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Factors of Preparedness for Flooding in Shoreline Communities: A Case Study of Ocean Gate

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FACTORS OF PREPAREDNESS FOR FLOODING IN SHORELINE COMMUNITIES: A CASE STUDY OF OCEAN GATE

By

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Dedication

I would like to dedicate this to my parents, Jen and Roy Voss Jr., my grandparents Gail and Roy Voss Sr; Ruth and George Goldhacker, my sister Amy Voss and the rest of my friends and family, who without their support and guidance, this thesis would not have been possible.

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Abstract

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Factors are often described as one that actively contributes to the production of a result. With communities more at risk of severe flooding due to factors such as climate change in the near future, it is vital to community preparedness and their resilience that we understand those factors that make a community resilient or vulnerable. This study seeks to identify the salient factors that contribute to community and individual preparedness for flooding events. The study examines the shoreline community Ocean Gate in New Jersey to identify common factors that either facilitate or do not facilitate preparedness. This study found that there was no evidence to support that the factors of age, sex, gender, and prior experiences had any statistically significant impact on individuals' preparedness in Ocean Gate. Although this may be attributed due to community togetherness and a similar demographic population.

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Chapter 1

Introduction

Communities severely impacted by disasters often rely on the mutual aid of outside communities and organizations to help recover. This is one role of The Federal Emergency Management Agency (FEMA), which receives $25.89 billion dollars in funding to assist American cities and communities prepare, mitigate, respond, and recover from disasters (National Low Income Housing Coalition, 2022). FEMA began during the presidency of Jimmy Carter, as part of his "A Nation Prepared" vision (FEMA, n.d). This vision helped communities become better prepared for disasters as well as increase preparedness for federal response all across America.

While impactful in helping millions of people recover from disasters and helping many communities more resilient, FEMA and other governments have seen their fair share of failures. These failures were most commonly seen in the past few decades, such as with the failure to communicate and properly assess data, which led to the Twin Towers terror attack on 9/11 in New York City, as well as the slow and minimal response from federal agencies that plagued Louisiana and New Orleans in the aftermath of Hurricane Katrina in 2004. Additionally, several failures by local, county, and state agencies to keep their communities safe, such as the Flint, Michigan or Jackson, Mississippi water crises that occurred (Sifner & Edwards, 2022). Some of these communities are still impacted by the failure of government agencies to effectively respond to disasters. These failures lead to an erosion of trust between communities and the government when it comes time to help prepare or recover from a disaster. This mistrust plays a major role in the future of risk management and preparedness for flood,

as pointed out by authors Muñoz-Duque, Restrepo-Ochoa, and Fleury-Bahi (2021) in their study.

> On the other hand, trust in institutions emerged in this study as a relevant category. The first factor to be identified is the government's responsibility in its role as protector of citizens; a conception of the government that is essential for evaluating the coastal flooding risk and, overall, in managing problems related to climate change. However, according to the participants, this aspect contrasts with a perception of ineptitude, voluntary negligence and even corruption of government action. In this sense, it is perceived as a sort of "abandonment" of their fundamental mission of protection. (Muñoz-Duque, Restrepo-Ochoa, and Fleury-Bahi, 2021)

Trust, along with many other factors, play a role in how prepared communities are for flooding events, and thus need to be further studied in order to help fix gaps of preparedness for disasters that exist in shoreline communities.

Statement of the Problem

Factors that influence preparedness in shoreline communities will become more and more critical in the next few decades. As outlined by Ayyub & Kearney (2007), sea levels can be expected to rise about 19.6 feet and affect over 100 million people by the end of this century due to factors such as global warming. This will require many governments and communities across the globe to work together and create advanced planning and mitigation strategies in order to reduce the social and economic impacts of rising sea levels such as coastal flooding and severe population resettlement. This creation of advanced planning and mitigation strategies needs to be built on a strong

foundation of community strength and trust between all stakeholders in the process. As stated by a study by Choi and Wehde (2020), trust plays a large role in the preparedness and resilience in communities that are affected by disasters. For example, a failure to respond in time and institutional failures as seen in the Jackson, Mississippi water crisis start to occur (Sidner & Edwards, 2022), one would expect government institutions to emerge. And this continued distrust leads to more and more communities refusing government help, leaving them more vulnerable to and unprepared for flooding events, causing mass casualty and damage.

Lack of preparedness in these communities is also a problem that many will face in the coming years as extreme weather and flooding in coastal communities becomes more common. While the number of those who intend to prepare within the year or so has risen significantly since FEMA's last National Household Survey (NHS), up to 49% of the population has not made any sort of preparedness in case of an emergency (FEMA, 2020). With large parts of the population being unprepared or unable to take the necessary actions to protect themselves and their property, disasters loom and place extra strain on resources that may already be strained or not there at all. Making sure governments and institutions like FEMA and DHS can effectively communicate with a community on what steps to take to prepare and help mitigate the fallout for these communities without it falling on deaf ears is a major concern that needs to be addressed.

Significance of the Study

Studying key factors such as age, race, gender, and prior experiences can help build more resilient communities in flood prone areas. The importance of these factors is outlined in several social scientific literature, such as the studies conducted by Choi and

Wedhe (2020), Paton (2007), and Johnson, Russell, and Lavin (2011), showing which factors can make a community more resilient and better prepared. While this study specifically deals with shoreline communities and what factors play a role in their preparedness, this study may also apply to many other coastal communities. While each community faces different risks and disasters, they may have the same issues that other shoreline communities do. Making it critical to understand if there are patterns or similarities in the factors of communities.

This study assesses which factors that play a role in community preparedness, as well as see which factors have a greater impact on a community compared to others. It would also give data on which demographic groups inside these communities are the most unprepared for flooding events and allow for more targeted policy to help these individuals, such as age, sex, gender, or ethnicity. Studying such factors can assist governments, specifically in coastal areas, make more targeted policy and mitigation decisions and allow community voices to be heard. Allowing for a public discussion to take place and allow for these communities to become more prepared for future storms, from the local level all the way to the federal level of preparedness.

This study also allows emergency planners and government agencies at the county, state, and federal level to see which factors are most important in the Ocean Gate, New Jersey community's preparedness, specifically as it relates to flooding. This study includes a multitude of factors such as age, gender, and income to understand how well they compare when it comes to an individual's preparedness. Gender and gender experience were specifically found by FEMA's Household Preparedness Survey, to highlight members of the LGBTQIA+ to be more likely less prepared than those who did

not identify with LGBTQIA+ (FEMA, 2022). When understanding the role of gender when compared to others, allows decision makers to compare and contrast different types of factors to see which have the most impact. Understanding the factors and how they impact how people experience disasters and recovery will allow for more resources to go to areas where much help is needed.

While research such as Kerstholt, Duijnhoven, & Paton (2017) and Dziale et. al. (2019) does exist on many factors such as age, gender and sex of flooding preparedness and how communities fare; these studies are limited on the specific area this study plans to study, with various studies either involving other disasters that are not flooding and studies taken place in various areas outside of Ocean Gate, NJ. The context of the Lieberman-Cribbin (2017) study is important to the context of this study, however it does not explore how it affects preparedness, and only looks at the increase of mental illness of those affected by flooding.

Purpose of Study

This study examines Ocean Gate, New Jersey and compares levels of preparedness and see if there is a correlation between a variety of Ocean Gate, New Jersey residents that either makes a community more or less prepared for flooding events. The objective is to find the most significant factors that affect one's preparedness, positively or negatively.

To this end, the following hypotheses are as follows,

Hypothesis 1:

There will be no statistical difference between residents' perceptions regarding government indifference and being "left behind"

Hypothesis 2:

There will be a significant difference in the level of disaster flooding preparedness among racial groups in coastal communities.

Hypothesis 3:

Levels of preparedness will be higher in those in younger age groups than those in older age groups.

Hypothesis 4:

There will be a significant difference in the level of disaster flooding preparedness among genders in coastal communities.

Hypothesis 5:

There will be a significant difference in the level of experience with flooding severity among members of the LGBTQAI+ community than non-LGBTQAI+ community members in coastal communities.

Chapter 2

Literature Review

The chapter will analyze recent studies and theories regarding age, sex, gender, prior experiences and other factors affecting their personal preparedness, specifically to flooding in coastline communities. In essence, factors will be examined with illustrative examples of demographics or trust in one's government to see how they play a role within an individual's level of preparedness. While the studies will be applied to flooding preparedness in New Jersey, not all studies reviewed will be located within New Jersey or involve flooding preparedness. The context of these studies will be applied to the current study to make connections or explain future findings. The review will introduce concepts and terms for this research, and then build upon these terms by connecting them to related literature and findings.

