DIALYSIS PATIENTS' SOURCES FOR RISK COMMUNICATION, PAST EXPERIENCES, PERCEPTIONS OF RISK, AND PREPAREDNESS TOWARD FUTURE HURRICANES: A COMPARISON OF PARTICIPANT RESPONSES BETWEEN NEW YORK AND TEXAS

by

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LIST OF ABBREVIATIONS

Abbreviation **Description**

ED- Emergency Departments

ENSO- El Niño Southern Oscillation

ER- Emergency Room

ESRD- End-Stage Renal Disease

ESRF- End Stage Renal Failure

GHG- Greenhouse Gases

IPCC Intergovernmental Panel on Climate Change

KCER- Kidney Community Emergency Response

NYC- New York City

RDRTF- Renal Disaster Relief Task Force

RQ- Research Questions

UTMB- University of Texas Medical Branch

WHO- World Health Organization

1. INTRODUCTION

The debate over the effects of climate change varies from a geographical standpoint. Globally, the climate has been stable for the past millennium; however, since the Industrial Revolution there has been a marked increase in the amount of carbon dioxide and other greenhouse gases (GHGs) in the Earth's atmosphere. For this reason, weather and climate have been undergoing unprecedented changes in the modern era, and many of these changes are known to affect human health. Among the more prominent of these health-affecting changes is the apparent (or, at minimum, expected—see van Aalst [2006]) rise in the frequency of extreme weather events, such as natural disasters). Crucially, people and places differ in their capacities to adapt to and cope with natural disasters (e.g., Cutter et al. 2008). Effective emergency management planning, particularly in an era of anthropogenic climate change, must therefore grow out of a nuanced understanding of the needs and challenges that different locations and population subgroups face during disasters. One population subgroup that has received relatively little attention in this stream of research is individuals living with chronic diseases.

In the United States, thousands of people suffer daily from different types of chronic illnesses and genetic disorders, such as diabetes, arthritis, epilepsy, sickle cell anemia, and kidney failure. Treating patients with chronic diseases takes considerable amounts of time and medical resources. Living with chronic diseases affects a person's way of life both physically and mentally. While a majority of hospital emergency departments (ED) are fully equipped to handle any type of medical emergency based on

guidelines and protocols, people with health issues face higher chances of having medical complications during a disaster. Furthermore, with some medical conditions, treatment is a matter of daily survival (Ford et al. 2006, 1).

On this backdrop, this thesis investigates disaster perceptions and preparedness among dialysis patients who require three visits to a dialysis center every week to receive treatment and must travel to a center regardless of weather conditions. It is hypothesized that, patients with end-stage renal disease (ESRD), needs to focus on and adhere to strict guidelines for managing their disease, are not likely to have alternative plans for treatment in the event of a disaster (Charnow 2015, 16). This combines with a lack of public information on disaster planning for ESRD patients. If individuals with ESRD are given options for early dialysis treatment through better emergency planning, education, and knowledge of a preparedness plan, then the hospitalization rate for ESRD patients would likely decrease during a disaster.

This research focused on the nexus between dialysis patients' needs and challenges relative to hurricane occurrences. Two geographical regions of the eastern Unites States—New York City and Galveston, Texas—that experience frequent impacts from major hurricane occurrences were delineated for study. A sample of patients from each area was chosen to participate in a survey exploring the needs and challenges of dialysis patients toward the hurricane hazard. In addition, the comparison of two regions highlighted geographical similarities and differences of patients' responses which will aid in medical professionals and patients in planning for future occurrences, and managing treatments during a hurricane.

1.1 Research Questions

This research examined how individuals with (ESRD) received and used information using communication sources in preparing for a hurricane disaster in these two regions, examined their past (direct and indirect) experiences with, and perceptions of future risk from hurricane occurrences, as well as, assessing levels of preparedness for future occurrences. Four questions guided this research, and were reflected in the composition of the survey instrument.

RQ1: From what sources do dialysis patients receive weather-related and hurricane-related information, and how might this differ between those in New York and Texas? How frequently do patients in each region use these sources?

RQ2: How do dialysis patients' experiences with past hurricane occurrences compare between regions?

RQ3: Are there differences in individual perceptions of risk of dialysis patients toward future hurricane occurrences between patients in the two regions?

RQ4: How do dialysis patients from the two regions compare in their preparation, especially medical preparation, for future hurricane occurrences?

When answering these questions, this research considered the availability of particular types of communication sources with regard to regional location, and how frequently those sources were relied upon.

During 2005 Hurricane Katrina, emergency departments (EDs) and other medical facilities suffered structural damages which "disproportionately affected chronically ill populations by limiting access to critical life maintaining health care services" (Bogdanov et al. 2015, 109). In 2005, when Hurricanes Katrina and Rita made landfall on the Gulf Coast of Louisiana, hospitals and dialysis units were either temporary or permanently closed down; because of this, most dialysis patients lost access to urgent medical care (Kleinpeter 2007).

A delay in treatment for a dialysis patient will create adverse health effects. To minimize these effects, disaster planning preparation and pre-dialysis treatment is advised. If dialysis patients have access to pre-dialysis treatment centers in combination with a personal disaster preparedness plan before a hurricane makes landfall, then that significantly decreases their hospitalization rates in hospital emergency rooms. Studies in risk communication and disasters have illustrated the importance of having a useful information system. According to Ellis et al. (2015), "during Hurricane Katrina, cell phones and the Internet were used to obtain information not available in news media" (422-423). The importance of media communication and its fast-growing communication systems is due to its wide-reaching range.

Even though access to these communication systems comes in many different forms, people facing health difficulties and/or requiring medical treatment on a daily basis are often not able to respond to warning information. In a report exploring the

response to the 2015 Katrina and Rita Hurricanes, the National Council on Disability noted that many people with disabilities were unable to be evacuated due to a lack of appropriate vehicles (Ellis et al. 2015). Due to these circumstances, and the increased use of media communications in society the overall goal of this research was to evaluate the relationship between risk communication sources available to ESRD patients, and the extent to which they used this information to prepare for a hurricane event.

2. BACKGROUND

There are numerous climate systems that affect the world's weather patterns, such as the El Niño Southern Oscillation (ENSO), an event that takes place between the interaction of ocean and atmosphere. This phenomenon changes precipitation and temperature patterns around the world. Sea level rise and global temperature increase is also associated with climate change.

Natural disasters have killed millions of people over the last 20 years, impacting the lives of at least 1 billion more people, and resulting in enormous economic damages. In the decade 1994 to 2004, there were approximately 1 million thunderstorms, 100,000 floods, tens of thousands of landslides, earthquakes, wildfires and tornadoes, and several thousand hurricanes, tropical cyclones, tsunamis, and volcanoes" (Quadrelli and Sulpice 2014, 24).

Understandings of climate change are filled with uncertainties. As a result of this, the long-term effects from climate change are not fully understood and according to the Intergovernmental Panel on Climate Change (IPCC), "the damage caused by global warming is likely to be irreversible and catastrophic if no global action is quickly taken to stabilize the rise in temperature of the Earth's surface" (Shi et al. 2015, 2183). To minimize future damage of properties and human casualties that may arise from the byproducts of climate change, public understanding of this threat is essential for creating appropriate mitigation and adaptation policies. Understanding public perceptions for any type of threat or risk will also refashion their rationalizations toward disaster preparedness. According to the World Health Organization's (WHO) Water Quality Division, communication is defined as, any purposeful exchange of information about

risks between interested parties… or the act of conveying or transmitting information between parties about a range of areas including, levels of health or environmental risks, the significance or meaning of health or environmental risks, decisions, actions or policies aimed at managing or controlling health or environmental risks (317-318) (as reported in Bartram et al. 2001).

Disasters of any kind will likely place a tremendous amount of, "demands on healthcare systems, necessitating expansion of hospital surgery capacity, including increased numbers of healthcare workers to handle patient needs" (Charney et al. 2014, 1). In some cases, disasters have created an opportunity for long-term changes within health care systems and infrastructure requirements. Finne and colleagues (2015) report that after 2005 Hurricane Katrina, it is now required that dialysis facilities have back-up power plans and/or generators so that they might remain open in the face of power outages. In New York City (NYC) after the 1965 citywide blackout, laws were created to ensure that every hospital would have a backup generator. During the 1977 blackout, NYC suffered another citywide blackout due to an emergency backup generator that failed.

In 2005, Alleyne and colleagues observed that Bellevue, a major trauma center hospital, had to close the emergency department (ED) resulting in 15 patients that were on mechanical ventilation being manually ventilated with bag–valve–mask devices by rotating staff. Chronically ill patients suffer more during a disaster. In addition, Alleyne and researchers on NYC's 2003 blackout reported that community-based chronically ill patients with respiratory device failures were responsible for the greatest burden.

Hospital preparedness varies by regional type (rural and urban) and specialized facility (trauma care or medical center). In a 2008 study, Edwards finds that hospitals located in rural regions tend to face difficulties when it comes to sparing emergency personnel for preparedness training and planning. He concluded that small hospitals in rural areas where population is scanty are, by definition, disadvantaged for disaster preparedness.

2.1 Dialysis Patients

Kidney disease is defined as losing nearly all of the functions to the kidneys or abnormalities related to the functions of the kidneys. In the United States alone, there are over 20 million people living with Stages 2 through 4 Kidney Disease without dialysis. End stage renal disease (ESRD) counts for a half of a million hospitalizations. Patients suffering from End Stage Renal Failure (ESRF) require three to four hours of dialysis treatment weekly. Dialysis is a process where artificial transfer of solutes and water is performed between the patient's blood and a dedicated solution (dialysate) across a semipermeable membrane (Duncan et al. 2009). Dialysis patients typically schedule routine travel arrangements to their dialysis facility. Bern and colleagues (2006) report that, "Problems related to underlying medical conditions and dialysis access lead to frequent emergency department visits and hospitalizations for many patients… "These issues include maintenance of vascular access, drug selection and dosing, judicious laboratory testing, adequate nutrition, and effective coordination of care" (83).

The recognition of special treatment needs and the urgency of care for renal patients in the aftermath of large natural and manmade disasters prompted the establishment of the Renal Disaster Relief Task Force (RDRTF) by the International

Society of Nephrology in 1989 (Anderson et al. 2009).

During 2005 Hurricane Katrina, dialysis centers in New Orleans, Louisiana, as well as in Mississippi and Alabama struggled to maintain care. During that period of time, about 17 percent of patients missed three or more dialysis sessions, and 23 percent were hospitalized in the month following Katrina (Howard et al. 2012). Brice and researchers (2011) found that patients requiring dialysis were dependent on technology to sustain their lives. Interruptions in critical infrastructures (e.g., water, electricity, or transportation systems) translated into a life-threatening event for dialysis-dependent patients.

In the aftermath of a disaster, renal problems may become more severe; a report by Biesen and colleagues (2009) stated the importance of focusing on disaster preparedness along with better evacuation planning and therapeutic options, as after 2005 Hurricane Katrina some patients claimed that they were unaware of an evacuation plan. These findings are significant given that Hurricane Katrina forced the evacuation and relocation of over one million residents from New Orleans and the Gulf Coast region of the country. There were almost 6,000 patients with end-stage renal disease (ESRD) on life sustaining dialysis treatment in the region affected by the storm (Anderson et al. 2009).

Addressing the importance of having a disaster preparedness plans may lead to better outcomes for dialysis patients as missing a dialysis treatment may cause adverse health problems. According to Anderson and colleagues (2009), results indicated that “a higher percentage of hemodialysis patients who evacuated on or after the date of the storm, who were placed in a shelter upon evacuation, and were unaware of their dialysis

unit's evacuation plans missed three or more sessions in the aftermath of Hurricane Katrina," and in addition to this, "patients who were unaware of their dialysis unit's evacuation plans were more likely to miss three or more hemodialysis sessions" (1203). Lastly, a 2008 report by Anderson and colleagues found that in a non-disaster setting, between 5 and 9 percent of U.S. hemodialysis patients missed at least one treatment per month as compared to 44 percent of hemodialysis patients who missed one or more dialysis sessions in the aftermath of Hurricane Katrina.

