BOSTON COLLEGE School of Social Work

Dissertation Examination Committee

Shanta Pandey, PhD (Co-Chair) Samantha Teixeira, PhD (Co-Chair) Thanh V. Tran, PhD David T. Takeuchi, PhD

BEFORE THE LIGHTNING STRIKES: PREPAREDNESS, CAPACITIES, AND SOCIAL WELFARE POLICY

MICRO, MEZZO, AND MACRO CORRELATES OF DISASTER PREPAREDNESS

A dissertation by

SMITHA RAO

Submitted to Boston College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Dissertation Co-Chairs: Drs. Shanta Pandey and Samantha Teixeira

Abstract

Anthropogenic climate change will push 100 million of the world's population into poverty in the next decade, and worsen economic, food, and housing insecurity. Natural disasters are some of the most manifest markers of climate change impacts, set to become more intense and frequent as a result of the climate crisis. The brunt of these stressors falls disproportionately on the most marginalized populations across the world - women, children, people with disabilities, and older adults, among other disadvantaged groups. Despite a surge of interest in scholarship on disasters and their unequal impacts, studies on preventative strategies and action have been relatively fewer even though it is widely agreed that post-disaster recovery is enhanced when coupled with pre-disaster readiness and planning. There are multiple empirical and theoretical unknowns around factors promoting or hindering preparedness at micro, mezzo, and macro levels, which are all critical avenues for interventions. This three-paper dissertation addresses this gap in the context of the United States to understand individual and household capacities in dealing with natural disasters. The human capabilities approach helps to frame the overall dissertation examining the associations of social and structural vulnerabilities, selfefficacy, disaster experience, disaster-related information, and participation in social

welfare policy with household disaster readiness. The individual papers are further informed by self-efficacy theory and concepts spanning Vulnerability, Absorptive Capacity, and Resilience. Three aims guide this research resulting in three separate papers: Paper 1 examined associations between social vulnerabilities, disaster selfefficacy, and preparedness using nationally representative data from Federal Emergency Management Agency's (FEMA) National Household Surveys 2018. Disaster preparedness was found to vary across self-efficacy and social vulnerability. The confidence in one's abilities to carry out necessary preparatory action and socioeconomic status were consistently associated with higher preparedness controlling for social vulnerability indicators. Paper 2 assessed the role of social and structural (housing and neighborhood) vulnerabilities in disaster risk reduction employing household-level data from nationally representative American Housing Survey (AHS) 2017. Results suggested that housing insecurity and social vulnerability concurrently were associated with disaster readiness. Further, this paper examined if the association of social vulnerability with disaster preparedness varied by housing insecurity among households in the U.S. Results suggested that housing insecurity moderated the association between minimal preparedness and socioeconomic status, sex of the householder, marital status, and presence of older adults in the house. Paper 3 probed the effects of social vulnerability and welfare policy participation on disaster readiness in U.S. households using the AHS 2017 data. Further, the paper examined the direct and indirect effects of household demographics and participation in social safety net programs (TANF, SSI, SNAP, Housing Vouchers) on household disaster preparedness and found that income, education, race, and having a person with disability at home were statistically mediated at least partially by welfare recipiency. This dissertation examined fissures between intent, capacities, and disaster preparedness with implications for vulnerable communities in the U.S. Results from this three-paper dissertation offer multiple takeaways and intervention points at individual and household levels for social work scholarship, education, and policy. In probing factors that enable or prevent households from taking steps to safeguard themselves against future threats, this dissertation helps inform and affirm values of human dignity and human rights, particularly among vulnerable groups. Overall, the dissertation extends the conversations around individual, contextual, and policy interventions needed to assist vulnerable populations in absorbing and overcoming the multitude of shocks they face. Social and structural barriers to improved household capacities to deal with disasters and other shocks can be addressed through effective policy interventions and a robust safety net. This dissertation examines these elements separately and offers key considerations for research, practice, and policy.

Keywords: Disasters; Disaster Preparedness; Vulnerability; Social Welfare Policy; Climate Change; Housing insecurity; Social Work; Environmental Justice To a green and equitable tomorrow

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I recognize as an immigrant in this country, that I live and work on land stolen from Indigenous communities. These communities have stewarded this land for generations and have been dispossessed of their land through enduring settler colonialism. I affirm my commitment to justice and reconciliation in the U.S. and everywhere.