Perceived Risk & Education

An important concept of understanding preparedness for flooding is the perception of risk. Perceived risk is an extremely hard term to define, as one person's definition of risk is completely different than someone else's definition. In general, risk perception is defined as how a person understands the complexity of an environment and in order to make an assessment and thus take the best course of action to protect themselves (Lemée et al., 2018). Each individual, even in high prone flood areas, will view the risk of flooding differently. One person in a community could, for a variety of factors, be extremely scared of flooding events and take every necessary precaution in order to protect themselves and their property from flooding. While their next door

neighbor finds there to be no risk of flooding whatsoever, and plans to ride out the event and takes little precaution in protecting themselves.

Lemée (2018) found four psychological keys that affect one's perception of risk, being the fear, knowledge and exposure to risk. With the fourth key being a community's collective risk. These keys were determined by a study of the French coastline communities as performed by Lemée (2018) and found all four keys to have significant impact on individuals on how they perceive risk. These keys were found to be the main drivers of risk perception, in which each of the keys have their own separate factors such as prior experiences and a variety of mental health factors.

Risk perception becomes an issue when the residents of communities feel they are safe from flooding events and less perceive flooding as less of a risk. This perception is lessened due to a variety of factors such as increase in flood mitigation projects such as levees and dams, as well as a lack of floods in the area (Chang et al. ,2022). This lessened perception of risk led communities to take less preparedness measures and had reduced flood awareness as their outlook was more optimistic and had less reason to fail (Chang et al., 2022). This lack of perception and increased reliance on engineering projects creates less prepared communities and leaves a large population at risk. As shown with Hurricane Katrina, the failure of such levee and dam projects can create more damage than the hurricane itself. As such, preparedness measures need to be taken even in communities where the perceived risk is low in order to create resilient communities and prevent the loss of life and property.

An individual and communities' perception of risk can also be affected by the amount of education that they have received. If one does not understand the severity of a

possible event, then they are less likely to take the appropriate measures to protect themselves and may end up causing harm to oneselves. This issue with education and pre-landfall preparedness was also seen in the US following Hurricane Sandy and Katrina. Authors Lumbroso et. al (2017) found several studies conducted by FEMA (2013), Gladwin and Morrow (2006), Baker et. al (2021), and the CDC (2012) found several issues that lead to deaths due to those who did not understand pre warning systems.

> In the USA, researchers found that many people are "under-concerned" about the risk posed by coastal surges and that their evacuation intent are often overstated (FEMA, 2013). A post-Katrina behavioral survey found that most of the respondents in Alabama, Mississippi and Louisiana could not interpret a National Weather Service storm surge forecast correctly (Gladwin and Morrow, 2006). A survey completed just before Sandy indicated that people expected the primary hazard to be wind (Baker et al., 2012). However, most of the 67 deaths caused directly by Hurricane Sandy in the USA were due to drowning, primarily when the storm came ashore (CDC, 2012). (Lumbroso et. al., 2017, p.1369)

If one is not properly able to assess the knowledge given to them by government officials and other agencies in the wake of a storm. Then it is safe to assume that they lack the education needed to properly prepare if they do not understand how potentially dangerous a flood can get, causing unnecessary harm.

This problem will also be existent into the near and far future, as many individuals fail to understand the impacts that climate change will affect, especially with sea level rise and more flooding. Perez and Egan (2016, p.903) mention that communities

are very much concerned about the sea-level rise and global warming affecting their community, they know very little about the specifics of sea level rise or how soon they may face the impacts of severe flooding. Making sure individuals can properly understand the risks with storms and make good informed decisions will greatly impact preparedness and create more resilient communities.

Flood Mitigation

While flood mitigation projects can create a false sense of security and less prepared communities. It will be vital to many communities that flood prevention tactics are in place, as climate change will continue to create more violent storms and flooding events, especially in shoreline communities (Ayyub & Kearney, 2007). These tactics include a variety of projects, such as advanced drainage systems, levees, and employing natural flood prevention systems like mangroves (Lourenço et al., 2020). Many of the tactics and proposals discussed by Lourenço (2020) allow communities to become more resilient communities while also limiting urban sprawl and keeping flooding events to minimums, allowing for communities to be resilient while also sustainable and built to the needs of the land and surrounding area. Unlike many cities in the US, where cities are often built without regard for its natural environment and surroundings, which creates more issues.

Another way to prevent damages and mitigate flooding events centers on community education regarding actions to take before a flooding event occurs. If communities are able to effectively assess the risk of flooding and take necessary action such as evacuations and other preventative measures, communities will be able to recover much faster, and thus receive fewer negative impacts and be able to prepare even better

for the next event. Pandey (2019) discusses this in her article in regards to community engagement in Nepal. Nepal is an extremely disaster-prone country, facing a variety of disasters such as floods, land & mudslides, droughts, and a variety of other disasters (Pandey, 2019). As Nepal is a poorly developed country, Pandey had this to say about the implementation of community driven preparedness:

> The government and newly enacted governance mechanisms need to clearly articulate the pathways to address this gap by providing members of communities various disaster-related drills, and training and establishing a small local disaster risk reduction and management army of dedicated volunteers in each of the communities of Nepal – nationwide – irrespective of their geographical locations. Such initiatives are crucial for disseminating disaster-related information and engaging community members in preparedness and mitigation plans, and holding a standby local emergency team to respond against multiple hazards and disasters in the immediate aftermath of their occurrence. (Pandrey, 2019, para. 29)

This makes the creation of community preparedness events as well as knowledge of risk an important tool for communities in order to mitigate flood damages and stay prepared for future flooding events.

Early flood warning systems also play an important role in preparing communities for future flooding events. Early warning allows an opportunity for individuals to gather their belongings and evacuate from areas where flooding is immediate, is a great way to save lives and promotes the use of go-bags and other last-minute preparations. Additionally, Girons (2017) found that early warning systems play a small but integral

role in individual preparedness and can maintain communities' preparedness levels to high while minimizing damage to property and lives.

But with warning systems comes an inherent trust in the government and its system to operate as planned with any issues. And should issues arise, it may erode public trust and make it harder for governments to implement other systems. Girons highlighted this trap in his study, "Trust is especially relevant when false alarms and missed events occur, undermining the confidence of the public in the warnings issued and therefore decreasing the likelihood that adequate precautionary actions will be taken" (Girons et al., 2017, para. 34). This makes warning systems a double-edged sword, where successful implementation can save lives and increase preparedness in communities while also at risk of reducing trust and therefore less preparedness if it were to fail or be misused.

This over reliance of flooding mitigation can cause real problems and was seen in Dutch communities. According to Kerstholt et. al (2017, para. 37), the found a surprising bias that occurs in certain communities:

> The problem of encouraging household and personal flood preparedness could be compounded by the fact that citizens may be over-reliant on structural flood defenses. Not only are these structural measures, such as dikes, highly visible, but Dutch people also have been consistently told by the government that they are quite safe in their country due to these measures. A combination of the presence of prominent structural measures and being consistently told of the effectiveness of these measures could, via the action of the risk compensation bias, reduce people's perceived need for personal preparedness. This bias arises because

> people make judgments about their risk based on their perception of how safe the environment appears to be. The visibility of structural mitigations and civic risk management agencies consistently reminding people of their existence and their ability to offer protection (which people may overestimate) can result in people seeing their environment as safe and as negating any need for them to prepare.

This is an interesting find because many of the same risks that are found in New Jersey with flooding events can also be explained by the finds of this study. With many people living in extremely flood prone areas and feeling a false sense of security and safety with flood prevention techniques.

Trust in Government

One's perception of trust in government has been found in many studies to have an effect on how an individual fares in a disaster. In a study conducted by Choi and Wehde (2020), they found that individuals that have more trust in FEMA and local emergency management authorities are more likely to better prepare. It also outlines the importance for emergency management authorities and government agencies to manage their reputation and the importance of good communication to communities. Choi and Wehde's results were also replicated by Zhang (Zhang et al., 2022), the study looked at how trust affects an individual's disaster preparedness in the aftermath of two major earthquakes. The study found that a high trust factor in government correlated with a better perception of disaster preparedness (Zhang et al., 2022). The same result was found in two completely separate cultures dealing with separate disasters. With earthquakes in the mountainous regions in China and tornadoes in the midwestern states with Choi and Wehde’s study.

Another study conducted by Repetto, Cordón, and Bronfman (2022), looks at how one's political ideology affects preparedness for earthquakes and tsunamis. This research found that political ideology does have direct and indirect effects in one's preparedness. With those who identify as right wing or pro-market on the political scale having a higher level of preparedness than those who self-identified as left wing (Repetto, Cordón, and Bronfman (2022). Another interesting find of the study was that those who were pro-state and had greater trust in government authorities also held more responsibility in the government. Placing a greater responsibility on the government in times of disaster and being less prepared in the event of a disaster happening (Repetto Cordón, and Bronfman (2022).