3. LITERATURE REVIEW

Bernard and researchers conclude that, “Climate change may alter the frequency, timing, intensity, and duration of extreme weather events” (2001, 191). Some of these alterations may increase precipitation. Studies have shown that changes in these climate systems may create extreme weather events, such as flooding, hurricanes, droughts and tornadoes. For example, Edge and colleagues (2011) found that coastal areas in Corpus Christi, Texas will have intensification of hurricanes due to sea level rise (SLR) along the time periods of 2000, 2030 and 2080 based on hydrodynamic simulation projections. In addition to this, changes in sea levels along with sea surface temperatures may affect the intensity of a hurricane, as hurricanes are a natural force dictated by sea surface temperatures, wind shears and other meteorological influences.

There exists a paucity of research concerning the public’s perception of risk and long-term health hazards associated with climate change. Akerlof and researchers (2010) found that public perception of risk and the role of vulnerability in shaping people’s assessment of the threat has been even less studied. Indeed, vulnerability, specifically, related to how levels of health and well-being influence individuals’ perceptions toward climate change risks has been little explored (2577). People’s perceptions toward climate change or any other type of disaster may vary based on culture, education, socioeconomic, worldview, social network information access and geography. Trying to understand risk communication in accordance to public perception is important because research has shown that the public’s concern about this topic “is driven by country-specific factors like national prosperity, media coverage of the issue, and political action by political elites and by governments” (Shi et al. 2015, 2184).

Other factors that contribute to the perception of risk in society are socioeconomically disparities. Blendon and researchers (2010) found that, "being employed is related to hearing about the evacuation orders and having a bank account is related to understanding the evacuation orders… along with people who were not employed were significantly less likely than were those who were employed full-time to have heard evacuation orders" (225). In addition to socioeconomically disparities, Shi and colleagues (2015) found that, "low-income individuals seemed to be less aware of climate change than higher-income individuals. Women were significantly more concerned about climate change than men" (2184).

Results from a survey conducted by Akerlof and researchers (2010) in three different countries (United States, Malta and Canada) regarding people's perception towards climate change and health risks, show that: "Fifty percent or more of Canadians and Maltese said that climate change is already harming people's health, while only slightly more than a third of Americans said the same... A majority of Americans said that global warming will cause a range of environmental and societal impacts over the next 20 years" (2563).

Inadequate assessment and management for patients with a chronic illness poses a long-term health risk, which may affect both their physical and mental states of mind during a disaster. A vast majority of research publications has addressed future prevention for infrastructure damage, long-term effects on the community, and economic disadvantages during a natural disaster; however, many of these publications do not emphasize the importance of treating patients with chronic illnesses. Balluz and

colleagues (2006) found that: “In interviews with medical personnel in hurricane-affected areas, a leading concern expressed was the urgency of treating people with chronic diseases such as diabetes, cardiovascular disease, hypertension, and kidney disease” (1).

The minimal numbers of publications on this topic may result from ideas that, “many of the disasters have occurred in poor countries where chronic disease has been historically less of a health priority or in wealthier countries, catastrophic damage to the medical infrastructure is uncommon, so patients with chronic diseases continue to receive care” (Balluz et al. 2006, 3). After Hurricane Katrina, numerous studies have shown a number of adverse outcomes for dialysis patients, including increased hospitalization. Due to this, many states require dialysis facilities to have back-up power plans and/or generators so that they may remain open in the face of power outages.

To further help patients on dialysis during disaster, many dialysis facilities have various types of protocols in place. These might include: directing patients to facilities that remain open, using shorter dialysis treatments to accommodate more patients, remaining open for a third shift, and in some cases operating 24 hours a day using staff from other facilities to ensure that additional patients affected by the emergency will receive timely dialysis (Finne et al. 2015). The National Kidney Foundation has 13 essential items for a dialysis-specific preparedness plan for patients, which includes their insurance information, list of medication(s), and sodium polystyrene sulfonate.

In most cases before a disaster, dialysis patients are provided with copies of their medical records. These medical records consist of: demographic (“face”) sheets, history and physical data, dialysis patient identification cards, medication and allergy profiles, recent dialysis flow sheets, dialysis orders, and recent laboratory studies, including

tuberculin skin testing results or chest radiograph results, Hepatitis B status, and other pertinent information. Also, patients affiliated with the large dialysis organizations are provided an emergency toll-free number to report their location; however, they are encouraged to continue dialysis at an affiliated provider because their electronic medical records would be available (Kleinpeter 2009). In other cases, patients are provided with a list of dialysis centers to receive information on back up locations in the event of needing temporary dialysis treatment.

3.1 Historical Tropical Storms: Cost and Damages

Hurricane Sandy made landfall on October 29, 2012, in New Yok City (NYC). The event was a tropical storm with winds stretching over 900 miles causing storm surges over a large area. Based on the storm surge prediction, mandatory evacuation was in place for certain zones. Due to the large destruction, approximately 20,000 people were in shelter while 7 to 8 million people were without power.

Widespread problems in NYC included power outages, flooding, closures of bridges and tunnels, suspension of public transportation, and closures and/or emergency evacuations of health care facilities. People on dialysis were greatly impacted by the storm since they had to travel to dialysis centers in severe weather to receive their treatments three times a week (Arquilla et al. 2014). Harbord and colleagues (2015) observed that the interruption of the electric supply to lower Manhattan (below 39th Street) for an entire week was a disaster for patients with ESRD. Their research found that, among 13,264 patients with ESRD, there were increased emergency room (ER) visits and hospitalizations as well as an increased 30-day mortality rate compared with a similarly sized comparison group.

In addition, a survey conducted by Finne and researchers (2015) found that 89 percent of hospitals reported experiencing critical challenges during the storm, including: 1) hospital infrastructure problems (electrical utility outages, loss of backup generators, structural damage, and flooding), 2) patient surge (from other hospitals, home care, nursing homes, etc.), 3) communication breakdown and failures, and 4) lack of staffing" which included dialysis centers. Finne and colleagues also concluded that, "early dialysis ahead of Hurricane Sandy's landfall decreased the likelihood of ED visits, hospitalizations, and the 30-day mortality for dialysis patients in the areas most affected" (509). In addition to this, ESRD patients in New York City and New Jersey received early dialysis before Hurricane Sandy made landfall, while nearly 40 percent did not (509).

A survey conducted by Brice and researchers (2011) examined disaster preparedness for dialysis patients in North Carolina. For their research, they created 13 questions that were constructed using the NKF-recommended dialysis-specific disaster preparedness items; eight questions focused on preparedness for forced evacuation and the rest were related to shelter-in-place preparedness. Results for this study concluded that, out of 311 participants for dialysis-specific preparedness, 244 (80 percent) participants had insurance information and a listing of their medications accessible in case of forced evacuation. Only 129 (43 percent) knew of alternative dialysis centers and 128 (42 percent) had sufficient medical records at home to provide a dialysis center with treatment information. In addition, 47 people (15 percent) had an identifier that they could wear such as a bracelet or a necklace to alert health care providers of their chronic

illness.

Dialysis-specific preparedness to shelter-in-place demonstrated that more than half (169, or 63 percent) maintained an extra supply of medicines. From this research, Brice and researchers concluded that individual dialysis-specific disaster preparedness contributed to fewer missed dialysis sessions. Another research study that examined disaster preparedness and awareness with regards to dialysis patients during Hurricane Sandy was conducted by Harbord and colleagues in 2015. Their results showed that 271 (75.9 percent) participants had their insurance information, but only 158 (44.3 percent) participants carried a detailed medication list. Sixty-one (17.1 percent) participants had higher dialysis-specific preparedness levels when compared before and after the storm. Of those, 41 participants retained medical records at home, 27 participants had knowledge of their optional dialysis centers, and nine participants started to carry their detailed medication list with them. In this study, the researchers concluded that those dialysis patients were largely unprepared for a disaster.

Hurricane Ike made landfall at Galveston, Texas September 13, 2008. Bedient (2012) reports that, "Ike was the most destructive storm to make landfall on the Texas coast since the Galveston hurricane of 1900 and with $24.9 billion in damages, Ike was the third costliest storm in US history" (16). Hurricane Ike brought a small amount of rainfall to the Houston and Galveston areas; however, in coastal locations storm surge caused significant flooding along the barrier peninsulas from Seaside Beach to Bolivar Island where storm surge reached 17 feet on the Bolivar Peninsula alone. Also, on Galveston Island, many homes were flooded and beachside houses were washed away. Due to a combination of storm surge and high tides as well as high winds, a massive

amount of damage was reported. Galveston Island started to flood from the bay side of the island due to of lack of protection from the 17-foot high seawall that stands between the front of the island and the waters of the Gulf of Mexico. During Ike, over 2 million residents in the Houston area lost power.

In addition to this, Aleshinloye and researchers observed that, "Galveston County was the most severely impacted area as a result of the hurricane" (2014, 235) and due to the storm surge in Galveston, four of the power substations were flooded. In certain locations, dialysis units lost power for a period of time, and in most cases temporary generators were used to provide dialysis services. "However, the temporary generators at most hospitals and dialysis facilities did not operate the air conditioning or other ventilation systems, leading to hot and uncomfortable environments for patients and providers" (Kleinpeter 2009, 64). Evacuation orders were in full effect along the west end of Galveston Island where buses evacuated residents to the city of Austin. Hospitals located within the area from Bay City to Houston reached at or above patient capacity.

The University of Texas Medical Branch (UTMB) Hospital also evacuated its patients. A resilience study done by Aleshinloye and researchers (2014) stated that the City of Galveston should consider construction to elevate emergency operations centers to provide protection for locations that are important for critical personnel and equipment. These researchers also noted that when Hurricane Ike made landfall: "Buses and trolleys, in particular, were severely damaged by flooding…for this reason, the city should establish a system to secure the municipal transportation system so that there is not a complete loss of the transit system in a disaster event" (238). City leaders also agreed that the city must also update and protect the public transportation system.

3.2 Risk Communication and Perception of Risk

Due to climate change, there have been more cases of intensified hurricanes. Three of the strongest hurricanes in the 21st century were 2005 Hurricane Katrina, 2012 Hurricane Sandy, and 2008 Hurricane Ike. Changes in the climate are known to affect public health due to the rise in temperature and other weather patterns. More recent health risks include an increase in vector borne diseases, pulmonary disease and water borne diseases. Many of these diseases may arise from the impact of a hurricane. People that have low immunity to germs and bacteria are at greater risk. During a disaster, emergency managers and hospital officials have action plans and/or guidelines to ensure the safety of the people.

When examining different aspects of these factors that affect a person's health, risk communication and an individual's perception towards risk have focused on socio-demographics, worldviews and perceived hurricane risk and vulnerability. The importance of worldview is to understand the connection between the environment and society. In most scenarios, people with more independent worldviews toward the environment have a lower perception of personal risk during a natural disaster when compared to people that are more dependent on the environment. Conversely, people with egalitarian worldviews perceive risk from the environment to be relatively higher.

Elements that surround socio-demographic characteristics include gender, race and ethnicity, age, income and employment status, homeownership, and households with hurricane protective responses. With these types of components, Bostrom and colleagues (2015) state that, "prior studies have found that evacuation likelihood increases with income, decreases with income, or is insensitive to income" … with regard to worldview,

"risks are perceived when these social priorities are threatened," and lastly, perceived hurricane risk and vulnerability is based upon whether or not a resident knows "if they live in an evacuation zone or not know when there is an evacuation order, and thus will not evacuate" (1840). Exploring the reasoning behind why some people evacuate more often than others may be understood by examining socio-economic and racial disparities along the lines of information access.

According to Griffin and colleagues (2007), socio-economic factors along with race play considerable roles when it comes to evacuation during most hurricane storms. Results from their research indicated that very few participants learned of the evacuation order from a phone call, as this accounted for only 11.5 percent of the African American participants, 10.9 percent of the Caucasian evacuees, and 15.3 percent of the other nonwhite. Also, data supported the notion that interpersonal information may be a more critical source of information to minority victims, as only 56.4 percent of the Caucasian evacuees reported interpersonal information as very important, as opposed to 74.6 percent of the African American participants and 77.1 percent of the other nonwhite participants. The study between responding to risk communications and how people perceive a disaster is a growing field due to a greater number of more intense natural disasters theorized to be brought on by climate change. Within this research field, more studies need to be done with regard to how people coping with illnesses and disabilities respond to an impending disaster as well as those who are disenfranchised due to race, socioeconomic and sociodemographic.