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Chapter I. Introduction

Anthropogenic climate change is one of the biggest threats to human security in the 21st century, projected to push 100 million people into poverty by 2030 (Hallegatte et al., 2016), and overwhelmingly impacts the poorest and most vulnerable groups around the globe (IPCC, 2018). The latest scientific synthesis reports warn of devastating human impacts due to climate change in the coming years. Just over 2017 and 2018, the United States experienced 44 billion-dollar-events, termed as weather/climate events such as floods, droughts, freeze and winter storm events, severe storms, tropical cyclones, and wildfires exceeding USD 1 billion in losses (NOAA National Centers for Environmental Information (NCEI), 2020). Evidence suggests that every dollar spent in preparedness actions can save four to seven times the amount after a disaster (Multi-Hazard Mitigation Council, 2019; Together We Stand, 2016). Scholarship across disasters, sustainable development, climate adaptation, and natural resource management suggests that the assumption of natural and human systems being distinct, and therefore, treated discretely is short-sighted (Folke et al., 2002).

Capacity assessments at national and sub-national levels provide an overview of how systems adjust to changes (Ebi et al., 2006; Id et al., 2020; UNFCCC, 2011). At the same time, adaptations, readiness, and action to tackle crises often take place at the individual and household levels (Adger & Kelly, 1999; Chari et al., 2019). To examine gaps in how individuals and households respond and adjust to threats due to shocks such as natural disasters, it is critical to probe the social factors that enable or preclude crisis responses at these levels. This analysis can help clarify the strength of social systems to absorb or fend off shocks and threats to inform strategies of buffering or strengthening

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these capacities. This three-paper dissertation was conducted to fill knowledge gaps in disaster preparedness to inform social work and public health education, policy, and practice interventions. This chapter provides an overview of the study. Beginning with the significance, context, and key concepts germane to the study, the chapter incorporates a brief overview of each paper; the three subsequent chapters in the dissertation are standalone papers addressing each aim of the dissertation and the final chapter summarizes the overall contribution of the dissertation and articulates implications and future directions stemming from this work.

Natural Disasters and Vulnerable Populations

In the last decade alone, nearly 60,000 people died each year from natural disasters, and thousands more were impacted due to injury and other losses from disasters (Ritchie & Roser, 2019). Evidence suggests that the burden of these disasters in terms of mortality as well as long-standing ramifications such as loss of livelihoods, social support systems, educational and health setbacks, fall disproportionately on vulnerable groups such as women, children, people with disabilities, people of color, and older adults, (Fothergill et al., 1999; Wisner et al., 2003; Zottarelli, 2008). As an illustration, nearly 70% of the fatalities in the Indian Ocean tsunami of 2004, and over 60% in Myanmar's 2008 cyclone, were women (The World Bank, 2012) and projected childhood fatalities due to weather-related disasters over the next decade stand at an alarming 175 million (Kousky, 2016). Further, natural disasters have also been associated with long-term challenges in educational attainment and poor health outcomes among children (Datar et al., 2013; Kousky, 2016), loss of support systems and adverse mental health outcomes among older adults (Hikichi et al., 2016), and heightens the threat of homelessness and

displacement particularly among socio-economically marginalized groups (Enarson, 1999).

From the Mississippi River flood in 1927 to Hurricane Katrina, to the recent Texas winter storm related loss of power, water, and heating, communities of color, particularly African Americans dealt with a double environmental burden resulting from inequities in both the social and the natural environment (Mizelle, 2014). Communities of color face disparities in environmental exposures as well as social inequalities leading to deadly, often long-lasting health impacts. Climate change exacerbates this disparity, and disasters are the most discernible examples of effects of this shift. While disasters are often a smaller subset of multiple ongoing stressors that communities face, the discourse around them becomes heightened because of the magnitude of these events. Indeed it is the existing fractures in society that lead to many of the short and long-term vulnerabilities that are aggravated in a disaster event (Elliott & Howell, 2017).

Poverty, Climate, and Disasters

The linkages between poverty, climate breakdown, and disasters are many. Human induced climate change is responsible for erratic climate and weather related phenomena including the strength and occurrence of different types of disasters (P. Brown et al., 2018; Gamble et al., 2013; Piguet & Laczko, 2014). These events often affect the most impoverished and vulnerable across the world as discussed in preceding section. Further, climate change and associated disasters threaten to exacerbate poverty and stall progress made in the last century. Inclusive development and poverty alleviation therefore, are key to tackling climate and weather-related sudden disasters as well as slow onset disasters like droughts, sea-level rise, changes in water availability that affect human lives and livelihoods, and environmental displacement (Kemp & Palinkas, 2015; Otto et al., 2017; Walker et al., 2009).