This over reliance on government agencies was seen in the aftermath of Hurricane Sandy, between many of the government officials/agencies and the residents living there. In the book, *Taking Chances: The Coast after Hurricane Sandy,* authors Koning and Redlawsk (2016) found that many residents were not receiving the aid or help they needed in order to rebuild. They found that in a survey, in the year after Hurricane Sandy had made landfall, half of those who had requested aid had been denied and also felt extremely confused and felt that the government had not been clear about how to receive and/or apply for aid, (Koning and Redlawsk, 2016, p.82). This left many to feel abandoned by the state's recovery efforts and put them on shaky ground with much of the government. These feelings were even further exacerbated when it came to rebuilding.

> The shore looms large in New Jersey culture, and many felt its destruction viscerally. Yet, by February 2013, 62 percent of state residents were cautious about rebuilding at the shore, believing that assessments of the potential for

> future damage should be made before doing so. This was in stark contrast to the public push by political and business leaders to move forward with recovery efforts as quickly as possible in order to promote summer tourism. Residents also favored implementing strong precautionary measures to combat future natural disasters, particularly in flood zones. (Koning and Redlawsk, 2016, p.82).

This displays a very large issue when it comes to government trust, as many of the objectives and goals of political leaders were different than those who lived there. And if governments and businesses display different interests in the recovery process, then communities will be less than willing to listen to them in preparedness efforts as well as future recovery efforts.

Trust Within Communities

Another key concept to understanding how trust affects preparedness would be to examine other works on how trust in community affects preparedness before an event. In a study done to determine the effectiveness of preparedness of urban flooding in China, Lo et al. (2015) examined the effect of social capital on these communities. As described by Lo et al., (2015) social capital is the engagement and process of interconnected social networks that yield a large amount of resources and benefits to a community. In theory, persons with more social capital, such as having a larger network of individuals to ask for help/aid would be able to gain better resources and help in order to prepare for floods better than those individuals who have less social capital. They observed that social capital was pivotal in community preparedness and resilience for flooding events but observed some negative side effects of heavy reliance of social capital (Lo et al., 2015). It

found that those who solely rely on social capital and others for preparedness may become lax in their preparedness efforts and leave themselves vulnerable. As well as found relying on resources that may never come if they were not able to secure resources themselves. (Lo et al., 2015).

While social capital can be used to great effect to prepare for flooding events, it is not a resource that everyone has readily available. In a study conducted by Bott, Pritchard, and Braun (2020) it was found that poorer and minority communities, specifically those found in the global south. Have much less social capital than richer communities and as such much rely on local social capital and cannot have access to greater resources. So poorer communities are rebuilt on short term recovery, and thus lack innovation and resources to make long term decisions and preparedness goals which makes them more vulnerable (Bott, Pritchard, and Braun, 2020). This lack of innovation and resources was seen greatly in the aftermath of Hurricane Sandy and the Jersey Shore. As reported by FEMA (2013), most of those who registered for assistance from FEMA in the aftermath of Hurricane Sandy were those renting and with low income. This means they did not have access to the resources that many of the homeowners on the shore needed and thus were unable to recover without more federal assistance.

Community trust can also provide a sense of calm and bring better community awareness and cohesion prior to flooding events. In certain Indonesian communities that have conductive and supportive environments are more likely to have more social cohesion and as such have better risk perception than communities where there is little trust or not a sense of the whole community (Maulana, Gumelar, and Irianda, 2021). This better risk perception allows communities to make better decisions when it comes to

preparing individuals for flooding events, as well as make decisions that best protect the entire community. This sentiment was also reported by Koning and Redlawsk (2016) in the aftermath of Hurricane Sandy, where many had felt one of the positives of the storms was the way communities came together to help each other and the outpour of support to the most affected communities.

Communities and social capital can also have a major impact on the amount of mental stress/disorder that can be found in the aftermath of a flooding event compared to before an event. In the aftermath of the earthquake and subsequent tsunami that had affected Japan in 2011, it was found that communities that had high community social cohesion had had less levels of PTSD compared to other communities that had lower levels of community cohesion (Hikichi et al., 2016). This will be extremely important in the later discussion of mental health in the study, where the idea that those with mental issues from prior experiences and other circumstances are less likely to be prepared compared to those without mental illness or disorders.

Prior Experiences

A determinant of preparedness also stems from the prior experiences that individuals have of flooding events. Having experience with coastal flooding events as well as living in areas prone to flooding are more likely to have individuals that are more knowledgeable about the risks that occur with flooding, as well as be familiar with the warning systems and adopting protective measures and behaviors before an event (Coulston & Deeny, 2012). This is in contrast to communities who are not familiar with flooding events and live in less flood prone areas. Where they are more likely to be

unfamiliar with flooding risk and preparedness behaviors. While also ignoring or not being familiar with warning signs and systems that are put in place.

The mental health of those who have experienced severe flooding events also plays a large role in the ability of individuals and communities to prepare for flooding. In a world where mental health is finally starting to be understood and taken seriously, it is important to see the impact that these mental health illnesses have on people in the aftermath of a flooding event, as well as how it impacts them as they prepare for the next flooding event. A study following Hurricane Sandy found an increase in Anxiety, Depression, and Posttraumatic Stress Disorder (PTSD) in those affected, regardless of the severity of the flood they experienced. It was found that most people who had been affected had shown an increase in the amount of symptoms listed in the survey (Liebermen-Cribben et al., 2017). These increases in Anxiety, Depression, and PTSD were shown in a significant number of respondents across socioeconomic classes and had some impact in individuals in the aftermath of Hurricane Sandy and their likeness to prepare for floods, whether they be more inclined or not at all (Liebermen-Cribben et al., 2017).

These mental health issues found in the aftermath of Sandy were common in disaster prone communities, and were having negative effects in the lives of respondents. Many reported heightened anxiety or stress in the aftermath of a disaster and were found to display feelings of hopelessness (common sign of depression) and would avoid thoughts and behaviors related to future disasters, especially relating to preparedness measures (common sign of PTSD) (James et al., 2020). These behaviors and thoughts were also found in numerous cultures from around the globe, with the Indian population

facing increased anxiety and reduced preparedness for flooding and droughts (Mishra and Suar, 2012) Moreover, death from Israel also suggests reduced preparedness for conflict (Bodas et al., 2017). While all these studies deal with different circumstances and disasters from one another. It is important to understand the level of impact that mental disorders could have on preparedness and whether or not it is worth investing time and effort to help people better their minds and prepare.

There is also an economic component that goes into recovery and preparedness for the next flood. Mohor, Hudson and Thieken (2020) discuss the factors that go into flood losses in houses and found that houses that were affected with a larger impact flooding and incurred more losses were likely to last longer than someone with just surface flooding. This would also indicate that lower income households who are largely impacted by a flooding event would likely take even longer than average to recover and may be affected by another flooding event before their housing is repaired or a new location for living is found.

Economic Factors

Much like social capital, economic capital plays a critical role in preparedness for flooding events. As one would expect, those with more financial resources and income are in general more likely to be better prepared for disasters and as such flooding events. As found with flooding events in the Rio Grande Valley, those with higher income reported being much more prepared to evacuate and prepared their homes and family for disaster events (Donner, Lavariega-Montforti, 2018). This is in stark comparison to lower income families, where they are more likely to be unable to afford the necessary supplies, properly built shelter, or insurance.

The ability to purchase flood insurance is a decisive factor in whether or not a household is able to prepare for a flooding event. In 2014, natural hazards caused about $110 billion in losses along with 7700 fatalities worldwide, with the most dangerous of these hazards being flooding (Hudson et al., 2019). With these levels of damage comes a need to have those in areas gain flood insurance to protect their property and access funds needed should an impact occur. This issue arises when policy and insurance agencies discredit those in high-risk flood zones, making insurance in these areas extremely expensive and unaffordable to many in the area. This among other factors is what causes Hudson et al. (2019) to believe that areas are vastly underestimated in their protection investments and makes communities like those in the study severely at risk of flooding in the future.

Economic inequality is present in coastal communities all across the US, especially in the barrier islands of New Jersey such as Seaside Heights. With approximately 40% of individuals in Seaside Heights (Seaside Heights, n.d) being reported as in poverty. In these islands, along with New Jersey's other barrier islands and those in the US, there is a large disparity of low-, middle-, and high-income households present on these islands. This large disparity of income makes response in these areas difficult, as housing could range from multi-family low-income housing to houses people only use by the summer. This then in turns leaves each level of income more vulnerable than the other as pointed out by Zhu, Gopalakrishnan, and Smith (2022) in their research.

