social occasions, ranging from a onetime plane crash stemming from bad weather to the collective and long-lasting multitude of activities occurring during a war "(Quarantelli, 2000, p. 2). However a general crisis can be defined as a collective stress situation (Quarantelli and Dynes, 1977, p. 23). Natural disasters, including hurricanes, fit under the umbrella of a crisis. Therefore, disasters can be treated as such in terms of preparation, management, remediation, and communication.

The evolution of crisis communication has utilized many media during its history but none so impactful as social media. Social media such as Twitter and Facebook have had a transformative impact on our society (Coombs, 2007, pp. 164 - 165). These platforms have

become primary sources of communication and news for the public, as well as government agencies and news outlets disseminating information (Collins, Hynes, Madden, Neville, 2016, p. 161). This is often the case with routine news, as well as for organizations charged with communicating disaster relief and management information to the public during a crisis (Collins et al, 2016, p. 161). Because of this, it is of the utmost importance for this information to be timely, effective, and credible. Poor communication during a disaster often wastes precious time, confuses the public, and can halt the coordination of emergency responses (Collins et al, 2016, p. 167).

There exists a body of theory and guidelines describing how to mitigate the impact of a crisis on an organization. Traditional crisis communication theory is often used to repair the reputation of a company after a public crisis, such as a defective product. However, these theories can also be used by government agencies to "inform employees or the public of a potential hazard such as an impending storm which could have catastrophic effect" ("What is crisis communication? definition and meaning," n.d.). Additionally, emergency news about storms often come from sources such as the Red Cross. Such organizations send out real time updates via their Twitter accounts and maintain a presence before, during, and after an event. To ensure effective communication there should be "standards for management of major emergency incidents," such as natural disasters, coming from these agencies (Collins et al, 2016, p.167).

Following a standard crisis communication model during a natural disaster will help different agencies exchange information, as well as contribute to effective and efficient procedures for collaboration, cooperation, and coordination among these agencies and the public. Standardizing message content brings the public consistent information before, during, and after a crisis event.

The rationale for this research comes from several articles. In the first, researchers call for experiments with different publics in different crisis situations as well as analysis of the pre-disaster and post-recovery phases. They also called for the analysis of multiple forms and sources of crisis information given to the public (Austin, Jin, Liu, 2011, p. 351). In the second, the researchers call for study of the background of a disaster impacted area and how that affects government crisis communication and relief. They called for a study of how hashtags were used by relief agencies (Cho, Jung, Park, 2013, pp. 38-39). In the third piece, the authors called for more study in the use of Twitter by civic authorities, since there is a growing confidence from the public in these media, and more study on the interaction between the media and received information (Burgess, Bruns, Crawford, Shaw, 2012, p. 49). In the final article, the researchers discuss chaos theory and its role in crisis communication. They recommend research specifically on the ways crisis managers can use alternate forms of communication technology, namely the internet (Seeger, Sellnow, Ulmer, 2002, p. 290).

The goal of this research was to examine the use of crisis communication via Twitter from disaster relief agencies to see how the tweets compared to a standard model of crisis communication, and how their content can be improved. This paper will utilize crisis communication models and theory as a base as well as relevant disaster management theory. This body of theory and models will be compared to the tweets released by FEMA and the Red Cross, at the national and local scales, during hurricanes Harvey, Irma, Lane, Michael, and Matthew to ascertain if practitioners are employing best communication practices in their Twitter accounts. These storms were chosen because they were recent events, within the last five years, and the datasets were available.

Literature Review

Chapter 1: Space and Natural Hazards – The Convergence

This section will cover communication geography, virtual communities, disaster communication, communication during natural disasters, disaster communication using social media, and specifically natural disaster communication via Twitter. The first section, communication geography, will delve into the interdisciplinary efforts in communication geography, including space versus place, the history of communication overcoming distance, how the combination has been presented in past research, a framework to guide future research, and how the concept of the virtual community has emerged and how its connected with social media spaces. The next section will describe the two aspects encompassed in disaster communication, crisis communication, and risk communication. The section on communication and natural disasters will address natural disasters as a specific type of crisis within crisis communication, as well as present the best practices and current knowledge on disaster communication from National Oceanic and Atmospheric Administration (NOAA) and the Committee on the Future of Emergency Alert and Warning Systems: Research Directions. The last two sections cover how social media had been incorporated into disaster communication and how Twitter has been used in such communication.

Communication Geography and Virtual Communities

Two central ideas in geography are how to discuss space and place. According to Tuan, (1977) "'place' captures the idea of deeply layered subjective experience grounded in the particularity of local conditions and discourses, whereas 'space' implies potential as well as actual movement of bodies, goods, capital, information, and communication" (Adams & Jansson, 2012, p. 301). In essence, "space" is a location or area and "place" is the characteristics or sense

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of belonging associated with a space. The two are connected because "place, conceptualized in terms of geography and individual emotional-cultural or 'lived' involvement, cannot be understood without taking into consideration the spatial relations that sustain it" (Tsatsou, 2009, p. 24). When incorporating geographic concepts such as these with communication, the combination holds the potential to provide a view of "communication as spatial production" (Adams & Jansson, 2012, p. 301).

One idea in mass communication theory comes from prominent scholar Marshall McLuhan who states that "the medium is the message" (McLuhan, 2008, p. 27). Or that depending on what platform communication is distributed from, it impacts the message being communicated. The first medium that enabled quick, long distance communication across space was the telegraph. Invented in the 1840's, the telegraph was a communication system that could be used to send electrical signals over a wire laid between stations, similar to telephone wires. The messages, or telegrams, sent via the telegraph were in Morse code which is a simple system of dots and dashes corresponding to the English alphabet. This network facilitated communication between remote places in the United States, reducing the importance of space and time. This advancement led to synchronizing local time and establishing time zones, which allowed the first news agencies to develop in the beginning of the 19th century. This progression toward rapid global communications has been intensified by the development of broadcast media and digital communication technology (Tsatsou, 2009, p. 13). New media, such as the internet, have high interactivity and create societies within itself. These interactions have developed a new form of communication, one that is separate from physical location and where time is dissolved. Certain media platforms such as the internet "can take place regardless of space or time" (Tsatsou, 2009, p. 18). Often mobile phone users don't consider how physical boundaries will

impact communication, but rather how technical criteria may be a hindrance, such as signal strength or network coverage (Tsatsou, 2009, p 19).

Traditionally, communication and geography have been presented in several ways. Mediated mobility is the "process of moving or transmitting particular content through space" (Adams & Jansson, 2012, p. 302). This can range from a text message to a hazard alert. Mediatized mobility is when general spatial practices and mobility of people become dependent on and saturated with technologies. This is often seen in our world today; take, for example, the public's dependence on GPS technology when driving (Adams & Jansson, 2012, p. 302). Technological convergence gives new life to the adage, which came first the chicken or the egg? Now it takes on a new form when trying to decide which came first, the book or the movie? This phenomenon makes it unclear which contains the other and blurs the lines of which one is more important. Another example of this is the tweet versus the retweet. The original content of the tweet is important, but the impact is flat without the retweet (Adams & Jansson, 2012, p. 303). Interactive media make the single author less important; rather the importance comes from the connection, such as newspapers that "provide space for comments below news articles" (Adams & Jansson, 2012, p. 303).

Interfaces describe "the connections between human psychological, perceptual, and motor systems on the one hand and codes, software, and hardware on the other hand" (Adams & Jansson, 2012, p. 303). Examples include the keyboard or mouse, which connects the human motor system with the computer. In disaster communication another replacement for TV and radio is the smartphone.

The final one to consider is automated surveillance, which is a more recent occurrence. This technology refers to recording people and things in urban space. This issue is widely debated because it places power and monitoring over privacy and personal space (Adams &

Jansson, 2012, p. 305). This privacy issue can also be applied to the geotagging debate, discussing whether to add geographical data to various media, such as locations on tweets. Sometimes this information can be voluntarily displayed, allowing people to connect online and in real life. However, this poses other issues. "Humphreys (2011) found that the routinized behavior of 'checking in' at various places established a new level of self-surveillance among the users, especially in terms of expectations of continual information disclosure among friends. Altogether, the distinction between private and public space, increasingly takes the form of passwords and codes…" (Adams & Jansson, 2012, p. 305). Surveillance can also apply to internet searches, which are often sold to marketers, advertisers and politicians.

Adams and Jansson (2012) present the framework below as a guide for interdisciplinary work in communication geography. Each box represents a distinct aspect between space, place, and communication. When moving from representations to connections or textures to structures the geographical scale expands from place to space, or node to network. Across the row of the diagram, the container and contents trade places. (Adams & Jansson, 2012, p 306).

Table 1: Adams and Jansson Model of Communication Geography

REPRESENTATIONS (places in communication)	TEXTURES (communication in places)
CONNECTIONS (spaces in communication)	STRUCTURES (communication in space)

Representations- places in communication

"Much of what a person 'knows' about any given place is derived from communications" (Adams & Jansson, 2012, p. 306). For example, take a remote location such as Antarctica or the moon. Most people cannot visit but have some vicarious knowledge through verbal descriptions or visuals. This type of secondhand communication about a location can have serious implications. Another example is European knowledge of uncolonized America. During global colonization, communication about a place through images or stories, helped those far away understand and visualize new territories (Adams & Jansson, 2012, p. 307). "The challenge for geographers is to recognize not only that places are both material and symbolic, but also that the symbolic dimensions of place cannot be captured in facile references..." (Adams & Jansson, 2012, p. 307). Representations also encompass branding places or attempting to attract new citizens or companies. Branding, such as Nashville music or Danish furniture, gives way for a remote location to form a unique identity in a global market (Adams & Jansson, 2012, p. 308). Some positive aspects of representations can be found in film and video. An in depth look at a place through a documentary can foster community dialogue, greater understanding, and tolerance across the world (Adams & Jansson, 2012, p. 308).

Textures- communication in places

This box holds media as a key ingredient in place. In this sense, place is not a location but rather a texture that carries with it the different factors of life in a place (Adams & Jansson, 2012, p. 308). Adams and Janson suggest that communication in place can be thought of like scraps of thread in fabric. The connections made in place are "on-going and continuously evolving communication practices that interconnect a diverse and shifting array of human and nonhuman 'senders' and 'receivers'" (Adams & Jansson, p. 309). In some ways, the different aspects of a place make communication more or less likely. For example, the modern living room is often dominated by televised communication, with little verbal interaction. In another sense, places are

dominated by media driven communication, such as smartphones, homes, and cars that are built to respond and act based on a command communicated by people (Adams & Jansson, p. 309).

Structures- communication in space

Fixed infrastructure is often discussed and analyzed in traditional geographic research, and this includes communication infrastructure. The footprints of these structures can easily be mapped, everything from satellites to fiber optic cables and book publishers (Adams & Jansson, p. 310). The placement of these structures can often tell stories about the uneven development of certain countries or their importance, politically and economically, in the global network. "Unevenness prevails at all scales: between the developed countries and the 'global south,' between wealthier and poorer countries, between leading and lagging provinces within countries...between high-tech growth poles and declining industrial zones, and even between affluent and impoverished neighborhoods within a city" (Adams & Jansson, p. 310). This development pattern is directly related with the infrastructure of communication technology in a country. Mass media, such as film, can also demonstrate the power of countries like the United States whose film studios in Hollywood are favored over other studios around the world (Adams & Jansson, p. 310).

Connections- spaces in communication

Along with the internet came the term "virtual" (Adams & Jansson, 2012, p. 311). Phrases like "virtual space," "virtual place" and "virtual environment" were new aspects about communication via the internet. This allowed scholars to delve into the question, what is virtuality? (Adams & Jansson, 2012, pp. 311 - 312). Virtuality can be described as a "creation of new, alternative spaces outside of familiar geographical relations…" (Adams & Jansson, 2012, p. 312). This term carries with it the possibility for contact free from spatial bounds and instant interaction across distances (Adams & Jansson, 2012, p. 313). These kinds of new spaces created

within the internet do not have physical locations, but they have their own nodes and links that are far from "imaginary." When considering spaces in the virtual world, there have been many over the years. Some examples of internet spaces include "Second Life, social networking sites, and interactive online games" (Tsatsou, 2009, p. 21). These types of spaces shift conventional real-world temporal and spatial boundaries and fit them into online time schedules and activities that operate parallel to the offline world (Tsatsou, 2009, p. 21). However, this does not automatically mean someone can leapfrog over geographical space by using virtual spaces. During the dot-com revolution, many people were obsessed with the possibility of the virtual world replacing the real world, but few media and communications scholars actually asserted that place-based differences would become unimportant as a result of technology (Adams & Jansson, 2012, pp. 312- 313). As McLuhan (2008) describe, globalized communication is not about a homogenized world, but rather "a world where opportunities existed for the long-distance sharing of ideas and identity without reliance on the slow and sensually stripped-down medium of the written word" (Adams & Jansson, p. 312).

Virtual Community

This study is considering how the space of Twitter is being used to communicate with the public. This falls under "connections" in the Adams and Jansson model because spaces in communication also encompasses social media.

"Before the advent of electronic communications, people were bound by oral communication and physical travel, whereas today people are able to cross and adjust temporal and spatial distance largely because of the usage of electronic media and communications" (Tsatsou, 2009, p. 13). Even written communication, such as letters, was reliant on physical transportation. Today, our idea of time, space, and place are changed because we are free from

concepts such as the immediate and the local (Tsatsou, 2009, p. 16). Space is traditionally thought of as a physical location, but it can also be applied to areas created by technology where connections occur.

Cyberspace is the space of the internet. It itself is "a form of virtual reality that both afford[s] social interaction and embod[ies] cultural values" (Freeman & Jacob, 2012, p. 96). There are also subsequent smaller spaces that are created within the larger realm of cyberspace that can be thought of as virtual communities, including the spaces of social media.

Under the umbrella of "connections," Tsatsou cites social networks, like Twitter, as a manifestation of new spaces in the virtual world. "...almost instant transfer of messages and service across geographical boundaries….bridge spatial, temporal, as well as cultural distances, often creating new spaces (e.g. online forums) and new measures of time (e.g. Twitter…)" (Tsatsou, 2009, pg. 17). These new spaces within the internet can be referred to as the virtual community.

Within social media people are able to receive updates on society, interact with one another, share thoughts or opinions, connect to organizations, network with people, and much more. These are the same characteristics of a real-world community. As the Red Cross and FEMA communicate via Twitter to their virtual community, they understand (as will be highlighted below) that the virtual community is not separate from the "real" community. Their followers are a subset of the community and of the citizens they serve, but one that can influence others through other communication practices.

Disaster Communication

A disaster is an event "concentrated in time and space, in which a society or one its subdivisions undergo physical harm and social disruption, such that all or some essential

functions are impaired" (Barnshaw, Letukas, Quarantelli, 2008, p. 2). The two aspects that

comprise disaster communication are risk and crisis communication (Hawthorne et al., 2014, pp.

2 - 3). They each focus on different areas in the disaster cycle. Risk communication prefaces the

event, or the pre-event phase, and comes after the event, or the post-event phase. Crisis

communication is during the event and post-event phases (Steelman & McCaffrey, 2013, p. 668).

Most of crisis communication research focuses on how to protect an organization's image during

an unexpected event (Hawthorne et al, 2014, pp. 2 - 3) while risk communication is concerned

with how to inform individuals about potential hazards (Hawthorne et al, 2014, pp. 2 - 3). These

fields were developed in other disciplines, but the same principles can be applied to disaster

communication.

Crisis Communication

A disaster has had many definitions throughout its life and is still widely debated

(Quarantelli, 1987, p. 18). Additionally, scholars have debated its meaning and what the

definition should expand to include. One definition of disaster is "an event, concentrated in time

and space, in which a society or a relatively self-sufficient subdivision of a society undergoes

severe danger and incurs such losses to its members and physical appurtenances that the social

structure is disrupted and the fulfillment of all or some of the essential functions of the society is

prevented" (Quarantelli, 1987, p. 19). The word disaster has usually been attributed to "major

physical disturbances such as earthquakes and floods, or what came to be traditionally known as

Acts of God" (Quarantelli, 1987, p. 8). The term natural disaster evolved because secular and

non-religious ideologies began to spread and "nature was increasingly substituted for the

supernatural and the term natural disaster came to the fore" (Quarantelli, 1987, p. 8). However,

recently this term has spawned the idea of "Acts of Men." This concept developed because it

became apparent all responsibility couldn't be attributed to Acts of God or Acts of Nature. For

decades, society has been considered a factor in the strength and impacts of disasters. The vulnerabilities of the social system often cause worsening results of the disaster (Quarantelli, 1987, p.9). For example, it has been hypothesized that "continuing air pollution that increases carbon dioxide levels will make some hurricanes up to 60 percent stronger in the next century" (Quarantelli, 1987, p. 26). The use of the word disaster has also been expanded to discuss other major events in society. These can include automobile smog, erosion of sandy coastlines, or nuclear waste dump sites.

Disasters are different from catastrophes. Catastrophes are social crises when there is "complete disruption of social life and the community no longer functioned in any meaningful sense" such as the Tangshan Earthquake in China or Hurricane Katrina in New Orleans (Quarantelli, 1997, p. 40).

Crisis communication during natural disasters has its own subdiscipline. The very broad concept of a crisis is a collective stress situation, but it can be broken down further into consensus and dissensus (Quarantelli and Dynes, 1977, p. 23). Dissensus events are ones that divide people, such as political protests. Consensus events are those where the event is routine and there are norms to rectify the situation. The latter is where natural disasters fall (Quarantelli and Dynes, 1977, p. 23). Because disasters have always been a part of the human experience, it is natural for people to develop ways to prepare for or mitigate the effects of these events (Quarantelli, Lagadec, and Boin, 2007, p. 16). However, as human societies have evolved, new threats and hazards present themselves, such as mass shootings or the risks associated with nuclear power (Quarantelli, Lagadec, and Boin, 2007, p. 17).

Quarantelli (1988) emphasized that what is communicated is more important than how it is communicated. Usually there will remain a way to communicate during a disaster whether that

is with in-tact power lines or a ham radio (Quarantelli, 1988, p. 376). This constant

communication is even more so present in today's time with platforms such as social media.

Research has shown successful disaster management results mainly from the activities of

emergency organizations, such as FEMA (Quarantelli, 1988, p. 373). One main problem in

disaster communication is poor, incomplete, or inefficient information flow (Quarantelli, 1988,

p. 376). More successful communication can bring the public better content, rather than by

changing the media. This study is already analyzing the content on a platform already in use by

these agencies, Twitter. Evaluating the content of the communication and how it can be

improved will help bring the public complete and efficient information.

Scholars such as Coombs study crisis communication in an organizational sense, however

he does not address crisis communication in the public sector or during natural disasters.

Researchers such as Quarantelli focus on these angles and are therefore better for this study.

Risk Communication

Risk communication began in the study of risk management, which studies and assesses

risk models. The roots of risk management are in environmental management, public health, and

emergency management. The goals of risk communication are to prevent harm by "building trust

in the communicator, raising awareness, educating, reaching a mutual agreement, and motivating

action" (Steelman & McCaffrey, 2013, p. 685). Most of these goals are achieved through proper

planning before a crisis.

Effective risk communication can inform people of potential hazards, including natural

disasters, that may affect them and how to handle the situation accordingly. Two important

players in risk communication are communicators, such as FEMA or other emergency

management personnel, and the community ("A Whole Community Approach to Emergency

Management: Principles, Themes, and Pathways for Action," 2011, pp. 3-4). There must be trust built among them in advance to avoid worsening a crisis. There are three elements to risk communication: the message, medium, and audience. All must work in coordination to successfully bring information to the public. There are also "*Seven Cardinal Rules of Risk Communication.*" These are to partner with the public, plan your efforts, listen to community concerns, be honest, use credible sources, work with the media effectively, and communicate with compassion (Telg, 2010, p. 2). These steps will also help engage the community. Complacency when preparing for disasters is a problem but when the community is engaged with planning efforts they are more likely to be prepared (Kapucu, 2008, p. 246).

Communication and Natural Disasters

It is important to distinguish between the different types of crises because the type of event will dictate the best methods of communication. There are several levels of "crisis taxonomies," which include "natural disasters" such as tsunamis, earthquakes, and hurricanes (Seeger, 2006, p. 234 - 235). This paper focuses specifically on natural disaster crisis communication, so it will be different than crisis communication for a company.

Scholars have analyzed crisis communication in organizations and even politics but an emerging area is in natural disaster crisis communication (Griffin, Lachlan, & Spence, 2007, p. 541). Quarantelli (1988) found that information flowing from an organization to the public is rare but important (Quarantelli, 1988, p. 377). Often times, organizations relaying information do a poor job (Quarantelli, 1988, p. 377). It is noted that many times this stems "from the organization's failure to understand that what is meaningful information to organizational personnel is not necessarily useful to endangered persons" (Quarantelli, 1988, p. 377). If an

organization pre plans, then it can address many concerns that would arise trying to communicate during a disaster.

Natural disasters are crises are marked with a high level of danger and the communication is focused on reducing negative outcomes. These can either be in a passive role, where messages encourage the receiver to take some action, or aggressive, including mandatory evacuations. Crisis messages during natural disasters are different than the typical events covered by crisis communication. One difference is that outside of the news media, the majority of storm information, such as evacuations and preparedness information, come from the government or government affiliated agencies. Unlike business' public relations teams, the goal of government communications during these times is the safety of the citizens, rather than stakeholder or business interests (Begg, Kuhlicke, Renn, & Wachinger, 2013, p. 1059).

The most notable difference in natural disaster communication is that the crisis is very visible and is often covered preemptively for several days or longer. Because of this lead time people are able to take action to avoid negative impacts if they believe it necessary (Griffin et al., 2007, p. 541). Two previous natural hazard case studies, hurricanes Katrina and Sandy, demonstrate the power of social media in natural disaster communication (Garnett & Kouzmin, 2007) (Cebrian, Hasan, Sadri, & Ukkusuri, 2017).

Hurricane Katrina was a Category 3 hurricane upon landfall, and hit Louisiana and Mississippi in late August of 2005. New Orleans was one of the worst impacted areas due to its close proximity to the coast, the city's crumbling levee system, and because the city sits below sea level. This storm caused 1,836 deaths and was the second costliest storm in United States history with $120.5 billion in recovery costs ("Hurricane Katrina Statistics Fast Facts.," 2017). During the storm there were little to no social media used because it was in its infancy. Most of the information about the situation and the people being affected were delivered through the top-

down mass media system. There were many adverse effects because of various mishandlings, including lagging aid from the government and improper framing from those tasked with delivering news. "The imagery that spread around the world, through the electronic media in particular, was of a state of anarchy" (Quarantelli, Rodriguez, & Trainor, 2006, p. 83). It is widely held that Katrina was a communications failure stemming from, "communication gaps, missed signals, information technology failures, administrative buffering, turf battles, and deliberate and unintentional misinterpretations…" (Garnett & Kouzmin, 2007, p. 171). This cycle was amplified by national television networks and the 24/7 cable television cycle Quarantelli, Rodriguez, and Trainor, 2006, p. 84). As a result, aid to the area from first responders, the government, and relief agencies was ineffective. Some of the nation's top officials, President Bush, Vice President Cheney, the Secretary of Homeland Security, and the director of FEMA were focused on other issues when the storm struck and never took appropriate action (Garnett & Kouzmin, 2007, p. 173). Actual comments from the mayor of New Orleans and the police chief stating that snipers were shooting at helicopters tourists and the police. The FEMA director at the time was quoted saying that his agency was working under "conditions of urban warfare" (Quarantelli, Rodriguez, & Trainor, 2006, p. 83).

The "storm damage eliminated or hindered much available communication technology, interpersonal low-tech communication occurred in unexpected situations. 'The information vacuum in the Superdome was especially dangerous. Cell phones didn't work, the arena's public address system wouldn't run on generator power, and the law enforcement on hand was reduced to talking to the 20,000 evacuees using bull- horns and a lot of legwork'" (Garnett & Kouzmin, 2007, p. 174). The news stories that came out during Katrina were equally disorganized, such as the false headlines about civilians firing gunshots at rescue military helicopters, a 7-year-old rape victim, and the Superdome and Convention Center being stacked with dead bodies (Garnett &

Kouzmin, 2007, p. 175). "Because of media coverage of the helicopter rumor, some rescue efforts were abandoned or delayed. The rumor about bodies at the Convention Center prompted the diversion of a mortuary unit from other collections needed to maintain public health" (Garnett & Kouzmin, 2007, p. 175). There were several factors that contributed to these stories and delayed recovery efforts. One was that there was no communication, through social media or otherwise, from the victims in the crisis. As a result, many of these biased or untrue news stories were distributed throughout the United States and around the globe in over 150 news outlets, painting a desolate picture of the state of affairs in the region (Garnett & Kouzmin, 2007, p. 175).

Hurricane Sandy was a Category one storm upon landfall, and hit the upper Atlantic coast, mostly New York and New Jersey, in late October 2012. This storm killed 106 people and was the most destructive along the Atlantic coast with rebuilding costs totaling $75 billion ("Hurricane Sandy Fast Facts," 2017). One major difference between Hurricane Sandy and Hurricane Katrina is that social media was present during Sandy. Many of the states affected had power outages, similar to Katrina, but the areas were still able to receive information and communicate sans traditional news outlets. There were several million tweets circulating about issues ranging from "storm location and time, [and] media coverage…" to "activities of political leaders and celebrities" (Cebrian et al., 2017, p. 4). One of the major benefits of crisis communication via social media in this storm was that vulnerable communities were able to respond with sufficient preparation and receive information even though their community may have been horribly devastated (Cebrian et al., 2017, p. 3). During this storm effective crisis communication was a major aspect in keeping residents safe. This includes "systematic planning, collection, organization, and circulation of relevant awareness information to the target audience, reaching out to every individual in a community" (Cebrian et al., 2017, p. 3).

Research and Best Practices in Natural Disaster Communication

Quarantelli compiled the major findings based on studies from 15 years of research on local mass media activities and operations. First, mass media organizations put little effort into disaster preparedness planning. Most have no plans for what the organization would do if the facilities were impacted or coverage of stories became unattainable during the disaster or the aftermath. Those that do have plans, don't have comprehensive ones (Quarantelli, 1990, p. 1). Second, locations with multiple mass media outlets have a lot of variance in type of coverage. Studies found that not all media outlets cover the disaster and for those that do, there is variation in pattern and depth (Quarantelli, 1990, p. 1). The third finding was that disaster coverage is massive for all media. Organizations that provide information about disasters usually have many stories (Quarantelli, 1990, p. 2). Fourth was that disaster news stories are almost exclusively provided by local mass media organizations. It is clear that "local mass media systems consider disasters in their own community as "their" disasters…" (Quarantelli, 1990, p. 3). Fifth is that field reporters have more autonomy than usual when covering disaster related studies. Normally reporters have great autonomy in the field, but this increases under the chaos of the disaster (Quarantelli, 1990, p. 3).

Sixth is that there is selective reporting on disaster related topics. Research found that subjects such as volunteer search and rescue and activities of volunteers are not covered very often (Quarantelli, 1990, p. 3). Seventh, it was found that mass media organizations change their formal structures to accommodate disaster coverage. Personnel in the organization may have to perform roles outside of their jobs (Quarantelli, 1990, p. 4). Eighth, they found that different media outlets cover different parts of the disaster. "Generally, the electronic media are the primary distributors of hard news items during the early emergency time period. Where there is not a loss of electrical power, television plays the prime role, otherwise it is radio. Furthermore,

there is a definite tendency for the 'mass media' to become 'personal media'" (Quarantelli, 1990, p. 5). Also, many radio stations will air personal messages from listeners about their safety, the wellbeing of others, and additional personal information. Newspapers are more dominant in the post impact period (Quarantelli, 1990, p. 5). Ninth, it was found that mass media organizations mostly use traditional sources of information even during times of disasters. Local government officials were cited the most often as well as police, fire and relief agencies. Local emergency management was cited the least often (Quarantelli, 1990, p. 5). The final two findings were that citizens were heavily used as sources during times of disaster and that often mass media, especially television, perpetuates disaster myths (Quarantelli, 1990, pp. 6-7).

In a study on sheltering habits during disasters, Quarantelli (1991) found that little attention is paid to sheltering, and more to evacuation. "A congressional mandate and tradition may give the local Red Cross chapter a major responsibility for the sheltering of the larger metropolitan areas. Local emergency management agencies exhibit the range of no interest or involvement with the problem of evacuees, to an acceptance of the major responsibility for coordination of all disaster sheltering and housing activities in the local community" (Quarantelli, 1991, p. 4).

After several natural disasters, such as Hurricane Katrina, the United States government noticed their shortcomings when it came to alerting populations at risk of impending storms (National Academies, 2018, p. 1). In 2006 Congress passed the Warning, Alert, and Response Network or WARN Act, which was the first significant change to the disaster alert system since the mid-1990's ("National Academies systems," 2018, p. 1). In addition, new technologies such as smartphones, offered new ways to communicate with the public. This includes new platforms such as government run social media accounts or Facebook's Safety checks, which allows users

to register their status (National Academies, 2018, p. 2). The Department of Homeland Security examined how new technologies, such as social media, are used by the public during hazards or disasters. One finding of their study is that the 90-character message system of the previous Wireless Emergency Alerts (WEA) system was insufficient to relay all necessary information (National Academies, 2018, p. 3). This makes room for more expansive social media platforms, such as Twitter, which can hold 280 characters per message. Systems such as the WEA are based on the ubiquity of cellphones today. 92% of American adults own a cell phone and messages are often tailored to the users' needs based on environmental and contextual information (National Academies, 2018, pp. 4-6). Because of the widespread adoption of technology by the public, there are likely to be new expectations for alert systems to adapt to such technology. More so, issuing warnings based on communication avenues that people are using and accustomed to will be most effective (National Academies, 2018, p. 6).