The United Nations General Assembly adopted the resolution on a global framework of development benchmarks known as the sustainable development goals (SDG) comprising 17 interconnected goals with multiple targets to measure progress against (Transforming Our World: The 2030 Agenda for Sustainable Development, 2015) with a goal to "leave no one behind." SDG1, 'Ending poverty in all its forms by 2030', warns that the pace of poverty reduction has reduced around the world. The looming threat of natural disasters has merited deliberations on the kind of steps countries, communities, households, and individuals can take to mitigate loss of life and property as a result of these hazards, reified in the Sendai Framework for Disaster Risk Reduction 2015-2030 (UNDRR, 2019). The Sendai framework connects disaster risk reduction to questions of building resilient human-environmental systems, and complements the SDG agenda of poverty alleviation and bolstering human and planetary rights (UN General Assembly, 2015; UNDRR, 2019). Despite a recognition of this interplay between poverty, human well-being, and environment, policies and programs have rarely manifested this view (Schleicher et al., 2018). In the United States too, persistent social inequalities as a result of historically unjust policies and worsening natural disasters pose an additional threat to community wellbeing (Hallegate et al., 2017). The reciprocity between poverty alleviation and disaster risk reduction has been articulated by several scholars and multilateral agencies (Davies et al., 2009; Hallegate et al., 2017; Hallegatte et al., 2020). SDGs too, highlight the importance of "building resilience in poor and vulnerable communities to reduce their exposure and vulnerability to climate-related

extreme weather events, and other economic, social, and environmental shocks and disasters" (UN General Assembly, 2015, p19). Consequently, there is growing interest in the global community around 'adaptive social protection' models that combine aspects of welfare policy, climate action, and disaster risk reduction to build both short and long-term resilience (World Bank, 2016). Well-being and self-determination in communities can be bolstered by identifying and dismantling barriers to resources and action and fostering capacities to respond to the intersecting nature of these 21st century problems. This dissertation addresses some of these complications and contributes to building knowledge on these overlapping concerns of social work and development.

Definitions

This section provides definitions of key terms pertinent to this dissertation.

Disaster Preparedness

The central construct used throughout the dissertation is disaster preparedness, a key component of vulnerability reduction and building capacities of communities to respond to impending stressors such as a natural disaster (Gallo et al., 2018; Y. C. Kim & Kang, 2010; Sandifer & Walker, 2018). The United Nations International Strategy for Disaster Risk (UNISDR) defines disaster preparedness as:

"The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions" (UNISDR & UNOCHA, 2008)

Research on hazards and disasters comprise both pre-event vulnerability assessments and mitigation measures, as well as post-disaster impact evaluations;

preparedness spans both of these temporally (Sutton & Tierney, 2006). In the US, the Federal Emergency Management Agency (FEMA) plays the principal role of coordinating response after a declared disaster. While the US is a signatory to the Sendai Framework, FEMA's National Response Framework does not cite this framework (FEMA, 2019b) even though components and provisions are comparable. FEMA defines preparedness as " a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response." Preparedness traverses contingency planning, stockpiling supplies, stand-by movement, and communication plans in the event of disaster. As part of prevention and education, FEMA funds and outlines preparedness standards and recommendations for communities, businesses, governments and nongovernmental partners in the United States. Building and improving skills, technologies, and policies at different scales for effective response both before and after a disaster are also key to disaster preparedness (Sutton & Tierney, 2006; Tselios & Tompkins, 2020).

For individuals and households, FEMA provides suggestions and issues periodic guidelines and preparedness calendars. Disaster preparedness at the household level involves pre-event preparatory actions such as having an evacuation plan, an emergency kit with food, water, and medicines for a few days for all members of the household, and financial preparedness (FEMA, 2018b; Fothergill et al., 1999), and is considered 'a year round responsibility' by the agency. A review of scholarship on disaster preparedness suggests that prior experience of disaster and receiving information on disaster planning are key determinants of preparedness (Ardalan & Sohrabizadeh, 2016; Becker et al., 2017; Malmin, 2020). Since disasters impact groups with existing vulnerabilities more than others, it may be hypothesized that this susceptibility also factors into communities' capacities before the event to prepare for the eventuality of a disaster (Flanagan et al., 2011; N. Rao et al., 2019; Zottarelli, 2008).

There are a number of ways in which disaster preparedness has been operationalized in previous studies and while there are overlaps, there is no consensus on an established scale or measures (Ardalan & Sohrabizadeh, 2016; Ashida et al., 2018; Kohn et al., 2012; Spittal et al., 2006). Most preparedness measures in the U.S. stem from guidelines from FEMA and other international literature and typically include having a plan and being ready with a series of emergency supplies (Kohn et al., 2012; Nojang & Jensen, 2020). Some studies have utilized a cumulative score of disaster preparedness including multiple aspects of disaster preparedness from having supplies such as food, water, and batteries to last a few days, to the preparation of an evacuation kit, and sometimes communication and evacuation plans (Gowan et al., 2015; Malmin, 2020; Norris et al., 2008; Rus et al., 2018). Zamboni & Martin (2020) use both an overall preparedness measure, as well as stratified resource and supply preparedness measures. To capture variability in results owing to different operationalizations, it might be pertinent to conceptualize disaster preparedness on a range of different criteria (Malmin, 2020).