> The results are consistent with our hypothesis that low-income households with limited economic resources might not migrate out after natural disasters because of financial constraints. With an increase in income, middle- and high-income

> households, who have greater economic resources, might view migration as the optimal adaptation strategy in natural disaster prone regions and migrate out. However, households at top-1-percentile-income distribution with greater access to resources may invest in high-cost high-return in-place adaptation strategies to decrease the natural disaster effect and not respond to the natural disaster by migrating out. Households with the ability to adapt in place might place a higher value on the economic opportunities and coastal amenities provided and continue to stay in the natural disaster prone regions (Zhu, Gopalakrishnan, and Smith, 2022).

This disparity of income may also cause many race and equality factors, as it tends for those who report low-income and being unable to move also tend to be those who report to be a minority or non-white.

Race and Disaster Equity

As is common for coastal states, New Jersey has a large number of barrier islands that leave them the most vulnerable to flooding and sea level rise than mainland New Jersey would. These barrier islands, such as Seaside Heights, in New Jersey have been very important to the overall culture in New Jersey and have had some effect of nostalgia and joy for a majority of citizens in the area. But because they are largely tourist attractions and rely heavily on people not local to the area, there is an outside force that requires individuals to rebuild to show strength or out of a necessity of income. This local resilience and rebuilding are highlighted by author Mark Hewitt (2016) in his chapter *Boardwalks Reborn*, where he says, “For regions shaped by nostalgia and sustained by repeated waves of investment, rebuilding is rarely questioned. Disasters have often been

treated as events that have been experienced and overcome before, or as rare events, interpretations that downplay coastal risk. Either interpretation encourages promoters to rebuild." (p.173). This causes many coastal and barrier islands to rebuild despite the fact that there are repeated events that cause destruction on these islands. Such as the Ash Wednesday Storm in 1962 that had completely destroyed the barrier island of Seaside Heights, only for it to be rebuilt and further developed only to be devastated again in Hurricane Sandy (Hewitt, 2016, p.173).

An important aspect of flood mitigation is to make sure that there is fair and equal distribution of resources and that no communities are left unprepared for flooding events. This is often described as environmental justice, where steps are taken to ensure poor and minority communities that are exposed to worse conditions due to a variety of issues such as resource extraction and land use are given resources to help combat or fix issues (Chakraborty et al., 2019). While some sort of inequality exists in almost every disaster, it was nowhere near as prevalent than during Hurricane Harvey, where Chakraborty made a compelling find when investigating which communities suffer the most damages:

> Specifically, we found that the Harvey-induced flood extent significantly increased in neighborhoods predominantly comprising Black, Hispanic, and socioeconomically deprived residents. This statistical evidence of distributive injustice associated with flooding in Greater Houston represents an important starting point for more detailed investigation of disproportionate health impacts associated with Hurricane Harvey. Given the well-documented physical and mental health problems associated with flooding,13,14 racial/ethnic minority and socioeconomically disadvantaged individuals residing in highly inundated

> neighborhoods are likely to suffer the additional burden of adverse health outcomes. (Chakraborty, 2019, p.249)

Making sure that every community is fully prepared and able to mitigate flooding events will be vital to the success of many communities around the world. As without proper distribution of resources, we leave many disadvantaged communities to fend for themselves and may cause social issues and that create chaos.

Hurricane Katrina also showed many of the same similarities with poor and minority communities being affected much more disproportionately than non-minority communities. In New Orleans, a large amount of socioeconomic factors between minority communities and white communities created a large disparity in a community's ability to properly prepare and mitigate flooding damage. For example, in the days before Katrina had made landfall, many of those in poorer communities had lived in the lower parts of the city elevation wise, making them much more susceptible to flooding (Henkel, Dovidio, & Gaernter, 2006). Many individuals that live far below sea level had very little access to resources, such as a car or better flood prevention measures, being forced to ride out the storm in very unprepared and flimsy structures. While the majority white communities that lived in higher elevated areas of the cities were able to evacuate as well as have access to flood prevention resources and fared much better than those in the lower elevated areas (Henkel, Dovidio, & Gaernter, 2006).

The disparity between minority and white communities was stressed even further, with a majority of funding sent by government agencies to make improvements to the city of New Orleans were used in white communities. Creating a larger, more segregated community in New Orleans where those trapped in the low-lying areas of the city were

likely unable to afford to move out of the city and trapped in areas where infrastructure was extremely weak at best and left extremely vulnerable (Henkel, Dovidio, & Gaernter, 2006).

This disparity was also seen in the aftermath of Katrina, with New Orleans' Lower Ninth Ward being without power and water for months after the first initial event. It took much longer to restore minority communities following Katrina and created a even larger trust gap among minority communities and the state, local, and federal governments that they already resented, creating communities who are unlikely to listen if another Hurricane Katrina event were to occur in the area again (Henkel, Dovidio, & Gaernter, 2006). This makes race an important factor in preparing communities for flooding. As explained by Henkel (2006), this distrust between government and minority communities inherently exists regardless of prior experiences, as the government has shown repeated ignorance and unfair treatment of minorities. And this makes it extremely difficult to tell certain people and communities to start preparing or listen to education on preparedness techniques. As they may be skeptical of the government's true motive and will be less willing to engage in preparedness techniques and leave themselves vulnerable.

Government involvement, such as the creation and use of the floodplain buyout program, may also include its own basis towards race. This issue of government involvement is discussed by A.R. Sliders (2019), where the author discusses many of the inherit and present biases in her article *Social justice implications of US managed retreat buyout programs.* She found that houses that were mainly targeted were houses that were declared as substantially damaged (Sliders, 2019). The issue with this lies within how

buyout programs declare properties substantially damaged, which is more likely to target lower income and minority communities. Compared to houses that may be equally destroyed but get to stay because the house is worth inherently more, meaning it does not meet the damage criteria (Sliders, 2019). Systemic racism, along with many other issues, causes race and equality to be a large factor when it comes to community preparedness.

Gender & Sexuality

As disasters and flooding events become more and more common, the role of women in preparing for these events is important to build and sustain a resilient community. Not only do men and women have different physical needs, women serve an important role in households and are often neglected in many disaster planning, mitigation, and recovery aspects (Cvetković et al., 2018). Such as with disaster equity, allowing equal representation allows for more perspectives to be seen in regards to resources and policy that may have not been otherwise. Which increases community preparedness and allows for greater resilience to flooding.

Leaving women out of the discussion for preparedness and mitigation makes less resilient communities. Researchers in Serbia found that there was significant factors that impact women in preparedness and recovery and it should not be ignored by others when making disaster preparedness decisions:

> Women generally reported being less confident, but perhaps had more realistic views about being prepared while also reporting more household- and family-level cares, concerns, and preparedness behaviors in selected areas… leading to a state of affairs that lead to less ability to connect with active social networks

> within the community, coupled with being less informed and able to be involved in larger decision-making processes (Cvetković et al., 2018, pg.15).

By its very nature, gender is an essential factor when preparing communities for flood events. Women provide a perspective that men could not have and also require different needs in the aftermath of a flooding event that can be often overlooked. Giving women a seat at the planning table enriches the perspectives and allows communities to engage in the whole community approach to build a more resilient future.

Another interesting concept which is now becoming more discussed and studied would be the role of the LGBTQAI+ community and their preparedness for flooding events. While little is known about the true extent of preparedness, FEMA's household study provided glimpses of a severely underrepresented population. With FEMA themselves addressing the situation they are in as, "Age, financial insecurity, pregnancy, and identification with a historically disadvantaged group—including minorities and the lesbian, gay, bisexual, transgender, queer (LGBTQAI+) community—are all factors that can increase vulnerability." (FEMA,2022). This is along with other factors in the survey that were found, such as past traumas as retaliation for their sexuality as well as fewer social support groups than other people (FEMA, 2022). It is important to find the vulnerabilities that exist in order to help provide the resources they need to prepare.

LGBTQAI+ was also found to be largely absent from media reporting and coverage in areas post disaster. In a study conducted by McKinnon, Gorman-Murray, and Domine-Howe (2017), media coverage rarely highlighted any sort of LGBTQAI+ households or communities; they focused on heterosexual families and couples. This lack of coverage leaves many LGBTQAI+ households without a voice and are often left

without assistance in their specific needs (McKinnon et al., 2017). Whether unintentional or not, leaving LGBTQAI+ communities out of disaster reporting and assistance creates even more marginalized communities and leaves them out of getting the resources they need to become more resilient.