Public response and engagement are vitally important in the natural disaster communication link. If the public is not receiving and acting on hazard warnings, then those messages should be improved or changed. Understanding public receptiveness encompasses several components such as message characteristics, accessibility, geotargeting, and community engagement (National Academies, 2018, p. 10). For example, how can warnings be tailored to those with differing abilities? One example of this would be including sign language translation in any videos posted in a warning message. Another concern is how to close the "digital divide" for those who cannot afford a cellphone (National Academies, 2018, p. 12). For those who do receive alerts in a timely manner, there are still issues regarding delayed response that must be overcome. Often once an alert is received, people "engage in a variety of activities that reconstructs their perception of safety into a reception of personal risk, creating a delay between the alert and the action" (National Academies, 2018, p.19). Rather than take action immediately

to be as safe as possible, people do other activities first if they believe their personal possibility of danger is not pressing. This is not uncommon. There is "almost always a delay between when an alert is received and when the recipient takes protective action," otherwise known as the protective action initiation (PAI) time (National Academies, 2018, p. 18). Some factors that influence a person's PAI time include message characteristics, milling, reunification, and time to prepare (National Academies, 2018, pp. 18-19). Milling is about seeking confirmation from others about alerts. This could affect whether to believe the warning is real and deciding if their families are at risk (National Academies, 2018, p. 20). Reunification is when people wait until all immediate family members are reunited. This could include activities such as coming home from work, picking up children from school, and waiting until they find a place where pets are allowed (National Academies, 2018, pp. 21-22). There is also preparedness, which accounts for the time needed to gather resources and secure the homestead (National Academies, 2018, p. 22).

There are five message topics that severely impact motivation of recipients to take timely protective action: guidance, time, location, hazard & consequences, and source. When these topics are present, public responsiveness increases (Drabek, 1999). Guidance is about telling the public exactly what to do to make sure they are safe (National Academies, 2018, p. 23). This can include information on how to be prepared or how to evacuate a dangerous area. Time and location factors inform people about when they should start to take actions and by when they should have it completed (National Academies, 2018, p. 23). For example, when tornado warning messages are sent farther in advance than 30 minutes, people are less likely to take action in a timely manner (National Academies, 2018, p. 29). Including the type of hazard and subsequent consequences is vital because preparation for a hurricane and resulting flooding is much different than other types of disasters. To heed the guidance however, people must trust the sources. Often, people will turn to their families and friends to verify warning messages

(National Academies, 2018, p. 23). In fact, when familiar accounts share emergency alerts from official accounts, it adds to the credibility of the message (National Academies, 2018, p. 35)

Recent research has studied aspects such as the use of URLs in warning messages and how using geotags in disasters can deliver more relevant and accurate alerts (National Academies, 2018, pp. 28-29). New research on message delivery methods have studied best practices with social media communication. In the US, 69% of all adults use some form of social media. These platforms are widely used during disasters by emergency managers, those impacted, and global onlookers (National Academies, 2018, p. 32). Social media can be used as a real time communication tool when gathering and releasing information, as well as a platform to organize support messages or response efforts. However, it is often difficult for the public to pinpoint pertinent information in the volume of content that is shared (National Academies, 2018, pp. 33-34). That is one reason people rely on the accounts of emergency management and relief agencies to bring them the information they need (National Academies, 2018, pp. 33-34). Difficulties for emergency responders using social media platforms include having to sift through oceans of content to send out relevant information, the public expectation to get a response from agencies when posting on social medias' two-way communication channels, social medias' lack of geographical bounds making it's hard to distinguish between the community in need and the rest of the world's commentary, misinformation that is often spread on these platforms, and finally, reluctance by many emergency personnel to adopt social media (National Academies, 2018, pp. 33-34). Another thing to note is that social media best practices for disaster communication are still evolving. Previous research has found that although communications from agencies remains an important resource, social media provides people with an avenue to instantly create, disseminate, and share information with a wide audience (Heverin and Zach, 2010, p. 35).

The Committee on the Future of Emergency Alert and Warning Systems: Research Directions calls for continued "research in this area to better understand changing practices in order to more fully realize the acknowledged potential of the platforms" (National Academies, 2018, p. 35).

NOAA is a research agency that spends billions of dollars a year "monitoring and predicting risk from environmental hazards to help people, communities, businesses, and governments find and use the right information to understand risk and make smart decisions" (NOAA, 2016, p. 1). NOAA's best practices for communication can be found below (NOAA, 2016, p. 12-14). This agency's resources were used because it had general communication tactics as well as specific communication guidelines for hurricanes.

1.**Have an informed plan** - know what needs to be achieved and how to do so

    Have a clear goal - look to change behavior or seek action

    Understand your audience - consider the diversity of the group

    Know who else is talking - know the other sources people may hear information from

    Develop and deliver the right message - create what is said and how it is said

2.**Speak to their interests, not yours** - connect emotionally with your audience

    Know what is important to the audience - connect with their values and concerns

    Be a good listener - let the audience be heard, understand how they respond

    Start a dialogue - make sure communication is not one-way

    Build trust - continue to be honest to build trust

    Consider demographics and economics of message recipients

3. **Explain the risk**- use stories and visuals to help the audience understand hazards

    Start with impacts - show what the impacts will be in the community

    Share audience experiences - the community will relate better to local stories

Be open about unknowns - start with the known, don't avoid uncertain topics

Use doom and gloom sparingly - scare tactics usually do not work

4. Offer options for reducing risk - offer solutions for barriers to action

Describe the options - provide options, describe how they can benefit people

Give options at the individual and community level - empower residents

Engage audience in blue sky planning - plan before it is necessary

Allow audience to discuss options - set up opportunities to learn from others

5. Work with trusted sources and the public - people seek confirmation from several trusted sources

Engage with the audience regularly - learn the people's needs early

Identify trusted sources of information - find out who the people listen to

Establish partnerships with trusted sources - increase the odds the message will get to the audience

Work with them to create and share consistent information- use multiple messengers

6. Test messages or products; evaluate performance - test messages on target audience before

Get audience feedback - can be a focus group or a survey

Ask questions that provide useful feedback - feedback from audience in their words

Be willing to make changes - make improvements before next communication

7. Use multiple ways to communicate - understand how the audience likes to receive messages

Use the audiences preferred medium - this can be television or social media

Use multiple mechanisms/formats - have the audience hear the message multiple times

Make sure messages are compatible with the medium being used - modify the message to the medium

These general guidelines will inform several codebook questions. Guideline number two above advised speaking to the audiences' interest, not the agency's interests, by connecting emotionally with the audience. This translated to concepts about showing concern or well wishes, offering condolences, and thanking those who helped.

Best practice guideline three was to explain the risk by using stories and visuals to help the audience understand hazards. One concept category was telling stories of the disaster. Offering options for reducing risk was the fourth best practice guideline from NOAA (NOAA, 2016, 12-14). This would fall under use one concerning preparedness. One significant codebook concept stemming from this was planning for situations that come from the disaster, such as a power outage. Number five of the NOAA guidelines was to work with trusted sources and the public, which means engaging with the audience regularly and identify trusted sources. The codebook questions are agencies replies to tweets as well as connecting the public with content from other local, state, regional, or national sources.

In addition to the general guide, NOAA compiled best practices for communication during tropical cyclones, including hurricanes (NOAA, 2016, p. 25). Every disaster event is different but depending on the type of disaster, residents would prepare for a hurricane differently than an earthquake. The guidelines below help specify communication specific to hurricanes.

1.Address barriers the public faces during hurricane preparedness. These include...

Cost and time of mitigation, supplies, and evacuation

The extent to which shelters accommodate public needs (ex. pet-friendly)

2.Convey hurricane risk information in a clear and compelling manner

Include a narrative to accompany facts

When communicating with businesses, include adaptive measures

Label landmarks on risk maps so the public can identify their location

3.Implement policy options to promote hurricane preparedness

Create financial incentives for homeowners to take preparedness actions

Enforce emergency/action plans within families and community groups

Strengthen federal warning systems and organization partnerships

Understand business and individual needs, constraints, and goals to preparedness

Have information channels for quick communication

From these specific guidelines for best practices tropical storms communication, some concepts were developed. The first guideline is to address barriers the public faces during hurricane preparedness, such as supplies, evacuation, and shelter accommodations (NOAA, 2016, p. 25). This guideline was used for preparedness concepts from use one as well as a concept question on shelters in use four and an evacuation question in use two. The second specific guideline for best communication practices during a hurricane is convey hurricane risk information in a clear and compelling manner (NOAA, 2016, p. 25). The concept questions informed by this were recent storm concerns, inclement weather warnings, and general forecasting.

Disaster Communication and Social Media

In a natural disaster, people look to traditional media sources, including television and radio, for weather information, alerts, and evacuation notices (Cebrian et al., 2017, p. 125). Disaster coverage has been dominated by different mass media, however, many benefits have emerged when discussing the use of social media during such events. Social media platforms such as Twitter and Facebook differ from traditional media because they are able to target their

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information to a certain group affected by a crisis (Cebrian et al., 2017, p. 125). Social media not only assists in more targeted communication, but also in emergency response, community interaction, and crisis informatics, a field combining computing and social science knowledge of disasters (Cebrian et al., 2017, p. 125). One of the biggest benefits of using social media during a crisis, is a two-way communication system which allows civilian users to interact with agencies about questions, ask to be rescued, or check in on loved ones. Not only that but the information it provides can be specified to a person or place and allow interaction with videos or websites. Conversely, mass media disaster communication presents a static message at specific intervals through means such as television or radio (Hawthorne et al., 2014, p. 3).

As social media is adopted into society it changes how people communicate during emergencies. Rather than wait for a message to be presented by a media source, the people are active participants in telling the story (Heverin and Zach, 2010, p. 1). Heverin and Zach have conducted studies on Twitter's role in communication during and after crisis events. This includes one study on the tweeting patterns during the Seattle-Tacoma search for a killer (Heverin and Zach, 2010, p. 1) and another study about using microblogging to discuss three campus shootings (Heverin and Zach, 2012, p. 34). In both of these instances, the two-way communication system allowed the public to tweet about the information.

Social media is a general term that encompasses "together blogs, micro-blogs, forums, audiophoto-video-sharing, wikis, social bookmarking, social networking and other digital tools and applications that facilitate interactive communication and content exchange" (Stal, 2013, p. 6). This communication happens among individuals, with varying audiences, and within organizations (Stal, 2013, p. 6). Social media accounts for one out of every four and a half minutes of online activity, and this increases substantially during a crisis (Austin et al., 2011, p.

345). For example, the daily views on CNN's iReport increased 240% the day of the earthquake in Haiti (Greco, Lachlan, Lin, Najarian, & Spence, 2016, p. 648).

Social media are unique connection tools because the information does not flow in a hierarchical, top-down manner. Instead it mostly flows horizontally, giving more power to the public to connect and share (Begg et al., 2012). After September 11th, 2001 research in crisis communication showed the importance of interpersonal networks. This study showed that the majority of people learned of the terrorist attack from someone else in their own personal network. This idea of personal connections is the entire basis of social media and can expand to include news outlets and government agencies to relay information about an event or news around the world (Griffin et al., 2007, p. 543).

Another thing to consider is direct versus indirect information. Those with direct experience of an event have a positive effect and reinforce precautionary behavior. People with indirect experience of a hazard must base their knowledge on indirect sources, such as the mass media (Begg et al., 2012, p. 1053). This helps with personalizing the information and retweeting communication efforts. So even if the information is not direct, indirect information from peers garners more trust. The influence of direct experience can have a profound effect on those who are inexperienced because "…direct experience in more detail: personal exposure to the natural event (e.g., a flood) can offer an illustration of the threat and demonstrates the potential for future risk" (Begg et al., 2012, p. 1052).

Twitter and Natural Disaster Communication

Social media offer portable sources for communication and information, something that traditional media does not offer. Impacts from a storm can inhibit the use of traditional news consumption via television, radio, and newspaper. For this reason, social media are more

consistent avenues to reach those affected by a disaster. Other caveats for an optimal crisis communication tool is that it is "low-cost, easy-to-use, scalable, mobile, reliable, and fast network that provides…one to many communication" (Hawthorne et al, 2014, p. 4). Social media have many of these characteristics in addition to being timely information sources, accessible, and not as dependent on the power grid.

Twitter was founded in 2006 and by 2019 the site had over 321 million users ("Twitter reveals its daily active user numbers for the first time," 2019) and in 2015 it was one of the top 10 most visited sites globally (Anderson et al., 2015, p. 2453). Tweets are brief messages of 140 characters (later in November 2017 this was updated to 280 characters) which are posted to a personalized network for each person (Cebrian et al., 2017, p. 3). These messages can also be retweeted to other people's networks which can greatly expand each tweet's reach. Another feature of Twitter is hashtags. These use the symbol '#' to preface a short phrase that can connect to wider issues and start a discussion among the entire Twitter network (Burgess et al., 2013, p. 29). Often these hashtags relate to various topics and can be 'trending' which puts them at the forefront of discussions on the platform. For example, the hashtag '#metoo' has been a trending topic on Twitter since late 2017 due to several high-profile figures admitting to sexual assault. People have been accompanying this hashtag with personal accounts of sexual assault and harassment. This has connected many people over a sensitive issue and sparked a national conversation on how to raise awareness and solve the problem. Twitter has global reach and is classified as both "social network and an informational network" (Cebrian et al., 2017, p. 126). If users 'follow' it can connect them with their personal networks as well as celebrities, politicians, magazines, news outlets, and government agencies. This broadens their information source and new sources can be added at any time (Burgess et al., 2013, p. 35).

There are several types of social media sites that can be used for communication but Twitter is popular for natural disaster communication because it is meant for microblogging, or sharing information via short and frequent posts (Hawthorne et al, 2014, p. 4), which is easily able to transition into documenting information on a disaster (Hawthorne et al, 2014, p. 11). Twitter is also used because the information is presented in temporal order. Other social media sites are able to connect people and distribute communication, but other usability factors hamper their adoption for the use of natural disaster communication. Instagram is a "digital content sharing" platform (Hawthorne et al, 2014 p. 4) that places content out of order and is mainly used for pictures and videos rather than text. Facebook is also used during disasters, but Twitter use often outpaces Facebook during times of crisis. For example, in a study of the 2010 Haiti earthquake, Twitter had more posts about the event than Facebook (Hawthorne et al, 2014 p. 11) (Muralidharan, Rasmussen, Patterson, Shin et al., 2011, pp. 176 - 177).

FEMA has proactively embraced social media to connect more with the public and utilize outlets, most notably Twitter, in their communication efforts. Because of this they are now the tenth most popular government agency on Twitter and are able to effectively distribute disaster information and assistance to victims. FEMA has also divided its communication efforts into 10 smaller districts, each with their own directed Twitter feed in order to specialize the information to a region in the case of a disaster. (Jacobzone, Radisch, & Wendling, 2013, p. 14).

Nonprofit organizations lag behind in social media adoption. However, the American Red Cross has taken to using social media to connect with people and build relationships. The platforms they utilize most are Twitter and Facebook. Researchers found that the Red Cross' posts on social media get a better response rate than when they use traditional media and their chapter website for the same purposes. Users of the Red Cross social media accounts touted the simplicity and the ability to share and retweet as the main reasons they use the Twitter accounts.

When it comes to how the organization uses social media, they found it useful to connect with reporters as well as keep track of media stories when they are in the field (Briones, Jin, Kutch, & Liu, 2010, p. 40).

Some agencies do not follow the lead of FEMA and the Red Cross, which can have adverse effects. Organizations that do not have an active social media presence during a disaster are seen by the public as disorganized or disinterested. This is especially true for the government, whose role is to serve the public (Jacobzone et al., 2013, p. 6). It is important to note that this study will look at the tweets sent out by specific government or government affiliated agencies rather than just all public tweets discussing the storm. This is because during a major event it is difficult to know what public information is reliable if the source is not an established and legitimate authority (Greco et al., 2016, p. 649).

Summary

Traditionally, mass media communicated about disasters via television and radio. Today the medium has shifted to cellphones and social media. The popularity of cyberspace has swept the world and social media has provided an excellent community for information to be delivered quickly and without a power source (Cebrian et al., 2017, p. 125). The virtual world has many layers, one of which is virtual communities like Twitter. Similar to any other community, communication between the pubic and emergency management should be tailored until it is most effective. The main idea highlighted in this chapter is that relaying disaster communication via Twitter should emphasize messaging factors such as delivery, accuracy, timeliness, and usefulness. These factors are seen in disaster communication best practices as well as disaster communication theory. Sadly, disaster relief agencies have been slow to adapt to the changing times. The next chapter, will discuss the agencies of interest for my study, Red Cross and FEMA, as well as their engagement efforts with the community.

Chapter 2: Agencies, Organizations, and Engagement Efforts

This chapter is about diffusion of innovation, community engagement, FEMA, the Whole Community initiative, Red Cross, and the Red Cross Ready campaign. Diffusion of innovation helps us understand how the rate of information is adopted in society. When considering Twitter usage by public agencies, the adoption rate may be slow. After diffusion of innovations, there is a section on community engagement and why this is a crucial tactic to garner the best action from disaster communication. The final sections covers the origins and evolution of FEMA and the Red Cross as well as their respective plans to get the public interested and willing to prepare for upcoming disasters.

Diffusion of Innovation

Diffusion of innovation theory helps to explain the adoption process of an innovation by modeling its lifespan (Chang, 2010, p. 1). An innovation can be any "idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1962, p. 11). Scholars have found that diffusion of innovation follows an "s-curved pattern" which suggests that the innovation will "spread across consumer groups until adoption reaches a plateau…" (Anderson, Lewis, & Dedehayir, 2015, p. 2454). This diffusion differs based on many variables including the type of innovation, the social system being affected, the communication channels, and time (Chang, 2010, p. 2). In past research this has been used to examine everything from the spread of hybrid corn, to the global diffusion of cars, in addition to adoption of technologies (Anderson et al., 2015, p. 2454). For example, mobile phones and VCRs needed only a few years to gain a high level of adoption, whereas using seatbelts in cars required decades to reach the same levels (Anderson et al., 2015, p. 2454).

This theory helps to understand how an innovative idea or product affects individuals, communities, and other stakeholders (Chang, 2010, p. 2), as well as how these ideas infiltrate a social system over time (Coursaris, Yun, & Sung, 2010, p. 2). The rate at which an innovation penetrates a society is dependent on seven factors; personal innovativeness, relative advantage, compatibility, complexity, trialability, observability, and perceived popularity.

Personal innovativeness can be simply understood as an individual's willingness to change. Integrating new innovations into one's lifestyle can be daunting but those who have high personal innovativeness are "active information seekers and can handle high levels of uncertainty" that comes with a new product or service (Coursaris, et al., 2010, p. 2). They are also expected to have a more positive outlook about the target innovation and are willing to adopt it earlier than other members of a social system (Coursaris, et al., 2010, p. 2).

Relative advantage refers to the "economic, social prestige, convenience, and satisfaction benefits it provides to the user" (Anderson et al., 2015, p. 2454). It is also related to the notion that the new innovation is superior to the idea that it supersedes. For example, Coursaris, Yun, and Sung note that the "relative ease of being connected through the use of a one-to-many application, an inherent characteristic of Twitter, is a key strength…" of this specific platform (Coursaris, et al., 2010, p. 2).

Compatibility is when an innovation blends consistently with the existing values, beliefs, and past experiences that potential adopters have come to know with existing technologies (Anderson et al., 2015, p. 2454). When an innovation is more compatible, the uncertainty and risk factors decrease. With Twitter, those who already rely on staying connected can do so with ease since the application connects people anywhere at any time, allows them to message for free, as well as easily state their status and opinions (Coursaris, et al., 2010, p. 2).

The next factor is complexity, or the difficulty associated with using the product. This is an important factor because innovations that are difficult to use or understand are less likely to diffuse (Anderson et al., 2015, p. 2454). Twitter is attractive in this sense because it has a simple interface and limited tweet length which aids in brevity. (Coursaris, et al., 2010, p. 2).

Trialability is the degree to which a potential adopter can try out a product to determine if it has value in their life. This can also lower risk and uncertainty in their minds (Coursaris, et al., 2010, p. 3). Because Twitter is free and accounts are simple to make, the trialability is high.

Observability relates to how visible an innovation is to others. A positive association is created when adopters can easily see the integration of an innovation in society. Twitter has been exposed to many people in society since it has been around for more than a decade, receives frequent media attention, and is often used by public figures such as celebrities and politicians (Coursaris, et al., 2010, p. 3).

The final factor influencing the rate of adoption is perceived popularity. Adoption of an innovation may not be related to need but rather social pressure. Network externalities are the "increased utility of a communication medium as a result of an increasing user base" (Coursaris, et al., 2010, p. 3).

Diffusion of innovation theory is normally applied to innovations from companies, but the literature and research has expanded when it comes to an innovation's adoption in the public sector (Anderson et al., 2015, p. 2453). The public arena provides many vital services to citizens in the community, therefore the adoption of technology, such as social media, and practices, such as effective disaster social media use, by them can be directly related to the efficiency and quality of the services they provide (Anderson et al., 2015, p. 2455).

Sadiq, Tharp, and Graham (2016) researched what information sources individuals rely on during a natural disaster. They studied FEMA on the national scale as well as several local sources such as friends, family, fire departments, emergency management, and more. They noted that in the past, the public has received their disaster information from emergency management officials and news media. More recently, the public has sought information through websites and social media from emergency management agencies at the federal, state and local levels (Sadiq et al., 2016, p. 7). Social media platforms have become major tools in the disaster information world because of their accessibility, depth of information, and speed at which information can be distributed (Sadiq et al., 2016, p. 8). As mentioned in Chapter One, FEMA has been an early adopter of social media, especially Twitter, which is beneficial for the diffusion of this innovation in the public sector because when it comes to disaster content, "information flows from FEMA to state and local governments and the public" (Sadiq et al., 2016, p. 8). Even though FEMA is seen as an authority in distributing disaster information, the organization is not often who the public turns to most often during these crises. The Pew Research Center found that local governments in the United States are the closest to citizens and the most trusted (Sadiq et al., 2016, p. 8). Pew also conducted a public opinion survey showing 63% of the public has a favorable view of local government, compared to just 28% for the federal government (Sadiq et al., 2016, p. 8). The research study conducted by Sadiq et al (2016) found the sources people" would rely on a great deal" when preparing for a disaster are: Friends and family (39.2%), fire departments (24.1%), police departments (20.2%), American Red Cross (17.5%), county/city emergency management agency (16.6%), state emergency management agency (14.2%), Federal Emergency Management Agency (FEMA) (10.9%), local religious organizations (10.1%), colleges and universities (2.7%).

The local and state levels in each organization are important when it comes to communication during natural disasters because they are most often connecting directly with the citizens. This also demonstrates how important local, state, and regional organizations disaster content is on social media platforms are and their need to be as consistent and informative as national agencies. This is why the study included national and local FEMA (which includes upward of 10 states in one account) and national and local Red Cross.

As mentioned in Chapter 1, Twitter has become a worldwide success since its 2006 launch. In 2019 the site had over 321 million users ("Twitter reveals its daily active user numbers for the first time," 2019) and in 2015 it was one of the top 10 most visited sites globally (Anderson et al., 2015, p. 2453). However, its adoption, especially in the public sector, can be based on the type of agency and engagement efforts employed by agencies.

Community Engagement

A community is loosely defined as "a group of people united by at least one but perhaps more than one common characteristic, including geography, ethnicity, shared interests, values, experience or traditions" (O'Mara-Eves, Brunton, McDaid, Oliver, Kavanagh, Jamal, et al., 2013, p. 44). But other characteristics such as the community functioning as a system can also be encompassed. Community engagement is defined as "approaches to involve communities in decisions that affect them" (O'Mara-Eves et al., 2013, p. 44). It also refers to "values, strategies and actions that support authentic partnerships, including mutual respect and inclusive participation, power sharing and equity, and flexibility in goals, methods, and timeframes to fit priorities and capacities of communities" (Wells, Springgate, Lizaola, Jones, & Plough, 2013, p. 3). It is an impactful strategy for smaller regions to engage with their residents to plan and prepare for disasters because "...all response is first local..." (Newnham, Patrick, Balsari, &

Leaning, 2015, p. 2) at the community level. These decisions vary based on the demographics, location, proximity, type of storm and level of preparedness. It is important for each community and family to plan for their unique needs. The impacts of community decisions can vary significantly as well, depending on the knowledge and preparedness of the community impacted. Studies have shown that "inadequate community preparedness [can] reduce response effectiveness and efficiency, increase the burden on affected populations and infrastructure, and impede the rescue and response efforts of the local and national authorities" (Newnham et al., 2015, p. 3).

There are several levels to disaster preparedness and management which include communication, resources, programs, and organizations dedicated to assisting those in need. This may span a range of disasters, from hurricanes and tornadoes to mudslides and wildfires. Thankfully, there are communication tactics that are designed to target and prepare citizens before a disaster. Community engagement is a "strategic process with the specific purpose of working with identified groups of people" ("What is Community Engagement," n.d.). This is a unique tactic when applied to natural hazards because citizens can take care of their own individual needs and be proactive with their community when it comes to preparing for a disaster (Sobelson, Wigington, & Harp, 2015, p. 2).

Crisis communication, community engagement, and social media fit hand in hand because they all feed off of one another. Crisis communication using social media is a form of community engagement because users of these social media platforms form their own community. As Palen, Vieweg, Sutton, Liu, and Hughs (2007, p. 1) argued, "ICT [Information and Communication Technology] in recent disasters have served as communication platforms for disaster survivors, curious onlookers, and compassionate helpers wishing to aid those directly

affected by crisis. Disaster organizations as well as individuals are able to participate in response

and relief efforts without ever setting foot in the geographical space of the disaster."

Microblogging platforms, such as Twitter, where users can write small blogs about themselves or

their activities, enable communication daily around the world. This can range from banal

information about thoughts or events to crucial correspondence about emergencies (Vieweg,

Hughes, Starbird, & Palen, 2010, p. 1080). In recent years microblogging during disasters has

demonstrated great importance for the agencies sending aid and survivors telling their stories.

Since disasters have a low probability of occurring, fostering preparedness for them often

competes for attention with day to day life (Kapucu, 2008, p. 246). Even more so, "public

complacency" undermines many of the efforts set out by the government to prevent negative

effects in the event of a disaster (Kapucu, 2008, p. 246). "Effective community outreach in

disasters requires understanding community needs and issues…" and one effective method of

outreach is to develop "appropriate forms of communications and messaging" to nurture an

informed and alert community (Newnham et al., 2015, p. 3).

By enhancing communication between communities and government agencies as well as

first responders, disaster effects can be minimized. This is especially true with pre-disaster

communication (Kapucu, 2008, p. 247). One example is in Florida where the State Emergency

Response Team (SERT) handles statewide response to emergency situations. They mobilize the

"closest appropriate responder (Kapucu, 2008, p. 245)" to any threat, event or disaster. With this

approach in place many of the responders come from within the county they serve during a

disaster (Kapucu, 2008, p. 245). SERT works heavily with local emergency management

agencies to prepare communities for disasters which directly "reduces the immediate demands on

response organizations" and allows them to aid other residents who cannot help themselves (Kapucu, N., 2008, p. 250).

Relief agencies in recent disasters have heavily utilized the capabilities of social media, not only to communicate and share information, but also to build community resilience, how a community can "bounce back" from a disaster (Dufty, 2012, p. 40). Social media can aid in this because it has already established or can form "communities of practice" or groups who share a passion for the same thing and regularly interact (Dufty, 2012, p. 42). Specifically, social media can be used in a resiliency capacity to develop networks, inform about warnings or risks, engage in preparation, crowdsource, provide support, coordinate response, and conduct post event learning. Some concerns for community managers include how much they should incorporate social media compared to traditional media, if they should utilize social scientists to gain a deeper understanding of community development, and how the definition of "community" changes from geographically bound to more expansive (Dufty, 2012, p. 43).

The Federal Emergency Management Agency

"Helping people before, during, and after disasters."
~FEMA Mission Statement, updated 2019 ("About the Agency," n.d.)

Federal organizations and disaster relief agencies have a long history of providing aid in different ways to the people of the United States and abroad. Some of these agencies include the Red Cross, United Way, and the Salvation Army.

The major federal government relief coordination agency, FEMA, was established in 1979 by President Jimmy Carter to coordinate the, "Federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror" ("Home | FEMA.gov," n.d.). FEMA's

origins, previous to being an established entity, can be traced back to 1803 when a general

Congressional act gave assistance to a New Hampshire town after a fire ("Home | FEMA.gov.,"

n.d.). In the following century legislation was passed more than 100 times to respond to natural

disasters around the United States. In the 1930's support for disaster response and management

was in high demand, because of the desolation left by the Dust Bowl and other events of the time

(Mcleman et al., 2013, pp. 419 - 422). The Reconstruction Finance Corporation was created in

1932 and given authority to make loans to repair public facilities after natural disasters ("Home |

FEMA.gov," n.d.).

There have been three major shifts during FEMA's existence; the first was moving from

disaster management to crisis preparedness, the second was revitalization under James Witt, and

the third was absorption under the Department of Homeland Security (Adamski, Kline, &

Tyrrell, 2006).

Under President Ronald Reagan there were two directors of FEMA. The first was Louis

O. Guiffrida who replaced the first director appointed by President Carter. Guiffrida's

background was not in disaster management, but rather state level terrorism preparedness. He did

not have direct experience in natural disaster management and used FEMA funds for

preparedness against nuclear attacks. There were also concerns about his style of management.

These issues prompted former Tennessee Senator Al Gore and other government officials, to

inquire about FEMA's operations and effectiveness, leading to a Congressional hearing and

ended with Guiffrida's resignation (Adamski, Kline, & Tyrrell, 2006, p. 7). In Reagan's second

term he appointed Julius Becton who was previously the director of the Office of Foreign

Disaster Assistance in the State Department. Though he restored some integrity to FEMA's

office, he continued prioritizing resources for national security purposes, rather than for natural disaster management (Adamski et al., 2006, p. 7).