4. RESEARCH DESIGN

This research employed a survey design and the development of a survey instrument. Data were collected by the survey instrument from a sample of dialysis patients in two locations in the U.S., with the following four research questions (RQ) in mind:

RQ1: From what sources do dialysis patients receive weather-related and hurricane-related information, and how might this differ between those in New York and Texas? How frequently do patients in each region use these sources?

RQ2: How do dialysis patients' experiences with past hurricane occurrences compare between regions?

RQ3: Are there differences in individual perceptions of risk of dialysis patients toward future hurricane occurrences between patients in the two regions?

RQ4: How do dialysis patients from the two regions compare in their preparation, especially medical preparation, for future hurricane occurrences?

4.1 Survey Instrument

Survey questions were created using Qualtrics, an online survey tool. A total of 38 questions were created using this software. The questions reflected the study questions presented above and in the introduction which assessed: communication sources and how frequently these sources were used for weather and hurricane information, such as by radio, television (The Weather Channel), newspaper, social network, social media, internet/website (nonsocial media) and local television; patients'

experiences with past hurricane occurrences; patients' perceptions of future risk from hurricanes; patients' general feelings of preparedness by stockpiling emergency supplies; dialysis-specific preparedness actions, such as medical documentation and identification of alternative center/hospital locations, and demographic information, such as age, gender, ethnicity and educational level.

Dialysis-specific preparedness questions followed the Kidney Community Emergency Response (KCER) Program checklist (Table 1) which consists of two parts: dialysis-specific disaster preparedness items and demographic characteristics. Dialysis-specific disaster preparedness were assessed using the KCER -recommended dialysis-specific disaster preparedness checklist. The survey instrument appears in Appendix B.

Table 1. Dialysis specific preparedness checklist (Kidney Community Emergency Response (KCER) Program

1: Personal information (emergency contact, primary care doctor, kidney doctor (Nephrologist) etc.)
2: Medical information (detailed list of your medications, dosages, treatment orders etc.)
3: Health insurance information
4: Medical ID jewelry
5: Arrange alternative treatment facility
6: Arranged back-up transportation to the dialysis facility
7: Arrange alternative treatment days
8: Know how to unhook from the machine
9: Have a 3-day emergency diet plan
10: 3-day emergency diet shopping list

4.2 Study Locations

This comparative research was conducted in two different states in the regions of Houston, Texas and New York City. These two regions were selected because Texas has experienced numerous seasonal natural hazards, such as tornadoes, floods, wildfires and hurricanes. The Texas Gulf Coast spans 367 miles, with a population of over 5 million people. Within this coastal region, roughly 46,792 people live with ESRD, as of December 2015. Over the course of 134 years, the Texas Gulf Coast region has experience twenty-two Category 3 or higher hurricanes. Furthermore, Texas was selected for two other main reasons—dependence on automobiles for transportation, as well as, the substantially large duration in time and distance between locations. For example, in certain areas it takes an hour to reach the closest hospital by car. New York City (NYC) was selected due to the opposite in physical characteristics as the state only has a coastline of 127 miles, and unlike the Houston-Galveston area, NYC has a sizeable population of over 12 million people. In addition, NYC has experienced relatively few hurricanes with only five Category 3 or higher hurricanes over the course of 190 years. Roughly, a total of 29,127 people in New York State live with ESRD as of December 2015.

4.3 Data Collection Participants

As originally planned, the survey instrument was distributed by the ESRD Network of Texas by broadcast fax to all 600 dialysis centers in Texas, while the ESRD Network of New York distributed the same survey instrument to NY patient groups and other dialysis centers. However, this method of data collection did not prove to be effective in yielding a significant sample for analysis. Therefore, it was necessary to use a

"sample of convenience" method, and physically visit dialysis centers in both regions—New York and Texas—to distribute questionnaires in person.

Dialysis centers in both locations were identified from a list, and phone calls were made in advance to centers asking for permission to visit and distribute the questionnaire to patients willing to participate. In Texas, two centers in Baytown (to the southeast of Houston, near the coast) and Crosby (to the northeast of Houston, further inland) gave permission for a visitation, yielding 29 participants who answered the questionnaire. In New York, one center in Brooklyn gave permission for visits yielding 33 participants. In total, a sample of 62 participants between the two regions responded to the survey questionnaire.

5. DESCRIPTIVE STATISTICS

5.1 Comparing Patients' Responses Between Texas and New York

This section presents descriptive statistics of similarities and differences in responses of dialysis patients between New York and Texas. Descriptive analysis will also indicate which variables might play an important role in differentiating the two regions. There were 33 number of participants (53.23%) from the Brooklyn region and 29 number of participants (46.77%) from the Baytown-Crosby region east of Houston, Texas.

Comparison of Participants' Sources for General Weather-related News

Data in Table 2 reports that there were only minor differences in how participants in each region received information about general, everyday weather-related news. For instance, the largest counts, approximately 72 percent of participants in the Texas regions, received general weather-related information from The Weather Channel followed by Local News and the Radio. Fewer counts were observed for social media and Newspapers. Compared to 67 percent of participants in the New York regions that received general weather-related information from The Weather Channel followed by Local News and the Radio

Table 2. Comparison of Participants' Sources Used for Weather-related News

Sources for Weather-related News	Regional Location Count /% within population		
	Texas	**New York**	**Total**
Radio	10	11	21
	34%	33%	34%
The Weather Channel (TV)	21	22	43
	72%	67%	69%
Newspapers	0	1	1
	0%	3%	2%
Social Networks	6	5	11
	21%	15%	18%
Social Media	5	4	9
	17%	12%	15%
Internet/ Websites	6	6	12
	21%	18%	19%
Local news (TV)	12	17	29
	41%	52%	47%
Total	29	33	62
	100%	100%	100%

5.2 Frequency of Sources for General Weather-related News

Table 3 reports how frequently participants used these sources for general weather-related information. Percentages were based on the number of participants responding to each item. Counts were highest for The Weather Channel in both regions. About two-thirds (66.7%) of participants in Texas indicated that they used The Weather Channel, "A great deal," compared to only half of participants (50%) in the NYC region.

Local news had the second highest count. Over half of participants in Texas relied on local news “A great deal” for weather-related information (58.3%) as compared to only about one-third in NYC (27.3%). Regions differed markedly in use of social networks. Sixty percent of New York participants relied on family, friends and co-workers “A great deal,” while those (66.7%) in Texas used social networks in “A moderate amount.” For social media, only 40 percent of Texas participants used Facebook and other like sources, while those in NYC were evenly distributed among choices at 25 percent for each. Similarly, one-third participants in both regions used the Internet/websites in “a moderate amount.” Newspapers were not a frequent source of weather-related information for participants in either region.

Table 3. Comparison of Participants' of Sources Used Most Frequently for General Weather-related News

Sources	Regional Location	Count / %				
		A great deal	**A lot**	**A moderate amount**	**A little**	**Not at all**
The Weather Channel (TV)	Texas	14	3	3	1	0
		66.7%	14.3%	14.3%	4.8%	0%
	New York	11	8	1	2	0
		50.0%	36.4%	4.5%	9.1%	0%
Newspaper	Texas	0	0	0	0	0
		0%	0%	0%	0%	0%
	New York	1	0	0	0	0
		100%	0%	0%	0%	0%
Radio	Texas	1	1	3	3	2
		10%	10%	30%	30%	20%
	New York	3	2	3	3	0
		27.3%	18.2%	27.3%	27.3%	0%
Local news (TV)	Texas	7	3	2	0	0
		58.3%	25%	16.7%	0%	0%
	New York	9	4	2	2	0
		52.9%	23.5%	11.8%	11.8%	0%
Social Network	Texas	1	1	4	0	0
		16.7%	16.7%	66.7%	0%	0%
	New York	3	0	2	0	0
		60%	0%	40%	0%	0%
Social Media	Texas	1	1	2	1	0
		20%	20%	40%	20%	0%
	New York	1	1	1	1	0
		25%	25%	25%	25%	0%
Internet/ Website	Texas	1	1	2	2	0
		16.7%	16.7%	33.3%	33.3%	0%
	New York	1	1	2	1	1
		16.7%	16.7%	33.3%	16.7%	16.7%
*Percentages and totals are based on responses for each item.						

5.3 Comparison of Participants' Sources for Hurricane-related News

Data in Table 3 reports how participants received specific information about hurricane-related news. Percentages are based on the number of participants answering each question. Again, participants' percentages did not differ markedly between the regions. The highest counts in each region were for The Weather Channel (76% Texas, 64% NYC) and Local News (62% Texas and 58% NYC).

Lower counts were observed in each region for Internet/websites, social networks, radio, and social media, in that order. In addition to this, percentages were lowest for both locations for newspapers.

Table 4. Comparison of Participants' Sources Used for Hurricane-related News

Sources for Hurricane-related News	Regional Location Count / % within population		
	Texas	New York	Total
Radio	4	6	10
	14%	18%	16%
The Weather Channel (TV)	22	21	43
	76%	64%	69%
Newspapers	0	2	2
	0%	6%	3%
Social Networks	4	3	7
	14%	9%	11%
Social Media	2	3	5
	7%	9%	8%
Internet/ Websites	7	3	10
	24%	9%	16%
Local news (TV)	18	19	37
	62%	58%	60%
Total	29	33	62
	100%	100%	100%

5.4 Comparison of Participants' Sources Used Most Frequently for Hurricane-related News

Table 4 reports how these sources of information were used for hurricane related news. Percentages are based on the number of participants answering each item. Over one-third (36.4%) of participants in Texas indicated that they used the Weather Channel, "A great deal," and another third (31.8%) said that they used this source, "A lot." This compared to a higher usage in NYC where well-over half (57.9%) of NYC participants used The Weather Channel, "A great deal" and almost one-fourth (23.8%) relied on this source, "A lot." One third of participants (33.3%) in Texas used local news, "A great deal," and half (50%) used it "A lot." Over half (52.6%) of New York City participants used local news, "A great deal," and 42.1 percent used this source "A lot" for hurricane-related news. Few participants in both locations indicated that they used social networks, newspapers and radio for receiving hurricane-related news. Participants in Texas had slightly greater frequencies for using the Internet/websites (28.6%, "A lot"); however, 42.9 percent reported using this source, "Very little."

Table 5. Comparison of Participants' of Sources Used Most Frequently for Hurricane-related News

Sources	Regional Location	Count/ %				
		A great deal	**A lot**	**A moderate amount**	**A little**	**Not at all**
The Weather Channel (TV)	Texas	8	7	5	2	0
		36.4%	31.8%	22.7%	9.1%	0%
	New York	11	5	3	1	1
		52.4%	23.8%	14.3%	5%	5%
Newspaper	Texas	0	0	0	0	0
		0%	0%	0%	0%	0%
	New York	1	0%	1	0	0
		50%	0%	50%	0%	0%
Radio	Texas	0	2	2	0	0
		0%	50%	50%	0%	0%
	New York	4	2	0	0	0
		66.7%	33.3%	0%	0%	0%
Local news (TV)	Texas	6	9	2	1	0
		33.3%	50%	11%	5.6%	0%
	New York	10	8	1	0%	0
		52.6%	42.1%	5.3%	0%	0%
Social Network	Texas	2	1	0	0	1
		50%	25%	0%	0%	25%
	New York	1	2	0	0	0
		33.3%	66.7%	0%	0%	0%
Social Media	Texas	1	1	0	0	0
		50%	50%	0%	0%	0%
	New York	2	0	2	0	0
		50%	0%	50%	0%	0%
Internet/ Website	Texas	1	2	1	3	0
		14.3%	28.6%	14.3%	42.9%	0%
	New York	1	0	0	2	0
		50%	0%	0%	40%	0%
*Percentages and totals are based on responses for each item.						

5.5 Comparing Direct and Indirect Experience with Past Hurricane Occurrence of Participants Between Regions

This section compares direct and indirect experiences of participants in Texas and New York. When asked if they had ever experienced the effects of a hurricane, almost two-thirds (65.5%) of participants from Texas responded "yes" while less than half, (45.5% of participants from NYC responded "yes" (Figure 1). Direct experience would include damage to one's home, or property, and/or injury to one's self, and/or injury/death to a loved one, relative or friend.