Some other key concepts pertinent to the study are briefly discussed next.

Absorptive Capacity

Absorptive capacity is defined in climate and disaster literature as the short-term coping capacity to immediate shocks (Béné et al., 2018). Anticipating, responding, and adapting to changes are often socio-political processes that mediate how individuals and

communities deal with environmental and social challenges (Eriksen et al., 2015), and can be viewed as approaches where people and communities have the agency to make decisions.

Adaptation

Adaptation is a broader concept referring to the processes of adjustment to ongoing or expected changes across human, natural, and climate systems (IPCC, 2012). Adaptive capacity, as the term suggests, refers to the capacities of communities and systems to make the necessary coping adjustments in the longer term and is typically used in the context of global climate variability (Engle, 2011; Smit & Wandel, 2006).

Resilience

Resilience describes how communities respond to periodic as well as unexpected shocks. A working definition adopted by the Department for International Development (DFID) defines it as *"the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses - such as earthquakes, drought or violent conflict - without compromising their long-term prospects"* (DFID, 2011). Resilience, therefore, helps to frame capabilities of groups to cope with both short-term and long-term stressors. Disaster risk reduction, welfare assistance, and climate change adaptation together aim to build resilience among impoverished and vulnerable communities, a concept crystallized in Adaptive Social Protection (Béné et al., 2018; Davies et al., 2009).

Theoretical Framework

This dissertation is informed by the human capabilities approach, self-efficacy theory, and concepts outlined in the previous section (Bandura, 1978, 1999; Paton, 2003;

Sen, 2000, 2003; Wisner et al., 2003). Theoretical frameworks are described in the following sections.

Human Capabilities Approach

The overall dissertation is framed using the human capabilities approach. Despite multiple iterations of the approach, the conceptualization of the capabilities approach in the last four decades is largely attributed to Nobel Laureate and economist Amartya Sen (Robeyns, 2016). This framework puts human development at the center of the development paradigm. The United Nation's Human Development Index (HDI), borne out of this idea, looks beyond economic growth at aspects of human development that traverse dimensions of life expectancy, education and knowledge, and a decent standard of living (UNDP, n.d.). In its conceptualization, the capabilities approach goes beyond low income as an etiological underpinning of poverty and suggests that the foundation of deprivation lies elsewhere. By prioritizing people, this approach highlights the predispositions and conditions that can be considered necessary to transition out of poverty. The key components of the capability approach are resources, capabilities, and functionings, presented in figure 1 (Robeyns, 2017; Sen, 2000).



Figure 1. The Human Capabilities Framework

Resources refer to the means to achieve goals and can comprise individual factors such as income, contextual factors, beliefs and characteristics. Capabilities signify the freedom to achieve and aspire and includes preference formation or social influences on decision-making. Functionings refer to achievements or carrying out activities and functions that individuals, households, or systems want to pursue. While functionings refer to being or doing that which is of value to individuals, capabilities or agency denotes the ability to pursue these goals. Capability, therefore, denotes the freedoms that enable a person to do and be, to savor the life functionings that they value, including cognitive and strategic decision-making (Alkire & Deneulin, 2009). Between resources and capabilities lies the chasm where inequities and disparities hang in balance, affecting the substantive freedoms that Sen alludes to (Sen, 2000). While Figure 1, adapted from Robeyns (2016), shows a linear relationship between Resources, Capabilities, and Functionings, it is entirely possible that owing to systemic inequities such as racism, casteism, and sexism, one might not have capabilities or freedoms even in the presence of resources. Further, the presence of capabilities could also affect access to resources one can access which might affect the functionings. Therefore the relationship between these three concepts can be recursive. This dissertation focuses on the resources and capabilities aspects of the framework with disaster preparedness theorized as individual or household capabilities to prepare for a disaster. While the capabilities approach frames the overall study, the first paper operates within the framework but engages an alternate theoretical context to answer the research questions pertaining to the individual factor of self-efficacy and its relationship with disaster readiness. The second paper uses disaster vulnerability theory to inform the social and structural vulnerabilities' association with preparedness, and the third paper employs the capabilities approach in combination with Adaptive Social Protection to inform the study.

Self-Efficacy Theory

Widely recognized as a measure of human agency (Alkire, 2005; Bandura, 1978), self-efficacy is complementary to Sen's emphasis on human freedoms (Alkire, 2005; Sen, 2000). Self-efficacy, first proposed by psychologist Albert Bandura, refers to an individual or community's belief in their capacity to carry out activities and behavior changes toward desired outcomes (Bandura, 1978). With an origin in socio-cognitive theories, efficacy is considered a reliable representation of individual assessment of their capabilities (Bandura, 1999; Tran et al., 2013). The approach examines the interplay between personal and external factors with behaviors and desired outcomes (Figure 2). Here, Bandura suggests that personal and external contextual factors both affect behaviors in times of stress. An absence of belief in one's own capacity or a lack of belief in the usefulness of taking action in times of an external threat such as a natural disaster, can potentially hinder an individual's efforts to take action in times of a disaster (Paton & Johnston, 2001).