The second shift in the 1990's was when greater attention was given to effective emergency management and response. President William Clinton was previously governor of Arkansas and handled many major flooding events in his tenure. He appointed James Witt as FEMA director in 1993. Witt was Arkansas's Director of Emergency Services under Clinton and was the first FEMA director with relevant experience (Adamski et al., 2006, p. 9). Witt implemented a number of reforms in the agency from 1994 to 1998. There were five parts to Witt's overhaul; [1] conduct "a top-to-bottom review of FEMA's mission, personnel, and resources", [2] initiate "sweeping reforms that streamlined disaster relief and recovery operations", [3] emphasize "preparedness and mitigation", [4] implement "customer service training", and [5] boost "employee morale" (Adamski et al., 2006, p. 9). These changes were highly regarded and thoroughly tested when several disasters occurring during that period. Witt was widely praised for his efforts.

In 2002 there was an overhaul of how FEMA responded to hurricanes when the agency was absorbed into the Department of Homeland Security ("About DHS.," 2017). The DHS was created to bring agencies with similar functions, including emergency management, all under one roof. After the September 11, 2001 terrorist attacks the United States federal government took action based on a report conducted seven months prior by the Commission on National Security Strategy. This report stated there was a "serious and growing threat to the American homeland from terrorist attacks" which was later proven true by September 11th (DeLorenzo, 2013, p. 63). In addition, the report stated the structure of government security agencies was inappropriate to

protect the homeland, with efforts fragmented across more than 24 agencies or departments across the country (DeLorenzo, 2013, p. 63).

Homeland security was made a priority and FEMA along with 22 other agencies were absorbed into DHS (DeLorenzo, 2013, p. 1). Many were concerned about the autonomy and swiftness of response when FEMA was no longer an independent agency (Adamski et al., 2006, p. 4). Also, DHS is focused mainly on threats to the United States, issues such as terrorism and border security ("About DHS.," 2017), whereas FEMA's primary role has been on natural disaster preparedness and management. Other concerns like limited funds, lack of manpower, unqualified personnel, bureaucratic red tape, and co-mingling national and domestic issues has hampered much of their work (Adamski et al., 2006, p. 4).

"Whole Community" Initiative

Some of FEMA's efforts to increase public preparation for disasters are found on the Ready.gov website, along with a PDF guidebook, and several social media channels ("Plan Ahead for Disasters.", n.d.). Unfortunately, these channels have limited reach on social media platforms such as Twitter, where they only have 704,000 followers. FEMA faces the same issues as the Red Cross and other disaster relief agencies which is a lack of public willingness to engage and a lack of awareness. FEMA has other goals that are at their forefront, but part of their mission is to "build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards" ("Sixty Percent of Americans Not Practicing for Disaster.," 2015). Preparation is in their agency description; however, according to their 2015 study they report approximately 60% Americans are not prepared for a disaster ("Sixty Percent of Americans Not Practicing for Disaster.," 2015). Part of this is from poor communication, part is lack of information, and part is from unwillingness to engage. Another effort set forth by

FEMA is Whole Community. This is one of their main engagement programs and though it does not utilize social media much, it is important to understanding what the agency has done so far in its communication efforts.

Since its inception FEMA has been the primary federal disaster management authority in the United States. This is where the majority of funding for natural disaster response originates (Mener, 2007, p. 16). There are often constraints due to funding, lack of personnel, and altogether inappropriate approach to handling disaster relief. Because of FEMA's organizational structure, there is little to be done administratively, but there are other approaches that can be taken to rectify the issue and share responsibility in disaster management (Mener, 2007, pp. 57 - 62). An effective approach utilizing the citizens of a community through community engagement tactics such as preparing a disaster kit in advance of a storm. By engaging citizens, the brunt of the work FEMA bears can be spread out at the household level (Mener, 2007, pp. 57 - 62).

The Whole Community program represents a "philosophical approach" of FEMA on how to conduct and promote community engagement to aid in disaster preparation, management, and resiliency ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action.," 2011, p. 3). The new focus is on transforming the way emergency management is conducted normally, specifically on how to integrate all levels of the community, most importantly the average citizen ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action.," 2011, p. 2). This project began when FEMA's Office of Policy and Program Analysis (OPPA), commissioned the National Foundation for the Centers for Disease Control and Prevention (CDC Foundation), the Center for Disease Control and Prevention (CDC) and the Office of Public Health Preparedness and Response (OPHPR) (Sobelson et al., 2015). The objectives were to "identify, promote, and

learn" from existing community engagement efforts that exemplify the goals they envisioned for the Whole Community program (Sobelson et al., 2015, p. 3). Sobelson, Wigington, and Harp (2015) conducted a literature review and identified 50 programs. From there they had conference calls with the 50 program leaders and gathered information which was used to develop the Whole Community principles and themes. Seven programs across the United States were also identified from the original 50, and those received funding by the agencies to act as a "body of knowledge" (Sobelson et al., 2015, p. 3).

On the FEMA website, "Whole Community" has a page dedicated to the program. The agency targets "individuals, families, communities, the private and nonprofit sectors, faith-based organizations, and state, local, tribal, territorial, insular area, and federal governments" ("Whole Community," n.d). The first dropdown section on this page is called "Shared Responsibility." Here the page states that disaster preparedness is a responsibility that everyone should bear. Whole Community means two things; first "Involving people in the development of national preparedness documents" and the second is "Ensuring their roles and responsibilities are reflected in the content of the materials" (Campbell et al., 2018, p. 52). The second dropdown menu called "Learn More" brings the reader to more material on the ready.gov FEMA website ("Get Involved," n.d.). The home page of the website has a section entitled "Get Involved" and has separate pages dedicated to how to "Be Informed," "Plan Ahead," "Take Action" as well as materials for kids.   On the "Get Involved" page there are many other sections on Citizen Corps, Youth Preparedness, Volunteering, a vast array of social media Toolkits, and much more. There are also publications, videos, training sessions, and webinars ("Get Involved," n.d.).

A separate section on the FEMA website is entitled "A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action" and is accompanied by

a PDF attachment ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011). This document "presents a foundation for increasing individual preparedness and engaging with members of the community as vital partners in enhancing the resiliency and security of our Nation through a Whole Community approach. It is intended to promote greater understanding of the approach and to provide a strategic framework to guide all members of the emergency management community as they determine how to integrate Whole Community concepts into their daily practices" ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011, p. 2). The document has an overview of principles (discussed below), themes, and pathways stemming from successful practices used in the field. FEMA administrator Craig Fugate stated that "a government-centric approach to disaster management will not be enough to meet the challenges posed by a catastrophic incident. That is why we must fully engage our entire societal capacity...." ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011, p. 2). This collective learning approach has been gaining steam in many communities around the country. There is a diverse collection of information supplied from residents and official coalitions, which are presented at conferences, seminars, and various meetings ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011, p. 2).

The main three principles are as follows; [1] meet the needs of the entire community including the demographics and values of all, [2] bring everyone into the emergency management team by engagement and empowerment, and [3] strengthen already beneficial institutions. The strategic themes are to, "Understand community complexity, Recognize community capabilities and needs, Foster relationships with community leaders, Build and maintain partnerships, empower local action, and Leverage and strengthen social infrastructure,

networks, and assets" ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011, p. 5). Each of these are paired with real-world examples that demonstrate how the concepts are applied. One of the biggest points of emphasis is on creating a framework for each community, because their needs can vary widely ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011, p. 19). These themes, principles, and other information are not meant to be "how-to" guides, but "rather a starting point that may lead to further discussions on how to implement a whole community approach" (Sobelson et al., 2015, p. 2).

One example of Whole Community application comes from the Community and Regional Resilience Institute (CARRI), an agency tasked by FEMA to "develop a process for enhancing community resilience" (Plodinec, Edwards, & White, 2014, p. 10). CARRI designed the Community Resilience System software (CRS), which was pilot tested in eight communities and developed a software for higher education institutions, the Campus Resilience Enhancement System (CaRES), which has also been tested (Plodinec et al., 2014, p. 14). Both of these programs were rooted in the concept that community resilience is "about achieving an acceptable…level of functionality." However, it must also be action oriented, utilize the community expertise, and must be scalable (Plodinec et al., 2014, p. 10). In this case CARRI dissected the sectors of the community based on what services they provide. This same approach was taken for higher education institutions. The six steps CARRI outlined to develop each community's respective Whole Community program are "Organization, Assessment, Goal Setting, Action Planning, Implementation, and Evaluation" (Plodinec et al., 2014, pp. 13-14). Organization involves defining the community sectors and the program's leadership team. Assessment involves dissecting each sector and their needs, such as "What are the significant threats facing our community? What is our current capacity in each service area? What assets

critical to carrying out our core functions are at risk from those threats? What resources do we have available for recovery?" (Plodinec et al., 2014, p. 13. In each sector, subject matter experts answered a series of relevant questions for the researchers to develop a knowledge base (Plodinec et al., 2014, p. 13). Steps three and four, goal setting and action planning, are mostly determining a vision from the assessed information and how to carry it out. Steps five and six, implementation and evaluation, are about achievement and if they are meeting the goals set in steps three and four (Plodinec et al., 2014, pp. 13 - 14).

Once the study concluded there were some interesting findings. First was that communities took longer to organize their programs than the researchers had thought. They determined it was because Whole Community is founded on relationships in the community, which take time to develop and are based on layers of conversation and interaction (Plodinec et al., 2014, p. 14). Second, the software was deemed a success because it helped communities identify shortfalls and rectify them. For example, the software "might indicate that hospitals in the community are unaware of the plans made by electric power providers to minimize disruptions and to restore service when they occur. In this case, the CRS might suggest that a community's hospitals should connect with the electric power provider to determine how and when power might be restored in the event of a severe storm" (Plodinec et al., 2014, p. 13). Third, it was shown that local businesses must be active in Whole Community, not just local government because often businesses better understand the ins and outs of the community they serve (Plodinec et al., 2014, p. 16). Fourth, the implementation of the software at the higher education level was more successful than the community level because they have many of the sectors, hierarchies, and procedures outlined already (Plodinec et al., 2014, pp. 15 - 16).

The American Red Cross

"The American Red Cross prevents and alleviates human suffering in the face of emergencies by mobilizing the power of volunteers and the generosity of donors." ~Red Cross Mission Statement, updated 2019 ("Mission & Principles," n.d.)

The American Red Cross was established in 1881 by Clara Barton. The idea came to her after she returned from a European trip and noted the work done by the Swiss Red Cross. The American Red Cross' first congressional government charter was established in 1900. One of the original purposes of the organization was to serve people in need throughout the United States, later this expanded to the Red Cross networks internationally ("Our History," n.d.). In addition, the Red Cross acted as a medium of communication for overseas military members and their families. The American Red Cross' first educational programs were in first aid, water safety, and nursing ("Our History," n.d.). After the beginning of World War I, their local chapters grew and they had an influx of people becoming members, enrolling their children in the junior Red Cross program and joining their educational programs. World War II saw the heavily utilization of the Red Cross once again. The organization registered over 100,000 nurses, shipped 300,000 tons of supplies to the warfront and began their donation program to send blood overseas to the wounded military. This program is now civilian based and provides 40 percent of the U.S.' blood supply ("Our History," n.d.)

In the past century, the Red Cross has provided relief and resources for cases like the 1918 influenza outbreak, various environmental disasters, such as the Great Depression droughts in the 1930's, as well as the Korean, Vietnam and Gulf wars. It partnered with other federal agencies such as FEMA. With the help of employees and volunteers, the Red Cross serves five main purposes; collecting, processing, and distributing blood; helping those affected by disasters

in America; supporting military members and their families; providing health and safety information and training; and sending relief to disaster struck areas internationally ("Our History," n.d).

The Red Cross is a prominent humanitarian organization, but they have not escaped their fair share of mismanagement and scandals. There have been critiques of the Chief Executive Officer's salary, donation money uses, lack of aid provided for disaster areas such as the Haiti earthquake, and accusations of the Red Cross staging publicity stunts instead of providing relief (Ritholtz, 2017), ("Red Cross Workers May Have Stolen $6 Million in Ebola Aid," 2017), (Eisinger & Elliott, 2014a), (Eisinger & Elliott, 2014b). Similar charitable organizations include UNICEF, Oxfam, Save The Children, and the Salvation Army. These are other well-known disaster relief organizations that have a national or international focus and a parallel mission to the Red Cross. Many of these organizations do not have the scandals associated with the Red Cross and pull from the same base for donations and volunteers ("10 Disturbing Things ProPublica Learned Investigating the Red Cross' Sandy Relief Efforts," n.d.).

Despite these allegations and criticisms, the Red Cross remains one of the most recognizable organizations in the world because of their commitment to serving those in need. They have blood donation services, provide guides and information on what to put in an emergency or first aid kit, guides on how to prepare for disasters, CPR training as well as how to keep your home properly updated with safety precautions. In addition, they have information on how to survive various emergency situations such as an active shooter and information on various diseases such as HIV/AIDS. They have also launched the Red Cross Ready campaign to prepare the public for natural disasters and emergency situations ("What We Do | Emergency Management | Red Cross," n.d.)

Be Red Cross Ready Campaign

According to the United States Census, there are about 330 million U.S residents, 72% are over 18 and under 65 ("QuickFacts," n.d.). In addition, the Pew Research center estimates that 84% of American households contain at least one smartphone (Olmstead, 2017). Despite this large possible pool, the national Red Cross Twitter only has 5.4 million followers (Account, 2018). With this perspective, there is a low number of people who follow the Red Cross and receive information about their disaster preparedness efforts. Their Twitter account seems to be more centered on after crisis communication and news about the organization, rather than preparation. There are some tweets about beforehand preparation, such as steps to take for a winter storm power outage, however, they are often only released before a storm. This can create a pattern where the public are only concerned with disaster preparedness when there is a storm brewing, so the Red Cross caters to that idea.

The Red Cross Ready national campaign was launched in 2007 and its purpose is to let "you help yourself" by following "simple steps in advance to ensure you can weather a crisis safely and comfortably" ("How to Prepare for Emergencies," n.d.).

The Red Cross began the Ready campaign because they recognized the need for better public preparedness for disaster situations ("Everyone Must Be Prepared For Emergencies," 2017). This can save time, money, lives, and resources. By increasing efficiency of citizens' operations during a disaster, it will put less pressure on organizations like the Red Cross and FEMA to provide all of the aid. If the majority of the public can take care of their baser needs, these organizations can focus on getting medical attention and resources to communities who may be more severely affected or vulnerable groups, such as the poor and the elderly. This idea

is beneficial to the public as well because they won't have to rely on outside aid which may be inadequate or delayed ("Everyone Must Be Prepared For Emergencies," 2017).

The Red Cross Ready Campaign is broken into a three-step system. The first step is to "Get A Kit." This step is all about procuring the proper supplies needed for certain situations. This survival kit details basic items such as water, canned food, batteries, extra clothes, sanitary products, extra cash and more. They also advise planning for your family's unique needs such as specific medical supplies, baby food, pet supplies, entertainment for children, and set of extra keys. The list also suggests items for common disasters you may face depending on your location. For example, areas that experience frequent floods and hurricanes warrant waterproof items, rain gear, and supplies to secure parts of your home. At the bottom of this section, there is a guide on how to make a well-stocked first aid kit for a family of four, which can be adjusted depending on your family's size ("How to Prepare for Emergencies," n.d.).

The second step is to "Make A Plan." They advise you to make a personalized emergency plan, broken down into three steps. The first is to discuss types of emergencies and how to prepare for them with your family. The second step is to delegate responsibilities to each of your family members and how you will coordinate as a team. The final step is to practice your plan. In addition to these steps, the website has printable disaster plan templates and a tip sheet on how to use said template available in English and Spanish. Below the template section, there are several drop down menus that specify how to account for common scenarios such as how to inform loved ones of your status, how to adjust for a potential evacuation, and what to do if your family is separated ("How to Prepare for Emergencies," n.d.).

The third step is to "Be Informed." The Red Cross has an active social media presence which helps disseminates information quickly as well as keep the public consistently informed

during a disaster or about everyday information. This can be found on their social media platforms or the public can download the emergency app for Apple IOS and Android. Under step three they suggest knowing: the difference between weather watches and warnings, preparing for disasters when traveling, how to contact local authorities in an emergency, and more. They also suggest making emergency contact cards for each family member, for which they offer a printable template on the website ("How to Prepare for Emergencies," n.d.).

Aside from these steps on their website they offer courses to be Red Cross Ready, a Red Cross Ready Personal Preparedness Handbook, an education channel with instructional videos, a preparedness factsheet which contains all of the website information, a link to the online Red Cross store on the website, ways to share the information with friends and family, and how to prepare for disasters at work, school and for your pet ("How to Prepare for Emergencies," n.d). There is also a ready rating webpage, specifically designed to prepare small businesses for a disaster, which offers instructional videos, steps, and links to join the newsletter ("How to Prepare for Emergencies," n.d).

There are not many followers of the local chapters, which suggests that the public is not concerned with community engagement for natural disasters, which is one of the focuses of the campaign. There are many followers on the national Red Cross, who mostly post about relief efforts including shelter locations, reminders such as daylight savings and disaster news, but not on how to be Red Cross Ready. Many local chapters of the Red Cross regularly retweet information about being Red Cross Ready, as well as information on workshops and how-to's. There is some attendance and receptiveness to the campaign, but they are far from 100% engagement (Account, 2018).

Another avenue the national Red Cross uses is YouTube. They have 22,665 subscribers with 1,495 videos. The majority of their channel contains testimonials, reviews, and news videos on events such as wildfires and aid in Puerto Rico. Some of the material is on being Red Cross Ready, however, it is not the majority. Searching "Red Cross Ready" in YouTube brings up a variety of videos on everything from how to make a disaster kit with Jamie Lee Curtis to creating your disaster plan filmed with everyday people. Most of the videos do not have many views but some, such as the Jamie Lee Curtis survival kit video and the PrepareU video with tips geared toward individual readiness, have 72,000 and 39,000 views respectively ("YouTube," n.d.). Though new technology is an excellent method of communication, apps and social media miss the elderly, who may not use smartphones, and the poor, who may not have the means to own one.

Summary

Diffusion of innovation or information flows from top to bottom, beginning with those who possess the product or knowledge, and ending with those who want or need it. There is a sea of information on the internet, and when disaster strikes the average person may not be able to sift through it all. That is why they turn to trusted sources, including FEMA and Red Cross. FEMA's Whole Community initiative and Red Cross' Red Cross Ready campaign have implemented engagement efforts that will help the public prepare for a disaster and increase resilience. This chapter outlined how necessary these engagement efforts are by the agencies, especially considering that the public may not turn to them first for information. In addition, engaging with the public that would be impacted can allow their needs to be heard and implemented ahead of time, offering a smooth transition between the crisis event and relief efforts.

This section on community engagement also helped to inform some concept questions. FEMA and Red Cross have their community engagement programs Whole community and Red Cross Ready. Whole community had a few ideas that translated to concepts such as promoting other social media accounts and planning at the neighborhood level ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011). The Red Cross Ready Campaign is about preparedness and informed the creation of several concept question. The first step of the Red Cross Ready Campaign is to Get a Ket ("How to Prepare for Emergencies," n.d.). This should be a specialized kit that fits with your family's needs and aligns with that concept. The second step is to Make a Plan which informed the concept of planning for multiple situations and planning for your family's specific needs ("How to Prepare for Emergencies," n.d.). The final step is to Be Informed which led to the concept question of tweeting up-to-date information ("How to Prepare for Emergencies," n.d.).

No matter how much planning there is before a disaster, it is still necessary to understand specific vulnerabilities that impact the populations being served. The next chapter will discuss the demographic information of Texas, Hawaii, and Florida.

Chapter 3: Location Background

This chapter provides an overview of the location demographics of Texas, Hawaii, and Florida to give a sense of how communication with the populations could be hindered as well as consider other barriers to the disaster relief efforts. These factors could and should affect the type of engagement and communication employed, but that may not always be the case. The key to effective disaster mitigation is understanding population vulnerabilities, defined as "the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist, and recover from the impact of a natural disaster" (NOAA, 2016, p. 7). Populations and locations are rarely homogenous and the severity of the impact of a disaster on a community is usually a product of the "risk and the varying vulnerabilities…of the population" (Newnham et al., 2015, p. 2). For example, in the United States, earthquakes happen with similar frequency and intensity as in India. Despite the similarities in earthquake characteristics, the death toll is disproportionately higher in India. There are several factors embedded that can shed a light on why the impact is more severe in one place versus another (Kahn, 2003). This same idea can be employed when looking at demographic differences in each storm location that present barriers to communication and resilience. This chapter will explore age, gender, ethnicity, socio-economic status, language, culture, and disability.

Table 2: Demographics of Texas, Hawaii, and Florida

Hurricane	Harvey	Lane	Irma, Matthew, Michael
State	Texas	Hawaii	Florida
Population	28,701,845 (2018)	1,420,491 (2018)	21,299,325 (2018)
% under 18 years old	26.0%	21.4%	20.0%
% over 65 years old	12.3%	17.8%	20.1%
Female percentage	50.3%	49.8%	51.1%
Largest racial groups	79.2% White; 12.7% African American; 5.0% Asian	37.8% Asian; 25.7% White; 10.2% Native Hawaiian/ Other Pacific Islander	77.4% White; 16.9% African American; 2.9% Asian
% hispanic ethnicity	39.4%	10.5%	25.6%
People with a disability under 65	8.0%	6.5%	8.6%
Median age (more youthful population may use social media more)	34.2 years old	38.5 years old	40.4 years old
% of people at least 5 years old speaking another language at home	35.3%	25.8%	28.7%
% for education level	82.8% high school graduate or higher; 28.7% having a bachelor's degree or higher	91.6% high school diploma; 32.0% having a bachelor's degree or higher	87.6% high school diploma; 28.5% having a bachelor's degree or higher
Median household income	$57,051	$74,923	$50,883
% living below the poverty line (impact cost of technology)	14.7%	9.5%	14.0%

Above is a demographic table for Hawaii, Florida, and Houston. The information was gathered

*from the Census.gov website using quickfacts. ("*U.S. Census Bureau QuickFacts: Texas," n.d.),

("U.S. Census Bureau QuickFacts: Florida," n.d.), and ("U.S. Census Bureau QuickFacts:

Hawaii," n.d.).

Age

For the most part, when discussing age and disaster communication, the elderly present the most significant challenge. Florida has the highest percentage of people over 65 (20.1%) due to the state's substantial population of retirees. Hawaii has 17.8% and Texas has 12.3%. Florida has to contend with a lot of issues that come along with the elderly and disaster preparedness. There are resources specifically for older populations, however research conducted by the Health and Retirement study found that two thirds of their participants lack an emergency plan, have never participated in preparedness programs, and were not aware of resources tailored for them. Also, from this study, 15% of respondents had medical equipment that would be affected during a power outage (National Academies, 2018, pp. 37 - 38)

Social isolation of the elderly prevents them from receiving warning messages or asking for assistance when necessary. Social isolation is compounded by lagging mobile device ownership. Eighty percent of adults 65 and older own a mobile device, but those of this same group that own a smartphone is only 42% (National Academies, 2018, pp. 37 - 38). This could lower access to weather alerts, internet connectivity, and disaster information on social media. Lack of mobile devices can prevent the elderly from connecting with rescue teams, staying current during blackouts, and contacting family (National Academies, 2018, pp. 37 - 38). Those with mobility issues have difficulties during and after a disaster and the older a person is, the less they are prepared. Also, due to chronic illness more prevalent in old age, the elderly are more susceptible to psychological and physical stress (National Academies, 2018, pp. 37 - 38).

On the other end of the spectrum lies people 18 years and younger. Though this population is more adept at using smartphones and social media, they are still dependent on their respective guardians, potentially hampering preparations or evacuations (National Academies, 2018, pp. 37 - 38). Texas has the largest percentage of people under 18 (26%), with Hawaii

(21.4%), and Florida (20%) as second and third. This means during hurricane Harvey, there were a lot of child dependents that had to be accounted for by parents and families that had to be serviced by relief agencies. This could include anything from getting diapers and formula for babies, to taking time to comfort or explain circumstances to young children (National Academies, 2018, pp. 37 - 38).

Gender, ethnicity, socio-economic status

Along with the elderly, women and minorities are vulnerable populations during disasters. Some factors that influence a person's perception of a hazard are financial resources, home ownership, car ownership, social connections, and relationships, such as spouse or children (National Academies, 2018, p. 39). Any of these may cause a person to take delayed action, believe they will not be affected by the storm, or impair their ability to prepare or evacuate.

A Rhode Island study found that women were more likely to rent their home, have children, and make an income less than $100,000 when compared to men (National Academies, 2018, p. 39). All three states had the percentage of women hovering around 50%. However, Texas (50.3%) and Florida (51.1%) were slightly higher. This may mean there will be more assistance given to women who are struggling financially. Also, women may not be able to do the work associated with preparing for hurricanes, such as securing the home. Women are more likely to rent their homes, which may mean there is less of an attachment when evacuation orders are issued. Women make less money than men on average and this can also impair their ability to properly prepare for an impending disaster. Expendable money is often needed in the case of an emergency to prepare kits as well as evacuate to places other than shelters.

In addition to expendable income, states with higher median income may have citizens who are better equipped to weather a storm because of better access to technology, such as smartphones with social media. This is not always the case though since smartphones are very

common across all socio-economic levels. Education levels directly impact income levels. All three states have above 80% graduating high school, but the states have only around 30% of their residents with a bachelor's degree or higher. Florida has the lowest median household income out of the three states, almost $8,000 less than Texas and almost $25,000 less than Hawaii. This suggests Florida residents may have financial barriers during preparation and evacuation. Hawaii has the highest median income ($74,923), however it comes with a high cost of living, meaning residents don't have as much expendable money as their income suggests ("U.S. Census Bureau QuickFacts: Texas," n.d.), ("U.S. Census Bureau QuickFacts: Florida," n.d.), ("U.S. Census Bureau QuickFacts: Hawaii," n.d.).

Median income can be subjective based on location, but poverty levels are directly related to those who would severely struggle financially to weather a storm and make preparations in advance. All three states have poverty levels nearing or exceeding 10%. Poverty could affect a person's ability to prepare and evacuate ("U.S. Census Bureau QuickFacts: Texas," n.d.), ("U.S. Census Bureau QuickFacts: Florida," n.d.), ("U.S. Census Bureau QuickFacts: Hawaii," n.d.).

The same Rhode Island study found that minority populations were less likely to own a car, more likely to have an income less than $100,000, and often have nowhere to stay if a hurricane hits (National Academies, 2018, p. 39). All three states have high minority populations. Texas and Florida especially have a large gap between the majority and minority populations. When city or state emergency managers are planning for a disaster, it is important to consider how low income or minority populations many be impacted. For example, in the 2019 political climate, being Hispanic can present challenges such as harassment or threats of deportation. Texas' percentage of the population with a Hispanic ethnicity is 39.4%. For Florida it is lower with 25.6%, however both states have significant Hispanic populations. Both have

over a quarter of the state identifying as Hispanic, which may cause people who are in the country illegally to avoid shelters during evacuations *("*U.S. Census Bureau QuickFacts: Texas," n.d.), ("U.S. Census Bureau QuickFacts: Florida," n.d.).

Language and Culture

Racial and ethnic diversity in the United States continues to grow. By 2055 the United State won't have a sole racial or ethnic majority (National Academies, 2018, p. 40). The resulting cultural and linguistic diversity can present a problem for emergency managers who may not be able to communicate effectively with these populations. In New York City there are over 200 languages spoken, but alerts and warning messages are only available in 18 languages (National Academies, 2018, p. 40). This can lead to a large portion of citizens unable to understand or receive messages. With the prevalence of smartphones, there are many tools that can aid in language translation, such as Google Translate. However, these present their own problems. For example, translation tools are not perfect and can cause further confusion. These tools also fail to account for differences in dialects (National Academies, 2018, p. 41).

In a study conducted in southern Mississippi, 47.3% of respondents wished they could receive disaster messages in a language other than English. The study also found that authorities relied on posters and pictures to bring information to Vietnamese and Hispanic residents (National Academies, 2018, p. 40). The respondents stated that they are most likely to trust family and friends for disaster information. It also showed that respondents trusted TV, radio, and sirens before social media (National Academies, 2018, p. 40).

Culture can impact how people respond to warnings or the disaster itself. The Loma Prieta earthquake in 1989 hit several cities in California. Mexican families who had experienced earthquakes in their home country opted to camp outdoors instead of staying in damaged buildings. It took time for authorities in the cities to allow them to use public parks as a shelter

space. Those staying in these camps cited a desire to stay close to home to protect possessions (National Academies, 2018, p. 41). In addition, people from Central America found that the tents and fences erected by the American Red Cross and the National Guard were reminiscent of government-backed concentration camps (National Academies, 2018, p. 41). These unforeseen issues can arise when foreign communities are not included in city planning efforts or when they do not have proper knowledge about emergency practices in the US.

Texas has 35% of its population age five or older who speak another language at home. Florida has 29% and Hawaii has 26%. Difficulty understanding English may impair their ability to understand general alerts and information. This may cause some parents to rely heavily on their children in these times of crisis because they are more proficient in English.

Disability

Those with disabilities or different abilities can benefit from alerts that are sent through mobile phones because they can be tailored in accordance with the capabilities of that person. For example, those who are deaf may not be able to hear sirens so timely alerts sent to a cell phone could save lives (National Academies, 2018, p. 42). Unfortunately, some disabilities are severe and affect mobility, prevent evacuation, or a person's ability to understand disaster alerts. People with disabilities can also have medical equipment, a similar issue facing the elderly, or require in home care, which may not be available during a storm. The disabled population under 65 in Texas is 8%, in Florida it is 8.6%, and in Hawaii it is 6.5%. In all three states the disabled population is nearing 10%. This is an important minority that may be invisible at these times. Disaster relief agencies should communicate with these individuals about their needs and options to overcome any obstacles (NOAA, 2016, p. 10).