Figure 2 illustrates participants' responses when asked if they knew anyone that was affected by a hurricane. Forty percent of those in both regions indicated "yes," where indirect experience included knowing others who were less related, who received damage, injuries, and/or deaths. Indirect experience would also include "hearsay" news of others' experiences with an occurrence.

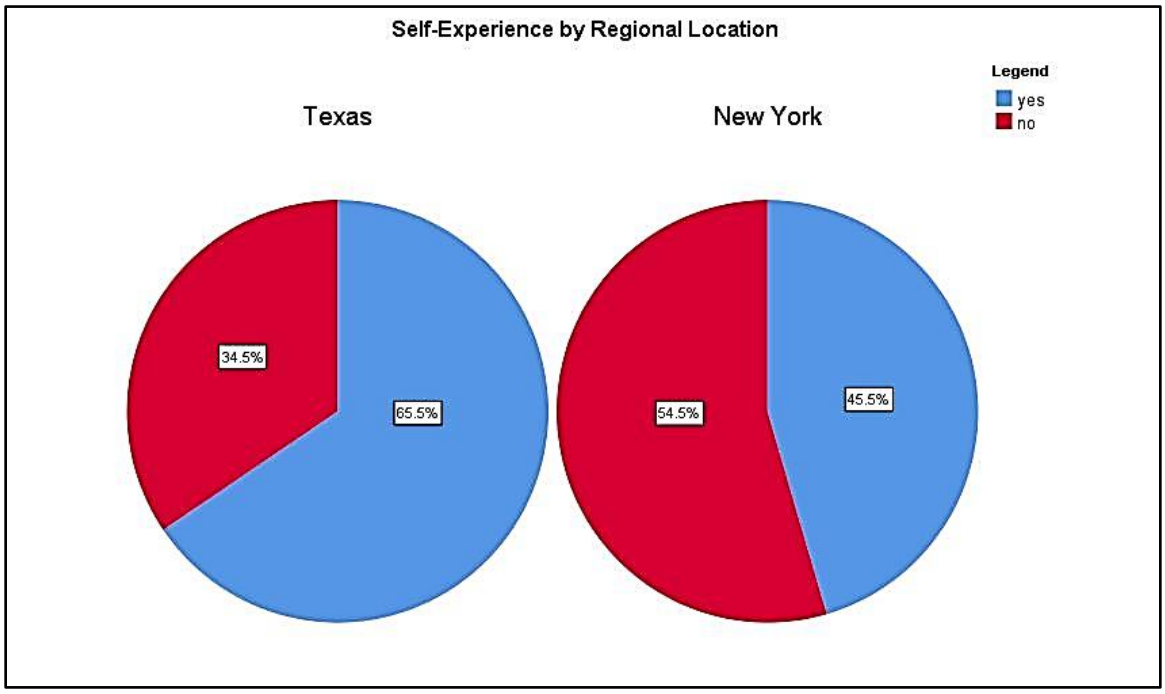

Figure 1. Comparison of Participants Who Experienced Direct Effects from a Hurricane

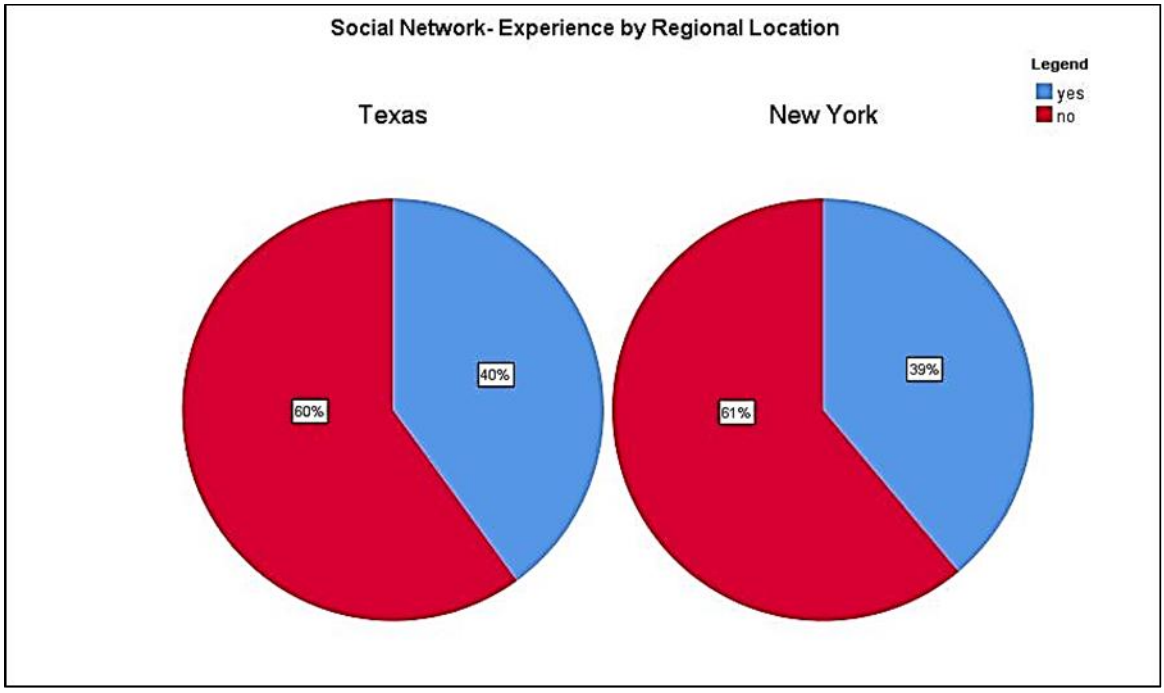

Figure 2. Comparison of Participants Who Experienced Indirect Effects from a Hurricane.

5.6 Frequency of Direct Experience

For participants that responded "yes" to: "I have experienced the effects of a hurricane," Figure 3 illustrates the frequency of these experiences. Only five percent of participants living in Texas experienced, "A great deal," and, "A lot." About one-third of Texas participants (32%) replied that they experienced a hurricane in a "Moderate amount" (32%) and over half (53%) said "A little." In comparison, almost one-third (27%) of those in NYC said that they had "A lot" of direct experience. Interestingly, over half of participants in both regions, 53 percent in Texas and 60 percent in NYC indicated that they experienced a hurricane only "A little.

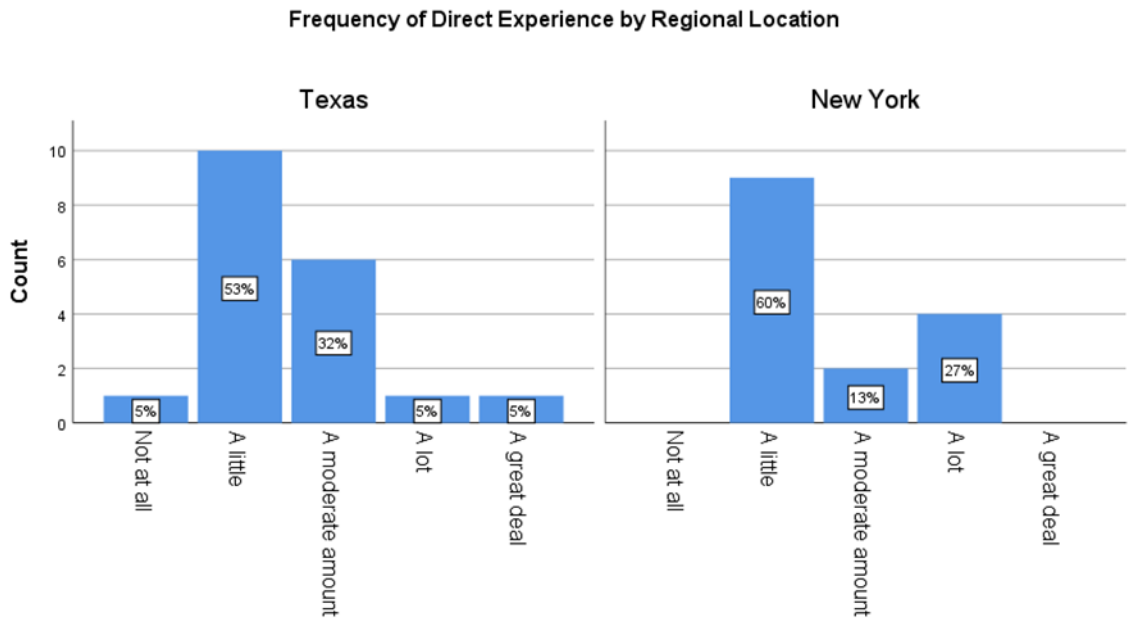

Figure 3. Comparison of Frequency of Direct Experience from a Hurricane

5.7 Perception of Future Risk: Comparing Participants' Responses between Texas and New York

This section compares dialysis patients' perceptions of future direct risks as well as the likelihood of experiencing future hurricane damage to their neighborhoods, dialysis centers and to themselves. Table 5 reports that 9 percent of participants from New York City believed that they were, "Extremely likely" to experience the effects from a future hurricane, while only 3 percent of those from Texas believed the same. On the other hand, almost half, (48%) of the participants living in Texas indicated that they believed that it was, "Somewhat unlikely" that they would experience the effects of a future hurricane, which was comparable to 39 percent of participants living in New York City. Table 6 reports patients' perceptions of the likelihood that their neighborhoods would receive damage by a hurricane in the future. Only 30 percent of participants living in New York believed that their neighborhood was "Extremely likely" to experience a

hurricane in the future compared to 14 percent of those living in Texas. Furthermore, only 41 percent of participants in Texas believed that their neighborhood was, "Somewhat unlikely" to experience future damage while 24 percent of New York participants responded the same.

Table 6. Comparing Participants' Perceptions of Risk for Experiencing a Future Hurricane

Perceptions of (Direct) Future Experience		**Regional Location**		**Total**
		Texas	**New York**	
Extremely likely	Count	1	3	4
	% within population	3%	9%	6%
Somewhat likely	Count	11	14	25
	% within population	38%	42%	40%
Somewhat unlikely	Count	14	13	27
	% within population	48%	39%	44%
Extremely unlikely	Count	3	3	6
	% within population	10%	9%	10%
Total	Count	29/100%	33/100%	62/100%
Percentages and totals are based on respondents.				

Table 7. Comparison of Participants' Perceptions that Neighborhoods Will Experience a Future Hurricane

Neighborhood (Indirect) Experience		Regional Location		Total
		Texas	New York	
Extremely likely	Count	4	10	14
	% within population	14%	30%	23%
Somewhat likely	Count	10	12	22
	% within population	34%	36%	35%
Somewhat unlikely	Count	12	8	20
	% within population	41%	24%	32%
Extremely unlikely	Count	3	3	6
	% within population	10%	9%	10%
Total	Count/% within population	29/100%	33/100%	62/100%
Percentages and totals are based on respondents.				

Table 7 gives the percentages and counts for participants believing that their dialysis centers would be affected by a future hurricane. The two regions were comparable and almost evenly divided between believing that it was "Extremely likely" and "Somewhat likely" that their centers would be affected, as well as, believing, conversely, that it was "Somewhat unlikely" and "Extremely likely." Forty-one percent of participants from Texas believed that it was, "Somewhat likely" that their center would experience hurricane damage while only 24 percent of New York City participants responded the same. In addition, 15 percent of participants in New York City believed their dialysis center is "Extremely unlikely" to experience future damage by a hurricane as compared to 14 percent of the Texas participants.

Table 8. Comparing Participants' Perceptions that Dialysis Center Will Experience a Future Hurricane

Self-Future Dialysis Center Experience		Regional Location		Total
		Texas	New York	
Extremely likely	Count	0	6	6
	% within population	0.0%	18%	10%
Somewhat likely	Count	12	8	20
	% within population	41%	24%	32%
Somewhat unlikely	Count	13	14	27
	% within population	45%	42%	44%
Extremely unlikely	Count	4	5	9
	% within population	14%	15%	15%
Total	Count/	29/100%	33/100%	62/100%
Percentages and totals are based on respondents.				