While the United States is much more socially aware and accepting of those in the LGBTQAI+ community, there are still social and political biases that increase their vulnerability to disasters. While other coastal states and coastal communities face biases that affect the preparedness and vulnerability of LGBTQAI+ communities. Such as the large Christian population blaming the gay population of New Orleans for the coming of Hurricane Katrina as a result of the city's increasing LGBTQAI+ population and its city's "sins" (Richards, 2010). These issues were further exacerbated by the cancellation of the Southern Decadence, also known as "Gay Labor Day", a largely LGBTQAI+ parade held to celebrate the end of the summer (Richards, 2010). This, among others such anti-LGBTQAI+ sentiments in the aftermath of disasters, such as the increase of "bathhouses" for the increase of male workers rebuilding New Orleans, greatly increased criticism of the LGBTQAI+ community in the aftermath of Katrina and left many without the resources to either leave the city or rebuild (Richards, 2010). Leaving the LGBTQAI+ to rely on itself for resources while facing criticism and shame from other communities, specifically religious ones, who were extremely present in the rebuilding of New Orleans (Richards, 2010).

Additional, members of the LGBTQAI+ may also be more vulnerable to floods and other disasters. As noted by Dunn (2016) and highlighted by Enarson et. al.(2018) , where gay men in Jamaica were forced into unsafe living conditions near the bank of a

gully, a ravine formed by water, and were ostracized and subjected to violence, stigma, and discrimination at the hands of government officials (Dunn, 2016). This gully often flooded during heavy rains. While maybe not as prevalent in the US, there are still many marginalized communities where members of the LGBTQAI+ may reside in unsafe areas or communities due to outside factors such as lack of resources (Enarson et al., 2018). The often lack of community support, homophobia and substandard living conditions makes the LGBTQAI+ community less likely to receive the resources needed to prepare for flooding and should not be overlooked by scholars, policy makers, and first responders.

Age, Relationship & Family Status

While it is believed to be insignificant in the context of this study, other studies have found a statistically significant relationship between marriage and disaster preparedness. According to Bronfman (2019), the presence of a significant other provides greater concern and willingness to better prepare, along with children and other loved ones. Also, children are more likely to engage in safety measures at school and bring the information home from school, convincing their parents/guardians to participate in preparedness and safety measures (Bronfman, 2019). This readiness support structure is in contrast to individuals who either live by themselves or do not have school age children in the house. Where individuals who live by themselves or do not have children are less likely to receive the support structure that exists when children engage in safety measures at school. While maybe not as significant as other factors, family planning is an important factor to pay attention to in certain cases.

Children, as a group, are a facet that emergency management authorities must consider when it comes to preparing and planning for flooding. Often children were overlooked in the preparedness and recovery aspects of emergency planning until Hurricane Katrina hit New Orleans in 2004, leaving many children without the necessities or resources to continue developing as well as being given the help they need in the aftermath of a disaster; such non-planning left many with long term, unresolved issues (Peek et. al., 2018). Peek et. al. (2018) research finds that children are often more vulnerable to psychological, sociological, and physical effects in the aftermath of a storm and will experience different side effects than adults. As such, Peek et. al. (2018) argues that children's resilience and capabilities should be studied further and that children should have a voice or some sort of action taken in order to make sure they are protected and that their special needs are met before a flooding event takes place as well as is in place after an event.

Larger family dynamics and social status may also affect an individual's level of preparedness for a flooding event. Enarson et. al. (2018) points out that single women are much more likely than men to experience missed time off work, more violence, and more likely to be displaced in the event of a disaster. In previous studies, single mothers were also most likely to be exposed to these factors than mothers who had a support system in place before disasters, such as a husband (Enarson et. al.,2018). Specifically, in the aftermath of Katrina, single African American women often found government policies worked against reported family interests and resource sharing that was often common among the single women of New Orleans after Katrina (Enarson et. al., 2018). This is in

stark contrast to single men and married couples, who are often found to recover faster, have faster economic recovery, and less long-term effects (Enarson et. al., 2018).

Domestic violence is also an issue that may increase or arise in the event of a severe flood to a community. As pointed out by Houghton (2009), it was found that in the aftermath of disasters, the main supporters of households may often feel embarrassed or ashamed of outside support often leading to an increase of violence and domestic abuse in households post disaster. Houghton (2009) also observed that this violence may be due to social and economic strain faced post disaster, or is an increase of prior violence experienced in the household. This often leaves victims of abuse trapped in situations where abuse is likely to continue. As often the abuser often provides many of the necessities needed prior to and after a storm, making leaving seem like an impossibility due to the unpredictability of leaving which may be worse than the current situation some victims may find themselves in (Houghton, 2009). Such abuse makes providing psychological help and domestic violence help to victims following a disaster crucial to helping communities recover and become more resilient.

Age is also a significant factor that plays a role in the preparedness of communities. Bronfman (2019) found that individuals between the ages of 30-59 were likely to have the highest level of preparedness. Compared to under the age of 30 where an individual may lack the resources necessary to carry out certain preparedness tactics and maybe also only a child with little understanding. Above the age of 59, individuals may have the resources available; however, they are older and may not be physically able to prepare, and require the help of others (Bronfman,2019).

Limitations of Research

While plenty of research and literature exists on the many issues that go into preparedness and flooding in coastal communities, there are limitations on how accurate and reliable the information can be. Little research exists on the area of Ocean Gate, New Jersey, and of the studies that do exist that relate to areas similar to Ocean Gate, New Jersey, it is limited to only one or two factors, not the list of factors discussed in the literature review. Additionally, populations and communities discussed in the literature review are also very different compared to the small shore communities targeted in this research. Meaning that findings might not be duplicatable and resolutions can vary from much of the literature discussed.

Chapter 3

Methodology

Introduction

The purpose of this chapter is to explain the methods and techniques used in order to obtain and analyze data that is required to complete the study. The study uses a quantitative research method in order to find/establish a relationship between the factors of age, race, gender, and a variety of other factors listed in chapter 2. The study will also use a survey with convenience sampling in order to obtain a diverse and unbiased sample of the population. Analysis of the data collected will primarily involve chi-squared tests to determine the impact of these variables to one's preparedness. Much of the decisions made in this survey design was partially influenced or designed by the standards set by Creswell & Creswell (2018) in their book *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.*

Methodology

Human Subject Protection & Privacy

In order to ensure safety in human subjects as well as the privacy of potentially sensitive or confidential data, a series of steps will be taken to ensure privacy. An IRB certification was submitted through Rowan University, where it was then sent to the main IRB office where it was approved and sent to Rowan's Office of Research Compliance (4-18-2023). All data collected by the survey will not be traceable to individuals who sent back forms and will be kept confidential and secure until 2 years after as was agreed upon with the IRB as well as Rowan University. There was no financial compensation or

incentive offered to participants of the survey. There was also no forced participation, persuasion, or benefit for those who participated in the survey.

Design

This methodology of this quantitative research involves a correlational research method. Examining a multitude of factors at one point in time and seeing which factors of the ones listed is the most impactful to the individuals responding to the questionnaire. The survey is cross-sectional and will only examine the participants feelings and perceptions, and will not involve direct contact with the participants.

Sample & Procedure

The population of this sample will consist of individuals located in the town of Ocean Gate, New Jersey, comprising those who either rent or own homes in the town, which is located near the coast. Ocean County, the county which Ocean Gate is located, has an extremely high-Risk Index, according to the National Risk Index provided by FEMA in 2020. Ranking in the 99.8 percentile for coastal flooding and 98.9 percentile for riverine flooding, making the town extremely vulnerable to flooding. Ocean Gate has a population of 1,983 (Data USA, n.d) with a majority of the population being white at 94.5% of the population, with the next highest minority being Hispanic at 3.74% (Data USA, n.d). There are a few major businesses located in the town, with 4 restaurants, a corner market, and a few local businesses that are run out of homes. The town often sees small flooding events throughout the year but the last major flooding disaster the town had experienced was Hurricane Sandy. This population was chosen by convenience sampling, in order to get the most unbiased and diverse population possible. The town of Ocean Gate relies heavily on the use of the post office as the town does not have any mail

delivery system, so each resident is required to have a post office box. This allows for the elimination of bias when it comes to communication systems, as all residents must go to the post office and do not get mail from outside means. The minimum number of surveys needed in order to gain a statistically significant amount of the population is 200, with an extra 50 allowed for an oversample. The study lasted for two weeks, where surveys were handed out and completed from the time the post office was open until it closed.

For this study, participants will be chosen at random as they approach the post office of Ocean Gate. Individuals will be asked to participate in the survey and if they choose to participate, they will be given a physical copy to fill out. If so the participants completed a set amount of questions, where once complete was sent back to the researcher. If any questions or concerns arose during the survey, participants were given the contact information of the researcher in order to correct any issues.