Mass communication scholars have examined the various communication platforms used during crises for many years. This included sources such as television and radio. Now they have begun to examine one of the most relevant forms of communication and information in modern society, social media (Cebrian et al., 2017, p. 125). The body of literature regarding traditional mass media has now expanded to discuss how to best leverage social media use in a crisis. The question matters because those who may use social media in an urgent situation, such as emergency management staff, are tasked with emitting content in an oversaturated social media landscape. Social media often have no rules, unlike the structured setting of traditional mass media, so putting out urgent messages in this lawless landscape can be daunting (Cebrian et al., 2017, pp. 125-126). While there is reliance on television and radio, the merging of many platforms requires agencies to consider how people get their information, which increasingly involves social media in their information–seeking processes. As discussed previously, public engagement with crisis information can mean life of death so creating a best practice model for social media is crucial.

Table 3: Functions of Disaster Social Media

Disaster social media use	Disaster phase
Provide and receive disaster preparedness information	Pre-event
provide and receive disaster warnings	Pre-event
signal and detect disasters	Pre-event -> Event
Signal and receive requests for help or assistance	Event
inform others about one's own condition and	Event

location and learn about disaster-affected individual's condition and location	
Document and learn what is happening in the disaster	Event -> Post-event
Deliver and consume news coverage of the disaster	Event -> Post-event
Provide and receive disaster response information; identify and list ways to assist in the disaster response	Event -> Post-event
raise and develop awareness of an event; donate and receive donation; identify and list ways to help or volunteer	Event -> Post-event
Provide and receive disaster mental/behavioral health support	Event -> Post-event
Express emotions, concerns, well-wishes; memorialize victims	Event -> Post-event
Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster	Event -> Post-event
Discuss the socio-political and scientific causes and implications of and responsibility for events	Post-event
(Re)connect community members after an event and making new connections	Post-event
Implement traditional crisis communication activities	Pre-event -> Post-event

This table was taken from Hawthorne, J., Houston, J. B., Perreault, M. F., Park, E. H., Hode,

M. G., Halliwell, M. R., Turner, S.E, Davis, R., Vaid, S., McElderry, J. A., Griffith, S. A. (2014)

as "Table 1. Functions of disaster social media."

Pre-Event

The model is separated into pre-event, event, and post-event phases. *Provide and receive*

disaster preparedness information is the first category under pre-event and is based on the

premise that an informed and prepared population could be more resilient in a disaster. Releasing

information on preparedness can connect citizens ahead of time to resources or organizations

(Hawthorne et al, 2014, p. 8). The second category, also under pre-event, is *provide and receive*

disaster warnings. This information can also be seen by people who do not follow specific

accounts (such as FEMA), but can receive the information if someone they follow reposts it.

Social media also allows for alerts to be automatically distributed to those within a specific

geographic area. Even if users don't sign up to receive these warnings, they can still receive them

by being in a designated disaster area (Hawthorne et al, 2014, p. 9). The third category, *signal*

and detect disasters, falls under pre-event and event and covers users who discuss disasters

through posts. During the 2011 earthquake in Virginia, many people in the eastern United State

stated they read about the event on Twitter before feeling it. Social media can be a rapid source

to learn about disasters that are impending (Hawthorne et al, 2014, p. 9).

Event

Send and receive requests for help or assistance falls under the event phase. Social media

are generally more reliable in disasters, as it does not rely on the power grid, and can be an

appropriate platform to request assistance (Hawthorne et al, 2014, p. 10). The fifth category is

inform others about one's own condition and location and learn about disaster-affected

individual's condition and location. When a disaster strikes, people want to know if family and

friends in the affected area are safe. This is also important if the person impacted wants to report

their own condition or make connections with others (Hawthorne et al, 2014, p. 10). *Document*

and learn what is happening in the disaster is the sixth category which falls under the event and

post-event phases. Uncertainty and danger follow often in disasters, so having information on

what is occurring can help those within and outside of the disaster area. Documenting

information through social media is dependable because it does not rely on a power grid and can

come firsthand from those in the disaster zone (Hawthorne et al, 2014, p. 4). Also, individuals can act as "information brokers" who collect, collate, and link to information from different sources. This information can continue to expand when other users comment or provide new information to the original post. Information added in this system by unknown or unverified sources does present problems, such as rumor spreading, scams, inaccurate information, etc. Documenting the disaster also has the potential for crowdsource maps to be made depicting weather conditions, damage, and relief aid. For example, the Red Cross created a "heat map" of disaster social media activity that can inform disaster response and update users about what is occurring in the affected area (Hawthorne et al, 2014, pp. 11-12). This is an example of "infoveillance" or monitoring and analyzing social media to understand a disaster (Hawthorne et al, 2014, pp. 11-12).

Post-Event

Deliver and consume news coverage of the disaster is under the event and post event phases. This category is similar to the previous category except this is coverage of the disaster from a journalistic perspective. There is overlap between citizen information and journalistic reporting, however, social media are usually used to augment traditional media coverage of a disaster from a news source (Hawthorne et al, 2014, p. 12). *Provide and receive disaster response information; identify and list ways to assist in the disaster response* is the seventh use under the event and post event phases. During and after a disaster, many people and organizations want to know how to get information and how to help. Social media are avenues that can provide quick and consistent information about what is happening and what is needed for relief and recovery (Hawthorne et al, 2014, p. 12). Also under the event to post event phases is *raise and develop awareness of an event; donate and receive donation; identify and list ways to help or volunteer*. This category can be used to raise awareness of a disaster, prompting

donations or other opportunities to assist. Sometimes this step is necessary to inform the public of the scope of the impact and motivate individuals to donate or volunteer (Hawthorne et al, 2014, p. 13).

Provide and receive disaster mental/behavioral health support can be addressed in two general ways during a disaster. The first is through advertising official services that provide support and the other is by connecting people with friends, family, or other individuals, creating a social support resource (Hawthorne et al, 2014, p. 13). *Express emotions, concerns, well-wishes; memorialize victims* is about showing concern about those affected by an event as well as memorialize anyone that was killed (Hawthorne et al, 2014, p. 14). The last category in the event to post event phase is *provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster*. Coverage of a disaster has the ability to last longer on social media than on traditional mass media because they are not bound by traditional news cycles. This category can begin in the event phase and last for several weeks after the disaster is over. Social media provides the opportunity for citizens in and outside the area to engage in discussion and problem solving (Hawthorne et al, 2014, pp. 14-15).

The three categories in the post event phase are *discuss the socio-political and scientific causes and implications of and responsibility for events, (re)connect community members after an event, and making new connections and implement traditional crisis communication activities*. These categories will not be addressed in the codebook because creating measures were too ambiguous, required additional data, or were outside of the scope of the study. For example, the category *discuss the socio-political and scientific causes and implications of and responsibility for events* is meant to address why an event occurred or who was responsible (Hawthorne et al, 2014, p. 15). Considering this study is about hurricanes, an unintentional crisis, there is usually one to blame as there would be for an intentional crisis such as a terrorist attack

(Ulmer, Sellnow, and Seegar, 2002, pp. 10-13). However, often times there are people to blame for secondary impacts of the hurricane. *(Re)connect community members after an event and making new connections* is not data available for this study. Tweets on reconnection that are in the data set are limited to platforms facilitating reconnection or urging people to register themselves as safe. Therefore, any data on reconnection can be housed under category five, *inform others about one's own condition and location* as well as *learn about disaster-affected individuals' condition and location* (Hawthorne et al, 2014, p.15). The final category *implement traditional crisis communication activities* is about crisis communication aimed at restoring organizational normalcy or regaining/repairing image and reputation. This is outside the scope of the study. (Hawthorne et al, 2014, p.16).

The researchers that created this model envisioned that it could be used in practice or for research. As far as research is concerned, this framework can be expanded upon, each category can be individually addressed, or researchers can study how certain social media platforms may be better than others in disaster communication. In practice, this framework provides a chance for practitioners to standardize social media disaster use. Each category offers the opportunity for integration into actual disaster social media operations (Hawthorne et al, 2014, pp. 16-17). The study will combine both aspects by researching how practitioners' Twitter use aligns with the framework.

Research Questions

The general research question is, did FEMA and the Red Cross, at both the national and local scales, follow the principles of crisis communication via their Twitter accounts during hurricanes Harvey, Irma, Lane, Matthew and Michael? Below are the individual research concepts from the codebook that will be tested in SPSS.

Phase 1: Pre-event

Use 1: Provide and receive disaster preparedness information

Research Question 1) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about planning/preparation for different types of residences (ex. homes, apartment)?

RQ 2) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about planning/preparation at the neighborhood or county level?

RQ 3) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about planning/preparation based on a family's specific needs (ex. for a family of 4)?

RQ 4) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about planning/preparation information for an animal?

RQ 5) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about available training resources?

RQ 6) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about planning covering multiple situations (no food, power outage, etc)?

RQ 7) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about addressing people with unique needs (ex. disabled people, sick, the elderly)?

RQ 8) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about general planning/preparation for the storm?

RQ 9) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about recent or new storm concerns?

RQ 10) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about resources for information in other languages (ex. linking to resources available in Spanish)?

RQ 11) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about promoting a phone app?

RQ 12) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about promoting a number to text?

RQ 13) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about promoting a phone number?

RQ 14) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about promoting other social media accounts (ex. @Readygov)?

RQ 15) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about promoting a website?

RQ 16) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about downloadable information?

Use 2: Provide and receive disaster warnings

RQ 17) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about general forecasting?

RQ 18) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about warning of inclement weather?

RQ 19) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about evacuation?

Phase 2: Pre-event -> Event

Use 3: Signal and detect disasters

RQ 20) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about ways to receive up to date information on the disaster or resources, such as shelter openings?

Phase 3: Event

Use 4: Send and receive requests for help or assistance

RQ 21) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about contacting helplines?

RQ 22) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about government aid during the storm?

RQ 23) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about shelters, where they are or how to find them?

RQ 24) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about contacting Emergency Management in the area?

Use 5: Inform others about one's own condition and location and learn about a disaster-affected individual's condition and location

RQ 25) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about how to connect to family, friends, or other citizens?

Phase 4: Event -> Post-event

Use 6: Document and learn what is happening in the disaster

RQ 26) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about connecting people to news organizations telling victims' stories?

RQ 27) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate using specific hashtags that can connect people affected (ex. #helphouston, #SOSHarvey)?

RQ 28) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about controlling rumors spread about the disaster?

RQ 29) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about information from/about emergency management sources?

RQ 30) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from local level sources (ex. Mayor, city officials)?

RQ 31) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from state level sources (ex. governor, congressional representatives)?

RQ 32) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from regional level sources?

RQ 33) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from national level source (ex. The White House)?

Use 7: Deliver and consume news coverage of the disaster

RQ 34) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from local news outlets (ex. Houston - KTRK, KHOU, KLAS, Fox26)?

RQ 35) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about/from national news outlets (ex. CNN)?

Use 8: Provide and receive disaster response information; identify and list ways to assist in the disaster response

RQ 36) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about how residents/victims should respond to the disaster once it is underway?

RQ 37) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about safety actions, preparations, or recommendations?

Use 9: Raise and develop awareness of an event; donate and receive donations; identify and list ways to help or volunteer

RQ 38) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about how to give general donations, other than money, to disaster recovery?

RQ 39) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about how to give monetary donations to disaster recovery?

RQ 40) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about how to volunteer in disaster recovery?

RQ 41) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about disaster relief jobs?

Use 10: Provide and receive disaster mental/behavioral health support

RQ 42) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about mental health resources?

Use 11: Express emotions, concerns, well-wishes; memorialize victims

RQ 43) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about offering concern or well wishes?

RQ 44) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about offering condolences for victims?

RQ 45) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about thanking those who have helped?

Use 12: Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster

RQ 46) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about telling stories of the disaster?

RQ47) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about rebuilding finances?

RQ 48) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about assistance for home repairs?

RQ 49) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about finding jobs after the hurricane?

RQ 50) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about general assistance for victims?

RQ 51) How do FEMA national, American Red Cross national, local FEMA agencies, and local Red Cross agencies communicate about miscellaneous information?

Methods

To address the overall research question, a content analysis of text only was conducted on tweets. The tweets were coded according to a codebook that was based on the best use model seen in Chapter 4. Content analysis is a "research technique for the objective, systematic, and quantitative description of manifest content of communication" (Neuendorf, 2002, p. 1). Another definition is the "systematic, objective, quantitative analysis of message characteristics" (Neuendorf, 2002, p. 1). This study used content analysis as the method. This form of analysis can be brought to bear on a range of communication processes, such as human interactions, portrayals of TV characters, and word usage in newspapers (Neuendorf, 2002, p. 1). For this study of Twitter communication, the application was coding tweets. Content analysis is the fastest growing technique over the past several decades in mass communications research (Neuendorf, 2002, p. 1). This is in part due to advancement in text-analysis software as well as the availability of online datasets and archives (Neuendorf, 2002, p. 1). The content analysis process was developed to "bring rigour and authority of 'natural' scientific inquiry to the study of human and social phenomenon" (Neuendorf, 2002, p. 1). This method was also developed as a counterbalance to the persuasive effects of post WWII mass media. Many politicians and academics wanted to police the symbolism of popular culture being spread through propaganda (Deacon, Pickering, Golding, Murdock, 1999, p. 115). Examples of how content analysis has been used in the past, include a 1912 analysis of the press (Krippendorf & Bock, 2009, pp. 16 - 20), a 1959 study of propaganda during WWII (Eldor & George, 1959), and a recent study about word count analysis in popular media (Krippendorf & Bock, 2009, pp. 38 - 41).

The purpose of content analysis is to quantify features of large number of texts and use the statistics to make broad inferences about certain processes (Deacon et al., 1999, p. 116). This is

what this study is doing when coding tweets. Content analysis was chosen as the method because it is a directive method, meant to give direct answers to the questions posed and not meant to explore text or develop insight (Deacon et al., 1999, p. 117). Because content analysis can only support, qualify or refute the initial question, it will lose the "complex and varied processes of meaning-making within texts" (Deacon et al., 1999, p. 117). Because of this, the method is a good choice for this study as it is not studying deeper questions about the tweet but rather how they fit in the coding scheme (Deacon et al., 1999, p. 117).

Content Analysis

Deciding what to include in the study of the text is based on the research objectives. In general, content analysis is not reliable when coders must read between the lines to gather the meaning (Deacon et al., 1999, p. 121). Because of this, the study will only work with the text in each tweet and exclude corresponding images or videos. The goal of any content analysis is "to produce counts of key categories and measurements of the amounts of other variables" (Neuendorf, 2002, p. 14). This is a numerical process that provides a summary of whatever message data set a researcher is working with (Neuendorf, 2002, p. 14 – 15). The type of messaging used are tweets, which are mass messages that are meant for a large, undifferentiated audience and is usually mediated through a source such as television, radio, or in this case, social media (Neuendorf, 2002, p. 22).

Secondary data also needs to be screened for credibility and relevance to the project (O'Leary, 2017, p. 266). For example, this study saw the use of the word hurricane multiple times. However, not all of the uses were related to the hurricane datasets for this study. Some of the uses were in reference to aid efforts for previous hurricanes but were captured in the sample based on the term. These uses had to be removed for the dataset. Also, there were some accounts that were no longer active or tweets that had been deleted. These were also removed. Secondary

data is also commonly very vast, so it is necessary to keep the study goal in mind and narrow it based on that.

Some things to keep in mind are that the catchment system to pull together the tweet dataset is for tweets all over the world. However, the filtering words are in English, therefore the tweets collected are usually in English, unless the other language uses the English filtering words. This was the case in several Spanish tweets. In addition, because the Center for Risk and Crisis Management uses some generic words to filter tweets such as "hurricanes," they closed a hurricane collection to start a new one to try and avoid overlapping tweets from back to back hurricanes. This is not a guarantee that there will not be other hurricanes discussed in what they designate as the "Maria" hurricane collection period, for example.

Population

Population and Sampling

The population of interest are tweets. The first step in the data collection was to gather a representative sample of tweets sent out by the five agencies. The tweets were provided by Dr. Joseph Ripberger who is an associate director at the University of Oklahoma Center for Risk and Crisis Management, housed under the National Institute for Risk and Resilience also at the University of Oklahoma. The Center has a catchment set up, so that whenever there is a disaster, their system filters all tweets for certain words and stores them in a database. Dr. Ripberger described the process as such,

"Twitter has something called its streaming API and the way that the streaming API works is that we essentially connect through Twitter to their API and identify through that connection any tweets that we want to collect…. basically what happens is that any time any tweet that is

published anywhere in the world has one of our keywords in it, it automatically streams into our database. It continuously builds this database as more and more tweets come in."

Twitter describes its APIs as a way for computers to communicate with one another to request or deliver information. If someone wants to access these APIs they must register as an application, after which they can only access public information on Twitter. After obtaining the software application, it can call on "endpoints" which are unique numbers that correspond with tweets, accounts, users, direct messages, ads, and publisher tools. Applications can only access public information on Twitter such as public tweets and replies. Twitter makes these searchable by keywords or by requesting tweets from specific accounts. Other endpoints, such as those for private direct messages, are not accessible to all applications and require special permissions ("About Twitter's APIs," n.d.).

The filter words used by the Center to collect tweets from hurricane Harvey were "hurricane, #hurricane, #Harvey, #HurricaneHarvey". The tweets for this study were narrowed by using usernames associated with the national and local scale Twitters for FEMA and Red Cross as filters. For hurricane Harvey this included, @fema, @RedCross, @RedCrossHouston, and @FEMARegion6. This resulted in 213 tweets comprising the data set, made up of original tweets from these accounts as well as content that was retweeted. Below is a chart showing for each of the five storms, their filtering words, the usernames, dates the storm spanned, and dates of the tweets in the data set.

Boundaries and Time Period

Table 4: Hurricanes, Dates, Usernames, and Filtering Words

	Dates of Tweets	Storm Span	Usernames	Filtering words
Matthew	Oct 4 - Nov 3, 2016	Sept 28-Oct 9, 2016 **Landfall** Oct 6	FEMA National **(@fema)** American Red Cross **(@RedCross)** FEMA region 4 for AL, FL, GA, KY, MS, NC, SC, TN **(@femaregion4)** Red Cross Central Florida **(@RedCrossCFL)** South Florida Red Cross **(@SFLRedCross)** North Florida Red Cross **(@RedCrossNorthFL)**	hurricane, #hurricane, #matthew, #hurricanematthew
Harvey	Aug 23 - Sept 1, 2017	Aug 17-Sept 1, 2017 **Landfall** Aug 25	FEMA National **(@fema)** American Red Cross **(@RedCross)** Red Cross Houston **(@RedCrossHouston)** FEMA region 6 for TX, OK, AR, LA, NM & 68 tribal partners **(@FEMARegion6)**	hurricane, #hurricane, #Harvey, #HurricaneHarvey
Irma	Sept 2 - Sept 11, 2017	Aug 30-Sept 12, 2017 **Landfall** Sept 10	FEMA National **(@fema)** American Red Cross **(@RedCross)** FEMA region 4 for AL, FL, GA, KY, MS, NC, SC, TN **(@femaregion4)** Red Cross Central Florida **(@RedCrossCFL)** South Florida Red Cross **(@SFLRedCross)** North Florida Red Cross **(@RedCrossNorthFL)**	hurricane, #hurricane, #Irma, #HurricaneIrma

Lane	Aug 21 - Sept 3, 2018	Aug 15 - Aug 29, 2018 **Landfall** Aug 22	FEMA National **(@fema)** American Red Cross **(@RedCross)** FEMA region 9 for Arizona, California, Hawaii, Nevada, & the Pacific Islands **(@femaregion9)** Hawaii Red Cross **(@HawaiiRedCross)**	hurricane, #hurricane, #lane, #hurricanelane
Michael	Oct 9 - Nov 13, 2018	Oct 7-Oct 11, 2018 **Landfall** Oct 10	FEMA National **(@fema)** American Red Cross **(@RedCross)** FEMA region 4 for AL, FL, GA, KY, MS, NC, SC, TN **(@femaregion4)** North Florida Red Cross **(@RedCrossNorthFL)**	hurricane, #hurricane, #Michael, #HurricaneMichael

These tweets are a type of secondary data, which is data that exists regardless of a certain research project. In other words, it is data that was not created by the researcher for their project. Some examples include tweets, census records, large-scale surveys, and photographs (O'Leary, 2017, p. 266). Secondary data can save time, money and keep an objective buffer between the data and the researcher (O'Leary, 2017, p. 266). There is no need to worry over "building trust; getting people to act naturally" etc. (O'Leary, 2017, p. 268). However, secondary data use carries with it several potential pitfalls. First, the collection of data is not in line with the original research design, and thus the research question may have to adapt to the limitations of the data collection process (O'Leary, 2017, p. 266). Another issue with using secondary data is that the data collection process rarely conforms perfectly with the research question. In this case, temporal limitations on collection determined the number of tweets gathered for each storm. The timeframes of the tweets collected are vastly different from storm to storm. This is either because the center had advanced notice of a storm approaching, meaning they see it out at sea or monitor

when hurricane force winds begin, so they can start to set up the collection earlier. However, if the storm does not start producing hurricane force winds until a few days out, then they cannot start the collection as early. Usually, collection for each storm extended over about one week, though a few spanned about one month. NOAA states hurricane Harvey lasted from August 17-September 1, however the tweets provided were from August 23 - September 1. Only Hurricane Michael encompassed the full storm timeline. One thing to note, retweets on an account from other sources, rather than just the original tweets from that account, were also included in the datasets.

Procedure

There are two parts to a coding frame. The first is the "coding schedule" where the values will be entered and the second is the "coding manual" also referred to as a coding scheme or codebook. This contains all of the codes, or numbers, for each variable (Deacon et al., 1999, p. 124). Constructing an original codebook is a multi-step process that involves repeated revisions and spelling out of specific details. Instructions should be written out on what a codable unit looks like for each measure and other instructions on coding protocol. Depending on the researcher, there may be more information in the codebook than in the coding form, or vice versa (Neuendorf, 2002, p. 132). Practice coding, or pilot coding, can show where there are issues in the codebook, and that it may need revisions (Neuendorf, 2002, p. 133).

Three versions of the codebook were developed, each edited by committee member Dr. Moore. Then the final codebook was pilot tested on hurricane Harvey and more revisions were made before giving the codebook to the coders.

This study used deductive coding, or where categories are known prior to coding, based on the categories in my chosen model. A codebook was developed with 60 measures based on the model discussed in Chapter 4 in order to classify tweets. This included 10 metric categories, such

as number of likes, and 50 specific concepts based on the categories in the model. For example, the model category "Provide and receive disaster warnings" was broken down into three questions for the codebook; Does this tweet contain an element of general forecasting? Does this tweet contain a warning of inclement weather? Does this tweet contain an element about evacuation? The 50 specific concepts were coded nominally, or when the use of numbers are arbitrary and only used for labeling (Neuendorf, 2002, p. 120). They are (1) Present if tweet addressed the concept, or (2) Not Present if the tweet did not address the concept. There are also examples of tweets in each codebook question. Associated pictures and videos were not coded for reasons discussed earlier. Some of the codebook categories overlap, such as general forecasting and how to receive up to date information when coding new weather alerts, or information from an emergency management source and information from a local source when coding a retweet from a city's emergency management office.

After developing the codebook, all tweets were coded for each of the five storms and an Excel file was used as the coding sheet. Human coding uses people to code, using a predefined codebook and coding form/schedule to record the observations. This is different from computer coding which is the automated tabulation of text for content, typically counting words, phrases, or other text-only indicators (Neuendorf, 2002, p. 52). Human coding is based on a codebook, which should be very clearly defined and leave little room for ambiguity. The need for clarity is to eliminate any coding differences individual coders may have (Neuendorf, 2002, p. 132).

Measures

Research question one asked if the tweet contains an element of planning/preparation for different types of residences such as homes or apartments. To identify this concept in tweets coders looked for content on how to secure one's home or apartment or safety measure to take for their home. An example tweet reads "If you have to shelter in a high-rise, stay on floors just above floodwaters. The higher you go, the stronger the winds. #Harvey."

Research question two asked if the tweet contains an element of planning/preparation at the neighborhood or county level. To identify this concept in tweets coders looked for content on community planning or communal neighborhood assistance. An example tweet reads "RT @NWS: You can play a large role in how your neighbors fare before, during and after a hurricane. #HurricanePrep #Irma https://t.co/orGEI."

Research question three asked if the tweet contains an element of planning/preparation based on a family's specific needs such as a plan for a family of four. To identify this concept in tweets coders looked for content discussing family preparations for a disaster. An example tweet reads "Create a disaster plan for you and your family and more with the #RedCross emergency app."

Research question four asked if the tweet contains an element of planning/preparation information for an animal. To identify this concept in tweets coders looked for content discussing preparations for animals before or during the storm including which shelters allowed animals. An example tweet reads "RT @NWS: What would you do with your pets during a hurricane? Visit https://t.co/r5fOFEIGQy to make a plan #HurricanePrep https://t.co/0Khl…"

Research question five asked if the tweet contains an element about training resources available. To identify this concept in tweets coders looked for content discussing classes for volunteer training, online training information, or medical classes like CPR. An example tweet reads "NEW COURSE: The #RedCross has released a 'First Aid for Severe Bleeding' online course so you can learn how to respond to life-threatening bleeding emergencies! Visit…"

Research question six asked if the tweet contains an element about planning covering multiple situations such as no food or a power outage. To identify this concept in tweets coders looked for content discussing how to adapt to situations resulting from the storm such as a power outage or flood. An example tweet reads "RT @ReadyHarris: #Harvey STEPS TO TAKE NOW: Be sure you have a way to stay informed. Battery powered radios work great when the power goes…"

Research question seven asked if the tweet contains an element addressing people with unique needs such as disabled people, sick people, and the elderly. To identify this concept in tweets coders looked for content discussing subjects such as how to these subgroups can evacuate, receive medical supplies, or assistance. An example tweet reads "If you have unique needs #PlanAhead before you evacuate more info: http://www.ready.gov/myplan #Irma."

Research question eight asked if the tweet contains an element about general planning/preparation for the storm. To identify this concept in tweets coders looked for content discussing planning and preparation that were not addressed by the previous planning questions. An example tweet reads "Learn what to do before, during and after a #hurricane https://t.co/ooB3LpPpW3."

Research question nine asked if the tweet contains an element about contains an element about discussing recent or new storm concerns. To identify this concept in tweets coders looked for content discussing storm conditions or movement that was new. These tweets were usually accompanied by words such as new, update, or breaking. An example tweet reads "RT @TwitterMoments: Update: @FLGovScott has declared a state of emergency ahead of Hurricane #Irma later this week. https://t.co/gHKANfrMrQ."

Research question ten asked if the tweet contains resources for information in other languages. To identify this concept in tweets coders looked for tweets pointing to online content or social

media accounts in languages other than English. these resources can be linked to a page or another account. The tweet should not be counted for this question if the tweet is simply in another language, it has to provide resources (planning or response) in that language. For example, telling people to follow FEMA Espanol, not retweeting a tweet from FEMA Espanol. An example tweet reads "Our #Harvey page has resources in Español, Tagalog, Tiếng Việt, 中文, 한국어, اردو, & عربى. You can find them here:… https://t.co/Vs99f0xZm5."

Research question eleven asked if the tweet contains an element of promoting a phone app. To identify this concept in tweets coders looked for content discussing a phone app from the agency or another organization. An example tweet reads "With Hurricane #Harvey moving closer to landfall in #Texas, download our Emergency app for critical weather alerts:… https://t.co/yZWQqWKbTj."

Research question twelve asked if the tweet contains an element of promoting a phone number to text. To identify this concept in tweets coders looked for content discussing a phone number along with the word text. An example tweet reads ""Find open shelters in your area with the FEMA App or text SHELTER and your zip code to 4FEMA (43362). Msg & data rates apply. #Harvey."

Research question thirteen asked if the tweet contains an element of promoting a phone number to call. To identify this concept in tweets coders looked for content discussing a phone number possibly along with the word call. An example tweet "#RedCross is providing shelter, meals & comfort to people impacted by #Harvey. To find a location: http://rdcrss.org/2iCVOc8 or 1-800-REDCROSS."

Research question fourteen asked if the tweet contains an element of promoting element of promoting other social media accounts. To identify this concept in tweets coders looked for the at symbol or a direction to followers to "follow" certain accounts. Promoting other social media accounts does not mean retweeting. It has to be the @ embedded in the text or telling people to follow an account(s) (in this case it may or may not be embedded). An example tweet "Follow @HoustonOEM for important safety updates like this one. Be safe everyone. #Harvey https://t.co/DSDlj5JOgk."

Research question fifteen asked if the tweet contains an element of promoting website. To identify this concept in tweets coders looked for a URL or an embedded website like with picture. An example tweet reads "To locate #RedCross shelters visit https://t.co/OB36nh0fEY. #HurricaneHarvey."

Research question sixteen asked if the tweet contains downloadable information. To identify this concept in tweets coders looked for an attachment on the tweet leading to pdf downloads. An example tweet reads "Now is the time to get prepared 4 #Irma. Need help? Be #RedCrossReady w/our hurricane safety checklist. Download @… https://t.co/17sekr8Sd4.

Research question seventeen asked if the tweet contains an element of general forecasting. To identify this concept in tweets coders looked for information on storm movement or conditions. This can overlap with new/updated information or warnings. It must contain specifics on the hurricane. For example, this storm is a category 4, this storm has reached 140 miles per hour. Can also refer generally to winds, rain. etc. An example tweet reads "RT @NWSMiami: 12PM: Hurricane Irma has max sustained winds of 140 mph. It's still too early to determine exactly what impacts SFL…"

Research question eighteen asked if the tweet contains a warning of inclement weather. To identify this concept in tweets coders looked for content discussing the danger of the storm or dangerous conditions from the storm. An example tweet reads "RT @NWSMiami: 9/8 5AM Tropical Update: #Irma is an extremely dangerous Category 4 Hurricane Hurricane Warning in effect for all o…"

Research question nineteen asked if the tweet contains an element about evacuation. To identify this concept in tweets coders looked for content discussing how to get out or alerting the public they should leave. An example tweet reads "#Harvey is bringing dangerous storm surge, high winds, and the potential for inland flooding. Take evacuation orders seriously."