5.8 Hurricane and Self-Preparation: Comparing Participants' Responses from Texas and New York.

This section compares Texas and New York dialysis patients' hurricane preparation checklists. The majority of participants from both regions reported that they stockpiled emergency supplies (86% Texas and 73% New York City) (Figure 4). For those who responded "yes," only 7 percent of the Texas participants stockpiled non-perishable food compared to 8 percent of the participants in New York. The most stockpiled item, with a 9 percent response rate, was water for both locations (Figure 5). Lastly, for patient preparation level 58.6 percent of participants in Texas believed they were "Somewhat prepared" compared to 66.7 percent of the participants in New York City.

In addition, 13.8 percent of the participants in Texas believed that they were "Extremely unprepared" compared to zero percent participants from New York City (Figure 6).

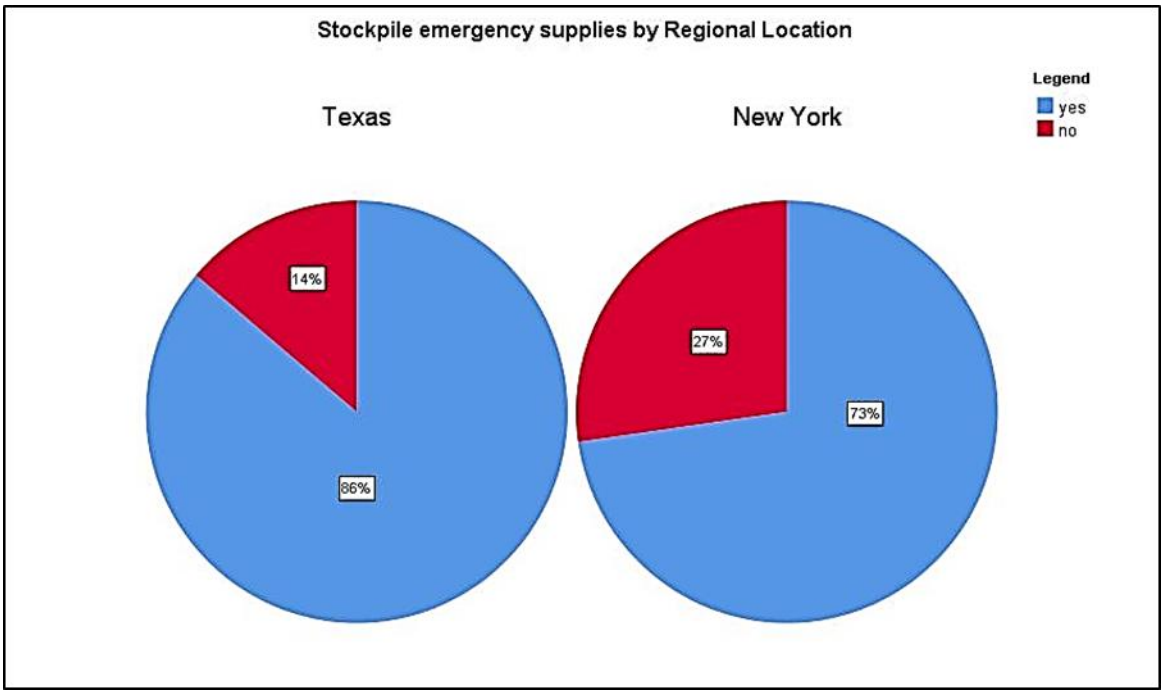

Figure 4. Comparison of Participants Stockpiling Emergency Supplies

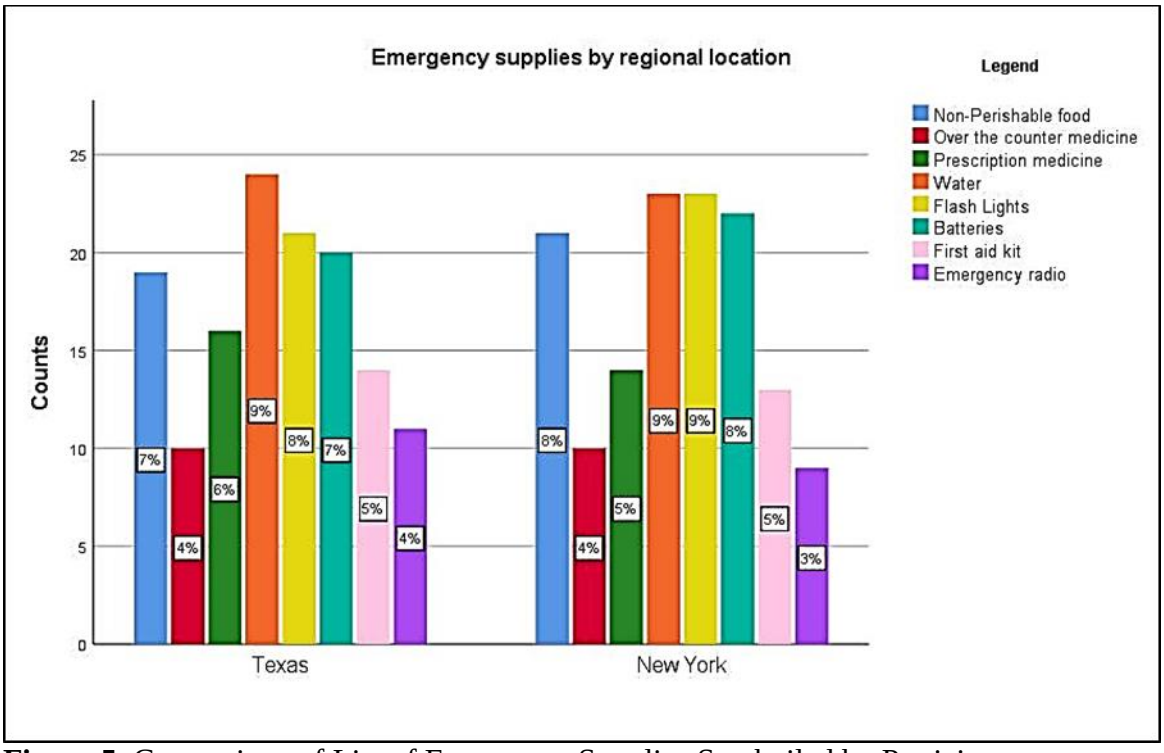

Figure 5. Comparison of List of Emergency Supplies Stockpiled by Participants

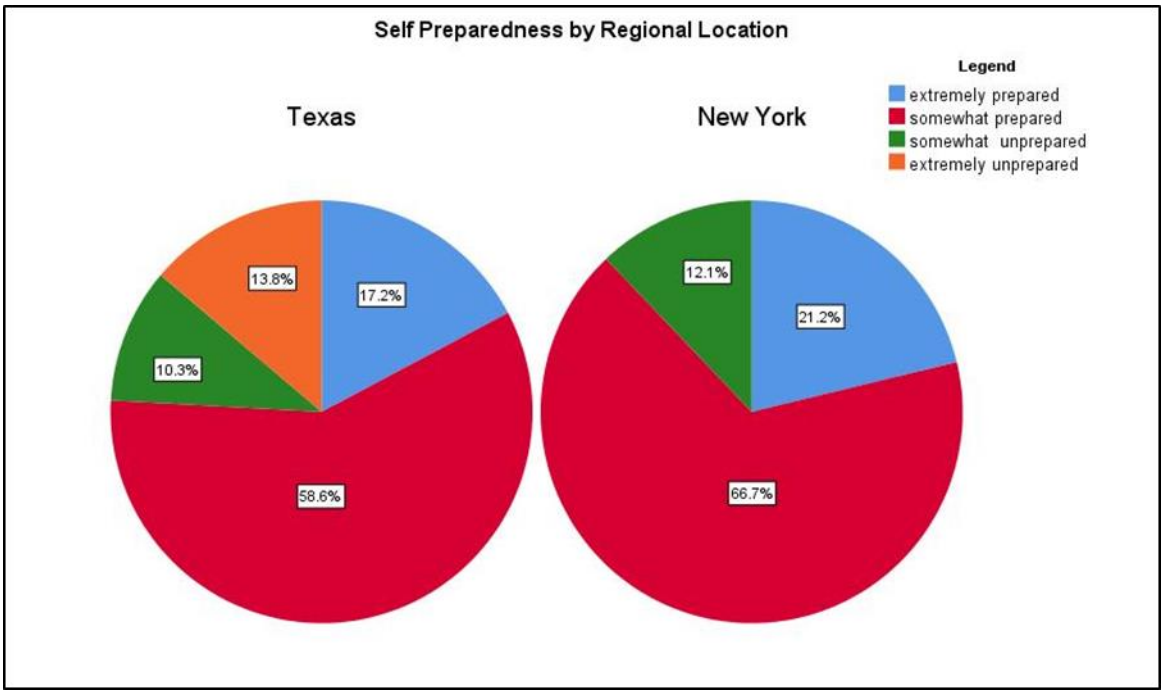

Figure 6. Comparison of Participants' Opinions of Preparedness Level.

5.9 Comparing Participants' Dialysis Specific Information

This section compares dialysis specific information for each location, and includes information about weekly dialysis treatments, a list of medical documentation, and participants' knowledge levels about early dialysis treatment. Almost all (97%) of the participants in New York City and 93 percent of the participants' in Texas received dialysis treatment between 2-3 times a week. Seven percent of the participants in Texas received treatment 4-6 times a week compared to 3 percent of participants in New York City (Figure 7). Figure 8 shows the percentage of participants in both regions having medical documents. Almost three-fourths (72.4%) of patients in Texas selected "yes" for having a list of their medical documentation compared to 87.2 percent of New York City participants.

In Figure 9, Medical dosages and information for doctors had the highest percentage among participants in Texas with a 23 percent selection rate. Only 17 percent of participants in New York City selected medical dosages, but had higher response rates for doctor information (22%) and emergency contacts (26%). Only 17 percent of the Texas participants selected having emergency contacts. Hepatitis B status had the lowest selection rate with only 8 percent from Texas participants and 6 percent from New York City participants (Figure 9).