In disaster research, self-efficacy has been found to be a suitable gauge of one's abilities to execute actions to deal with effects of hazards and is employed in both pre and

post-disaster scenarios (Benight et al., 1997; Samaddar et al., 2014; Tran et al., 2013). The disconnect between disaster perception, knowledge, and preventative action has prompted scholars to examine the role of cognitive processes that hinder or bolster behavioral change particularly in terms of disaster preparedness (Paton, 2003). Studies employing this concept in the context of disaster readiness have proposed a distinction between outcome expectancy- the usefulness of taking necessary action in time of disaster, and self-efficacy- an assessment of capacity or confidence in carrying out action, that both independently influence or are associated with behavioral change (Samaddar et. al., 2014).

Disaster Vulnerability Theory

The disaster vulnerability theory examines the potential of loss among communities owing to disasters but highlights the importance of root causes in a fractured and unequal society (O'Keefe et al., 1976; Zakour & Gillespie, 2013 pp17-18). Vulnerability itself is an interdisciplinary concept defined as the susceptibility of individuals, households, communities, or nations to harm or hazard (Flanagan et al., 2011; Nath & Behera, 2011; Otto et al., 2017; Tripathi, 2017). In the literature on climate change and disasters, vulnerability is typically a function of a series of indicators affecting a person or group's capacity to plan for, deal with, withstand, and restore functionings after a natural disaster (Wisner et al., 2003). Social vulnerability comprises socioeconomic and demographic factors (Adger & Kelly, 1999; Flanagan et al., 2011; Patterson et al., 2010), while structural vulnerability examines the confluence of multiple vulnerabilities that result in chronic situations and includes aspects of the built environment such as housing conditions and quality (Lopez et al., 2018; Ma & Smith, 2020; Quesada et al., 2011).

Conceptualizations such as the Social Vulnerability Index (SVI) in the context of the United States combines factors of socio-economic status (SES), minority status, household composition, and infrastructural indicators on housing and transportation into one index, while others have examined social and structural vulnerability separately (Cutter et al., 2008; Flanagan et al., 2011; Lopez et al., 2018). Indicator and index-based approaches to understanding vulnerability are robust but have had their share of critique because of lack of specificity (Hinkel, 2011); however, owing to their utility in identifying vulnerable regions, people, or sectors, they are used widely disaster related literature. To aid a more granular understanding of how these indicators are independently and concurrently associated with the outcome of interest, this dissertation includes them individually into the analyses. Similar to (Adger & Kelly, 1999), the use of the indicators here is a nod to how vulnerability is socially constructed; how identities, characteristics, and contexts are associated with societal circumstances that create vulnerable situations and affect coping capacities. Vulnerability is a key construct used throughout this dissertation study and is situated in the social processes that create inequalities and therefore differentiated vulnerabilities to disasters.

Gaps in Research

Scholarship on disasters suggests that existing and historical disparities make outcomes even more devastating and unequal (Elliott & Howell, 2017). Government reports on preparedness at the national level are mainly descriptive (FEMA, 2018a, 2020a). Studies examining differential impacts of disasters on socially vulnerable populations emphasize the need for social preparedness at individual, community, and national levels (Botzen et al., 2019; Hallegate et al., 2017). A scientometric review of scholarship on environmental social work spanning 1991 to 2015 found a number of studies focused on the impacts of natural disasters (Krings et al., 2020). While this scholarship is critical, the authors warn of the possible preeminence attached to scholarship on reactive, as opposed to proactive aspects of environmental research. This would mean inquiries in the upstream, to recognize social precursors to the disparate impacts after these events. Relatedly, preparedness actions and behaviors remain under-investigated, with evidence of large gaps in social preparedness despite greater concern and awareness on natural disasters (FEMA, 2020a; Healthcare Ready, 2020). While there have been multiple studies exploring the linkages between socio-demographic, psycho-social, and contextual factors on preparedness, many of these analyses focus on sub-populations and groups (Ashida et al., 2018; Baker & Baker, 2010), are conducted at the state, county, or city levels, work with smaller sample sizes (Kohn et al., 2012; Murti et al., 2014; Pollock et al., 2019), are specific to certain kinds of disasters (Ellis et al., 2019; Gowan et al., 2015), or do not investigate multiple forms of vulnerability simultaneously (Al-Rousan et al., 2014; Baker & Baker, 2010). A few national level studies in the US have explored the correlates of disaster preparedness and offer a springboard for further studies (Malmin, 2020; Zamboni & Martin, 2020). Further, a survey of literature also identified the following gaps: 1. Self-efficacy has rarely been examined concurrently with multiple social vulnerability indicators at the household level, in terms of its association with disaster preparedness (Adams et al., 2019; Baker & Baker, 2010).