Research question twenty asked if the tweet contains ways to receive up to date information on the disaster or resources. To identify this concept in tweets coders looked for content discussing the best social media accounts to follow for new information or the best websites. An example tweet reads "@SweetPeaVanity Hi Dee, you can follow @NHC_Atlantic to stay updated on how #Irma might affect your area."

Research question twenty-one asked if the tweet contains an element about contacting helplines. To identify this concept in tweets coders looked for content discussing phone numbers for help, including 911, or using the word helpline. An example tweet reads "RT @FLSERT: The #FL Emergency Information Line has been activated 24/7. For up-to-date information regarding #Irma please call 1-800-342-35…"

Research question twenty-two asked if the tweet contains an element about aid during the storm. To identify this concept in tweets coders looked for content on where to find aid or how to apply. An example tweet reads "Here's a snapshot of federal support to areas affected by #Harvey. For more information"

Research question twenty-three asked if the tweet contains an element about shelters. To identify this concept in tweets coders looked for content with the word shelter, or discussing where they are and how and find them. An example tweet reads "RT @SCEMD: Shelters are now open for those evacuating the SC southern coast #Irma https://t.co/6EbYrogSTj."

Research question twenty-four asked if the tweet contains an element about contacting Emergency Management in the area. To identify this concept in tweets coders looked for content with the words emergency management as well as their website, social media, or office number. An example tweet reads "RT @fema: If you're not sure what your hurricane evacuation route is, check with your local emergency mgmt office & listen to… "

Research question twenty-five asked if the tweet contains an element about how to connect to family, friends, or other citizens. To identify this concept in tweets coders looked for content discussing reconnection tools such as registrations websites or phone apps. An example tweet reads "Connect with friends and family by downloading the Red Cross safe and well app https://t.co/LffjeEXThM #RedCross #safeandwell #Harvey."

Research question twenty-six asked if the tweet contains an element that allows people to connect to news organizations telling victims' stories. To identify this concept in tweets coders looked for content about directly calling for victims for contact an outlet and tell their story. An example tweet reads "Stories from hurricane survivors https://www.weather.gov/safety/hurricane-survivors.

Research question twenty-seven asked if the tweet contains a specific hashtag being used that can connect people affected. To identify this concept in tweets coders looked for hashtags other than the storm name or the state the storm was in, such as such as #helphouston or #SOSHarvey.

Research question twenty-eight asked if the tweet contains an element controlling rumors spread about the disaster. To identify this concept in tweets coders looked for content dispelling false rumors or using phrases such as "rumor control." An example tweet reads "RT @EnergyPressSec: Rumors that fuel shortages in Texas are due to@FEMA blocking sales are FALSE. Get the facts here: https://t.co/qAP2tKA…"

Research question twenty-nine asked if the tweet contains an element about or from emergency management sources. To identify this concept in tweets coders looked for content from or about any scale of emergency management personnel. This coding category does include retweets. Coders should not code the main account tweeting. The coder may have to click on the person/organization to find out what they do. An example tweet reads "RT @NWSHouston: EMERGENCY MANAGEMENT HAS REQUESTED: IF HIGHEST FLOOR OF YOUR HOME BECOMES DANGEROUS...GET ON THE ROOF. #houwx… "

Research question thirty asked if the tweet contains an element about or from local level sources. To identify this concept in tweets coders looked for content from local sources such as the mayor or city officials. This coding category does include retweets. Coders should not code the main account tweeting. The coder may have to click on the person/organization to find out what they do. An example tweet reads "RT @CityofMiami: ATTENTION - Thirteen new shelters are now open!!! Please follow the link to find the one nearest you. #Miami… "

Research question thirty-one asked if the tweet contains an element about or from state level sources. To identify this concept in tweets coders looked for content from state sources such as the governor or congressional representatives. This coding category does include retweets. Coders should not code the main account tweeting. The coder may have to click on the person/organization to find out what they do. An example tweet reads "RT @ABC: Gov. Greg Abbott says more heavy rainfall expected tonight, urges Texans to stay off the road…"

Research question thirty-two asked if the tweet contains an element about or from regional level sources. To identify this concept in tweets coders looked for content from regional sources such as the governor or congressional representatives. In this case, regional means larger than a state, ex the northwest region of the United States. This coding category does include retweets. Coders should not code the main account tweeting. The coder may have to click on the person/organization to find out what they do. An example tweet reads "Regional Administrator Gracia Szczech meets with @FLSERT to discuss response efforts for Hurricane #Irma https://t.co/Lflz7p79w5."

Research question thirty-three asked if the tweet contains an element about or from national level sources. To identify this concept in tweets coders looked for content from national sources such as the White House. National level sources do include congressional representatives. This coding category does include retweets. Coders should not code the main account tweeting. The coder may have to click on the person/organization to find out what they do. An example tweet reads "From the @WhiteHouse: today is the National Day of Prayer for Hurricane Harvey survivors.https://t.co/RpZkWzzbsF."

Research question thirty-four asked if the tweet contains an element about or from local news outlets. To identify this concept in tweets coders looked for content from local news outlets such Houston's local TV stations KTRK, KHOU, KLAS, and Fox26. An example tweet reads @KHOU "Tracking Hurricane Harvey: Voluntary evacuations issued for Galveston."

Research question thirty-five asked if the tweet contains an element about or from national news outlets. To identify this concept in tweets coders looked for content from national news outlets such as CNN. An example tweet reads @cnnbrk "Tropical Storm Harvey expected to be a Category 3 hurricane when it hits the middle Texas coast Friday."

Research question thirty-six asked if the tweet contains an element about how residents/victims should respond to the disaster once it is underway. To identify this concept in tweets coders looked for content that was telling an action or giving a recommendation on how to cope with storm conditions. An example tweet reads "Before heading to bed, make sure you have a way to receive weather alerts overnight. #Irma https://t.co/JOMjWwDXcb."

Research question thirty-seven asked if the tweet contains an element about safety actions, preparations, or recommendations. To identify this concept in tweets coders looked for content using the words safe, safety or something similar, and/or telling or recommending an action to do to prevent harm to yourself or belongings. An example tweet reads "RT @Readygov: Always use generators outside the home in properly ventilated areas. #Harvey https://t.co/mGZzQZesJo."

Research question thirty-eight asked if the tweet contains an element about how to give general donations, other than money, to disaster recovery. To identify this concept in tweets coders looked for content using the words donate, charity of give. An example tweet reads "RT @USAgov: Donating to charity to help Harvey recovery efforts? Do your research first! https://t.co/ivgAVutyYc https://t.co/IFVBfio1lA."

Research question thirty-nine asked if the tweet contains an element about how to give monetary donations to disaster recovery. To identify this concept in tweets coders looked for content combining the words donate and a dollar amount. An example tweet reads "To help people affected by #HurricaneHarvey, please visit https://t.co/lG3cxjpyAd or text the word HARVEY to 90999 to make a $10 donation."

Research question forty asked if the tweet contains an element about how to volunteer in disaster recovery. To identify this concept in tweets coders looked for content asking people to volunteer in storm relief efforts or linking information on how to volunteer. An example tweet reads "RT @fema: If you'd like to help people affected by #Harvey, connect with trusted voluntary organizations by visiting:…"

Research question forty-one asked if the tweet contains an element about disaster relief jobs. To identify this concept in tweets coders looked for content linking job postings or telling people how to find disaster relief jobs. An example tweet reads "RT @fema: If you'd like to help people affected by #Harvey, connect with trusted voluntary organizations by visiting:…"

Research question forty-two asked if the tweet contains an element about mental health resources. To identify this concept in tweets coders looked for content linking mental health relief information, websites or stress relief hotlines. An example tweet reads "RT @fema: The

@distressline is a great resource if you were affected by #Harvey & need to talk to someone to help you cope. C…"

Research question forty-three asked if the tweet contains an element offering concern or well wishes. To identify this concept in tweets coders looked for content offering well wishes or showing concerns for victims and those assisting in recovery. An example tweet reads "From the @WhiteHouse: today is the National Day of Prayer for Hurricane Harvey survivors. https://t.co/RpZkWzzbsF."

Research question forty-four asked if the tweet contains an element offering condolences for victims. To identify this concept in tweets coders looked for content showing sorry for any victims who were hurt of died. An example tweet reads @MiamiHurricanes "Our thoughts and condolences are with everyone affected by the horrible events that occurred in our neighboring community Orlando."

Research question forty-five asked if the tweet contains an element thanking those who have helped. To identify this concept in tweets coders looked for content using the words thank you or showing appreciation for those helping in recovery. An example tweet reads "#ThankYou for your support to help those impacted by #HurricaneIrma https://t.co/7n07KbzN3h."

Research question forty-six asked if the tweet contains an element of telling stories of the disaster. To identify this concept in tweets coders looked for content that were narratives that don't tell any actual information or steps to take for mitigation. An example tweet reads "This blanket here kept me warm last night. Safely settled at a #RedCross shelter, a mother recalls her family's d… https://t.co/AJcaPhHfiJ."

Research question forty-seven asked if the tweet contains an element about rebuilding finances. To identify this concept in tweets coders looked for content about finances or money. An example tweet reads "#firstofthemonth financial matters for survivors affected by #Harvey. https://t.co/pSpQ4CkC12"

Research question forty-eight asked if the tweet contains an element assistance for home repairs. To identify this concept in tweets coders looked for content about resources on home repair or assistance. An example tweet reads "RT @ReadyHarris: Experiencing HOME FLOODING? Please report it by going to https://t.co/xmgComXqXz and click the RED BOX. #Harvey https://t."

Research question forty-nine asked if the tweet contains an element about finding jobs after the hurricane. To identify this concept in tweets coders looked for content linking job boards or discussing where to find a job post-disaster. An example tweet reads "@HarmonyWVTM13 @done0747 Hi, you can find any open job opportunities after Harvey here: https://t.co/A4X5gsXgYq."

Research question fifty asked if the tweet contains an element about general assistance for victims. To identify this concept in tweets coders looked for content on any assistance not covered in the previous categories. An example tweet reads "Puerto Rico: If you received damage from #Irma, you may be eligible for disaster assistance. Apply by visiting… https://t.co/1gqnDrZf8D"

Research question fifty-one asked if the tweet contains miscellaneous information. To identify this concept in tweets coders looked for content that did not fit with any previous concepts

Intercoder Reliability

Reliability is defined as "the extent to which a measuring procedure yields the same results on repeated trials" (Neuendorf, 2002, p. 14). When human coders are used in content analysis it is called intercoder reliability. This is "the extent to which independent coders evaluate a characteristic of a message or artifact and reach the same conclusion," or agreeability (Lombard 2002, p. 589). This is a critical step in quantitative methods and in content analysis. Content analysis relies on recording the objective characteristics of a message, so without some form of reliability, there is no way to know if the analysis is objective, therefore the measures produced could not be considered valid (Neuendorf, 2002, p. 141). If there is a high level of disagreement among coders, this could signal a weakness in the methods such as poor definitions, categories, or training (Lombard., 2002, p. 589).

In addition, attaining an acceptable level of intercoder reliability is important because it provides basic validation of the coding scheme. By validating the coding scheme, it shows that the codebook is not only useful to one person (usually the main researcher who developed it) but can be objectively used by anyone to attain similar results (Neuendorf, 2002, p. 142).

The relationship between agreement and reliability is direct. Agreement is what is measured, and reliability is what is inferred from this measurement (Krippendorff, 2004, p. 414). After coding was complete, an index of reliability was used to calculate the agreement (Lombard, 2002, p. 590). This resulted in a coefficient that signals if the reliability is high or low. There are several indices to measure intercoder reliability but Scott's pi was used for this study, because it can be calculated for two coders and nominal level data (Lombard, 2002, p. 591). The equation for Scott's pi is as follows:

$$\pi = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)}$$

"Pr(a) represents the amount of agreement that was observed between the two coders. Pr(e) represents the amount of agreement that is expected between the two coders" (Allen, 2017).

This index uses a coefficient scale ranging from 0.00, agreement at chance level, to 1.00, perfect agreement (Lombard, 2002, p. 590). A value of less than 0.00 indicates agreement less than chance (Neuendorf, 2002, p. 150). To correct for chance agreement this test uses a joint distribution for two coders. This takes into account the number of categories and how values are distributed across them by the coders (Lombard, 2002, p. 591). This test also ignores differences in how the two coders "distribute their evaluations across coding categories for that variable" (Neuendorf, 2002, p. 150). This test already assumes that the coders have coded the categories identically. If this is not true, then the formula does not account for the reduced agreement (Lombard, 2002, p. 591).

The acceptable level of reliability is debated, but coefficients of 0.90 or greater are acceptable to all, 0.80 are accepted in most situations, and below that there is still disagreement because most textbooks on social science research methods do not offer a specific cut off figure. Those that offer recommendations do not have unanimous consensus (Neuendorf, 2002, p. 143).

Coding decisions are done by each coder individually. The calculation of reliability is done by the researcher. Decisions on how to code a unit should be made based on information in the coded text only, however coders can review the text as often as needed to gather enough information to make a decision (Neuendorf, 2002, p. 133). There was a 2-hour coder training session this the two coders after the codebook was developed. The coders went through each concept and worked on how to code several examples of tweets.

Reliability was not tested on the metric questions (number of likes, retweets, hashtags, and comments) because they are not subjective, rather these objective numbers are taken straight from the tweets. The coding dataset for intercoder reliability was created based on a random sample. Random sampling is necessary for the information to be generalizable. Randomness is defined as each element in the population must have an equal chance of being selected. This will usually require itemizing each unit in a population, or creating a sampling frame (Neuendorf, 2002, p. 83). To create a 20% subset of tweets for my coders to use, a systematic random sampling method was used (Neuendorf, 2002, p. 84). The process begins with choosing a random start between one and x in the dataset. Then, a skip interval must be established. If the population size is known, the interval will be population/desired sample size (Neuendorf, 2002, p. 85). In the case of this study, a 20% sample size was desired for intercoder reliability so every 5th tweet was coded.

After running the Scott's pi tests for reliability, these were the results from the concepts.

Phase 1: Pre-event

<u>**Use 1: Provide and receive disaster preparedness information**</u>

Research question one asked if the tweet contains an element of planning/preparation for different types of residences such as homes or apartments. Scott's pi returned a percent agreement of 100%.

Research question two asked if the tweet contains an element of planning/preparation at the neighborhood or county level. Scott's pi returned a percent agreement of 93.1%.

Research question three asked if the tweet contains an element of planning/preparation based on a family's specific needs. Scott's pi returned a percent agreement of 96.6%.

Research question four asked if the tweet contains an element of planning/preparation information for an animal. Scott's pi returned a percent agreement of 96.6%.

Research question five asked if the tweet contains an element about training resources available. Scott's pi returned a percent agreement of 93.1%.

Research question six asked if the tweet contains an element about planning covering multiple situations. Scott's pi returned a percent agreement of 96.6%.

Research question seven asked if the tweet contains an element addressing people with unique needs. Scott's pi returned a percent agreement of 94.8%.

Research question eight asked if the tweet contains an element about general planning/preparation for the storm. Scott's pi returned a percent agreement of 98.3%.

Research question nine asked if the tweet contains an element about contains an element about discussing recent or new storm concerns. Scott's pi returned a percent agreement of 94.8%.

Research question ten asked if the tweet contains resources for information in other languages. Scott's pi returned a percent agreement of 96.6%.

Research question eleven asked if the tweet contains an element of promoting a phone app. Scott's pi returned a percent agreement of 94.8%.

Research question twelve asked if the tweet contains an element of promoting a phone number to text. Scott's pi returned a percent agreement of 89.7%.

Research question thirteen asked if the tweet contains an element of promoting a phone number to call. Scott's pi returned a percent agreement of 91.4%.

Research question fourteen asked if the tweet contains an element of promoting element of promoting other social media accounts. Scott's pi returned a percent agreement of 98.3%.

Research question fifteen asked if the tweet contains an element of promoting website. Scott's pi returned a percent agreement of 93.1%.

Research question sixteen asked if the tweet contains downloadable information. Scott's pi returned a percent agreement of 100%.

Use 2: Provide and receive disaster warnings

Research question seventeen asked if the tweet contains an element of general forecasting. Scott's pi returned a percent agreement of 94.8%.

Research question eighteen asked if the tweet contains a warning of inclement weather. Scott's pi returned a percent agreement of 96.5%.

Research question nineteen asked if the tweet contains an element about evacuation. Scott's pi returned a percent agreement of 96.6%.

Phase 2: Pre-event -> Event

Use 3: Signal and detect disasters

Research question twenty asked if the tweet contains ways to receive up to date information on the disaster or resources. Scott's pi returned a percent agreement of 96.6%.

Phase 3: Event

<u>Use 4: Send and receive requests for help or assistance</u>

Research question twenty-one asked if the tweet contains an element about contacting helplines. Scott's pi returned a percent agreement of 96.6%.

Research question twenty-two asked if the tweet contains an element about aid during the storm. Scott's pi returned a percent agreement of 96.6%.

Research question twenty-three asked if the tweet contains an element about shelters. Scott's pi returned a percent agreement of 98.3%.

Research question twenty-four asked if the tweet contains an element about contacting Emergency Management in the area. Scott's pi returned a percent agreement of 96.6%.

<u>Use 5: Inform others about one's own condition and location and learn about a disaster-affected individual's condition and location</u>

Research question twenty-five asked if the tweet contains an element about how to connect to family, friends, or other citizens. Scott's pi returned a percent agreement of 89.7%.

Phase 4: Event -> Post-event

<u>Use 6: Document and learn what is happening in the disaster</u>

Research question twenty-six asked if the tweet contains an element that allows people to connect to news organizations telling victims' stories. Scott's pi returned a percent agreement of 96.5%.

Research question twenty-seven asked if the tweet contains a specific hashtag being used that can connect people affected. Scott's pi returned a percent agreement of 94.8%.

Research question twenty-eight asked if the tweet contains an element controlling rumors spread about the disaster. Scott's pi returned a percent agreement of 91.4%.

Research question twenty-nine asked if the tweet contains an element about or from emergency management sources. Scott's pi returned a percent agreement of 91.4%.

Research question thirty asked if the tweet contains an element about or from local level sources. Scott's pi returned a percent agreement of 93.1%.

Research question thirty-one asked if the tweet contains an element about or from state level sources. Scott's pi returned a percent agreement of 93.1%.

Research question thirty-two asked if the tweet contains an element about or from regional level sources. Scott's pi returned a percent agreement of 93.1%.

Research question thirty-three asked if the tweet contains an element about or from national level sources. Scott's pi returned a percent agreement of 98.3%.

Use 7: Deliver and consume news coverage of the disaster

Research question thirty-four asked if the tweet contains an element about or from local news outlets. Scott's pi returned a percent agreement of 94.8%

Research question thirty-five asked if the tweet contains an element about or from national news outlets. Scott's pi returned a percent agreement of 94.8%.

Use 8: Provide and receive disaster response information; identify and list ways to assist in the disaster response

Research question thirty-six asked if the tweet contains an element about how residents/victims should respond to the disaster once it is underway. Scott's pi returned a percent agreement of 96.6%.

Research question thirty-seven asked if the tweet contains an element about safety actions, preparations, or recommendations. Scott's pi returned a percent agreement of 96.6%.

Use 9: Raise and develop awareness of an event; donate and receive donations; identify and list ways to help or volunteer

Research question thirty-eight asked if the tweet contains an element about how to give general donations, other than money, to disaster recovery. Scott's pi returned a percent agreement of 93.1%.

Research question thirty-nine asked if the tweet contains an element about how to give monetary donations to disaster recovery. Scott's pi returned a percent agreement of 96.6%.

Research question forty asked if the tweet contains an element about how to volunteer in disaster recovery. Scott's pi returned a percent agreement of 96.6%

Research question forty-one asked if the tweet contains an element about disaster relief jobs. Scott's pi returned a percent agreement of 96.6%.

Use 10: Provide and receive disaster mental/behavioral health support

Research question forty-two asked if the tweet contains an element about mental health resources. Scott's pi returned a percent agreement of 96.6%.

Use 11: Express emotions, concerns, well-wishes; memorialize victims

Research question forty-three asked if the tweet contains an element offering concern or well wishes. Scott's pi returned a percent agreement of 93.1%.

Research question forty-four asked if the tweet contains an element offering condolences for victims. Scott's pi returned a percent agreement of 98.3%.

Research question forty-five asked if the tweet contains an element thanking those who have helped. Scott's pi returned a percent agreement of 93.1%.

Use 12: Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster

Research question forty-six asked if the tweet contains an element of telling stories of the disaster. Scott's pi returned a percent agreement of 93.1%.

Research question forty-seven asked if the tweet contains an element about rebuilding finances. Scott's pi returned a percent agreement of 93.1%.

Research question forty-eight asked if the tweet contains an element assistance for home repairs. Scott's pi returned a percent agreement of 93.1%.

Research question forty-nine asked if the tweet contains an element about finding jobs after the hurricane. Scott's pi returned a percent agreement of 93.1%.

Research question fifty asked if the tweet contains an element about general assistance for victims. Scott's pi returned a percent agreement of 100%.

Results

 This results section covers the SPSS outputs returned as significant according to the test that was run (ANOVA, Fishers, or Chi Square). The percentages given are from the "% within" category from the SPSS table output. This percentage describes how many "present" readings were coded for that agency in that category out of the total number of "present" readings overall. This does not determine how many total tweets from that agency contained this tactic. Percentages are rounded to the nearest whole number.

 In order to run the SPSS analysis, the local agencies were grouped together into FEMA local and Red Cross local. Analysis on each of the codebook questions will be done on the broad categories: FEMA national, Red Cross national, FEMA local (encompassing FEMA regions 4, 6, and 9), and Red Cross local (encompassing Red Cross Houston, Central Florida, South Florida, North Florida, and Hawaii). By grouping the agencies, the ability to examine patterns between the agencies and their regional differences was lost. This was done for statistical purposes, otherwise the smaller agencies within FEMA local and Red Cross local would not have had enough tweets individually to run the necessary tests.

 The frequencies for the groupings are 495 tweets for FEMA national, 80 tweets for Red Cross national, 432 tweets for FEMA local, and 184 tweets for Red Cross local. There were a total of 1,230 tweets collected in all. 39 tweets were removed either because they were not about the proper storm or the tweet no longer exists. This left 1,191 tweets to be coded.

 The tests used for analysis in SPSS were ANOVA, Pearson's Chi Square test, and Fisher's Exact test. Analysis of variance, or ANOVA, is used to determine statistical significance between the means of two or more groups ("SPSS Tutorials: One-Way ANOVA," n.d.). This type of test can be used on ratio data, or data that describe exact values and has a true zero.

ANOVA was used to test the metric questions which are the exact number of likes, retweets, hashtags, and comments on each tweet.

Pearson's Chi Square is a test that measures the association between two or more categorical variables. This means there is no relationships between the variables, and numbers or letters are assigned arbitrarily to each ("SPSS Tutorials: Chi-Square Test of Independence," n.d.). This type of data is described as nominal. This is what was used for the codebook categories with (1) Present and (2) Not Present. "The chi-squared test is used to compare the distribution of a categorical variable in a sample or a group with the distribution in another one. If the distribution of the categorical variable is not much different over different groups, we can conclude the distribution of the categorical variable is not related to the variable of groups" (Kim, 2017, p. 152). This test relies on approximation and assumes that the sample size is large.

Fisher's Exact test is used when the expected count, or the ideal frequency for each variable, is not high enough to properly run Pearson's Chi Square test. "When more than 20% of cells have expected frequencies < 5, we need to use Fisher's exact test because applying approximation method is inadequate" (Kim, 2017, p. 154). If the expected count is below five in one or more cells, then a Fisher's test must be used. The Fisher's test is similar to a Chi Square test except it is used for small sample sizes and does not rely on approximation, like Chi Square does, but rather gives an exact value based on the sample size (Kim, 2017, p. 154).

Metric Questions

ANOVA was run on number of likes per different organization. Results showed significant differences, $F(3, 1185) = 5.139$, $p < 0.01$. Post Hocs using Bonferroni showed that Red Cross had significantly ($p < 0.05$) more likes (Mean = 1245, Standard Deviation = 5205) than FEMA (M = 531, SD = 2051), significantly ($p < 0.001$) more likes than FEMA Local (M = 287, SD = 1332), and significantly ($p < 0.01$) more likes than Red Cross Local (M = 306, SD = 1340).

ANOVA was run on number of retweets per different organization. Results showed significant differences, F(3, 1185) = 6.658, p < 0.001. Post Hocs using Bonferroni showed that Red Cross had significantly (p <0.001) more retweets (M = 1022 , SD = 4517) than FEMA (M = 305 , SD = 876), significantly (p <0.001) more retweets than FEMA Local (M = 239, SD = 1015), and significantly (p < 0.001) more likes than Red Cross Local (M = 255, SD = 829).

ANOVA was run on number of hashtags per different organization. Results showed significant differences, F(3, 1185) = 4.365, p < 0.01. Post Hocs using Bonferroni showed that FEMA had significantly (p < 0.001) fewer likes (M = 1.26 , SD = 0.883) than Red Cross Local (M = 1.56 , SD = 1.153).

ANOVA was run on number of comments per different organization. Results showed significant differences, F(3, 1185) = 3.876, p < 0.01. Post Hocs using Bonferroni showed that Red Cross had significantly (p <0.01) more comments (M = 39, SD = 149) than FEMA Local (M = 11, SD = 47), and significantly (p <0.05) more comments than Red Cross Local (M = 12, SD = 56).

Table 5: Metrics on Each Agency

	# of likes		Retweets		Hashtags		Comments	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
FEMA	531 (A)	2051 (A)	305 (A)	876 (A)	1.26 (A)	0.883 (A)	20	80
Red Cross	1245 (ABC)	5202 (ABC)	1022 (ABC)	4517 (ABC)	1.36	0.875	39 (AB)	149 (AB)
FEMA Local	287 (B)	1332 (B)	239 (B)	1015 (B)	1.38	1.033	11 (A)	47(A)
Red Cross Local	306 (C)	1340 (C)	255 (C)	829 (C)	1.56 (A)	1.153 (A)	12 (B)	56(B)

Letters in the same column are significantly different

Research Questions

Pearson's Chi Square was conducted on if a **URL** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 12.97, p < 0.01). FEMA National included 41%, FEMA Local 35%, Red Cross Local 15%, Red Cross National 9%.

Pearson's Chi Square was conducted on if a **video** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 52.22, p < 0.001). FEMA National included 36%, Red Cross Local 24%, Red Cross National 22%. FEMA Local 19%.

According to Pearson's Chi Square test, there is no significance between agencies and **photo** usage in tweets.

According to Fisher's Exact Test, there is no significance between agencies and use of **other graphics (ex. gif)** in tweets. All four agencies violated the expected count minimum of 5 or more, meaning no agency was communicating about this tactic frequently enough.

Pearson's Chi Square was conducted on if **another tweet** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 19.88, p < 0.00). FEMA National included 47%, FEMA Local 45%, Red Cross Local 8%, Red Cross National 0%.

Pearson's Chi Square was conducted on if the **tweet was a retweet** in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 113.21, p < 0.001). FEMA National included 47%, FEMA Local 38%, Red Cross Local 14%, Red Cross National 0%.

Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. This agency was not **replying to other tweets** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. FEMA National included 57%, Red Cross National 24%. FEMA Local 11%, Red Cross Local 9%.

Pearson's Chi Square could not be computed because Red Cross National and Red Cross Local violated the expected count minimum of five or more. These agencies were not **using another language** frequently enough in their tweets. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. FEMA Local included 64%, Red Cross Local 29%, FEMA National 7%, Red Cross National 0%.

Phase 1: Pre-event

<u>**Use 1: Provide and receive disaster preparedness information**</u>

The first research question asked how the agencies communicate about planning/preparation for different types of residences, such as homes and apartments. According to Fisher's Exact Test, there is no significance between agencies and communication about **planning/preparation for different types of residences** in tweets. Three agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question two asked if the tweet contains an element of planning/preparation at the neighborhood or county level. According to Fisher's Exact Test, there is no significance between agencies and communication about **planning/preparation at the neighborhood or county leve**l in tweets. All four agencies violated the expected count

minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question three asked if the tweet contains an element of planning/preparation based on a family's specific needs such as a plan for a family of four. According to Fisher's Exact Test, there is no significance between agencies and communication about **planning/preparation based on a family's specific needs** (ex. for a family of four) in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question four asked if the tweet contains an element of planning/preparation information for an animal. According to Fisher's Exact Test, there is no significance between agencies and communication about **planning/preparation information for an animal** in tweets. Two agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question five asked if the tweet contains an element about training resources available. According to Fisher's Exact Test, there is no significance between agencies and communication about **available training resources** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question six asked if the tweet contains an element about planning covering multiple situations such as no food or a power outage. Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. This agency was not communicating about **planning covering multiple situations (no food, power outage, etc)** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.05. FEMA Local included 57%, FEMA National 30%, Red Cross Local 14%, Red Cross National 0%.

Research question seven asked if the tweet contains an element addressing people with unique needs such as disabled people, sick people, and the elderly. According to Fisher's Exact Test, there is no significance between agencies and communication about **addressing people with unique needs (ex. disabled people, sick, the elderly)**. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question eight asked if the tweet contains an element about general planning/preparation for the storm. The Pearson's Chi Square test showed no significance between agency and communication about **general planning/preparation** for the storm, however it is nearing significance at 0.056.

Research question nine asked if the tweet contains an element about contains an element about discussing recent or new storm concerns. Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. This agency was not communicating about **recent or new storm concerns** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. FEMA National included 46%, Red Cross Local 41%, FEMA Local 14%, Red Cross National 0%.

Research question ten asked if the tweet contains resources for information in other languages. According to Fisher's Exact Test, there is no significance between agencies and communication about **resources in other languages (ex. linking to resources available in Spanish)** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question eleven asked if the tweet contains an element of promoting a phone app. According to Fisher's Exact Test, there is no significance between agencies and communication about **promoting a phone app** in tweets. Two agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question twelve asked if the tweet contains an element of promoting a phone number to text. Pearson's Chi Square could not be computed because Red Cross National and Red Cross Local violated the expected count minimum of five or more. These agencies were not communicating about **promoting a number to text** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.05. FEMA National included 40%, Red Cross National 27%. FEMA Local 20%, Red Cross Local 13%.