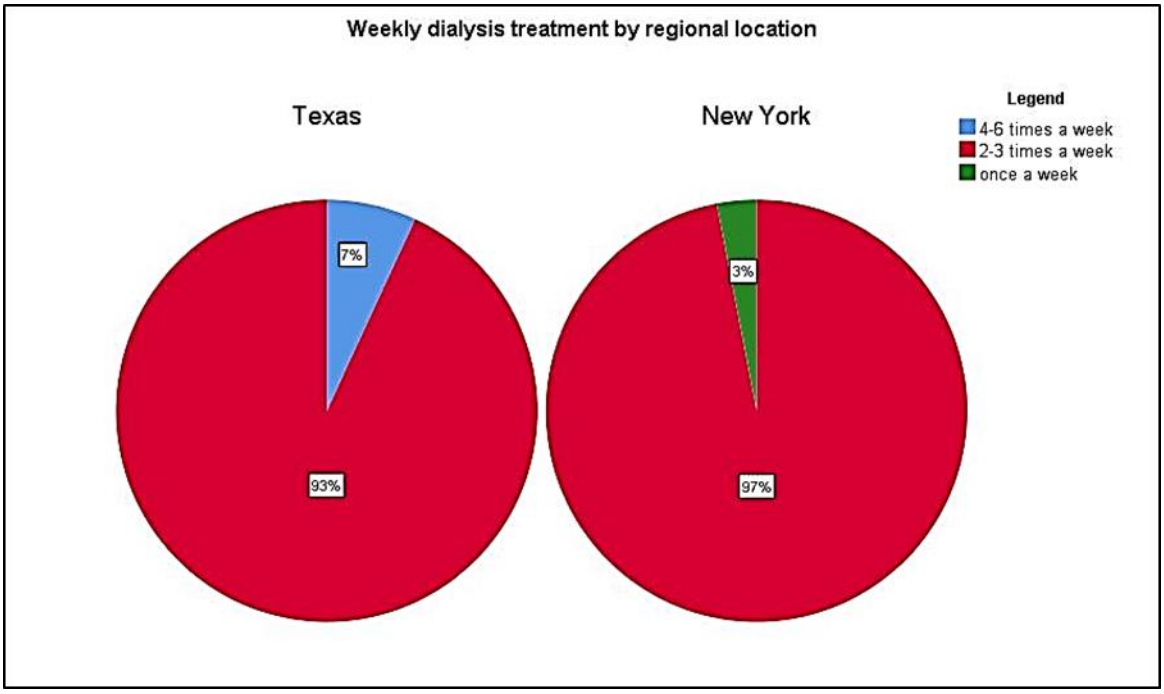

Figure 7. Comparison of Participants' Frequency of Dialysis Treatments

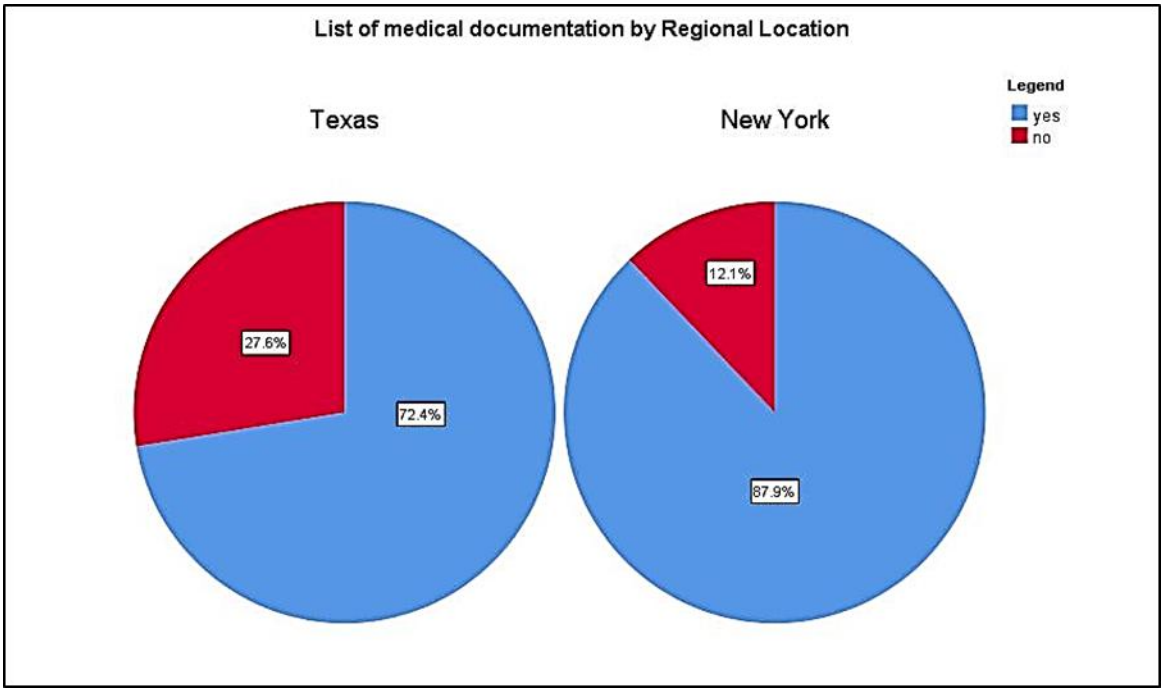

Figure 8. Comparison of Participants Having List of Medical Documents

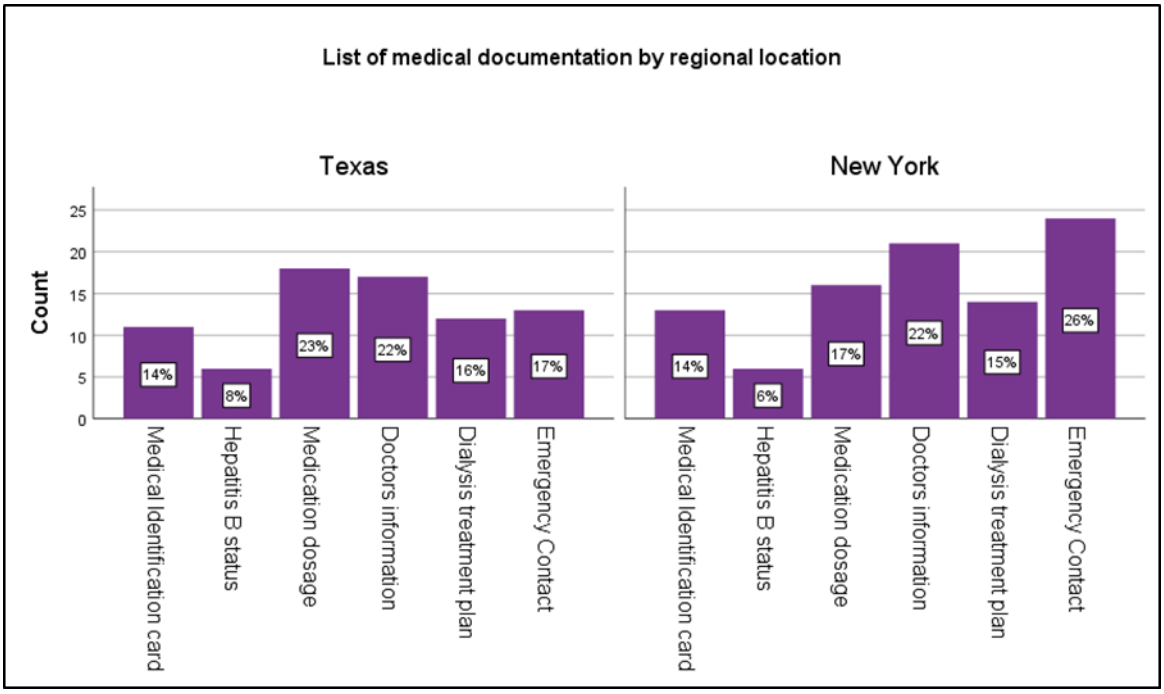

Figure 9. Comparison of Participants' Medical Documentations List

Figure 10 illustrates the percentage of participants who had arranged for a backup or alternative dialysis center. Results showed that the majority of Texas participants (86.2%) indicated that they did not have an alternative dialysis center backup compared to the 63.6 percent of New York City participants. Thus, only 13.8 percent of Texas participants and 36.4 percent of the New York participants selected "yes" for having an alternative dialysis center.

Knowing that early dialysis was available is likely to be crucial for patients when a hurricane is approaching. Figure 11 revealed that almost all Texas participants (82.3%) did not know if early dialysis was available. Only one-third of those from NYC (28.1%) did not know about the availability of early dialysis.

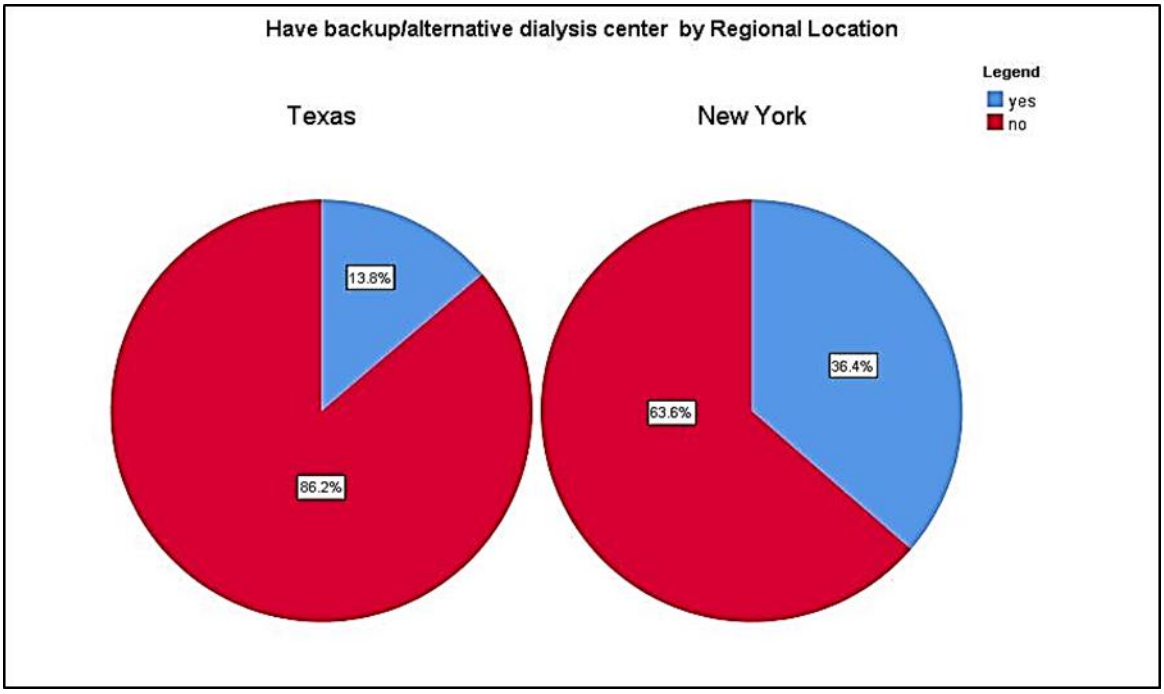

Figure 10. Comparison of Participants Arranging for an Alternative Dialysis Center.

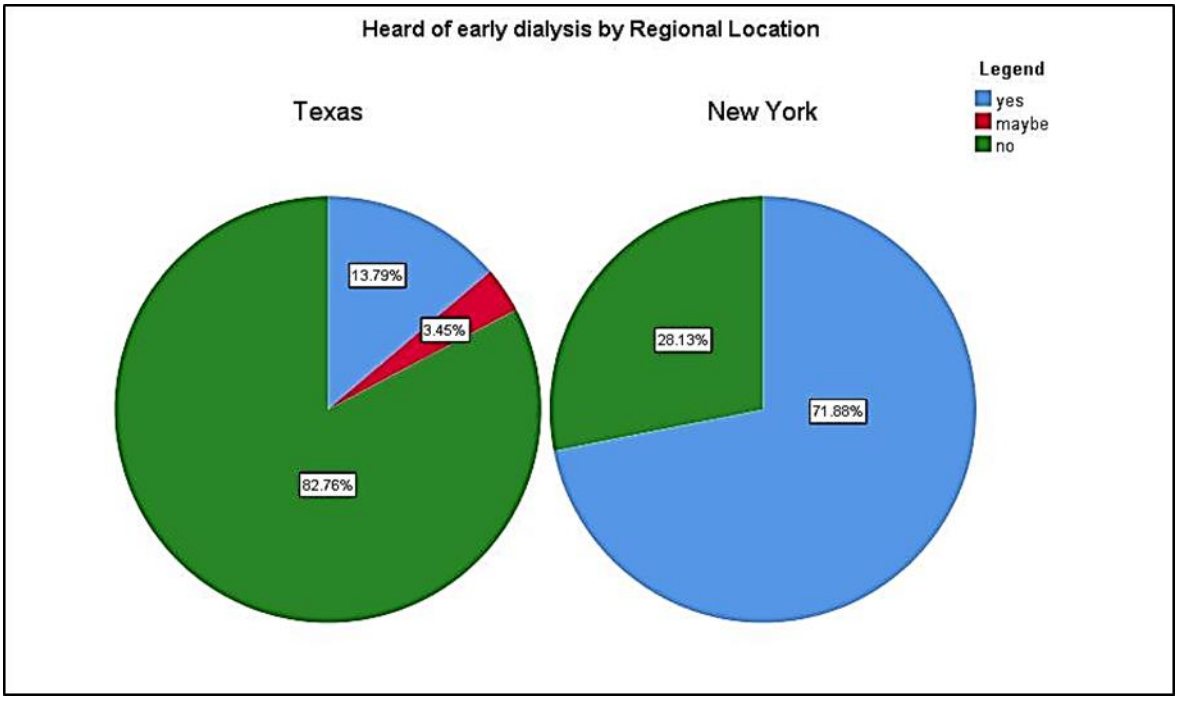

Figure 11. Comparison of Participants Knowing About Early Dialysis.

5.10 Demographic Profile of Participants

This section compares demographic information for participants in each location and includes age, ethnicity and education level. Demographics were comparable between the two regions. The majority of participants were within the age group of 45-54—about 58 percent of this group was from Texas while 42 percent were located in New York City. In addition, 62 percent of participants between the age group of 55-64 were located in New York City (Table 8). None of the participants were between the ages of 18-24. For ethnicity, the majority of participants in Texas were White (58.3%) as compared to 41.6 percent in New York City. Thus, the majority of participants in New York City were Black (60.7%) compared to 39.2 percent in Texas (Table 9).