Research Instruments

Survey Construction

The measure of preparedness was measured in the survey by a number of demographic questions such as sex, age, gender, sexuality, race and/or ethnicity, relationship status, income, education, prior experiences, levels of trust for government agencies. These demographic questions were chosen based on the literature review that was conducted at the beginning of the study as well as my own conclusions.

A multitude of survey question types was also employed in this survey in order to gauge multiple responses as well as the factors that may affect levels of preparedness. A multitude of Likert scales were used, with most using the answer key of very unlikely (1) to very likely (5). Checkbox questions were also used to see the amount of engagement

that communities had with warning systems, their practicing religion, and exposure to mental illness/distress following a flooding event if applicable to the participant. A rating scale was also used to determine the participants level of preparedness, with 1 being not at all prepared and 10 being very prepared. Dichotomous questions were also involved to see if certain exposures were met for skip filters present in the survey.

Chi-squared test

A chi-squared test is used to determine if two variables are either independent or dependent of each other, moving either closer or farther apart depending on their dependence on each other (University of Utah, n.d). While unable to establish a causal relationship, it can be determined to see if there is correlation between two variables, such as race with Whites and African Americans (University of Utah, n.d). This will be used to examine a multitude of variables in this study, such as gender, sex, race/ethnicity, and relationship status. These results will be first put into a cross tabulation table where the results of that will then undergo a chi-square test to get results.

There are two limitations of the chi-square test in the context of this study, the first being that it is extremely sensitive to population size. Meaning that relationships that may be trivial or have no significance may seem significant if the survey population is large enough (University of Utah, n.d). The second limitation is that it can only tell if the variables are related to each other and not if the variables have an effect on each other. Meaning that a more detailed research method would be needed in order to determine if the variables have an effect on each other and do not share a correlation (University of Utah, n.d.)

Survey Limitations

There are limitations that exist in this study, the major limitation being that there are factors that were not taken into consideration when conducting the study that may have an impact on survey results and participation in the survey. Another limitation would be that there could exist biases in the data and survey collection that skews toward a population due to the nature of the convenience sample and the current population that lives on the Jersey Shore. Limitations also exist in the data analysis, with better means of analysis possibly more effective at comparing the results of the data but were not chosen due to a variety of reasons, with the major reason of it being unknown at the time. This is also a snapshot in time of the levels of preparedness, and are due to change and be different at different times in the future. Limitations may also exist with the population size, as 200-250 surveys may not be large enough to provide any patterns

Chapter 4

Results

Demographics

The subjects of this study all participated in the town of Ocean Gate just outside of the town's Post Office during the spring of 2023. Of 250 printed surveys, 203 were completed and able to be used for this study, leading to a return rate of 81%. Table 4.1 lists the demographics of the participants in this study, 111 (55%) of the participants were male, 87 (43%) were female, and 4 (2%) listed preferred not to stay. There was also a large age disparity within the town, with 131 (64%) of the participants being over the age of 50 and the remaining 72 (36%) participants being between the ages of 18 and 49. The largest age group was between the ages of 50-69 with 80 (39%) participants. For the ethnicity of the town, it was a majority white with 176 (87%) of participants labeling as such, with the next highest ethnicity being African American with 10 (5%) participants and Asian having 3 participants (1%) and the last 12 participants being other or prefer not to say (6%). For sexually, 187 (92%) of participants listed as straight with 11 (5%) labeling as gay or lesbian, with the remaining 4 (2%) choosing not to answer. For relationship status, the largest demographic of the town was married, with 112 (55%) of responders. The next largest was single with 47 (23%) respondents, then widowed with 20 (10%) respondents. Followed by divorced with 15 (7%) and domestic partners with 5 (2%) respondents with both civil union and separated having 2 (1%) respondents. For education, the largest demographic in town was those with a bachelor's degree, making up 80 (39%) of the respondents. The next largest was some college but no degree with 48 (24%) respondents and those with a GED/High School diploma with 37 (18%)

respondents. Then 23 (11%) with a Master's degree and 9 (4%) with other types of education like trade school or nursing certificates. The last two education types that responded were those with doctorate's, having 4 (2%) respondents and some high school but did not graduate, with 2 (1%) respondents. The next demographic that was recorded was income, with the largest bracket being the over $100,000 with 56 (28%) respondents and $50,001-$75,000 range, having 43 (21%) respondents. Then was the $25,001-$50,000 range with 37 (18%) and $75,001-$100,000 having 32 (16%) respondents. The lowest brackets were preferred not say with 18 (9%) respondents and under $25,000 with 16 (8%) respondents. The last demographic group that was recorded in this study was religion, the largest two religious groups present in town were Christian with 76 (37%) respondents and Catholic with 53 (26%) respondents. The next two groups were Agnostic with 37 (18%) respondents and those who prefer not to say with 14 (7%) respondents. Then was Atheist with 10 (5%) and other religions not listed with 7 (3%) respondents. Jewish and Hinduism both had 2 (1%) respondents and finally Muslim with 1 (1%) respondent. See Table 4.1

Table 4.1

Demographics

	f	%
Gender		
Male	111	55%
Female	87	43%
Other	4	2%
Age		
Under 18	0	0%
18-29	34	17%

	f	%
29-49	38	19%
50-69	80	39%
70-79	37	18%
Over 80	14	7%
Race		
African American	10	5%
Asian	3	1%
Native American	2	1%
White	176	87%
Prefer Not to Say	7	3%
Other	5	2%
Sexuality		
Straight/Cisgender/Heterosexual	187	92%
Gay	8	4%
Lesbian	3	1%
Asexual	0	0%
Other	4	2%
Relationship Status		
Single	47	23%
Married	112	55%
Divorced	15	7%
Widowed	20	10%
Domestic Partner	5	2%
Civil Union	2	1%
Separated	2	1%
Education		
Some High School	2	1%
GED/High School Diploma	37	18%
Some College No Degree	48	24%
Bachelor's	80	39%
Master's	23	11%
Doctorate	4	2%
Prefer Not to Say	0	0%
Other	9	4%
Income		
Under $25,000	16	8%
$25,001-$50,000	37	18%
$50,001-$75,000	43	21%
$75,001-$100,000	32	16%
Over $100,000	56	28%
Prefer Not to Say	18	9%

	f	%
Religion		
Christian	76	37%
Hinduism	2	1%
Muslim	1	1%
Jewish	2	1%
Catholic	53	26%
Agnostic	37	18%
Atheist	10	5%
Prefer Not to Say	14	7%
Other	7	3%

Analysis of Data

Hypothesis 1

There will be no statistically significant difference between residents' perceptions regarding government indifference (being "left behind").

To study this hypothesis, participants were asked a question to gauge their level of preparedness on a scale of one to ten, with ten being the highest. As well as a question to gauge if individuals have ever felt like they had been left behind in the aftermath of a disaster by the government due to race factors, such as was seen during Hurricane Katrina and the Lower Ninth Ward (Henkel, Dovidio, & Gaernter, 2006).

This hypothesis had 122 of 203 results available in order to conduct an examination of the two variables. With the results of the cross tabulation and using chi-squared test in order to test the relation between these two variables, the test comes to a p-value of (x^2=.60, p <=.05). Using chi-square this value is determined to not be significant when it comes to an individual's preparedness in this community, the findings suggest that people who have felt left behind by their governments do not have an impact on their preparedness.

Hypothesis 2

There will be a significant difference in the level of disaster flooding preparedness among racial groups in coastal communities.

In order to study this hypothesis, respondents were asked two questions. One regarding their level of preparedness as well as another question about the race they best identify with. The results were then put in a cross tabulation and then underwent a chi-square test in order to determine the significance of the two variables. The results should find a significant relationship between the two variables.

With the chi square test, the overall results conclude to a p-value of (x^2=.50, p <= .05), which is deemed to have an insignificant relationship between the two variables. Thus, failing to support the proposed hypothesis and suggests that one's race does not factor into their preparedness.

Hypothesis 3

There will be significant differences in disaster flooding preparedness among different age groups.

To test this hypothesis, two questions were again asked to respondents in order to gauge if there was a statistically significant relationship, being their level of preparedness for flooding events, as well as the age of the respondent. These responses were then cross tabulated and put into a chi square test. With 203 responses, all surveys were eligible for this cross tabulation and subsequent chi square test. Using chi square after the cross-tabulation results, the p-value of the test comes out to (x^2= .20, p <=.05). With no relationship shown, it suggests the proposed hypothesis has no effect on one's preparedness, but does not completely outrule the two as factors. While deemed a

statistically insignificant relationship, it shows that all age groups in the town of Ocean Gate are equally prepared for flooding events, which suggests the null hypothesis of no difference.