Research question thirteen asked if the tweet contains an element of promoting a phone number to call. Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. Fisher's Exact Test, showed no significant between agency and communication about **promoting a phone number** in tweets, however it is nearing significance at 0.058.

Research question fourteen asked if the tweet contains an element of promoting element of promoting other social media accounts. Pearson's Chi Square was conducted on if agencies communicating about **promoting other social media accounts** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 25.87, p < 0.001). FEMA National included 52%, FEMA Local 36%, Red Cross Local 11%, Red Cross National 2%.

Research question fifteen asked if the tweet contains an element of promoting website. Pearson's Chi Square was conducted on if agencies communicating about **promoting a website** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 10.72, p < 0.05). FEMA National included 41%, FEMA Local 35%, Red Cross Local 15%, Red Cross National 9%.

Research question sixteen asked if the tweet contains downloadable information. According to Fisher's Exact Test, there is no significance between agencies and communication about **downloadable information** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Use 2: Provide and receive disaster warnings

Research question seventeen asked if the tweet contains an element of general forecasting. Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. This agency was not

communicating about **general forecasting** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance that = 0.001. FEMA National included 55%, Red Cross Local 25%, FEMA Local 19%, Red Cross National 1%.

Research question eighteen asked if the tweet contains a warning of inclement weather. Pearson's Chi Square was conducted on if agencies communicating about **warning of inclement weather** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 10.30, p < 0.05). FEMA National included 51%, FEMA Local 34%, Red Cross Local 15%, Red Cross National 0%.

Research question nineteen asked if the tweet contains an element about evacuation. According to Fisher's Exact Test, there is no significance between agencies and communication about **evacuation** in tweets. One agency violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Phase 2: Pre-event -> Event

Use 3: Signal and detect disasters

Research question twenty asked if the tweet contains ways to receive up to date information on the disaster or resources. Pearson's Chi Square was conducted on if agencies communicating about **ways to receive up to date information on the disaster or resources** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 13.85, p < 0.01). FEMA Local included 48%, FEMA National 44%, Red Cross National 4%, Red Cross Local 3%.

Phase 3: Event

Use 4: Send and receive requests for help or assistance

Research question twenty-one asked if the tweet contains an element about contacting helplines. According to Fisher's Exact Test, there is no significance between agencies and communication about **helplines** in tweets. Two agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question twenty-two asked if the tweet contains an element about aid during the storm. Pearson's Chi Square was conducted on if agencies communicating about **government aid during the storm** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 15.10, p < 0.01). FEMA National included 59%, FEMA Local 30%, Red Cross National 6%, Red Cross Local 5%.

Research question twenty-three asked if the tweet contains an element about shelters. Pearson's Chi Square could not be computed because Red Cross National violated the expected count minimum of five or more. This agency was not communicating about **shelters** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided

exact significance that = 0.001. FEMA Local 32%, Red Cross Local 30%, FEMA National included 25%, Red Cross National 13%.

Research question twenty-four asked if the tweet contains an element about contacting Emergency Management in the area. According to Fisher's Exact Test, there is no significance between agencies and communication about **contacting emergency management** in tweets. All four agencies violated the expected count minimum of 5 or more, meaning no agency was communicating about this tactic frequently enough.

Use 5: Inform others about one's own condition and location and learn about a disaster-affected individual's condition and location

Research question twenty-five asked if the tweet contains an element about how to connect to family, friends, or other citizens. According to Fisher's Exact Test, there is no significance between agencies and communication about **how to connect to family, friends, or other citizens** in tweets. Two agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Phase 4: Event -> Post-event

Use 6: Document and learn what is happening in the disaster

Research question twenty-six asked if the tweet contains an element that allows people to connect to news organizations telling victims' stories. No agencies communicated about **connecting people to news organizations telling victims' stories**.

Research question twenty-seven asked if the tweet contains a specific hashtag being used that can connect people affected. Pearson's Chi Square was conducted on if agencies communicating **using specific hashtags** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 24.07, p < 0.001). FEMA Local included 38%, FEMA National 30%, Red Cross Local 25%, Red Cross National 6%.

Research question twenty-eight asked if the tweet contains an element controlling rumors spread about the disaster. According to Fisher's Exact Test, there is no significance between agencies and communication about **controlling rumors** in tweets. Two agencies violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question twenty-nine asked if the tweet contains an element about or from emergency management sources. Pearson's Chi Square was conducted on if agencies communicating about **information from/about emergency management sources** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 79.17, p < 0.001). FEMA Local included 55%, FEMA National 42%, Red Cross Local 4%, Red Cross National 0%.

Research question thirty asked if the tweet contains an element about or from local level sources. Pearson's Chi Square was conducted on if agencies communicating **about/from local level sources** was present in each of the organizations Twitter responses. Results

showed significance (χ^2 (3) = 63.11, p < 0.001). Red Cross Local included 43%, FEMA Local 41%, FEMA National 16%, Red Cross National 0%.

Research question thirty-one asked if the tweet contains an element about or from state level sources. Pearson's Chi Square was conducted on if agencies communicating **about/from state level sources** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 35.18, p < 0.001). FEMA Local included 57%, FEMA National 31%, Red Cross Local 13%, Red Cross National 0%.

Research question thirty-two asked if the tweet contains an element about or from regional level sources. Pearson's Chi Square was conducted on if agencies communicating **about/from regional level sources** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 41.76, p < 0.001). FEMA National included 73%, Red Cross Local 16%, FEMA Local 12%, Red Cross National 0%.

Research question thirty-three asked if the tweet contains an element about or from national level sources. Pearson's Chi Square was conducted on if agencies communicating **about/from national level sources** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 92.29, p < 0.001). FEMA National included 57%, FEMA Local 16%, Red Cross Local 4%, Red Cross National 1%.

Use 7: Deliver and consume news coverage of the disaster

Research question thirty-four asked if the tweet contains an element about or from local news outlets. Pearson's Chi Square could not be computed because all four agencies violated the expected count minimum of five or more. They were not relaying communication **about/from local news outlets** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. Red Cross Local included 90%, FEMA Local 10%, FEMA National 0%, Red Cross National 0%.

Research question thirty-five asked if the tweet contains an element about or from national news outlets. According to Fisher's Exact Test, there is no significance between agencies and communication **about/from national news outlets** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Use 8: Provide and receive disaster response information; identify and list ways to assist in the disaster response

Research question thirty-six asked if the tweet contains an element about how residents/victims should respond to the disaster once it is underway. Pearson's Chi Square was conducted on if agencies communicating about **how residents/victims should respond to the disaster once it is underway** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 36.12, p < 0.001). FEMA

National included 55%, FEMA Local 40%, Red Cross Local 4%, Red Cross National 0%.

Research question thirty-seven asked if the tweet contains an element about safety actions, preparations, or recommendations. Pearson's Chi Square was conducted on if agencies communicating about **safety actions, preparations, or recommendations** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 27.88, p < 0.001). FEMA National included 58%, FEMA Local 34%, Red Cross Local 6%, Red Cross National 3%.

Use 9: Raise and develop awareness of an event; donate and receive donations; identify and list ways to help or volunteer

Research question thirty-eight asked if the tweet contains an element about how to give general donations, other than money, to disaster recovery. Pearson's Chi Square could not be computed because Red Cross National and Red Cross Local violated the expected count minimum of five or more. These agencies were not communicating about **how to give general donations** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. Red Cross National included 42%, Red Cross Local 26%, FEMA National 16%, FEMA Local 16%.

Research question thirty-nine asked if the tweet contains an element about how to give monetary donations to disaster recovery. Pearson's Chi Square could not be computed because Red Cross National and Red Cross Local violated the expected count minimum of 5 or more. This agency was not **communicating about how to give monetary donations** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.001. Red Cross National included 50%, Red Cross Local 32%, FEMA National 9%, FEMA Local 9%,

Research question forty asked if the tweet contains an element about how to volunteer in disaster recovery. According to Fisher's Exact Test, there is no significance between agencies and communication about **volunteering in disaster recovery** in tweets. One agency violated the expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Research question forty-one asked if the tweet contains an element about disaster relief jobs. According to Fisher's Exact Test, there is no significance between agencies and communication about **disaster relief jobs** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Use 10: Provide and receive disaster mental/behavioral health support

Research question forty-two asked if the tweet contains an element about mental health resources. According to Fisher's Exact Test, there is no significance between agencies and communication about **mental health resources** in tweets. Two agencies violated the

expected count minimum of five or more, meaning they did not communicate about this tactic frequently enough.

Use 11: Express emotions, concerns, well-wishes; memorialize victims

Research question forty-three asked if the tweet contains an element offering concern or well wishes. According to Fisher's Exact Test, there is no significance between agencies and communication **offering concern or well wishes** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question forty-four asked if the tweet contains an element offering condolences for victims. No agencies communicated about **offering condolences** for victims.

Research question forty-five asked if the tweet contains an element thanking those who have helped. Pearson's Chi Square could not be computed because Red Cross National and Red Cross Local violated the expected count minimum of five or more. These agencies were not **thanking those who have helped** frequently enough. Due to this, I ran a Fisher's Exact Test which gave a 2-sided exact significance of <0.01. FEMA National included 30%, Red Cross National 23%, FEMA Local 23%, Red Cross Local 23%.

Use 12: Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster

Research question forty-six asked if the tweet contains an element of telling stories of the disaster. Pearson's Chi Square was conducted on if agencies communicating about **telling stories of the disaster** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 78.92, p < 0.001). FEMA National included 33%, Red Cross Local 29%, FEMA Local 22%, Red Cross National 16%.

Research question forty-seven asked if the tweet contains an element about rebuilding finances. According to Fisher's Exact Test, there is no significance between agencies and communication about **rebuilding finances** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question forty-eight asked if the tweet contains an element assistance for home repairs. According to Fisher's Exact Test, there is no significance between agencies and communication about assistance for **home repairs** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question forty-nine asked if the tweet contains an element about finding jobs after the hurricane. According to Fisher's Exact Test, there is no significance between agencies and communication about **finding jobs after the hurricane** in tweets. All four agencies violated the expected count minimum of five or more, meaning no agency was communicating about this tactic frequently enough.

Research question fifty asked if the tweet contains an element about general assistance for victims. Pearson's Chi Square was conducted on if agencies communicating about **general disaster assistance** was present in each of the organizations Twitter responses. Results showed significance (χ^2 (3) = 19.30, p < 0.001). FEMA Local included 50%, FEMA National 37%, Red Cross Local 9%, Red Cross National 4%.

This chart has whether the codebook question returned as significant, as well as ranked percentages for which agency used the concept the most (1st) to who used it the least (4th) which can be seen on the left side. On the right side, there are the percentages for categories that were not significant. Though there was no significant different between agencies in these cases, it is still worth looking at to see how much each agency implemented the tactic. The event phases and usages are also denoted in the chart. There are 58 total categories. 30 were significant and 28 were not.

Table 6: Content Analysis Results

Codebook Category	Significant (Yes/No)	FEMA National	Red Cross National	FEMA Local	Red Cross Local
URLs	Y < 0.01	1st (41%)	4th (9%)	2nd (35%)	3rd (15%)
Video	Y < 0.001	1st (36%)	3rd (22%)	4th (19%)	2nd (24%)
Photo	N				
Other graphic	N	(33%)	(0%)	(22%)	(44%)
Another tweet	Y < 0.001	1st (47%)	4th (0%)	2nd (45%)	3rd (8%)
Retweet	Y < 0.001	1st (47%)	4th (0%)	2nd (38%)	3rd (14%)
Reply	Y < 0.001	1st (57%)	2nd (24%)	3rd (11%)	4th (9%)
Another language	Y < 0.001	3rd (7%)	4th (0%)	1st (64%)	2nd (29%)
Phase 1: Pre-event					
Use 1: Provide and receive disaster preparedness information					

Planning residence	N	(39%)	(0%)	(54%)	(8%)
Planning neighborhood	N	(75%)	(0%)	(25%)	(0%)
Planning for family	N	(14%)	(14%)	(29%)	(43%)
Planning animals	N	(20%)	(7%)	(47%)	(27%)
Training resources	N	(0%)	(0%)	(0%)	(100%)
Planning for situations	Y < 0.05	2nd (30%)	4th (0%)	1st (57%)	3rd (14%)
Planning unique needs	N	(60%)	(0%)	(30%)	(10%)
General planning	Nearing 0.05 sig	(33%)	(4%)	(39%)	(24%)
Recent storm concerns	Y < 0.001	1st (46%)	4th (0%)	3rd (14%)	2nd (41%)
Resources other languages	N	(60%)	(0%)	(40%)	(0%)
Phone app	N	(46%)	(5%)	(23%)	(27%)
# to text	Y < 0.05	1st (40%)	2nd (27%)	3rd (20%)	4th (13%)
Phone #	Nearing 0.05 sig	(34%)	(7%)	(52%)	(7%)
Other social media accounts	Y < 0.001	1st (52%)	4th (2%)	2nd (36%)	3rd (11%)
Website	Y < 0.05	1st (41%)	4th (9%)	2nd (35%)	3rd (15%)
Downloadable information	N	(0%)	(0%)	(50%)	(50%)
Use 2: Provide and receive disaster warnings					
General forecasting	Y = 0.001	1st (55%)	4th (1%)	3rd (19%)	2nd (25%)
Inclement weather warning	Y < 0.05	1st (51%)	4th (0%)	2nd (34%)	3rd (15%)
Evacuation	N	(58%)	(0%)	(30%)	(13%)
Phase 2: Pre-event -> Event					
Use 3: Signal and detect disasters					

Up-to-date information	Y < 0.01	2nd (44%)	3rd (4%)	1st (48%)	4th (3%)
Phase 3: Event					
Use 4: Send and receive requests for help or assistance					
Helplines	N	(48%)	(0%)	(41%)	(10%)
Government aid	Y < 0.01	1st (59%)	3rd (6%)	2nd (30%)	4th (5%)
Shelters	Y = 0.001	3rd (25%)	4th (13%)	1st (32%)	2nd (30%)
Contact emergency management	N	(25%)	(0%)	(50%)	(25%)
Use 5: Inform others about one's own condition and location and learn about a disaster-affected individual's condition and location					
Connect with friends/family	N	(43%)	(5%)	(43%)	(10%)
Phase 4: Event -> Post-event					
Use 6: Document and learn what is happening in the disaster					
Link victims with news orgs	N/A	(0%)	(0%)	(0%)	(0%)
Hashtags	Y < 0.001	2nd (30%)	4th (6%)	1st (38%)	3rd (25%)
Controlling rumors	N	(31%)	(0%)	(62%)	(8%)
Info from emergency management	Y < 0.001	2nd (42%)	4th (0%)	1st (55%)	3rd (4%)
Info from local sources	Y < 0.001	3rd (16%)	4th (0%)	2nd (41%)	1st (43%)
Info from state sources	Y < 0.001	2nd (31%)	4th (0%)	1st (57%)	3rd (13%)
Info from regional sources	Y < 0.001	1st (73%)	4th (0%)	3rd (12%)	2nd (16%)
Info from national sources	Y < 0.001	1st (57%)	4th (1%)	2nd (16%)	3rd (4%)
Use 7: Deliver and consume news coverage of the disaster					
Info from local	Y < 0.001	3rd (0%)	3rd (0%)	2nd (10%)	1st (90%)

news outlets					
Info from national news outlets	N	(44%)	(0%)	(11%)	(44%)

Use 8: Provide and receive disaster response information; identify and list ways to assist in the disaster response

Response once disaster is started	Y < 0.001	1st (55%)	4th (0%)	2nd (40%)	3rd (4%)
Safety actions or recommendations	Y < 0.001	1st (58%)	4th (3%)	2nd (34%)	3rd (6%)

Use 9: Raise and develop awareness of an event; donate and receive donations; identify and list ways to help or volunteer

General donations	Y < 0.001	3rd (16%)	1st (42%)	4th (16%)	2nd (26%)
Monetary donations	Y < 0.001	3rd (9%)	1st (50%)	3rd (9%)	2nd (32%)
Volunteering	N	(35%)	(8%)	(30%)	(28%)
Disaster relief jobs	N	(67%)	(0%)	(33%)	(0%)

Use 10: Provide and receive disaster mental/behavioral health support

Mental health resources	N	(71%)	(0%)	(29%)	(0%)

Use 11: Express emotions, concerns, well-wishes; memorialize victims

Concern or well wishes	N	(100%)	(0%)	(0%)	(0%)
Condolences	N/A	(0%)	(0%)	(0%)	(0%)
Thanking those who have helped	Y < 0.01	1st (30%)	2nd (23%)	2nd (23%)	2nd (23%)

Use 12: Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster

Telling stories of the disaster	Y < 0.001	1st (33%)	4th (16%)	3rd (22%)	2nd (29%)
Rebuilding finances	N	(0%)	(0%)	(100%)	(0%)
Home repairs	N	(33%)	(0%)	(67%)	(0%)

Finding jobs after the storm	N	(0%)	(0%)	(100%)	(100%)
General disaster assistance	Y < 0.001	2nd (37%)	4th (4%)	1st (50%)	3rd (9%)

Discussion

Communication geography is an interdisciplinary way to view communication as spatial production (Adams & Jansson, 2012, p. 301). Throughout history this collaboration between geography and communication has produced works such as the Morse telegraph and in recent years, the internet (Tsatsou, 2009, p. 13). Both of these demonstrate how communication can be transmitted regardless of boundaries (Tsatsou, 2009, p. 13). Some concepts in communication geography are about communication over a landscape but it can also include spaces in communication. One aspect of communication geography is the idea of the virtual community, one of which is Twitter (Tsatsou, 2009, p. 21). Tsatsou describes social networks as an "...almost instant transfer of messages and service across geographical boundaries….bridge spatial, temporal, as well as cultural distances, often creating new spaces (e.g. online forums) and new measures of time (e.g. Twitter…)" (Tsatsou, 2009, pg. 17). However, as these new spaces evolve, they are being used for communication usually dominated by mass media, such as weather news and alerts. Emergency managers and government agencies have begun to adopt social media, such as Twitter, for communication with the public as well as pertinent alerts about weather or relief efforts.

Research on best practices for natural disaster communication have been conducted by scholars and agencies, such as the National Oceanic and Atmospheric Administration. In Chapter 1 of the literature review there are some best practices that were outlined when it comes to disaster communication. The Department of Homeland Security found that 90-character message

lengths were too short to convey all the information necessary for social media platforms (National Academies, 2018, p. 3). Another study also found that issuing warnings based on communication avenues that people are using and accustomed to will be most effective (National Academies, 2018, p. 6). In the case of Twitter use by FEMA and Red Cross, the character length has been expanded to 280-characters and Twitter is a popular platform among the public, so it serves as a good communication avenue (Burgess, Bruns, Mahrt, & Weller, 2013, p. 29).

Several concepts that the tweets were coded for were inspired by the research and best practices found in the literature review. One concept from the model was the idea of connecting with friends and family during or after a storm. Government run social media accounts or Facebook's Safety checks, which allows users to register their status, were also found to be best practices (National Academies, 2018, p. 2).

NOAA is one of the premier hazards research agencies in the world, spending billions of dollars per year monitoring and predicting risk for events such as natural disasters. In addition, NOAA has a guide for communication during a disaster and the best practices were outlined in the literature review (NOAA, 2016, pp. 12-14). One guideline advised speaking to the audiences' interest, not the agency's interests, by connecting emotionally with the audience. All four agency groupings were analyzed for the concept categories under use 11 of the model, express emotions, concerns, well-wishes, or memorialize victims. FEMA national was the only agency that showed concern or well wishes. None of the agencies offered condolences, and all four agencies thanked those who helped, however, FEMA national did this more often. Another best practice guideline was to explain the risk by using stories and visuals to help the audience understand hazards. One concept category was telling stories of the disaster. All four agencies addressed this concept, but FEMA national and Red Cross local did more often. Offering options for reducing risk was a

best practice guideline from NOAA (NOAA, 2016, pp. 12-14). This would fall under use one concerning preparedness. One of the significant codebook concepts for this use was planning for situations that come from the disaster, such as a power outage. FEMA local addressed this concept the most often.

Number five of the NOAA best practice guidelines was to work with trusted sources and the public, which means engaging with the audience regularly and identify trusted sources (NOAA, 2016, pp. 12-14). From the literature review in Chapter 2, a study was conducted by Sadiq, Tharp, and Graham (2016) to see who individuals rely on for their information during a natural disaster (Sadiq et al., 2016). It was determined that people rely on their friends and family the most in these events. The agencies tweets were tested for replies and FEMA national addressed this concept the best. Under use six there were several concept questions about connecting the public with content from other sources. The research study conducted by Sadiq et al (2016) found that fire departments, police departments, and county/city emergency management were the second, third, and fifth most trusted source during a disaster. Pew also conducted a survey showing 63% of the public has a favorable view of local government, compared to just 28% for the federal government (Sadiq et al., 2016, p. 8). One concept the agencies Twitters were tested for was providing information from local sources. Both FEMA local and Red Cross local dominated because their groupings are made up of smaller local offices. FEMA national released most of the content for releasing information from national and regional sources. Though FEMA is a federal entity and is more likely to retweet content from other national level agencies or sources, considering only 28% of the public has a favorable view of the federal government, the agency may want to include other local sources more often.

In addition to a general guide for best practices in disaster communication, NOAA also created a specific guide for communicating during tropical storms (NOAA, 2016, p. 25). The first guideline is to address barriers the public faces during hurricane preparedness, such as supplies, evacuation, and shelter accommodations. Several preparedness concepts were tested from use one as well as a concept question on shelters in use four and an evacuation question in use two. Not many preparedness concepts were significant, nor was the question about evacuation content. But FEMA local and Red Cross local put out the most content about shelters. Considering these local offices would be in the same area as the shelters it connects that these agencies would have more content on this topic.

The second specific guideline for best communication practices during a hurricane is convey hurricane risk information in a clear and compelling manner (NOAA, 2016, p. 25). The concept questions informed by this were recent storm concerns, inclement weather warnings, and general forecasting. FEMA national and Red Cross local had the most content addressing recent storm concerns. This pattern continues for the concept of general forecasting but FEMA local and national provided the most content warning the public of inclement weather.

The section on community engagement also helped to inform some concept questions. FEMA and Red Cross have their community engagement programs Whole Community and Red Cross Ready. Whole Community had a few ideas that translated to concepts such as promoting other social media accounts and planning at the neighborhood level ("A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action," 2011). The agency that most often promoted other social media accounts was FEMA national, followed by FEMA local. planning at the neighborhood level did not return as significant. The Red Cross Ready Campaign is about preparedness and informed the creation of several concept question.

The first step of the Red Cross Ready Campaign is to Get a Ket ("How to Prepare for Emergencies," n.d.). This should be a specialized kit that fits with your family's needs and aligns with that concept. The second step is to Make a Plan which informed the concept of planning for multiple situations and planning for your family's specific needs ("How to Prepare for Emergencies.", n.d.). The final step is to Be Informed which led to the concept question of tweeting up-to-date information ("How to Prepare for Emergencies.", n.d.). Planning for a family's unique needs did not return as significant and FEMA local was ranked frist for providing information on planning for unforeseen situations. FEMA local also provided the most up-to-date information.

The demographic information also helped inform some concept questions. Though the concept did not return as significant, the information on age and disabilities prompted the creation of a question about unique needs. So, the information on languages helped inform the questions on tweeting in other languages and resources in other languages.

Quarantelli and other disaster communications scholars found some best practices for communication during disasters. One finding was that disaster coverage is massive for all media. Organizations that provide information about disasters usually have many stories (Quarantelli, 1990, p. 2). The Red Cross and FEMA are not media organizations, however FEMA national and local had more overall tweets than either Red Cross local or national.

Disaster news stories are almost exclusively provided by local mass media organizations (Quarantelli, 1990, p. 2). When it came to the research concept about information provided from local news outlets, FEMA local had 10% of the content and Red Cross local had 90% of the content. Both national level agencies had 0% of this content. The best practice here is true.

Two other findings were that there is selective reporting on disaster related topics. First is that many radio stations will air personal messages from listeners about their safety, the wellbeing of others, and additional personal information (Quarantelli, 1990, p. 5). Second is that subjects such as volunteer search and rescue and activities of volunteers are not covered very often (Quarantelli, 1990, p. 3). Heverin and Zach (2010) found that social media, and its two-way communication system, lets people become participants in telling thier story (Heverin and Zach, 2010, p. 1). The concept encompassing these is stories of the disaster. This trend of lacking stories was not true in the case of FEMA national with 33% and Red Cross local with 29%.

It was found that mass media organizations mostly use traditional sources of information even during times of disasters. Local government officials were cited the most often as well as police, fire and relief agencies. Local emergency management was cited the least often (Quarantelli, 1990, p. 5). Local government officials and police, fire and relief agencies are under the concept of information from or about local sources. FEMA local and Red Cross local were performed the strongest in this area with 41 and 43% respectively. However, when scaling upward, FEMA national provides information from equivalent state, regional, and national sources. It seems that in line with best practices, traditional information sources are used.

The final finding was that often mass media, especially television, perpetuates disaster myths (Quarantelli, 1990, pp. 6-7). The concept of rumor control was not significant; however, it was addressed the most by FEMA local, then FEMA national. For these agencies' Twitters, addressing rumors seems to have less importance than television.

In a study on sheltering habits during disasters, Quarantelli (1991) found that little attention is paid to sheltering, and more to evacuation. Local Red Cross chapters have a responsibility based on a congressional mandate and their past activities (Quarantelli, 1991, p. 4). Local emergency management agencies, such as the FEMA offices tested, exhibit the range of

"no interest or involvement with the problem of evacuees, to an acceptance of the major responsibility for coordination of all disaster sheltering and housing activities in the local community" (Quarantelli, 1991, p. 4). Sheltering was a popular topic for Red Cross local with 30% and FEMA local with 32%. Evacuation was not a significant topic, but it was covered most by FEMA national. In the case of social media, Quarantelli's findings were not true for the agencies studied.

There were several best practices that informed the codebook categories. From the evaluation above, FEMA national had content that most often addressed questions informed by best practices. however, the theory, research and best practices evaluation is only one aspect. The general research question was do FEMA and Red Cross, at the local and national scales, follow the principles of crisis communication via their Twitter accounts during hurricanes Harvey, Irma, Lane, Michael, and Matthew? To answer the overall research question, the next section of the discussion will analyze the research questions in six parts: an in depth look at each agency's content, then two comparison sections will follow, one on comparison between agency and the other comparing national versus local within agencies.

FEMA National

FEMA had the highest percentage of present readings in 18 of the codebook categories when comparing the four agency groupings. FEMA national had the highest percentage of URL's, video, other tweets, retweets, and replies included in their tweets. This signals FEMA national is providing additional information to the public outside of the text in tweets.

In addition, FEMA national ranked first or second in the following codebook questions:

- planning for diverse situations,
- discussing recent storm concerns,

- promoting numbers to text,

- promoting other social media accounts,

- including website links in tweets,

- providing general forecast information,

- giving warnings of inclement weather,

- providing ways to receive up to date information,

- giving information on government aid,

- using unique hashtags,

- providing information from emergency managers,

- providing information from state, regional, and national sources,

- providing information on how to respond once the disaster has started,

- giving safety actions or recommendations,

- thanking those who have helped,

- telling stories of the disaster,

- giving information on general disaster assistance after the storm.

Though FEMA national was not fourth place in any of the categories, it ranked third when it came to tweeting in other languages, providing information from local sources, providing information on shelters, providing information from local news sources, and asking for donations, monetary or otherwise. Tweeting in other languages is crucial considering how multi linguistic the United States has become. Based on the demographic information in Chapter 3, Texas (35%), Hawaii (26%), and Florida (29%) all have over a quarter of their population five years old and above speaking another language at home. If FEMA is not tweeting in the main minority languages found in these states, it is ignoring a large population of the community that it serves. Because the catchment system did not have filter words in other languages, it is

possible that these tweets were not captured. However, out of all of the tweets with resources to other languages, FEMA tweeted 60% of such tweets. Even if it is not tweeting in these languages, it provided links to resources that can better serve people who may speak and understand languages better than English. FEMA also did poorly when it came to tweeting information from local sources. It did however have the highest percentages for tweeting information from state, regional, and national sources. Their local information may be lacking because FEMA is a national government agency. Their ties to the local community may be weak considering the national level agency has to keep up with all disaster happening across the country. One solution to this could be to follow the lead of the local FEMA Twitter account who provided 41% of the local content.

FEMA also did not provide much information on shelters. This could also be a scale issue signaling that it does not know much about the shelter situation in the cities. This can also be adjusted by following the lead of FEMA local who was first in content about shelters. Though FEMA did not provide any information from local news sources, it did provide 44% of the content from national news sources. This is also a scale issue, since a national government agency is more likely to have connections with national news sources. Unfortunately, FEMA local may not be much help in this area considering it only provided 10% of the coverage from local news outlets. The final category that FEMA did poorly in was money donations and general donations. Donations are not a large factor to keep the agency running because it is government funded, however it would be pertinent to provide information on places where people can make donations.

FEMA national is using the most unique hashtags but it had the fewest overall number of hashtags out of all the agencies and are significantly lower than Red Cross local. Out of likes

retweets and comments, FEMA national has the second highest mean values, outpaced by Red Cross national.

FEMA's dominance in disaster communication is no surprise considering it is the nation's leading government disaster management and relief agency. These results showing broad coverage of the categories align with their purpose, mission, and history of providing support throughout the disaster cycle.

Red Cross National

Only the statistically significant results will be discussed in this section. However, it is worth pointing out that out of the 58 categories (significant and non-significant included), Red Cross national had 0% of the content in 32 of them, meaning it provided absolutely no content for over half of the categories. Overall Red Cross national did very poorly at addressing the codebook categories. Even when it did include certain information, it was ranked fourth 21 times, and third three times.