Table 10 shows that 83.3 percent of participants in New York had less than a high school degree compared to 16.7 percent of the Texas participants; however, 57.1 percent of the New York participants had a 4-year degree as compared to only 42.8 percent for Texas participants. In addition to this, none of the participants had a degree higher than a 4-year degree.

Table 9. Comparison of Participants' Age Groups

Regional Location	**Age Groups (Years)**							
	25-34	**35-44**	**45-54**	**55-64**	**65-74**	**75-84**	**85+**	**Total**
Texas Count	2	3	11	5	6	1	1	29
%	67%	43%	58%	38%	43%	25%	50%	47%
New York Count	1	4	8	8	8	3	1	33
%	33%	57%	42%	62%	57%	75%	50%	53%
Total Count	3	7	19	13	14	4	2	62
100%%	100%	100%	100%	100%	100%	100%	100%	100%

Table 10. Comparison of Participants' Ethnicity

	Ethnicity						
Regional Location	**White**	**Black or African American**	**Native Am. Indian or Alaskan**	**Asian**	**Native Am. Hawaiian or Pacific Islander**	**Other**	**Total**
Texas Count	14	11	0	0	1	3	29
%	58.33%	39.29%	0%	0%	50%	37.5%	46.77%
New York Count	10	17	0	0	1	5	33
%	41.67%	60.71%	0%	0%	50%	62.5%	53.23%
Total Count	24	28	0	0	2	8	62
%	100%	100%	100%	100%	100%	100%	100%

Table 11. Comparison of Participants' Education Level

Regional Location	**< High School**	**High School Graduate**	**Some College**	**2-year Degree**	**4-year Degree**	**Total**
Texas Count	1	7	9	6	6	29
%	16.67%	43.75%	52.94%	66.67%	42.86%	46.77 %
New York Count	5	9	8	3	8	33
%	83.33%	56.25%	47.06%	33.33%	57.14%	53.23 %
Total Count	6	16	17	9	14	62
%	100%	100%	100%	100%	100%	100%

6. COMPARATIVE STATISTICAL ANALYSES OF PARTICIPANT RESPONSES BETWEEN REGIONS

6.1 Introduction

This chapter provides a comparative statistical analysis of participants' responses related to: sources relied on for weather- and hurricane-related information, frequency of sources used, direct and indirect experience with a past hurricane occurrence, perceptions of personal risk towards future hurricanes and preparation both generally and for dialysis specific activities between the two regions, Texas and New York. The aim of this chapter was to determine which of the above measures were statistically significant, or not, in differentiating participants' responses between the two regions.

6.2 Between Regions Comparison of Participants' of Sources Used Most Frequently for General Weather-related and Hurricane-related News

Participants in both regions were asked to indicate their main communication sources for general weather-related and hurricane-related news. Because the two groups were relatively small and non-normally distributed, the non-parametric Mann-Whitney U-Test on two independent samples was employed to compare the two groups on the above-mentioned dependent variables.

The Mann-Whitney U-Test was chosen because it is a non-parametric test, and mirrors the parametric t-test; however, in contrast to the t-test, it does not compare group means. Instead, it uses ranked values to loosely compare the medians two independent samples. Thus, it is relatively insensitive to outliers, and it can be applied in cases with heavy tail distributions (Statistics Solutions 2017). Further, because the Mann-Whitney U-Test is a non-parametric test, it does not make strict assumptions about the distributions of variables in the analysis. Therefore, it was seen as the most appropriate

test for comparing groups because the dependent variable(s) was/were not normally distributed were on ordinal scales (Statistics Solutions 2017).

The test statistics were computed using the Statistical Package for the Social Sciences (SPSS). Of note, the SPSS software refers to the Mann-Whitney U-Test as the Mann–Whitney–Wilcoxon (MWW), Wilcoxon rank-sum test, Wilcoxon–Mann–Whitney test, or Wilcoxon two-sample test, and, therefore, a Wilcoxon statistic was included in the summary tables (Statistics Solutions 2017).

6.3 Interpretation of the Mann-Whitney U-Test

If the computed p-value of a given test was lower than the adopted significance level of alpha=0.05, the null hypothesis Ho of that test was rejected in favor of the alternative hypothesis, H_a.

The hypothesis tests for the between region comparison of participants' use of general weather/hurricane-related weather news were as follows.

H_o: The distributions of the two participant groups in the two regions for general weather/hurricane-related weather news will be equal.

H_a: The medians in the two participant groups in the two regions will not be equal for sources for general weather/hurricane-related weather news.

6.4 Results for Between Regions Comparison of Participants' Sources used for General Weather-related News

A Mann-Whitney U-Test was performed for each source that participants in both locations relied on for general weather-related news and were: Radio, Newspapers, The Weather Channel, Social Networks, Social Media, Internet/Websites, and Local News. Results from each the tests comparing the two regions indicated that there was no

statistically significant difference in any of the communication sources used. For example, the following statistics were: radio (U= 473, p=.925), local news (U=430, p=.429) and newspapers (U=464, p=.349) (Table 11).

6.5 Results for Between Regions Comparison of Participants' Sources used for Hurricane-related News

Participants relied on each of the same sources for obtaining specific hurricane-weather information, as well. Each source was tested using a Mann-Whitney U-Test. Results indicated that none of the communication sources used for hurricane-related information were statistically significant between participants in the regions. For example, statistics were: radio (U= 457, p=.9.642), local news (U=457, p=.721) and newspapers (U=449, p=.181) (Table 11).

Table 12. Between Regions Comparison of Participants' Use of Sources for General Weather-related and Hurricane-related News

Variable	Median		Mann-Whitney U	Wilcoxon W	Z-value	Asymp. Sig. 2-Tailed
General Weather News	**Texas**	**New York**				
Radio	8	8	473.000	908.000	-.095	.925
The Weather Ch.	1	1	451.000	886.000	-.486	.627
Newspapers	8	8	464.000	1025.000	-.937	.349
Social Networks	8	8	452.000	887.000	-.565	.572
Social Media	8	8	454.000	889.000	-.566	.571
Local News	8	1	430.000	991.000	-.792	.429
Internet/Web	8	8	466.500	901.500	-.247	.805
Hurricane Weather News						
Radio	8	8	457.500	1018.500	-.465	.642
The Weather Ch.	1	1	420.000	855.000	-1.033	.301
Newspapers	8	8	449.500	1010.500	-1.337	.181
Social Networks	8	8	456.000	891.000	-.579	.563
Social Media	8	8	468.000	1029.000	-.314	.753
Local News	1	1	457.000	892.000	-.357	.721
Internet/Web.	8	8	406.500	841.500	-1.594	.111

6.6 Between Regions Comparison of Participants' Direct and Indirect Experience with a Past Hurricane

Participants in both regions were asked to respond, "yes" or "no," about their direct/indirect experience with a past hurricane occurrence (property damage, animal/pet loss, missed worked, displaces, etc.). Because the variable was dichotomous, a Chi-Square Test of Independence was performed to assess the association between the two groups on the following hypotheses.

H_o: That participants' direct/indirect experience was independent between regions.

H_a: That participants' direct/indirect experience was not independent between regions.

6.7 Results for the Chi-square Test of Independence: Between Regions Comparison of Participants' Direct and Indirect Experience with a Past Hurricane

Results from the Chi-square test on Table 12 indicated that there was no statistically significant difference between participants between regions on direct experience: X2 (1) =.397, p=.529), and indirect experience (X2 (1) =1.69, p=.194) (Table 12). Since the p- value was higher than the significance level of 0.05 for comparing groups (regions) on direct experience, we failed to reject the null hypothesis. Thus, participants' experiences were not independent of the region.

Table 13. Between Regions Comparison of Participants having Direct and Indirect Experience with a Past Hurricane Occurrence

Variable	Texas		New York		Chi-square X^2	d.f.	Asymp. Sig. 2-Tailed
Direct Experience	**Yes**	**No**	**Yes**	**No**	.397[a]	1	.529
	19	10	15	18			
Indirect Experience	4	6	7	11	1.690[b]	1	.194
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 31.5.							
b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 14.5.							

6.8 Between Regions Comparison of Participants' Perceptions of Risk for Experiencing Future Hurricane Occurrences

The Mann-Whitney U-Test was performed to assess whether there was a statistically significance difference between participants in each region on the following measures.

- Participants' likelihood that they will experience the effects of a hurricane in the future (Q20).
- Participants' likelihood that their neighborhood will be damaged by a major hurricane in the future.
- Participants' likelihood that their dialysis center will be damaged by a major hurricane in the future.

6.9 Results for Comparison of Participants between Regions on Future Hurricane Experience

Results on Table 13 indicated that these variables were not statistically significant in differentiating participants' perceptions that they, or their neighborhoods, or their dialysis center would experience major damage from a future hurricane occurrence--regions for example test statistics were: self-experience (U= 422, p=.388), neighborhood experience (U=370.5, p=.110) and dialysis experience (U=442, p=.583 (Table 13).

Table 14. Between Regions Comparisons for Participants' Perceptions of Experiencing a Future Hurricane Occurrence

Variable	Median		Mann-Whitney U	Wilcoxon W	Z-value	Asymp. Sig. 2-Tailed
	Texas	New York				
Likelihood that participant will experience a future hurricane	3	2	422.000	983.000	-.864	.388
Likelihood that participants' neighborhoods will be damaged in a major hurricane in the future	3	2	370.500	931.500	-1.598	.110
Likelihood that participants' dialysis centers will be damaged in a major hurricane in the future	3	3	442.000	1003.000	-.549	.583

6.10 Between regions Comparisons on Preparing for a Hurricane: Stockpiling Emergency Supplies

Participants in both regions were asked to respond, "yes" or "no," whether they had stockpiled emergency supplies in the event of a hurricane. Because the variable was dichotomous, a Chi-Square Test of Independence was performed to assess the association between the two groups on the following hypotheses.

H_o: That participants' stockpiling emergency supplies is independent between regions.

H_a: That participants' stockpiling emergency supplies is not independent between

regions.

6.11 Results of Between Regions Comparison of Participants for Stockpiling Emergency Supplies

Results indicated that there was a statistically significant difference between participants on stockpiling emergency supplies x2 (1) =19.44, p= <0.01), (Table 14). Since the p- value was less than the significance level of 0.05, the null hypothesis was rejected.

Table 15. Between Regions Comparison of Participants' Stockpiling Emergency Supplies

Variable	Texas		New York		Chi-square X^2	d.f.	Asymp. Sig. 2-Tailed
Stockpiling Emergency Supplies	**Yes**	**No**	**Yes**	**No**	19.44[a]	1	.000
	25	4	24	9			
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 31.5							

6.12 Between Regions Comparison of Participants Having a List of Medical Documentation

Participants in both regions were asked to respond, "yes" or "no," whether they had a list of medical documentation in the event of a hurricane. Because the variable was dichotomous, a Chi-Square Test of Independence was performed to assess the association between the two groups on the following hypotheses.

H_o: That participants' list of medical documentation was independent between regions.

H_a: That participants' list of medical documentation was not independent between regions.

6.13 Results for Between Regions Comparison of participants Having a List of Medical Documentation

Results indicate that there was statistically significant difference between participants for having a list of medical documentation x2 (1) =24.1, p= <0.01), (Table 15). Since the p-value was less than the significance level of 0.05, the null hypothesis was rejected.

Table 16. Between Regions Comparison of Participants Having a List of Medical Documentation

Variable	Texas		New York		Chi-square X^2	d.f.	Asymp. Sig. 2-Tailed
List of Medical Documentation	**Yes**	**No**	**Yes**	**No**	24.143[a]	1	.000
	21	8	29	4			
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 31.5.							

6.14 Between Regions Comparison of Participants Knowing about Early Dialysis

Participants in both regions were asked to respond, “yes,” “no,” or “maybe” whether they knew of the availability of early dialysis in preparing for an imminent hurricane occurrence. Because the variable had three choices, a Chi-Square Test of Independence was performed to assess the association between the two groups on the following hypotheses.

H_o: That participants’ knowledge of early dialysis was independent between regions.