Hypothesis 4

There will be a significant difference in the level of disaster flooding preparedness among genders in coastal communities.

Hypothesis 4, also was examined by using the responses to two questions on the survey. One involved the respondent's level of flooding preparedness and the other question asked the respondents which gender they best identified with, the only genders that will be observed in this test is male and female. These results were then composed into a cross tabulation in which they then underwent a chi square test to determine if a relationship exists or not.

Using chi square, the p-value of this test came out to be (x^2=.90, p <= .05), which means there was no statistically significant difference between male and female and their perceived level of preparedness for flooding events. This result suggests the null hypothesis that there is no significant difference between male and females for levels of preparedness.

Hypothesis 5

There will be a significant difference in the level of experience with flooding severity among members of the LGBTQIA+ community than non-LGBTQIA+ community members in coastal communities.

For the last hypothesis two questions were asked again in order to determine if there was a significant relationship between two variables. The two questions asked were

the respondent's sexuality and the severity of damage they received during a flooding event if they experienced one. If found to have a correlation, this hypothesis will be similar to the findings of Dunn (2016), where members of LGBTQIA+ were exposed to less safe conditions and less resources due to social stigmatism. Making them more susceptible to more severe flooding damage and as such, less prepared for flooding events. The responses of the two questions were then run through a cross tabulation and chi square test.

Of 203 total responses, 121 responses were eligible for analysis in order to determine if a relationship between the two variables exist. The results of these tests produced a p-value of (x^2=.60, p <=.05), which means the relationship between sexuality and the severity of damage received in flooding events is not statistically significant. This suggests that the proposed hypothesis does not share the same results seen by Dunn (2016)

Chapter 5

Conclusion

Summary of Study

This study sought to determine which prominent factors found in literature played an important role in the preparedness for flooding events in Ocean Gate, New Jersey. Factors such as race, age, sex, gender, and in addition to prior experiences with flooding, their perception of government officials, as well as if they felt left behind during disasters are part of this study for the analysis. The requirements to participate in this study were to be over the age of 18 and a resident of Ocean Gate, New Jersey. Surveys were completed outside of the Ocean Gate Post Office, with a total of 250 surveys being conducted, 203 were properly completed and were used to conduct this study. The survey gauged their perceived level of preparedness and asked several questions that could have affected their level of preparedness as discussed earlier in the literature review.

Discussion of Findings

For the first research question, individuals were asked to state their level of perceived preparedness as well as if they had ever felt like they had been left behind by their government in the aftermath of a flooding event. A majority of the respondents had felt like they had not been left behind in the aftermath of a flooding event, and it was found to not have any significant relationship regarding how prepared individuals perceived themselves to be prepared for flooding events. A majority of respondents who did feel left behind fell between the range of 4 to 7 on the preparedness scale, with 1 being the lowest score for preparedness, and 10 being the highest score for preparedness, meaning they were somewhat prepared for a flooding event. These findings suggest

These findings are different from those found by Koning and Redlawsk that there was no significant relationship between the two factors Redlawsk (2016) and Henkel, Dovidio, & Gaertner (2006), where individuals were left confused and stranded in the aftermath of Hurricane Sandy and how to receive aid from the federal government. These sentiments were also felt in the aftermath of Hurricane Katrina, by residents in the Lower Ninth Ward who received less funding than the others in more affluent white communities in other parts of New Orleans. These perceived disparities created a sense of abandonment by public officials and led to those individuals being more prepared as they could not rely on officials to come and provide aid in case of another large-scale flooding event.

For the second hypothesis, individuals were asked to state the race they best identified with as well as their level of perceived preparedness for a flooding event. A majority of respondents identified as white and the results from this sample demonstrate no significant relationship between the two questions that were asked. These findings suggest that there is no significant relationship between one's race and their perceived preparedness for flooding.

This is contradictory to many of the studies discussed earlier in the literature review, such as Chakraborty (2019). Where minority individuals were impacted much more by Hurricane Harvey in Houston than non-minority individuals due to lack of preparedness resources and other outside factors such as improper land use or living below sea level. Or of the findings of Henkel, Dovidio, & Gaertner (2006), where the majority black community in New Orleans' Lower Ninth Ward were not given access to

resources to help prepare for flooding events that the majority white communities were, while being in a more flood prone area.

The third hypothesis, individuals ask about residents' perceived level of preparedness for flooding events, and then asked which age group they best belong to. A majority of respondents fell into the category of 50-69 and it was found that there was not a significant relationship between the two factors, although by a slim margin. These findings suggest the hypothesis that there is not a significant relationship between one's age and their perception of preparedness for flooding events and potentially in large coastal communities, this could be a different result.

These findings were contradictory to findings that were conducted by Bronfman (2019), where he found that individuals in certain age groups were more likely to have higher perceived flooding preparedness compared to those who were in younger or much older age groups. This was due to a variety of other factors outside of age, such as a lack of economic capital to afford the preparations necessary to prepare for flooding events that was found in younger age groups (Bronfman, 2019), as well as a lack of physical strength of capability to make the appropriate steps to prepare one's housing (Bronfman, 2019).

In the fourth hypothesis, participants were asked to describe their perceived level of flooding preparedness, and which gender/gender experience they best identified with. A majority of respondents were male, with only 4 falling outside the male/female binary. The results of this hypothesis suggest that there was no significant relationship between gender and one's level of perceived preparedness.

These findings are contradictory to the findings of studies discussed earlier in the paper, such as Cvetković et al. (2018) and Enarson et. al. (2018). Cvetković (2018) found that communities in Serbia were found to have fewer active connections within communities that had a lack of women representation and thus recovered less fast and had more gaps in preparedness beforehand. Similarly, Enarson et. al. (2018) found that women, specifically single women, recovered much more slowly and are exposed to more risks that make them unprepared for flooding events. These studies show the importance of gender within flooding preparedness and should be taken into preparedness efforts, even if this study disproves the notion.

The final hypothesis asked respondents two questions, to identify their sexuality, and to rate the severity of the flooding event if they had experienced one. A majority of respondents that were eligible for this question fell under the category of straight/cisgender with only 7 respondents not being in this category. The results of this examination showed there to be no significant relationship betweenone's self reported sexuality and the severity of damage they received during a flooding event.

This hypothesis was based on the notion that members of the LGBTQIA+ have access to less resources and thus have less preparedness for flooding events, leading to more severe events when they occur. This was seen by Dunn (2016), where gay men in Jamaica were forced into a gully and were harassed and received no help by the Jamaican government due to their sexuality. This left these men severely unprepared for major flooding events, causing massive damage and injury when located in these flood prone areas. Similarly, FEMA (2022), found that sexuality and gender can increase one's

vulnerability to risk due to trauma related to hate received for their sexuality and a lack of social support groups that other communities may have.

Conclusion

The first conclusion to be made regarding this study's research of coastal community flooding perception is that further research is needed in order to determine the most prominent factors for preparedness in smaller communities. For a variety of reasons, the data for 4 out of the 5 hypotheses in this study did not support the hypothesis, further research, possibly qualitative research is needed. Similarly, a larger population may be needed to further understand the differences.

Another conclusion to be made would be the lack of literature and research into the flood factors of small shoreline communities. Many of the studies that regard factors of preparedness are either involved in one specific factor or do not have geographically relevance to the small communities along the eastern coast of the United States. Of the studies used in the literature review, only one or two studies applied to conditions in New Jersey and often took place in other coastal communities in separate countries which have completely different demographics to those located in Ocean Gate, New Jersey. Further research into preparedness factors for New Jersey and the surrounding coastal states will only enhance the ability to be resilient in the face of flooding events, as these states stand to be greatly impacted by further rising sea levels and more severe flooding events.

The final conclusion to be made from this research would be that even though many of the hypotheses were not supported, there is still significance to the results. One of the reasons that could suggest why there is not such a large gap in preparedness due to factors seen in the literature would be because this community is much smaller and close

knit than those seen in the studies conducted by Dunn (2016) or Cvetković (2018). With close knit communities, individuals are likely to be very similar demographically and as such, could explain as to why this community does not have any observable gaps in flooding preparedness.

These findings were also echoed within the Community Resilience Index conducted by FEMA (2020), where Ocean County, the county which Ocean Gate is located in, had a score of 89.27 percentile rank in community resilience, which is defined as "ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions…" (FEMA, 2020, para. 1), which is better than 89% of other counties in the United States. This is also despite Ocean County having a higher-than-average Social Vulnerability Index, being relatively moderate on the index and being ranked 40.74 on the national index. The results of the National Risk Index study reflect the findings of this study. Despite the moderately relative Social Vulnerability and High Risk of Coastal/Riverine Flooding found by the National Risk Index, Ocean Gate and other communities within Ocean County have an extremely high Community Resilience Index. This could be an explanation for why there were no significant differences in preparedness found within this study.