Red Cross national had the highest rank in these codebook questions:

- money donations

- general donations

This is because Red Cross national the "generosity of donors" as a source of support in their mission statement ("Mission & Principles," n.d.). Red Cross national placed second in the following three categories: replies, promoting a number to text, and thanking those who have helped.

The Red Cross placed third or fourth in percentage of tweets with URLs, video, imbedding another tweet, including a retweet, and tweeting in another language. Because it did well in engagement efforts, such as number of likes and comments, it may suggest that it is more

concerned with engaging with the public than providing extra information through URL's or or other tweets. Red Cross was not concerned at all with use one is provide and receive disaster preparedness information. Within this use it was fourth in every category deemed significant. This included, planning for multiple situations, informing the public about recent storm concerns, promoting other social media accounts, and promoting websites. Red Cross national may not see it as their purview to provide the public with disaster preparedness information. Rather it should be left to agencies like FEMA who have close ties with other government agencies, like the National Weather Center, who can provide direct and credible information. For this same reason it may not feel the need to tweet about disaster warnings. The Red Cross was also fourth place when it came to use two is provide and receive disaster warnings, encompassing general forecasting and warning of inclement weather. Red Cross national was also not concerned with providing the public with up to date information on storm concerns, use three, as well as where to find government aid or shelters, use four. Considering Red Cross national is most focused on relief efforts it was surprising to see them do poorly in measures such as shelter information. However, Red Cross local was second place on shelter information. Red Cross may employ the same tactic as FEMA national by letting the local agency accounts handle the operations within the city. Red Cross' messaging did not improve for use 6, document and learn what is happening in the disaster, use seven, deliver and consume news coverage, or use eight, provide and receive disaster response information. The final category where Red Cross was also last is use twelve, provide and receive information about response, recovery and rebuilding; tell and hear stories about the disaster.

One area that Red Cross national is doing well in is engagement with the community. Red Cross national had significantly more likes and retweets than all the other agencies, and more comments than FEMA local and Red Cross local. However, it may have motives other than

just the wellbeing of citizens in mind because the more visible the agency is on social media, the more donations it can receive. Because of this it may put more energy into outreach, branding, and marketing than disaster communication content. Along this same line, the three categories that Red Cross national placed second in (replies, promoting a number to text, and thanking those who have helped) may also relate to their public relations efforts.

Red Cross national has information regarding preparation on their website but these resources are not relayed through social media to the general public. Despite less relevant content on its Twitter feed, Red Cross is much more visible in therms of likes, comments, and retweets. This may have to do with the branding of the organization. Because Red Cross national solicits donations through marketing and public relations activities, these same activities may be translation to more engagement on social media. Not addressing the majority of phases of the disaster communication cycle is an inappropriate angle for a disaster relief agency to take, especially a national chapter. The more often residents hear preparedness information, the more likely they are to act. Therefore, if Red Cross is actually concerned with citizens well being, it would broaden the scope of the content on their Twitter channel.

FEMA Local

FEMA local paralleled FEMA national in many ways. For 15 codebook categories it was either ranked first or second. FEMA local had the second highest number of first ranks with eight, and the highest second rank category with 13.

FEMA local addressed these codebook questions well:

- including URL's,
- imbedding another tweet,
- having a retweet,

- tweeting in another language,

- planning for a wider range of situations,

- promoting others social media accounts,

- promoting a website,

- warning of inclement weather

- providing up to date information,

- discussing government aid,

- informing the public of shelters,

- using unique hashtags,

- including information about or from emergency management sources,

- including information from local sources,

- including information from state sources,

- including information from national sources,

- including information from local news outlets,

- thanking those who have helped,

- discussing general disaster assistance,

- telling people how to respond to a disaster once it is started,

- including safety actions or recommendations.

FEMA local ranked third or fourth in nine codebook categories. Their low placement in video and replies indicates that this is not their primary tool to give the public extra information. The tactics it should utilize for this are URL's, embedding other tweets, and retweeting. By not regularly updating the public on recent storm concerns, FEMA local is not addressing categories on preparedness and possibly forecasting. This is not the same pattern of content coming from FEMA at the national level. This may signal that there is a division of tasks where the regional

level lets the national level handle more of the forecasting and preparedness information. Also, unlike FEMA national, the local level is not putting out much content on general forecasting. It is surprising that FEMA local is not covering much content from regional sources considering each FEMA local agency covers a region including multiple states, so it should have close ties with regional sources. Despite this it is stronger on tweeting content from local, state, and national sources. FEMA local does not promote a number the public is able to text. Because FEMA is federally funded, it does not have to rely on general or monetary donations. However, this does present an opportunity to promote other organizations that can use money for relief efforts. The final measure FEMA local performed poorly on was telling stories of the disaster. It would be worth their time to tweet more about stories. This type of engagement with people in the community builds trust.

Red Cross Local

There are many of the same patterns in Red Cross local as FEMA local. This agency is not as closely tied, content wise, with Red Cross national. Red Cross local came in third place most often. The organization only ranked first once and second 10 times.

Red Cross local performed well, meaning it ranked first or second, in the following codebook categories:
- including video,
- including another tweet,
- retweeting content,
- tweeting in another language,
- planning for unique situations,
- promoting other social media accounts,

- discussing general forecasting,

- including information on shelters,

- including information from local sources,

- including information from regional sources,

- including coverage by local news outlets,

- discussing general donations and monetary donations,

- thanking those who have helped,

- telling stories of the disaster.

Red Cross local was third or fourth in 14 codebook categories. Red Cross local did not

include many URL's and did not reply to many tweets. It would prefer to provide extra

information to their followers via video, embedding another tweet, or retweeting content. Similar

to Red Cross national, the local level does not include content on recent storm concerns or

inclement weather. Just like Red Cross national, the agency may see it as outside their

responsibilities as an organization. It also does not include many tweets with a number to text or

website link. Red Cross local is lacking up to date information on the storms. It is also not

including information on government aid or using unique hashtags. As the Red Cross is not a

federal agency, it may not feel the need to put out content on government aid. Considering how

engaged Red Cross local is with the community, it may want to reconsider connecting with

citizens in this way more often. Red Cross local did not include many unique hashtags, it had a

significantly higher number of general hashtags than FEMA local. Despite these hashtags being

more general, including several is a good tactic when trying to reach as many people as possible.

While they do include information from or about local level sources, they do not include much

information from emergency management sources, state sources, or national sources. The final

two categories it performed poorly on we're relaying safety measures or recommendations and discussing how to respond once the disaster has started.

Cross Comparison Between Agencies

When comparing all four agencies, FEMA at both scales, addressed more of the codebook questions and at a higher rate than Red Cross National and Local.

Table 7: Four Agency Comparison of Content Analysis

Agency	1st place (counts)	2nd place	3rd place	4th place
FEMA Nat	18	6	6	0
Red Cross Nat	2	3	3	21
FEMA Local	8	13	7	2
Red Cross Local	2	10	13	4

The table above shows that FEMA national has the highest number of first place positions, meaning it did the best among the agencies at providing a wide range of the concepts on its Twitter. FEMA local has the highest number of second place positions, meaning it did the second best among the agencies at providing a wide range of the concepts on its Twitter. Red Cross local is not far behind FEMA local for second place positions but it had more third place positions, meaning it did the third best among the agencies at providing a wide range of the concepts on its Twitter. Finally, Red Cross national has the highest number of fourth place positions, meaning it did the worst among the agencies at providing a wide range of the concepts on its Twitter.

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Red Cross national does not seem to be concerned with covering a broad range of disaster communication topics. This poses an issue because according to the literature in Chapter 2 regarding diffusion of innovation, Red Cross is more relied upon than FEMA (Sadiq et al., 2016, p. 8). Evidence of heavy engagement with the public can be seen in the number of comments, likes, and retweets. Based on the metrics chart in the analysis section, Red Cross national had significantly more likes and retweets than all the other agencies, and more comments than FEMA local and Red Cross local. Red Cross should consider providing content on a wider range of topics for the public to have the proper information.

Red Cross local did better than the national level across the board, so this agency may be leaning on their local chapters more to provide the content missing from the national chapter. Follower numbers are higher for Red Cross national on Twitter than at the local levels, so even though more disaster content is being distributed from the local Red Cross Twitters, it is reaching fewer people.

On the other hand, FEMA national and local are performing well, dominating the first and second place categories, and often running parallel to one another. For example, when FEMA national is first place in a codebook category, FEMA local is often second place.

FEMA national is providing much more content but it is lower than Red Cross national in terms of engagement, through likes, retweets, and comments. This may signal a lack of willingness for the public to engage with FEMA national. FEMA national had the highest percentage of replies, so it is not because the public believes they won't get a response. This could mean another reason, such as the public having a lack of trust in the national government (Sadiq et al., 2016, p. 8).

When looking at data based on use and phase, it shows similar patterns. FEMA national and local are overwhelmingly in the top two spots. The only time this changes is for use nine which covers donations and volunteering.

National versus Local

FEMA local outpaced FEMA national in the following measures: tweeting in other languages, planning for multiple situations, providing up to date information, information on shelters, using unique hashtags, info from emergency management, info from local sources, info from state sources, info from local news outlets, and general disaster assistance. This shows that FEMA local was more concerned with small scale operations and FEMA national was more focused on large scale information. The two FEMA agencies overlapped in some areas, such as preparation, safety recommendations, and disaster warnings.

Red Cross local outpaced Red Cross national in all measures except for replies, numbers to text, providing up to date information, discussing government aid, general donations, and monetary donations. This shows Red Cross local is more concerned with addressing all phases of the disaster communication process that the national level is. On one hand this may signal that the local level is more engaged with the community, which is a positive, but it also shows that people should not rely upon Red Cross national as their sole source of general disaster information.

FEMA local and Red Cross local were the top two agencies with content from or about local sources, including local news sources. FEMA local was the top agency tweeting about or from state sources, and Red Cross local was the top agency tweeting about regional sources. In general, local agencies have fewer resources but better knowledge of the community and closer ties on the ground. This pattern is good in terms of community engagement. The public has more confidence in local organizations' relief efforts as seen in Chapter 2 on Diffusion of Innovation

(Sadiq et al., 2016, p. 8). Police departments, fire departments, and local emergency management were cited in this chapter as trusted sources and were often retweeted by the agencies (Sadiq et al., 2016, p. 8). Both Red Cross local and FEMA local were first and second when it came to providing shelter information while FEMA and Red Cross national were third and fourth. This is because local agencies are closer to the scene. Each have that specialized knowledge and are more concerned with day to day operations of the citizens. These agencies were first and second when it came to tweeting in another language. The agency may have more knowledge of the linguistic diversity in its respective regions. Because the local agencies are small, so are their Twitter followers. This hampers engagement from local Twitter accounts. Red Cross local and FEMA local had significantly fewer likes, retweets, and comments than the Red Cross national chapter. However, Red Cross local had significantly more hashtags than FEMA national. Since the purpose of hashtags are to connect people based on a topic, this information shows Red Cross local is interested in connecting members of the community through multiple general hashtags. Red Cross local is also the smallest scale agency, usually covering areas smaller than a state, so it may have better knowledge of what the community wants to be linked with.

Implications and Limitations of the Research

The research presented indicates that several findings have relevance for understanding crisis communication via Twitter by the specific government agencies and relief organizations. It is clear that these entities cannot be expected to cover all phases of the disaster communication cycle. This seeming limiting of the type of tweets sent likely reflects the constraints of how agency and organization leadership sees as their primary role vis-à-vis the public they serve. There are clear differences between FEMA and the Red Cross in what content is tweeted. Additionally, there are differences in crisis communication content between the national and local scale operations for both FEMA and the Red Cross. The idea of each organization "staying

in their lane" may explain this scalar division, as leadership wants to see demarcated areas of engagement with the public inline with the roles that are envisioned at each level.

Concept questions were best addressed by FEMA national. This is not to say the other three agencies were not releasing the content on their Twitter accounts. It was simply to a lesser degree. Both FEMA national and FEMA local had over 400 tweets, meaning that the sample size may have led to greater diversity in the content. Though these two agencies had a similar number of tweets, FEMA national provided more diverse content. The only agency that was severely lacking in addressing the categories was Red Cross national. This organization had fewer than 100 tweets coded for this study. Not only does the Red Cross national organization need to diversify content, but it must tweet more in general.

FEMA national can tweet about more of the following concepts:

- Tweeting in other languages

- Providing information from local sources

- Providing information on shelters

- Providing information from local news sources

- Asking for donations, monetary or otherwise

Red Cross national can tweet about more of the following concepts:

- Incorporating URLs in tweets

- Incorporating video

- Imbedding other tweets

- Retweeting

- Tweeting in another language

- Planning for multiple situations

- Informing the public about recent storm concerns

- Promoting other social media accounts

- Using websites in tweets

- General forecasting

- Warning of inclement weather

- Providing the public with up to date information on storm concerns

- Where to find government aid

- Where to find shelters

- Incorporating hashtags in tweets

- Relaying information from emergency management

- Relaying information from local sources

- Relaying information from state sources

- Relaying information from regional sources

- Relaying information from national sources

- Providing information from local news outlets

- How people should respond once the disaster has started

- Safety actions or recommendations

- Telling stories of the disaster

- General disaster assistance

FEMA local can tweet about more of the following concepts:

- Incorporating video

- Replying to public tweets

- Informing the public about recent storm concerns

- Including numbers to text

- General forecasting

- Including information from regional sources

- General donations

- Monetary donations

- Telling stories of the disaster

Red Cross local can tweet about more of the following concepts:

- URL's

- Including other tweets

- Retweeting

- Reply to many tweets

- Planning for multiple situations

- Tweets with a number to text

- Other social media accounts

- Website link

- Warning of inclement weather

- Up to date information on the storms

- Information on government aid

- Using unique hashtags

- Include information from emergency management sources

- State sources

- National sources

- Relaying safety measures or recommendations

- Discussing how to respond once the disaster has started

As far as general applications, any entity, government or private, involved with crisis communication during a natural disaster event would benefit from doing an audit of their social media. Gaps in content may be discovered and a plan can be put into pace to rectify any gaps in information. Though agencies cannot cover all concepts, they should strive to maximize what they communicate so that the public is as informed as they can be from any one agency's Twitter. Formal divisions of content should be discussed between the national and regional offices if only to ensure there is a common policy and consistency in getting relevant content to populations of followers that need it. Given the variation in content from the agencies and organizations examined, it is advised that any member of the public follow multiple social media accounts if they are seeking disaster preparedness information or alerts. It is best to follow a national account and a local account to receive diverse information on national and local disaster topics.

Because content analysis is a quantitative method, the main strength of this study is its objectivity. A 20% sample of the tweets were re-coded by two other coders who had high agreement. This means that this study can be repeated and applied to other organizations. Future literature on best practices of disaster communication should consider following the model used for this study because it was specifically designed for social media use.

It is important to note that communication does not equate to relief efforts by employees, volunteers, or monetary support by these agencies. So, for example, even though Red Cross national did poorly at communicating in accordance with the model, it will still have a significant relief presence in the communities. One aspect noted was that Red Cross local would put up a lot of tweets describing the daily actions of their volunteers. This not only shows it is active in the community, but also provides good public relations, showing donors where their money is being spent especially after accusations of mismanaging donations ("Red Cross Workers May Have Stolen $6 Million in Ebola Aid," 2017). One issue faced during the analysis was many of the chi square tests could not be run because at least one agency was not doing the tactic enough, or the expected count was lower than five. This could mean the agencies are only focusing on specific things. Most often it was Red Cross national with low expected counts.

All research projects face hurdles and obstacles that must be addressed, some requiring changes in the original research design. A major one was that some tweets were in another language. This was addressed by the use of Google Translate. While clearly not the quality of a skilled translator, this was deemed sufficient to understand the tweets. However, due to this there may have been some tweets that were not translated the way the original language intended. Another issue was the inability to get a tweet data file that properly aligned with the storm spans. It is possible that specific forms of content that would normally be communicated by the agencies and organizations were excluded because they were not in the catchment protocol. If the tweet data sets aligned with the storm spans, then a thorough analysis of the full disaster communication cycle could have been done. Because this was not the case, the study lost the ability to determine if an agency is tweeting the proper concepts during the correct phases. The dataset also did not include the time of the tweet if it was retweeted by the agencies, so the date and time gathered are not all from the agencies tweeting. Because of this, no analysis on date or

time was conducted. Some tweets in the original data file from the Center for Risk and Crisis Management could not be found on Twitter anymore, therefore those tweets were not included in the study. This may have been due to someone deleting the tweet or their account after the tweet was collected.

Perhaps the most important contribution of this study has been the evaluation of a framework that is focused on social media usage by FEMA and the Red Cross during a specific natural disaster. The framework can be easily applied to other agencies and other disasters in order to see how well the entities comply with best practices.

Future research

There are a myriad of questions left unanswered by this research, and a few more opened up by this work. Continued investigation of the difference that scale of operations makes in what is communicated by which agency or organization is vital to understand their internal strategies for communicating with the relevant publics. Reorganization of government agencies such as FEMA may also impact their communication protocols. The fact that trust in FEMA is low warrants further research into how this image can be addressed through their crisis communication efforts during future natural disasters. For future research, a study can be conducted about communication for each storm individually. This could show things like the agencies tweeting more in Spanish during hurricane Harvey to accommodate the significant Hispanic population or more tweets about health preparation for the elderly during the Florida hurricanes. This could also show more specific regional differences between the local agency offices. For statistical reasons Red Cross local and FEMA local encompassed several smaller scale offices, but analyzing per storm would show the different communications practices between the offices. Conducting a study based on year would also be beneficial. By only looking at one agency, say FEMA national, the researcher can study improvement over time based on

storms from different years. The future of crisis communication will continue to require relevant entities gain familiarity with newer communication technologies and platforms. As access to the Internet increases across various socio-demographic groups, the challenge will be to understand the needs of users across several platforms while maintaining an effective standard of communication of crisis information to the public.

References

10 Disturbing Things ProPublica Learned Investigating the Red Cross' Sandy Relief Efforts.
(n.d.). Retrieved March 13, 2018, from https://www.propublica.org/article/disturbing-
things-about-the-red-crosss-sandy-relief-efforts

"A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways
for Action." (2011). FEMA. Retrieved April 29, 2018, from
https://www.fema.gov/media-library/assets/documents/23781#

"About DHS." (2017, September 27). US Department of Homeland Security. Retrieved from
https://www.dhs.gov/about-dhs

"About Us." (n.d.). American Red Cross. Retrieved March 13, 2018, from
http://www.redcross.org/about-us

"About the Agency." (n.d.). FEMA. Retrieved from https://www.fema.gov/about-agency

"About Twitter's APIs." (n.d.). Twitter. Retrieved from https://help.TwSadiitter.com/en/rules-
and-policies/Twitter-api

Account, A. R. (2018, April 27). American Red Cross (@RedCross). Retrieved from
https://Twitter.com/RedCross?ref_src=twsrc^google|twcamp^serp|twgr^author

Adams, P. C., & Jansson, A. (2012). Communication Geography: A Bridge Between Disciplines.
Communication Theory, 22(3), 299-318. doi:10.1111/j.1468-2885.2012.01406.x

Adamski, T., Kline, B., & Tyrrell, T. (2006). FEMA Reorganization and the Response to
Hurricane Disaster Relief. Perspectives in Public Affairs, 3, 3-36. Retrieved April 29,
2018, from https://www.asu.edu/mpa/FEMAReorganization.pdf.

Allen, M., (2017). Intercoder Reliability Techniques: Scott's pi. The SAGE Encyclopedia of
    Communication Research Methods. doi: 10.4135/9781483381411.n261

Anderson, M., Lewis, K., & Dedehayir, O. (2015). Diffusion of innovation in the public sector:
    Twitter adoption by municipal police departments in the U.S. 2015 Portland International
    Conference on Management of Engineering and Technology (PICMET).
    doi:10.1109/picmet.2015.7273207

Austin, L., Jin, Y., & Liu, B. F. (2011). How publics respond to crisis communication strategies:
    The interplay of information form and source. Public Relations Review, 37(4), 345-353.
    doi:10.1016/j.pubrev.2011.08.004

Barnshaw, J., Letukas, L., Quarantelli, E. L. (2008). The Characteristics of Catastrophes and
    Their Social Evolution: An Exploratory Analysis of Implications for Crisis Policies and
    Emergency Management Procedures. Disaster Research Center.

Begg, C., Kuhlicke, C., Renn, O., & Wachinger, G. (2012). The Risk Perception Paradox-
    Implications for Governance and Communication of Natural Hazards. Risk Analysis,
    33(6), 1049-1065. doi:10.1111/j.1539-6924.2012.01942.x

Briones, R. L., Jin, Y., Kutch, B., & Liu, B. F. (2010). Keeping up with the digital age: How the
    American Red Cross uses social media to build relationships. Public Relations Review.
    doi:10.1016/j.pubrev.2010.12.006

Burgess, J., Bruns, A., Crawford, K., & Shaw, F. (2012). #qldfloods and @QPSMedia: Crisis
    Communication on Twitter in the 2011 South East Queensland Floods . ARC Centre of
    Excellence for Creative Industries & Innovation (CCI).

Burgess, J., Bruns, A., Mahrt, M., & Weller, K. (2013). Twitter and Society. Peter Lang Publishing Group.

Campbell, C. G., Greenwalt, R., Raber, E., Mancieri, S., Dillon, M., Roy, K., . . . Ignacio, J. (2018). Response Risk Assessment Process for Chemical Incidents. doi:10.2172/1489462

Cebrian,, M., Hasan, S., Sadri, A. M., & Ukkusuri, S. V. (2017). Crisis Communication Patterns in Social Media during Hurricane Sandy. Retrieved October 25, 2017.

Chang, H. (2010). A new perspective on Twitter hashtag use: Diffusion of innovation theory. Proceedings of the American Society for Information Science and Technology, 47(1), 1-4. doi:10.1002/meet.14504701295

Cho, S. E., Jung, K., & Park, H. W. (2013). Social media use during Japan's 2011 earthquake: How Twitter transforms the locus of crisis communication. Media International Australia, 149(1). doi:10.1177/1329878X1314900105

Collins, M., Neville, K., Hynes, W., & Madden, M. (2016). Communication in a disaster - the development of a crisis communication tool within the S-HELP project. Journal of Decision Systems, 25(Sup1), 160-170. doi:10.1080/12460125.2016.1187392

Coombs, T. (2007). Protecting Organization Reputations During a Crisis: The Development and Application of Situational Crisis Communication Theory. Corporate Reputation Review, 10(3). doi:10.1057/palgrave.crr.1550049

Coursaris, Constantinos K.; Yun, Younghwa; and Sung, Jieun, "Understanding Twitter's adoption and use continuance: the Synergy between Uses and Gratifications and Diffusion of Innovations" (2010). SIGHCI 2010 Proceedings. 3.

Deacon, D., Pickering, M., Golding, P., Murdock, G., (1999). Researching communications: A

    practical guide to methods in media and cultural analysis. London: Hodder Arnold

DeLorenzo, M. (2013). FEMA and the Merger with DHS: Did it Impact FEMA's Autonomy and

    Performance? Retrieved April 29, 2018, from

    http://indigo.uic.edu/bitstream/handle/10027/9918/DeLorenzo_Michael.pdf?sequence=1

Department of State Florida Quick Facts. (n.d.). Retrieved from http://dos.myflorida.com/florida-

    facts/quick-facts/

Drabek, T. E. (1999). Understanding disaster warning responses. The Social Science Journal,

    36(3), 515-523. doi:10.1016/s0362-3319(99)00021-x

Dufty, N. (2012). Using social media to build community disaster resilience. The Australian

    Journal of Emergency Management, 27(1), 40-45. Retrieved April 29, 2018.

 Eisinger, J., & Elliott, J. (2014) a. Red Cross' Latest Claim Includes 'Donations of Blood'.

    Retrieved March 13, 2018, from https://www.propublica.org/article/red-cross-latest-

    claim-includes-donations-in-blood

Eisinger, J., & Elliott, J. (2014) b. The Red Cross CEO Has Been Serially Misleading About

    Where Donors' Dollars Are Going. Retrieved March 13, 2018, from

    https://www.propublica.org/article/red-cross-ceo-has-been-misleading-about-donations

Eldor, R., & George, A. L. (1959). Propaganda Analysis: A Study of Inferences Made From Nazi

    Plodinec et al., 2014, p. 13-14 Propaganda in World War II. Military Affairs, 23(2), 112.

    doi:10.2307/1985518

"Everyone Must Be Prepared For Emergencies." (2017, June 2). FEMA. Retrieved March 13,

    2018, from

https://www.fema.gov/blog/2015-04-29/everyone-must-be-prepared-emergencies

Freeman, G., & Jacob, E. K. (2012). Reconceptualizing Cyberspace: "Real" Places in Digital
Space. The International Journal of Science in Society, 3(2), 91-102. doi:10.18848/1836-
6236/cgp/v03i02/51318

Garnett, J. L., & Kouzmin, A. (2007). Communicating throughout Katrina: Competing and
Complementary Conceptual Lenses on Crisis Communication. Public Administration
Review, 67, 171-188. doi:10.1111/j.1540-6210.2007.00826.x

"Get Involved." (n.d.). FEMA. Retrieved April 29, 2018, from https://www.ready.gov/get-
involved

Greco, M. D., Lachlan, K. A., Lin, X., Najarian, K., & Spence, P. R. (2016). Social media and
crisis management: CERC, search strategies, and Twitter content. Computers in Human
Behavior, 54, 647-652. doi:10.1016/j.chb.2015.05.027

Griffin, D. R, Lachlan, K. A., & Spence, P. R. (2007). Crisis Communication, Race, and Natural
Disasters. Journal of Black Studies, 37(4), 539-554. doi:10.1177/0021934706296192

Hawthorne, J., Houston, J. B., Perreault, M. F., Park, E. H., Hode, M. G., Halliwell, M. R., . . .
Griffith, S. A. (2014). Social media and disasters: a functional framework for social
media use in disaster planning, response, and research. Disasters, 39(1), 1-22.
doi:10.1111/disa.12092

Heverin, T., Zach, L. (2010). Microblogging for Crisis Communication: Examination of Twitter
Use in Response to a 2009 Violent Crisis in the Seattle-Tacoma, Washington Area.

Heverin, T., Zach, L. (2012). Use of microblogging for collective sense-making during violent
crises: A study of three campus shootings. doi: 10.1002/asi.21685.

"Home | FEMA.gov." (n.d.). FEMA. Retrieved from https://www.fema.gov/

"How to Prepare for Emergencies." (n.d.). American Red Cross. Retrieved March 13, 2018, from

http://www.redcross.org/get-help/how-to-prepare-for-emergencies

Humphreys, L. (2011). Who's Watching Whom? A Study of Interactive Technology and

Surveillance. Journal of Communication, 61(4), 575-595. doi:10.1111/j.1460-

2466.2011.01570.x

"Hurricane Katrina Statistics Fast Facts." (2017, August 28). CNN. Retrieved December 07,

2017, from http://www.cnn.com/2013/08/23/us/hurricane-katrina-statistics-fast-

facts/index.html

"Hurricane Sandy Fast Facts." (2017, October 19). CNN. Retrieved December 07, 2017, from

http://www.cnn.com/2013/07/13/world/americas/hurricane-sandy-fast-facts/index.html

Jacobzone, S., Radisch, J., & Wendling, C. (2013). The Use of Social Media in Risk and Crisis

Communication. OECD Working Papers on Public Governance.

doi:10.1787/5k3v01fskp9s-en

Kahn, M. E. (2003). The Death Toll from Natural Disasters: The Role of Income, Geography and

Institutions. SSRN Electronic Journal. doi:10.2139/ssrn.391741

Kapucu, N. (2008). Collaborative emergency management: Better community organising, better

public preparedness and response. Disasters, 32(2), 239-262. doi:10.1111/j.1467-

7717.2008.01037.x

Kim, H. (2017). Statistical notes for clinical researchers: Chi-squared test and Fishers exact test.

Restorative Dentistry & Endodontics, 42(2), 152. doi:10.5395/rde.2017.42.2.152

Krippendorff, K. (2004). Reliability in Content Analysis: Some Common Misconceptions and

    Recommendations. Human Communication Research, 30(3), 411-433.

    doi:10.1093/hcr/30.3.411

Krippendorff, K., & Bock, M. A. (2009). The content analysis reader. Los Angeles: SAGE

    Publications.

Lombard, M. (2002). Content Analysis in Mass Communication: Assessment and Reporting of

    Intercoder Reliability. Human Communication Research, 28(4), 587-604.

    doi:10.1093/hcr/28.4.587

Mcleman, R. A., Dupre, J., Ford, L. B., Ford, J., Gajewski, K., & Marchildon, G. (2013). What

    we learned from the Dust Bowl: Lessons in science, policy, and adaptation. Population

    and Environment, 35(4), 417-440. doi:10.1007/s11111-013-0190-z

    https://repository.upenn.edu/cgi/viewcontent.cgi?article=1068&context=curej.

    McLuhan, E., (2008). Marshall McLuhan's Theory of Communication: The Yegg 1.

    ISSN: 1918-5901

Mener, A. S. (2007). Disaster Response in the United States of America: An Analysis of the

    Bureaucratic and Political History of a Failing System. CUREJ - College Undergraduate

    Research Electronic Journal. Retrieved April 29, 2018,

"Mission & Principles." (n.d.). American Red Cross. Retrieved from

    https://www.redcross.org/about-us/who-we-are/mission-and-values.html

Muralidharan, S., Rasmussen, L., Patterson, D., & Shin, J. (2011). Hope for Haiti: An analysis of

    Facebook and Twitter usage during the earthquake relief efforts. Public Relations

    Review, 37(2), 175-177. doi:10.1016/j.pubrev.2011.01.010

National Academies of Science, Engineering, and Medicine. (2018). Emergency alert and

     warning systems: Current knowledge and future research directions. Washington, DC.