2. There have been relatively fewer examinations of how social and structural vulnerabilities (socio-demographic and housing or neighborhood elements) are differentially associated with disaster preparedness, and whether one form of vulnerability amplifies the effects of the other on preparedness (Murti et al., 2014; Sundareswaran et al., 2015).

3. While multiple studies have explored the role of social protection on disaster risk reduction in the global context, this has rarely been explored in the context of high-income countries (Béne, 2012; Davies et al., 2013).

This dissertation addresses these gaps and examines the role of self-efficacy, multiple sites of vulnerability spanning and the social and structural, and participation in public assistance programs, on disaster readiness among U.S residents. This examination is designed to illuminate not just their readiness to deal with an anticipated or unanticipated disaster, but also associated factors at multiple levels, to identify potential intervention points for public health education as well as policy objectives and design.

Dissertation Specific Aims

The dissertation seeks to broaden our understanding of disaster readiness and investigates individual, household, and policy correlates of disaster preparedness in the United States. The following research questions and corresponding aims guide the three separate papers constituting the dissertation.

Q.1. What role do social vulnerability and self-efficacy play in disaster readiness? <u>Aim 1: Examine associations between social vulnerability, self- efficacy, and disaster</u> <u>readiness.</u> Social vulnerability factors have been associated with a range of disaster outcomes, but its association with preparedness has been inconsistent (Kohn et al., 2012). In the context of disaster readiness, self-efficacy is classified as a motivational driver of disaster decision-making and preparation, where, upon motivation and confidence to act, people make household decisions toward favorable outcomes (Paton, 2003). Using nationally representative data from Federal Emergency Management Agency's (FEMA) National Household Survey 2018, Paper 1 (Chapter II of this dissertation) examines correlates of disaster preparedness with an emphasis on social vulnerability and selfefficacy.

Q.2. How are social and structural vulnerabilities associated with household disaster readiness?

Aim 2: Understand the role of social and structural vulnerabilities in disaster risk reduction.

A key driver of long standing disparities in the US, housing inequities often fall along racial and socio-economic lines, impacting how communities are affected in a disaster (Metzger & Khare, 2019). Household level data from the national sample of AHS 2017 are employed to examine the role of social (socio-demographic) and structural (housing and infrastructure) vulnerabilities on disaster readiness among U.S. households. Further, Paper 2 (Chapter III of the dissertation) examines the multiplicative effects of housing insecurity and social vulnerability indicators on disaster preparedness.

Q.3. How does participation in federal safety net programs relate to household disaster readiness in the United States?

Aim 3: Investigate the association of social welfare policy participation with disaster preparedness.

Multiple studies have examined how social safety nets relate to climate action and disaster risk reduction in low- and middle-income countries, but this is largely absent in the context of high-income countries such as the U.S. Using the 2017 AHS national sample, this paper tests hypotheses on the association of social vulnerability and welfare policy participation with disaster preparedness. Further, a structural equation modeling-based decomposition analysis clarifies the direct, indirect, and total effects of social vulnerability on preparedness, through welfare policy participation.



Figure 3. Structure of the Dissertation

Figure 3 shows the overall structure of the three-paper dissertation. The overarching theoretical framework informing the dissertation is the capabilities framework. The dependent variable of interest across the dissertation is disaster preparedness. The three individual papers outlined above are, in-turn, informed by the self-efficacy theory, vulnerability theory, and adaptive social protection in addition to

being framed within a capabilities-framework. Chapter II examines individual correlates of disaster preparedness spanning disaster self-efficacy and social vulnerability. Chapter III examines the relationship of disaster readiness with social vulnerability and structural vulnerability exemplified by housing quality, housing insecurity, and neighborhood perception. Chapter IV examines the role of social welfare policy and social vulnerability in relation to disaster preparedness. The research conducted for the three papers has been approved by the Boston College Institutional Review Board and was considered exempt from review under 45 CFR 46.4. All tables were created using 'asdoc,' a Stata program written by Shah (2018).

This chapter provides a summary of the study and introduces the three chapters. Each chapter exists as an independent study and while there is potential for overlap, should be considered separately for the dissertation. The conclusion chapter situates the three papers' findings into the context of broader questions of social, economic, and environmental justice in a world where climate and weather-related disasters have become part of our lived realities.