H_a: That participants’ knowledge of early dialysis was not independent between regions.

6.15 Results for Between Regions Comparison of Participants' Knowledge of Early Dialysis

Results indicated that there was statistically significant difference between participants for having a list of medical documentation x2 (2) =28.4, p= <0.01), (Table 16). Since the p-value was less than the significance level of 0.05, the null hypothesis was rejected.

Table 17. Between Regions Comparison of Participants Knowing about Early Dialysis

Variable	**Texas**			**New York**			**Chi-square X^2**	**d.f.**	**Asymp. Sig. 2-Tailed**
Knowledge of Early Dialysis	**Yes**	**Maybe**	**No**	**Yes**	**Maybe**	**No**	28.459[a]	2	.000
	4	1	24	23	0	9			
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 20.3.									

7. CONCLUSION

By conducting this research, I conclude that, there is a relationship between knowledge of early dialysis, regional location and visits to Emergency Departments (ED) during a major hurricane as stated in Finne and colleagues research. In this research, data showed that 23 of the 33 participants in New York indicated "yes" for having knowledge of early dialysis, while only 4 of the 29 participants in Texas selected that same option. This finding is in agreement with Finne and colleagues' research in which they concluded that "early dialysis ahead of Hurricane Sandy's landfall decreased the likelihood of ED visits, hospitalizations, and the 30-day mortality for dialysis patients in the areas most affected" (509). Due to this, I conclude that an increased in knowledge of early dialysis is likely to lead to a number of decreased ED visits during a major hurricane; this is illustrated in this research where participants in New York had a higher count of having knowledge about early dialysis than participants living in Texas.

In addition to this, descriptive statistics and inferential tests did reveal that there were significant differences between participants in the two regions for: 1) carrying a list of medical documentation, 2) stockpiling emergency supplies, and 3) having knowledge about early dialysis. Percentages and statistical tests revealed that participants in New York City rated higher on all three variables. This behavior was also observed in Brice and researchers (2011), where their results concluded that, "out of 311 participants for dialysis-specific preparedness, 244 (80 percent) participants had insurance information and a listing of their medications accessible in case of forced evacuation while 128 (42 percent) had sufficient medical records at home to provide a dialysis center with treatment information" (2480).

Furthermore, this behavior might also be associated with dialysis centers educating their patients more on emergency preparation. For example, dialysis centers in NYC might be better at educating patients on how to disconnect from their dialysis machine in case of an emergency, the type of food they should stockpile, and how to arrange alternative dialysis treatment days.

When discussing factors that might affect communications sources, I conclude that regional location was not a significant factor. Therefore, there was no statistically significant difference between dialysis participants in the two regions on sources used to obtain general weather-related or hurricane-related information. This result supports Griffin and colleagues finding (2007) in which they concluded that, "very few participants learned of the evacuation order from a phone call, as this accounted for only 11.5 percent of the African American participants, 10.9 percent of the Caucasian evacuees, and 15.3 percent of the other nonwhite" (548). Furthermore, the two groups did not differ in frequency of usage for both types of weather information/news. In this research, the largest count and percentage increase for sources used, and for frequency, for both weather and hurricane news was The Weather Channel and the Local News while the second most used source was the radio. One of the main reasons why the radio was the second most used source was because most dialysis patients have sight issues. The connection between Griffin and colleagues (2007) research and this research was that they both demonstrated the importance of social networks. Griffin and colleagues (2007) research offered the notion that interpersonal information may be a more critical source of information to minority victims. This did not hold in my research where I found that social networks and social media were relied upon only moderately for weather-related

and hurricane-related news; however, I conclude that this occurred because participants indicated that they lived alone which most likely resulted in their usage of these sources as “A great deal” or “A lot.”

Given that there were no statistically significant differences in participants’ direct and indirect experiences with a hurricane, I also conclude that there might be some personal relationship that participants had with living in their regions even though there was no statistically significant difference between the two groups on many of the variables. Region, and one’s relationship to place, might be a factor to examine in future research. In addition, there was no statistically significant difference between participants in each region when a comparison was performed on perceptions of individual risk from future hurricane occurrence. Again, sense of place might be an important factor for future researchers to consider.

Overall, responses from participants in both regions demonstrated that dialysis patients are more likely to be prepared for a major hurricane most likely due to the wide availability of broadcast news on all geographic scales—national, regional, state and local. Further, medical professionals have increased communication efforts for dialysis specific preparedness education in both states. Demographics were also comparable in both regions, especially on age and education. Demographics showed that there was little difference in the profiles of participants in the two regions. It was beyond the scope of this research to perform correlation analyses within and between groups on demographics. This would be encouraged for future research.

Lastly, another consideration for future disaster research, is to examine the amount of time it takes dialysis patients to travel from their homes to dialysis centers, as

well as their alternative dialysis centers, by comparing travel time with different transportation options. This is vital to future research in emergency management because we might be able to implement policies that address certain transportation options which must be made available for these particular patients.

Also, future researchers might consider examining the protocols that dialysis centers use for educating their patients on dialysis specific preparedness measures to make sure that instructions are understood by non-English speaking groups of patients. It is important for future researchers and dialysis centers to focus on the need and importance of creating education communication programs for dialysis patients. Implementing clear and understandable guidelines and instructions will save lives of patients who must have this life saving treatment, and live in regions where natural disasters, such as hurricanes, are expected to occur on a more frequent basis.

APPENDIX SECTION

Appendix A: IRB Approval Letter

TEXAS STATE UNIVERSITY
SAN MARCOS
The rising STAR of Texas

In future correspondence please refer to 2017464

February 24, 2017

Shadae Dixon
Texas State University
601 University Drive.
San Marcos, TX 78666

Dear Ms. Dixon:

Your IRB application 2017464 titled "Dialysis patients' perception of risk from the hurricane hazard and preparedness survey." was reviewed and approved by the Texas State University IRB. It has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects' welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is not required as participation will imply consent; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

This project is therefore approved at the Exempt Review Level

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Research Integrity and Compliance. Please report any changes to this approved protocol to this office.

Sincerely,

Monica Gonzales

Monica Gonzales
IRB Regulatory Manager
Office of Research Integrity and Compliance

Appendix B: Cover Letter and Survey Instrument

Dialysis patients' perception of risk from the hurricane hazard and preparedness survey

Ms. Shadae Dixon, a graduate student at Texas State University, is conducting a research study to examine dialysis patients' levels of perception of risk and preparedness towards a possible major hurricane occurrence in the future. You are being asked to complete this survey because you are a dialysis patient.

Your input would be helpful and valuable. Your participation is voluntary. The survey will take approximately 15 minutes or less to complete. You must be at least 18 years old to take this survey.

We ask that you try to answer all questions; however, if there are any items that make feel you uncomfortable or that you would prefer to skip, please leave the answer blank. Your responses are confidential and anonymous.

If you have any questions or concerns, feel free to contact Ms. Dixon or her faculty supervisor, Dr. Denise Blanchard:

Shadae Dixon, Masters Student
Geography
347-942-0836
s_d196@txstate.edu

Dr. Denise Blanchard, Professor
Geography
1-512-245-2170
rb06 @txstate.edu

Pertinent questions or concerns about the research, research participants' rights, and/or research-related injuries to participants should be directed to Texas State University's IRB's chair, Dr. Jon Lasser 512-245-3413 – (lasser@txstate.edu) or to Monica Gonzales, IRB Regulatory Manager 512-245-2334 - (meg201@txstate.edu).

Do you agree to participant in this survey?

- ❍ Yes
- ❍ No

What are your main sources for weather related news? (Check all that apply)

- ❑ Radio (AM FM, Satellite, etc.)
- ❑ Television (The Weather Channel.)
- ❑ Newspapers
- ❑ Social Networks (family, friends and co-workers
- ❑ Social Media (Facebook, Twitter, etc.)
- ❑ Internet/ Websites (The Weather Channel, AccuWeather, National Weather Service, Weather Underground etc.)
- ❑ Television (Local news)

How frequently do you receive weather-related news from TELEVISION?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from NEWSPAPERS?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from SOCIAL NETWORKS?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from SOCIAL MEDIA?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from INTERNET/WEBSITES (other than social media)?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from RADIO?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive weather-related news from TELEVISION (Local news)?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

When it comes to hurricane related news, what are your main sources of information? (Check all that apply)

- ❑ Radio (AM, FM, Satellite, etc.)
- ❑ Television (The Weather Channel.)
- ❑ Newspapers
- ❑ Social Networks (family, friends and co-workers
- ❑ Social Media (Facebook, Twitter, etc.)
- ❑ Internet/ Websites (The Weather Channel, AccuWeather, National Weather Service, Weather Underground etc.)
- ❑ Television (Local news)

How frequently do you receive hurricane-related news from TELEVISION?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from TELEVISION (Local News)?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from NEWSPAPERS?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from SOCIAL NETWORKS?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from SOCIAL MEDIA?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from INTERNET/WEBSITES (other than social media)?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How frequently do you receive hurricane-related news from RADIO?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

Have you ever experienced the effects of a hurricane (property damage, animal/pet loss, missed work, displaced etc.)?

- ❍ Yes
- ❍ No

Do you know anybody that was affected by a hurricane (property damage, animal/ pet loss, missed work, displaced etc.)?

- ❍ Yes
- ❍ No

How frequently do you get affected by a hurricane?

- ❍ A great deal
- ❍ A lot
- ❍ A moderate amount
- ❍ A little
- ❍ Not at all

How likely do you think you will experience the effects of a hurricane in the future? (Category 3 or greater) (Property damage, animal/ pet loss, missed work, displaced etc.?)

- ❍ Extremely likely
- ❍ Somewhat likely
- ❍ Somewhat unlikely
- ❍ Extremely unlikely

How likely do you think your neighborhood will be damaged by a major hurricane in the future? (Category 3 or greater) (Property damage, animal/ pet loss, missed work, displaced etc.?)

- ❍ Extremely likely
- ❍ Somewhat likely
- ❍ Somewhat unlikely
- ❍ Extremely unlikely

How likely do you think your dialysis center/ hospital will be damaged by a major hurricane? (Category 3 or greater)

- ❍ Extremely likely
- ❍ Somewhat likely
- ❍ Somewhat unlikely
- ❍ Extremely unlikely

When you learn about a hurricane that might affect your area, do you stockpile emergency supplies?

- ❍ Yes
- ❍ No

What items do you stockpile? Check all that applies

- ❑ Non-perishable Food
- ❑ Over the counter Medicine
- ❑ Prescription Medicine
- ❑ Water
- ❑ Flash Lights
- ❑ Batteries
- ❑ First Aid Kit
- ❑ Emergency Radio

How prepared do you feel you are for a major hurricane? (Category 3 or greater)

- ❍ Extremely prepared
- ❍ Somewhat prepared
- ❍ Somewhat unprepared
- ❍ Extremely unprepared

How many days a week do you receive dialysis treatment?

- ❍ 4-6 times a week
- ❍ 2-3 times a week
- ❍ Once a week

In case of an emergency, do you have a list of your medical documentation?

- ❍ Yes
- ❍ No

What medical documentations do you have? Check all that apply

- ❑ Medical identification card
- ❑ Hepatitis B Status
- ❑ Medication dosage
- ❑ Doctors Information
- ❑ Dialysis treatment plan
- ❑ Emergency Contact

Have you arranged for a backup/alternative dialysis center or hospital in case your usual center or hospital is damage during a major hurricane? (Category 3 or greater)

- ❍ Yes
- ❍ No

Have you heard about early dialysis?

- ❍ Yes
- ❍ Maybe
- ❍ No

Gender

- ❍ Male
- ❍ Female

Regional Location

- ❍ Texas
- ❍ New York

City/ Zip Code?

Age

- ❍ 18 - 24
- ❍ 25 - 34
- ❍ 35 - 44
- ❍ 45 - 54
- ❍ 55 - 64
- ❍ 65 - 74
- ❍ 75 - 84
- ❍ 85 or older

Ethnicity

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Pacific Islander
- ❍ Other

Education Level

- ❍ Less than high school
- ❍ High school graduate
- ❍ Some college
- ❍ 2-year degree
- ❍ 4-year degree
- ❍ Professional degree
- ❍ Doctorate

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