National Weather Service Office of Climate and Weather Services. (2017, May 11). Weather

     Fatalities 2016. Retrieved December 7, 2017, from

     http://www.nws.noaa.gov/om/hazstats.shtml

Newnham, E., Patrick, K., Balsari, S., & Leaning, J. (2015). COMMUNITY ENGAGEMENT

     IN DISASTER PLANNING AND RESPONSE RECOMMENDATIONS FOR HONG

     KONG. Retrieved April 29, 2018, from https://cdn2.sph.harvard.edu/wp-

     content/uploads/sites/5/2015/11/Community-Preparedness-Policy-Brief-10.28.15.pdf.

Neuendorf, K. A. (2002). The Content Analysis Guidebook. Los Angeles: SAGE

NOAA. (2016). Risk Communication and Behavior. Retrieved from

     https://www.performance.noaa.gov/wp-content/uploads/Risk-Communication-and-

     Behavior-Best-Practices-and-Research-Findings-July-2016.pdf.

OLeary, Z. (2017). The essential guide to doing your research project. Los Angeles,CA: Sage

O'Mara-Eves, A., Brunton, G., McDaid, D., Oliver S., Kavanagh, J., Jamal, F., et al. (2013).

     Community engagement to reduce inequalities in health: A systematic review, meta-

     analysis and economic analysis. Chapter 4 Synthesis I: Theoretical synthesis of models,

     mechanisms and contexts for community engagement. National Institute for Health

     Research. doi:10.3310/phr01040

Olmstead, K. (2017, May 25). A third of Americans live in a household with three or more

     smartphones. Retrieved March 13, 2018, from http://www.pewresearch.org/fact-

     tank/2017/05/25/a-third-of-americans-live-in-a-household-with-three-or-more-

     smartphones/

"Our History." (n.d.). American Red Cross. Retrieved March 13, 2018, from

    http://www.redcross.org/about-us/who-we-are/history

Palen, L., Vieweg, S., Sutton, J., Liu, S. B., & Hughes, A. (2007). Crisis Informatics: Studying

    Crisis in a Networked World. doi:10.1.1.113.5750

"Plan Ahead for Disasters." (n.d.). Ready.gov. Retrieved March 13, 2018, from

    https://www.ready.gov/

Plodinec, J. M., Edwards, W. C., & White, R. K. (2014). Applications of a "Whole Community"

    framework for enhancing community or campus resilience. Procedia Economics and

    Finance, 18, 9-16. doi:10.1016/S2212-5671(14)00907-1

"Prepare and Care Kit Drive." American Red Cross. (n.d.). Retrieved March 13, 2018,

    from http://arcbrcr.org/wp-content/uploads/2016/03/1-1.pdf

Quarantelli, E.L., Lagadec, P., Boin A. (2007). A Heuristic Approach to Future Disasters and

    Crises: New, Old, and In-Between Types. In: Handbook of Disaster Research.

    Handbooks of Sociology and Social Research. doi: 10.1007/978-0-387-32353-4_2.

Quarantelli, E.L. (2000). Another Selective Look at Future Social Crises: Some Aspects of

    Which we can Already see in the Present. University of Delaware Disaster Research

    Center.

Quarantelli, E.L. (1991). Patterns of Sheltering and Housing in American Shelters. University of

    Delaware Disaster Research Center.

Quarantelli, E.L. (1990). The Mass Media in Disasters in the United States. University of

    Delaware Disaster Research Center.

Quarantelli, E. L. (1988). Disaster Crisis Management: A Summary of Research Findings.

    Journal of Management Studies. doi: 10.1111/j.1467-6486.1988.tb00043.x

Quarantelli, E.L. (1987). What Should We Study? Questions and Suggestions for Researchers about the Concept of Disaster. From the International Journal of Mass Emergencies and Disasters.

Quarantelli, E. L., Dynes, R. R., (1977). Response to Social Crisis and Disaster. Annual Review of Sociology. Vol. 3:23-49. doi: 10.1146/annurev.so.03.080177.000323.

Quarantelli, E.L., Rodriguez, H., Trainor, J. (2006). Rising to the Challenges of a Catastrophe: The Emergent and Prosocial Behavior Following Hurricane Katrina.

"QuickFacts Houston city, Texas; UNITED STATES." (2017). US Census Bureau. Retrieved April 29, 2018, from

https://www.census.gov/quickfacts/fact/table/houstoncitytexas,US/SEX205210

" QuickFacts." (n.d.). US Census Bureau. Retrieved March 13, 2018, from

https://www.census.gov/quickfacts/fact/table/US/PST045217

"Red Cross Workers May Have Stolen $6 Million in Ebola Aid." (2017). Fortune. Retrieved March 13, 2018, from http://fortune.com/2017/11/04/red-cross-ebola-fraud/

Ritholtz, Muralidhara. (2017, August 30). Think Twice When Donating to Harvey's Victims. Retrieved March 13, 2018, from https://www.bloomberg.com/view/articles/2017-08-30/skip-the-red-cross-when-helping-harvey-s-victims

Rogers, E. M. (1962). Diffusion of Innovations. East Lansing: Dept. of Communication, Michigan State University.

Sadiq, A., Tharp, K., & Graham, J. D. (2016). FEMA versus local governments: Influence and reliance in disaster preparedness. Natural Hazards, 82(1), 123-138. doi:10.1007/s11069-016-2183-6

Seeger, M. W. (2006). Best Practices in Crisis Communication: An Expert Panel Process.

    Journal of Applied Communication Research, 34(3), 232-244.

    doi:10.1080/00909880600769944

Seeger, M. W., Sellnow, T. L., & Ulmer, R. R. (2002). Chaos theory, informational needs, and

    natural disasters. Journal of Applied Communication Research, 30(4), 269-292.

    doi:10.1080/00909880216599

"Sixty Percent of Americans Not Practicing for Disaster: FEMA urges everyone to prepare by

    participating in National PrepareAthon! Day on April 30." (2015.). Retrieved March 13,

    2018, from https://www.fema.gov/news-release/2015/04/28/sixty-percent-americans-not-

    practicing-disaster-fema-urges-everyone-prepare

Sobelson, P. R., Wigington, M. C., & Harp, B. V. (2015). A whole community approach to

    emergency management: Strategies and best practices of seven community programs.

    Journal of Emergency Management, 13(4), 349. doi:10.5055/jem.2015.0247

"SPSS Tutorials: Chi-Square Test of Independence." (n.d.). Retrieved from

    https://libguides.library.kent.edu/SPSS/ChiSquare

"SPSS Tutorials: One-Way ANOVA." (n.d.). Retrieved from

    https://libguides.library.kent.edu/SPSS/OneWayANOVA

Stal, M. (2013). Disaster and Crisis Communication: Trend Analysis of Technologies and

    Approaches. United nations Office for Disaster Risk Reduction, 1-13. Retrieved

    December 7, 2017

"Summary of Natural Hazard Statistics for 2016 in the United States" (2017).

    https://www.nws.noaa.gov/os/hazstats/sum16.pdf

Steelman, T. A., & Mccaffrey, S. (2012). Best practices in risk and crisis communication:

    Implications for natural hazards management. Natural Hazards, 65(1), 683-705.

    doi:10.1007/s11069-012-0386-z

Telg, R. (2010). Risk and Crisis Communication: When Things Go Wrong. University of Florida

    IFAS Extension, 1-5. Retrieved December 7, 2017, from http://edis.ifas.ufl.edu/wc093

Tsatsou, Panayiota (2009) 'Reconceptualising 'Time' and 'Space' in the Era of Electronic Media

    and Communications', PLATFORM: Journal of Media and Communication Vol.1 (July

    2009): 11-32. ISSN: 1836-5132

Tuan, Y. F. (1977). Space and Place: The Perspective of Experience. Minneapolis, MN:

    University of Minnesota Press

"Twitter reveals its daily active user numbers for the first time." (2019). Washington Post.

    https://www.washingtonpost.com/technology/2019/02/07/twitter-reveals-its-daily-active-

    user-numbers-first-time/?utm_term=.284120dcc49f

"U.S. Census Bureau QuickFacts: Florida." (n.d.). U.S. Census Bureau. Retrieved from

    https://www.census.gov/quickfacts/FL

"U.S. Census Bureau QuickFacts: Hawaii." (n.d.). U.S. Census Bureau. Retrieved from

    https://www.census.gov/quickfacts/HI

"U.S. Census Bureau QuickFacts: Texas. (n.d.)." U.S. Census Bureau. Retrieved from

    https://www.census.gov/quickfacts/TX

NOAA. What is a hurricane? (2013, June 28). Retrieved December 07, 2017, from

    https://oceanservice.noaa.gov/facts/hurricane.html

Vieweg, S., Hughes, A. L., Starbird, K., & Palen, L. (2010). Microblogging during two natural

hazards events. Proceedings of the 28th International Conference on Human Factors in

Computing Systems - CHI 10. doi:10.1145/1753326.1753486

Wells, K. B., Springgate, B. F., Lizaola, E., Jones, F., & Plough, A. (2013). Community

Engagement in Disaster Preparedness and Recovery: A Tale of Two Cities - Los Angeles

and New Orleans. Psychiatric Clinics of North America, 36, 451-466.

doi:10.1016/j.psc.2013.05.00

"What is Community Engagement?" (n.d.). Pennsylvania State University Center for Economic

and Community Development. https://aese.psu.edu/research/centers/cecd/engagement-

toolbox/engagement/what-is-community-engagement

"What is crisis communication? definition and meaning." (n.d.). Business Dictionary.

Retrieved December 07, 2017, from http://www.businessdictionary.com/definition/crisis-

communication.html

"What We Do | Emergency Management | Red Cross." (n.d.). American Red Cross.

Retrieved March 13, 2018, from http://www.redcross.org/what-we-do

Whole Community. (n.d.). Retrieved from https://www.fema.gov/whole-community

YouTube. (n.d.). Retrieved from https://www.youtube.com/results?search_query=red cross ready

Appendix

The codebook is as follows:

Do NOT Code what is in videos, photos, or embedded tweets!

Part 1: Identifiers

Which disaster is being coded?

1. Harvey (2017)
2. Irma (2017)
3. Micheal (2018)
4. Lane (2018)
5. Matthew (2016)

Which organization's Twitter is being coded?

- Look at the column "username" in excel file!!

1. FEMA National (@fema)
2. American Red Cross (@RedCross)
3. FEMA region 6 for TX, OK, AR, LA, NM & 68 tribal partners (@FEMARegion6)
4. Red Cross Houston (@RedCrossHouston)
5. FEMA region 4 for AL, FL, GA, KY, MS, NC, SC, TN (@femaregion4)
6. Red Cross Central Florida (@RedCrossCFL)
7. South Florida Red Cross (@SFLRedCross)
8. North Florida Red Cross (@RedCrossNorthFL)
9. FEMA region 9 for Arizona, California, Hawaii, Nevada, & the Pacific Islands (@femaregion9)
10. Hawaii Red Cross (@HawaiiRedCross)

What is the date of the tweet?

YYYY-MM-DD

What is the time of the tweet?

    00:00 (Hour, Minutes)

Is the time AM or PM?

    AM/PM

What are the metrics of the tweet?

    E1)Number of likes

    E2)Number of retweets

    E3)Number of hashtags

    E4)Number of comments

What other content is present?

    URL

    1. Present

    2. Not Present

    Video

    1. Present

    2. Not Present

    Photo

    1. Present

    2. Not Present

    Other graphic (ex. gif)

    1. Present

    2. Not Present

    Another tweet

    1. Present

    2. Not Present

Does this tweet contain a retweet?

- Have to look at text in excel file

*"**RT @fema**: For a list of state and local resources, and important social media accounts related to #Harvey check: https://t.co/U6jMZE80oe"*

1. Present

2. Not Present

Does this tweet contain a reply?

*"**@Dianese22679298** If you're looking to donate & help after #Harvey, check organizations on @nationalvoad: http://nvoad.org/hurricane-harvey ..."*

1. Present

2. Not Present

Does this tweet contain another language?

- This can mean the whole tweet is in another language or part(s) of it is in another language

"Kisa pou konen leu wap evakue! https://t.co/2VOuuysD4C #Irma #SouthFlorida #RedCross"

"RT @FEMAespanol: #Harvey Ya pasó una semana. La línea @distressline es un gran recurso si necesita apoyo emocional o hablar con algu…"

1. Present

2. Not Present

Part 2: Disaster Phases & Disaster Social Media Uses

Phase 1: Pre-event

<u>**Use 1: Provide and receive disaster preparedness information**</u>

Does this tweet contain an element of planning/preparation for different types of residences (ex. homes, apartment)?

"If you have to shelter in a high-rise, stay on floors just above floodwaters. The higher you go, the stronger the winds. #Harvey"

1. Present
2. Not Present

Does this tweet contain an element of planning/preparation at the neighborhood or county level?

"RT @NWS: You can play a large role in how your neighbors fare before, during and after a hurricane. #HurricanePrep #Irma https://t.co/orGEI"

1. Present
2. Not Present

Does this tweet contain an element of planning/preparation based on a family's specific needs (ex. for a family of 4)?

"RT @ReadyHarris: #Harvey STEPS TO TAKE NOW: Ensure your family has enough food, water and supplies for 5-7 days. Don't forget medications...."

"Create a disaster plan for you and your family and more with the #RedCross emergency app"

""Now is the time to prepare for #Harvey: review your family plan, know your evacuation route, & check your supplies.... https://t.co/ogCQcmcIN9"

1. Present
2. Not Present

Does this tweet contain an element of planning/preparation information for an animal?

"If u have an animal emergency, inquiry or report related to #Harvey, call 713-861-3010 Animal Emergency Resp..."

"RT @NWS: What would you do with your pets during a hurricane? Visit https://t.co/r5fOFEIGQy to make a plan #HurricanePrep https://t.co/0Khl..."

1. Present
3. Not Present

Does this tweet contain an element about training resources available?

"NEW COURSE: The #RedCross has released a 'First Aid for Severe Bleeding' online course so you can learn how to respond to life-threatening bleeding emergencies! Visit..."

1. Present
2. Not Present

Does this tweet contain an element of planning covering multiple situations (no food, power outage, etc)?

"RT @ReadyHarris: FLOOD TIP: Fill your empty containers at home with drinking water. Fill your bathtub for washing and flushing needs..."

"RT @ReadyHarris: #Harvey STEPS TO TAKE NOW: Be sure you have a way to stay informed. Battery powered radios work great when the power goes..."

"RT @Readygov: ATMs don't work without power. Keep cash on hand in case of a power outage. https://t.co/HOiMvU0oMm #PlanAhead #Irma https://..."

"RT @FDACSNews: Expect to lose power. Here are some food safety tips for when you do. #Irma https://t.co/wWouov5zkW"

1. Present
2. Not Present

Does this tweet contain an element of addressing people with unique needs (ex. disabled people, sick, the elderly)?

"If you have unique needs #PlanAhead before you evacuate more info: http://www.ready.gov/myplan #Irma"

1. Present
2. Not Present

Does this tweet contain an element of general planning/preparation for the storm?

- This is a general category that would not include any of the previous categories. Do not double count.

"Be #RedCrossReady for #Irma, here's our official #hurricane safety checklist: https://t.co/wzkC4xc0fB"

"Before severe weather hits, take a few minutes to photograph your home, inside & out. Having a record makes recover… https://t.co/yjDZeyFAPi"

"Before the storm, get prepared! Scanning in documents now can save you worry later if flooding hits your home.… https://t.co/sTDvvWoA8q"

"Learn what to do before, during and after a #hurricane https://t.co/ooB3LpPpW3"

1. Present
2. Not Present

Does this tweet contain an element of discussing recent or new storm concerns?

- This is specifically focusing on NEW information, a good hint is if it has the words new, update, etc.

"RT @TwitterMoments: Update: @FLGovScott has declared a state of emergency ahead of Hurricane #Irma later this week. https://t.co/gHKANfrMrQ"

1. Present
2. Not Present

S)Does this tweet contain resources for information in other languages (ex. linking to resources available in Spanish)?

- This can either link to a page or another account. IT DOES NOT COUNT if the tweet is simply in another language, it has to provide <u>resources (planning or response)</u> in that language. For example, telling people to follow FEMA Espanol, NOT retweeting a tweet from FEMA Espanol.

"Our #Harvey page has resources in Español, Tagalog, Tiếng Việt, 中文, 한국어, اردو, & عربى. You can find them here:… https://t.co/Vs99f0xZm5"

1. Present
2. Not Present

Does this tweet contain an element of promoting a phone app?

"With Hurricane #Harvey moving closer to landfall in #Texas, download our Emergency app for critical weather alerts:… https://t.co/yZWQqWKbTj"

"Receive real-time weather alerts through the FEMA App. Download it for Apple or Android devices at… https://t.co/Ne9Jk0harx"

1. Present

2. Absent

Does this tweet contain an element of promoting a number to text?

"Find open shelters in your area with the FEMA App or text SHELTER and your zip code to 4FEMA (43362). Msg & data rates apply. #Harvey"

"RT @FLGovScott: Floridians and visitors can text FLPREPARES to 888777 in order to receive text alerts on hurricane preparedness from @FLSER"

1. Present

2. Absent

Does this tweet contain an element of promoting a phone number?

"#RedCross is providing shelter, meals & comfort to people impacted by #Harvey. To find a location: http://rdcrss.org/2iCVOc8 or 1-800-REDCROSS"

1. Present

2. Absent

Does this tweet contain an element of promoting other social media accounts (ex. @Readygov)?

- This does not mean retweeting other social media accounts. It has to be the @ embedded in the text or telling people to follow an account(s) (in this case it may or may not be embedded).

"Follow @HoustonOEM for important safety updates like this one. Be safe everyone. #Harvey https://t.co/DSDlj5JOgk"

1. Present

2. Not Present

Does this tweet contain an element of promoting a website?

"To locate #RedCross shelters visit https://t.co/OB36nh0fEY. #HurricaneHarvey"

1. Present

2. Not Present

Does this tweet contain downloadable information?

"Now is the time to get prepared 4 #Irma. Need help? Be #RedCrossReady w/our hurricane safety checklist. Download @... https://t.co/17sekr8Sd4"

1. Present

2. Not Present

Use 2: Provide and receive disaster warnings

Does this tweet contain an element of general forecasting?

- This means hurricane conditions or movement. This can overlap with new/updated information or warnings. Must contain specifics on the hurricane. For example, this storm is a category 4, this storm has reached 140 miles per hour. Can also refer generally to winds, rain. etc.

"RT @NWSMiami: 12PM: Hurricane Irma has max sustained winds of 140 mph. It's still too early to determine exactly what impacts SFL…"

1. Present

2. Not Present

Does this tweet contain a warning of inclement weather?

- This needs to be a tweet about danger of the storm or dangerous conditions from the storm.

"RT @NWSMiami: 9/8 5AM Tropical Update: #Irma is an extremely dangerous Category 4 Hurricane Hurricane Warning in effect for all o…"

"RT @NWS: Flooding is occurring across Florida with Hurricane Irma. At night it can be impossible to see. Stay indoors!…"

1. Present

2. Not Present

Does this tweet contain an element about evacuation?

"#Harvey is bringing dangerous storm surge, high winds, and the potential for inland flooding. Take evacuation orders seriously."

"With a lot of people on the move in FL, please only take the amount of fuel you need to get your destination…. https://t.co/VcxcMCbT76"

1. Present

2. Not Present

Phase 2: Pre-event -> Event

Use 3: Signal and detect disasters

Does this tweet contain an element of ways to receive up to date information on the disaster or resources, such as shelter openings?

"@SweetPeaVanity Hi Dee, you can follow @NHC_Atlantic to stay updated on how #Irma might affect your area."

1. Present
2. Not Present

Phase 3: Event

Use 4: Send and receive requests for help or assistance

Does this tweet contain an element about contacting helplines?

- This can include 911 or the like.

    "RT @FLSERT: The #FL Emergency Information Line has been activated 24/7. For up-to-date information regarding #Irma please call 1-800-342-35…"

    1. Present

    2. Not Present

Does this tweet contain an element about government aid during the storm?

    "Here's a snapshot of federal support to areas affected by #Harvey. For more information"

    1. Present

    2. Not Present

Does this tweet contain an element about shelters, where they are or how to find them?

    "RT @SCEMD: Shelters are now open for those evacuating the SC southern coast #Irma https://t.co/6EbYrogSTj"

    "Find open shelters in your area with the FEMA App or text SHELTER and your zip code to 4FEMA (43362). Msg & data rates apply. #Harvey"

    "RT @FLSERT: If you're unable to get to a shelter, emergency refuge can be taken here https://t.co/7Ykq8MPxJp #FLPrepares #Irma"

    1. Present

    2. Not Present

Does this tweet contain an element to contact Emergency Management in the area?

    "RT @fema: If you're not sure what your hurricane evacuation route is, check with your local emergency mgmt office & listen to… "

    1. Present

    2. Not Present

Use 5: Inform others about one's own condition and location and learn about a disaster-affected individual's condition and location

Does this tweet contain an element on how to connect to family, friends, or other citizens?

    "To find loved ones who marked themselves as safe after #Harvey or to register yourself, visit: https://t.co/dD8dLtWZJm @RedCross"

    "Connect with friends and family by downloading the Red Cross safe and well app https://t.co/LffjeEXThM #RedCross #safeandwell #Harvey"

1. Present
2. Not Present

Phase 4: Event -> Post-event

Use 6: Document and learn what is happening in the disaster

Does this tweet contain an element that allows people to connect to news organizations telling victims' stories?

ex. NWS "Stories from hurricane survivors https://www.weather.gov/safety/hurricane-survivors

1. Present
2. Not Present

Does this tweet contain a specific hashtag being used that can connect people affected (ex. #helphouston, #SOSHarvey)?

- Should be more specific than just #Harvey or the like.
  1. Present
  2. Not Present

Does this tweet contain an element about controlling rumors spread about the disaster?

"RT @EnergyPressSec: Rumors that fuel shortages in Texas are due to@FEMA blocking sales are FALSE. Get the facts here: https://t.co/qAP2tKA…"

"Here are some good tips to prevent fraud. More post-Harvey rumor control here: https://t.co/6xM4lrK7gI https://t.co/CoD6gRNzmR"

1. Present
2. Not Present

Does this tweet contain an element about or from emergency management sources?

- You can double count this category, ex, a FEMA administrator for FEMA region 5. This coding category does include retweets. DO NOT code the main account tweeting. May have to click on the person/organization to find out what they do.

"RT @NWSHouston: EMERGENCY MANAGEMENT HAS REQUESTED: IF HIGHEST FLOOR OF YOUR HOME BECOMES DANGEROUS...GET ON THE ROOF. #houwx… "

1. Present

2. Not Present

Does this tweet contain an element about or from local level sources (ex. Mayor, city officials)?

- You can double count this category, ex, Houston Emergency Management office. This coding category does include retweets. DO NOT code the main account tweeting.

"RT @CityofMiami: ATTENTION - Thirteen new shelters are now open!!! Please follow the link to find the one nearest you. #Miami... "

"RT @MiamiDadePD: Our officers are now sheltered for their safety. We cannot respond to calls for service. Stay indoors, DO venture out! #Hu..."

1. Present

2. Not Present

Does this tweet contain an element about or from state level sources (ex. governor, congressional representatives)?

- You can double count this category, ex, Florida Emergency Management office. This coding category does include retweets. DO NOT code the main account tweeting.

  "RT @ABC: Gov. Greg Abbott says more heavy rainfall expected tonight, urges Texans to stay off the road..."

  1. Present

  2. Not Present

Does this tweet contain an element about or from regional level sources?

- You can double count this category, ex, a FEMA administrator for FEMA region 5. This coding category does include retweets. DO NOT code the main account tweeting. In this case regional means larger than a state, ex the northwest region of the United States.

  "Regional Administrator Gracia Szczech meets with @FLSERT to discuss response efforts for Hurricane #Irma https://t.co/Lflz7p79w5"

  1. Present

  2. Not Present

Does this tweet contain an element about or from national level source (ex. The White House)?

- You can double count this category, ex, a FEMA administrator for FEMA national. This coding category does include retweets. This coding category does include retweets. DO NOT code the main account tweeting. National level sources do include congressional representatives.

  "From the @WhiteHouse: today is the National Day of Prayer for Hurricane Harvey survivors.https://t.co/RpZkWzzbsF"

  1. Present
  2. Not Present

Use 7: Deliver and consume news coverage of the disaster

Does this tweet contain an element about or from local news outlets (ex. Houston - KTRK, KHOU, KLAS, Fox26)?

ex. @KHOU "Tracking Hurricane Harvey: Voluntary evacuations issued for Galveston."

1. Present
2. Not Present

Does this tweet contain an element about or from national news outlets (ex. CNN)?

ex. @cnnbrk "Tropical Storm Harvey expected to be a Category 3 hurricane when it hits the middle Texas coast Friday"

1. Present
2. Not Present

Use 8: Provide and receive disaster response information; identify and list ways to assist in the disaster response

Does this tweet contain an element about how residents/victims should respond to the disaster once it is underway?

- This should be telling an action to take or giving a recommendation.

"Before heading to bed, make sure you have a way to receive weather alerts overnight. #Irma https://t.co/JOMjWwDXcb"

1. Present
2. Not Present

Does this tweet contain an element about safety actions, preparations, or recommendations?

- This can either mean using the words safe, safety or somethings similar, and/or telling or recommending an action to do to prevent harm to yourself or belongings.

"RT @Readygov: Always use generators outside the home in properly ventilated areas. #Harvey https://t.co/mGZzQZesJo"

"When the rain starts, please remember: don't drive through flooded roadways. https://t.co/oQXbtf7Q6G #Harvey https://t.co/7RwRb80or0"

"RT @FDACSNews: Expect to lose power. Here are some food safety tips for when you do. #Irma https://t.co/wWouov5zkW"

THIS WOULD NOT COUNT, has the word safe, but does not discuss how to be safe!

"Connect with friends and family by downloading the Red Cross safe and well app http://bit.ly/1iLLS9q #RedCross #safeandwell #Harvey"

1. Present
2. Not Present

Use 9: Raise and develop awareness of an event; donate and receive donations; identify and list ways to help or volunteer

Does this tweet contain an element about how to give general donations, other than money, to disaster recovery?

"RT @USAgov: Donating to charity to help Harvey recovery efforts? Do your research first! https://t.co/ivgAVutyYc https://t.co/IFVBfio1lA"

"For the latest updates on volunteering for our #Harvey response and how to help now, visit https://t.co/2s7A5fYu1A https://t.co/FzJWlqxXEG"

1. Present
2. Not Present

Does this tweet contain an element about how to give monetary donations to disaster recovery?

"To help people affected by #HurricaneHarvey, please visit https://t.co/lG3cxjpyAd or text the word HARVEY to 90999 to make a $10 donation."

1. Present
2. Not Present

Does this tweet contain an element about how to volunteer in disaster recovery?

"RT @fema: If you'd like to help people affected by #Harvey, connect with trusted voluntary organizations by visiting:…"

1. Present
2. Not Present

Does this tweet contain an element about disaster relief jobs?

"RT @fema: If you'd like to help people affected by #Harvey, connect with trusted voluntary organizations by visiting:…"

1. Present
2. Not Present

Use 10: Provide and receive disaster mental/behavioral health support

Does this tweet contain an element about mental health resources?

"RT @fema: The @distressline is a great resource if you were affected by #Harvey & need to talk to someone to help you cope. C…"

1. Present
2. Not Present

Use 11: Express emotions, concerns, well-wishes; memorialize victims

Does this tweet contain an element about offering concern or well wishes?

"From the @WhiteHouse: today is the National Day of Prayer for Hurricane Harvey survivors. https://t.co/RpZkWzzbsF"

1. Present
2. Not Present

Does this tweet contain an element offering condolences for victims?

> *ex @MiamiHurricanes "Our thoughts and condolences are with everyone affected by the horrible events that occurred in our neighboring community Orlando."*

1. Present
2. Not Present

Does this tweet contain an element of thanking those who have helped?

> *"#ThankYou for your support to help those impacted by #HurricaneIrma https://t.co/7n07KbzN3h"*

> *"RT @fema: A big thank you to the Coast Guard & all those supporting Texans in need. #Harvey response is a team effort. https://t.co/pfRyxJ2…"*

> *"We are so touched by the outpouring of support as we work to help people impacted by Hurricane Harvey. Our heartfelt thanks!"*

1. Present
3. Not Present

Use 12: Provide and receive information about (and discuss) disaster response, recovery, and rebuilding; tell and hear stories about the disaster

Does this tweet contain an element telling stories of the disaster?

- This is for narratives that don't tell any actual information or steps to take.

> *"This blanket here kept me warm last night. Safely settled at a #RedCross shelter, a mother recalls her family's d… https://t.co/AJcaPhHfiJ"*

> *"Thanks to you, Billy and his family are safe and well at a #RedCross pet evacuation center in #Miami.… https://t.co/smg7Z5cuit"*

1. Present
2. Not Present
1.

Does this tweet contain an element about rebuilding finances?

> *"#firstofthemonth financial matters for survivors affected by #Harvey. https://t.co/pSpQ4CkC12"*

1. Present
2. Not Present

Does this tweet contain an element about assistance for home repairs?

> *"RT @ReadyHarris: Experiencing HOME FLOODING? Please report it by going to https://t.co/xmgComXqXz and click the RED BOX. #Harvey https://t."*

1. Present
2. Not Present

Does this tweet contain an element about finding jobs after the hurricane?

"@HarmonyWVTM13 @done0747 Hi, you can find any open job opportunities after Harvey here: https://t.co/A4X5gsXgYq."

1. Present
2. Not Present

Does this tweet contain an element about general assistance for victims?

- This is assistance not covered in the previous categories.

  "Puerto Rico: If you received damage from #Irma, you may be eligible for disaster assistance. Apply by visiting… https://t.co/1gqnDrZf8D"

  "RT @FEMA_Brock: Those impacted by #Harvey contact your insurance company first then register w/ @FEMA at https://t.co/NHG4nJNf4jhttps://t.…"

2. Present
3. Not Present

Miscellaneous

1. Present