Chapter II. Heterogeneity in Disaster Preparedness in the United States: Role of Social Vulnerability and Self-Efficacy

The year 2017 was the costliest year on record in terms of disaster-related costs in the United States (U.S.), with property damage and associated relief costs exceeding 305 billion USD (NOAA National Centers for Environmental Information (NCEI), 2020). Aside from the economic strain, the human, social, and developmental consequences of these events comprise some of the foremost social justice issues of our time, with adverse effects experienced disproportionately by communities already struggling to make ends meet. The likelihood of climate and weather-related disasters such as floods, droughts, wildfires, superstorms, and hurricanes has increased manifold due to global climate change (IPCC, 2018), necessitating the need for proactive measures to prepare for these eventualities. A global assessment of disaster risk reduction noted that preparedness levels remain low even when countries are deemed well-prepared for such shocks (UNDRR, 2019, p 168). Improved disaster readiness is, therefore, an essential precursor to preserving people's well-being and is particularly significant in current times.

In the U.S., too, studies show substantial gaps in preparedness among individuals and households, making it imperative to understand factors associated with preparedness behaviors (FEMA, 2020a). Assessing and building capacities at individual and household levels are critical to devising appropriate strategies to aid communities in times of need. Too often, the burden of natural disaster outcomes falls disproportionately on socially vulnerable groups, including people of color, women, children, people with disabilities, and older adults (Bronfman et al., 2019; Elliott & Howell, 2017; Hikichi et al., 2016). While examining the impacts of disasters, especially on vulnerable groups, remains a

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pressing area of study, it is elemental to understand whether and how this vulnerability is related with the ability to withstand a disaster as well. Informed by Albert Bandura's (1978) theory of self-efficacy, this paper examines socio-cognitive and contextual factors associated with disaster preparedness in the U.S. through a quantitative analysis of crosssectional secondary data from the U.S. Federal Emergency Management Agency (FEMA).

Literature Review

Social vulnerability spans social and demographic factors that could lead to increased susceptibility to natural disasters and economic uncertainty, among other shocks (Flanagan et al., 2011, 2018). In disaster and hazards scholarship, this increased exposure typically translates to a higher likelihood of loss and a lower capacity for recovery (IHCAP, 2018). Disaster readiness is key to reducing the impacts of disasters, and given the higher losses clustered around community disadvantage in the U.S. and around the world (Kishore et al., 2018; Ma & Smith, 2020; Wisner et al., 2003), understanding how contextual vulnerabilities factor into disaster preparedness in the U.S. becomes imperative. Factors such as age, sex, and education have been associated with disaster readiness, but the specific directionality has differed. For instance, there is no consensus on the 'gender effect' on preparedness. At the same time, women seem to have a higher threat perception around natural disasters (Kohn et al., 2012); some studies suggest that they are more likely to have an evacuation plan or be more prepared (Hoffmann & Muttarak, 2017; Onuma et al., 2017; Russell et al., 1995) while others indicate otherwise (Bronfman et al., 2019; H. Kim & Zakour, 2017; Thomas et al., 2015). Physical disability, having young children at home, increasing age, and lower

socioeconomic status have been associated with preparedness behaviors, although this directionality has differed across studies (Kohn et al., 2012).

Socio-cognitive factors of risk and efficacy have been the subject of studies on how individuals and communities fare in the aftermath of a disaster (Patterson et al., 2010; Tran et al., 2013). Efficacy– the belief or ability to produce intended results, is often considered a pivotal precursor to behavioral adjustments in response to stressors and changes in social environments and improving the quality of life (Zanbar & Nouman, 2020). The literature on disaster self-efficacy centers around two aspects – a belief in the utility of taking preparedness actions and the confidence in one's ability to carry out these necessary actions. A belief in the usefulness of preparatory action (response efficacy) and trust in personal capacity to act across multiple readiness activities influence intention formation and action during disasters or other critical events (D'Amico et al., 2013; Samaddar et al., 2014; Taymoori et al., 2010). Belief in the self is deemed quantifiable in the literature on well-being and measuring human agency across cultures and disciplines (Alkire, 2005; Singh et al., 2016; Taymoori et al., 2010).