Future Suggestions

The first suggestion to be made would be to continue further research of flooding preparedness and the factors that affect it, especially in the area where studies were conducted. The town of Ocean Gate has a considerably smaller population when compared to other larger coastal towns such as Atlantic City and Toms River. Areas such as these can produce larger and more diverse populations that can show relationships

better. Especially in areas of ethnicity and LGBTQIA+ issues, where only 15 people out of 203 identified as something other than straight/cisgender. Conducting studies such as this or Henkel, Dovidio, & Gaertner (2006) study on populations where results number in the thousands or tens of thousands can allow for a clearer understanding and relationship of the factors that affect individuals.

Another recommendation that can be made would be to better educate individuals on the risk of flooding and enhance their awareness of flooding in their communities. While conducting this study, there was not a common consensus for individuals on if the town was at considerable risk to major flooding events, and affected their results as such. This fear was outlined by Perez and Egan (2016, p.903), where individuals were aware of risks such as sea-level rise and climate change, but do not know how soon these impacts and risks can be felt and as such, are not adequately prepared. This can be especially true in a community like Ocean Gate, where the town is bordered by a back-bay and river notorious for severe flooding during Hurricane Sandy. Educating these communities in the real risk that they face will inform them to make better decisions in regards to their preparedness for flooding and increase their perception of flooding risks.

The last suggestion from this study is to listen to the concerns of communities located in these high-risk flood areas and take it into consideration when allocating resources for flooding prevention. More likely than not, individuals located in these areas are likely to know more about which areas flood and which individuals are more at risk than others. Allowing for locals to dictate where resources are allocated in flood prone areas can help individuals who are the most vulnerable to flooding dangers become more resilient and create a stronger community. These outcomes were seen during Hurricane

Sandy and pointed out by Koning and Redlawsk (2016) and Choi and Wehde (2020) where a strong sense of community as well as a greater trust in government officials resulted in more resilient communities as well as a faster recovery in the aftermath of severe studies.

Limitations of Study

Several limitations are present in this study, the first being the size of the population used for this particular study. Many studies such as Zhang et al. (2022) and Bronfman (2019) had samples of hundred if not thousands of more people than this study, which may lead to clearer relationships than examined here. Another limitation would be the perception respondents have on their level of flooding preparedness, as it may not be accurate to what their real level of flooding preparedness is. The location of the study is also a limitation, as the population is predominantly white as well as in the older age groups, so answers were less diverse than areas that may have larger populations.

Another limitation that this study faced would be the inherent bias that exists with the population sampled for this study. As suggested by Dunn (2016), communities with similar demographics are more likely to be prepared compared to more diverse communities. With this study, 87% (176) of the population reported as white while 92% (187) reported as straight/cisgender/heterosexual. This creates a bias as the population does not create a large sample size to look at many of the factors that often involve minority populations in this study.

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Appendix

Survey Instrument

1. What is your Age?
    a. Under 18
    b. 18-29
    c. 30-49
    d. 50-69
    e. 70-79
    f. Over 80
    g. Prefer Not to Say
2. What best decides your race?
    a. African American
    b. Asian
    c. Native American
    d. White
    e. Prefer not to say
    f. Other
        i. Specify
3. What is your Gender?
    a. Male
    b. Female
    c. Prefer Not to Say
    d. Other
        i. Specify
4. What is your sexuality?
    a. Straight/Hetroesexual/Cisgender
    b. Gay
    c. Lesbian
    d. Asexual
    e. Other
        i. Specify
5. If answered yes to your gender being other than male/female or sexuality being straight, have you been denied access to resources/tools to help you prepare for flooding events because of your sexuality/gender? (If no skip to question 6)
    a. Yes
    b. No
6. What is your relationship status?
    a. Single
    b. Married
    c. Divorced
    d. Seperated
    e. Widowed

    f. Domestic Partner
    g. Civil Union
    h. Other
        i. Specify
    i. Prefer not to say
7. Are there any children or independents in your household?
    a. Yes
    b. No
8. What is your highest level of education?
    a. Some High School
    b. GED/High School Diploma
    c. Some College but no Degree
    d. Bachelor's Degree
    e. Master Degree
    f. Doctorate
    g. Prefer not to say
    h. Other
        i. Specify
9. Are you employed?
    a. Full-Time Employment
    b. Part-Time Employment
    c. Student
    d. Self-Employed
    e. Retired
    f. Prefer not to say
    g. Other
10. What is your yearly income?
    a. Under $25,000
    b. $25,001-$50,000
    c. $50,001-$75,000
    d. $75,001-$100,000
    e. Over $100,000
    f. Prefer not to say
11. Which of the following best describes your practicing religion?
    a. Christian
    b. Hinduism
    c. Musilm
    d. Jewish
    e. Catholic
    f. Agnostic
    g. Atheist
    h. Prefer not to say
    i. Other
        i. Specify

12. How well are you prepared for a flooding event? With 1 being not at all prepared and 10 being extremely prepared.
    a. 1-10

13. What is the risk of flooding in your community?
    a. Very Likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
14. Have you ever been involved in a flooding event? (if no skip to 24)
    a. Yes
    b. No
15. If yes, how severe did the event affect you?
    a. No damage
    b. Minor Damage
    c. Major Damage
    d. Unsalvageable
16. Were you ever forced to move/relocate permanently due to damage sustained from flooding?
    a. Yes
    b. No
17. Please check any of the following symptoms that best apply to you having ever experienced mental distress or illness following a storm.
    a. Depression
    b. Anxiety
    c. Loss of Sleep
    d. NIghtmares
    e. Hopelessness
    f. Thoughts of self harm/suicide
    g. Other
        i. Specify
    h. Prefer not to say
    i. None of the Above
18. If yes to the previous answer, did it personally affect your ability to prepare for the next flooding event?
    a. Yes
    b. No
19. Have you ever felt ignored or left behind in the aftermath of a flooding event due to your ethnicity or race?
    a. Yes
    b. No

20. Have you ever received aid from the government in the aftermath of a flooding event?
    a. Yes
    b. No
21. How would you rate your experience dealing with government officials in the aftermath of a flooding event?
    a. Very Good
    b. Good
    c. Neither Good or Bad
    d. Negative
    e. Very Negative
22. Did your prior experience with floodings encourage or discourage you to take more actions in preparing for flooding events?
    a. Very encouraging
    b. Encouraging
    c. Neither encouraging nor discouraging
    d. Discouraging
    e. Very discouraging
23. Were you ever unable to recover financially from a flooding event due to damage sustained?
    a. Yes
    b. No
24. How likely are you to listen to your government officials on emergency preparedness for flooding?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
25. How likely are you to ask for aid preparing for floods from the federal government?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
26. How likely are you to ask for aid preparing for floods from the state government?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
27. How likely are you to ask for aid preparing for floods from your local government?
    a. Very likely

b. Likely
c. Neither Likely or Unlikely
d. Unlikely
e. Very Unlikely

28. How likely are you to ask for aid preparing for floods from your neighbors on your block?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
29. How likely are you to ask for aid preparing for floods from your close friends?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
30. How likely are you to ask for aid preparing for floods from your family?
    a. Very likely
    b. Likely
    c. Neither Likely or Unlikely
    d. Unlikely
    e. Very Unlikely
31. Do you prepare for flooding events?
    a. Yes
    b. no
32. Would you be prepared to evacuate from a flooding event in under 48 hours?
    a. Yes
    b. No
33. Would you be prepared to evacuate from a flooding event in under 24 hours?
    a. Yes
    b. No
34. Do you receive or are there any early warning alerts/systems in your community?(If no skip to 36)
    a. Yes
    b. No
35. If yes to the previous question, click any of the following that apply.
    a. Weather Alerts
    b. County Alerts
    c. Social Media
    d. Flood Sirens
    e. Neighbors/Coworkers
    f. Newspaper
    g. Radio

    h. Television
    i. Town meetings
    j. Other
36. Are you able to afford/have flood insurance at your current home?
    a. Yes
    b. No
37. Are you physically able to perform the activities needed to prepare your home for flooding events?
    a. Yes
    b. No
38. Is/Has your living situation been affected by outside factors such as resource extraction, hazardous materials, or land use that has made it difficult to live in your area?(If no skip to 40)
    a. Yes
    b. No
39. If yes to the previous question, had it made your situation worse if affected by a flooding event?
    a. Yes
    b. No
40. Has your race/ethnicity ever had an effect on your ability to prepare for a flooding event?
    a. Yes
    b. No