Self-efficacy has also been seen as a significant variable in studying disaster preparedness and action (Adams et al., 2017, 2019; Paton, 2003; Samaddar et al., 2014). For instance, Adams et al. (2019) found that self-efficacy mediated the relationship between self-rated health and disaster preparedness. Another study found that outcome expectancy – the usefulness of taking preparatory action, and self-efficacy- confidence in the self in being able to carry out necessary action, were more likely to co-occur in informing preparedness behaviors, with self-efficacy potentially mediating the effects of outcome expectancy (Samaddar et al., 2014). Further, studies suggest that self-efficacy was associated with increased disaster preparedness across populations with particular needs and vulnerabilities such as children with health care needs, persons with a disability, and older adults, as well as for representative population-level studies (Adams et al., 2017; Hamann et al., 2016; Marceron & Rohrbeck, 2019; Rivera, 2020; Wirtz & Rohrbeck, 2018). The two components of response efficacy- perceived effectiveness and value of preparatory action, and individual's belief in their capability provide a window into cognitive processes that have the potential to stimulate preparedness behaviors (Paton, 2003; Samaddar et al., 2014). Self-efficacy is widely understood as an important determinant of favorable outcomes related to individual well-being and reducing vulnerabilities. The reverse relationship, however, remains understudied. A 2016 study suggested a neighborhood effect on lower self-efficacy (Boardman & Robert, 2016), but whether this remains the case across other vulnerability factors and in the context of disaster-related self-efficacy is undetermined.

Scholars posit that prior experience of disaster might influence risk perception and preparedness behaviors (Cisternas & Bronfman, 2020; Malmin, 2020; Najafi et al., 2015; Walters et al., 2019). While this is an inconsistent predictor (B. K. Paul et al., 2015), it might confound the relationship between vulnerability, self-efficacy, and disaster preparedness. Similarly, information seeking around disasters and preparatory actions has been associated with disaster preparedness and protective action among individuals as well as communities (Lindell & Perry, 2012; Méndez et al., 2020; Mishra et al., 2009; Walters et al., 2019). Homeownership and tenure have been associated with disaster preparedness in the literature, with renters being more susceptible to disasters

than homeowners (Fothergill et al., 1999; Ma & Smith, 2020; Russell et al., 1995). A comparison between renters and homeowners across New Orleans and Torrance showed that renters had more characteristics associated with lower disaster readiness, such as a higher likelihood of membership in minority groups, fewer resources at hand, and family composition variables that placed them in a more vulnerable position than homeowner demographics (Burby et al., 2003). A recent study examined the likelihood of having a household emergency plan using FEMA's National Household Survey, with the key independent variable being efficacy in terms of perceived usefulness of preparedness behaviors in the event of disasters, in addition to other covariates (Rivera, 2020). The study found a statistically significant relationship between a person's efficacy and the likelihood of developing a household emergency plan while controlling for other factors. However, the other component of efficacy, self-efficacy, or confidence in the ability to act at the time of disaster was not included in the analysis. Further, the study examined one aspect of preparedness- having an emergency plan. This study extends this work by including multiple facets of preparedness and including both measures of efficacyresponse efficacy and self-confidence in one's ability to take action and other indicators of social vulnerability, including adjusting for respondents' reduced capacity to take necessary steps due to a disability or health condition.

Theoretical Framework

While multiple theoretical frameworks inform studies on disaster preparedness, including the social learning model, vested interest theory, community resilience, health belief model, and the protective action decision model (PADM) (Adame & Miller, 2015; Lindell & Perry, 2012; Norris et al., 2008; Rostami-moez et al., 2020), this study employs
Albert Bandura's self-efficacy theory. Self-efficacy is widely recognized as a multidomain measure of human agency (Alkire, 2005; Bandura, 1978). A mainstay in Sen's work on capabilities has been the emphasis on human freedoms to achieve goals that are deemed necessary (Alkire, 2005; Sen, 2000); in that, self-efficacy can be understood as an extension of capabilities at the individual and family level. One of the foremost empirical investigations into self-efficacy by Albert Bandura (1978) uses the social cognitive theory as the base; deemed the theory of human agency, or the self-efficacy theory, suggesting that empowerment and human agency have internal and external elements. Perceptions around abilities to undertake actions make humans more capable of in-fact carrying out specific activities to affect changes in their lives (Alkire, 2005).

Self-efficacy falls into the realm of motivational propellers of disaster decisionmaking and preparation where once motivated to consider hazards such as natural disasters, people make household decisions toward favorable outcomes (Paton, 2003). According to the theory, a dearth of belief in their own capacity, and the usefulness of taking action can hinder efforts to act (Paton & Johnston, 2001). Bandura (1978) further suggests that individuals might believe in the effectiveness of taking action (response efficacy) but lack the confidence in carrying out those activities (efficacy/confidence) that can in turn affect their actions. Self-confidence can thus co-occur with response efficacy, and consequently and jointly impact the functioning (Bandura, 1999). Using this theoretical framework, this paper investigates the association of social vulnerability and perceived self-efficacy with disaster readiness.

Study Purpose and Aims

While many studies have examined correlates of disaster preparedness, theorizing it with the help of concepts of vulnerability and self-efficacy concurrently on nationally representative data have been rarer (Becker et al., 2017; Cisternas & Bronfman, 2020; Malmin, 2020; Witrago & Perez, 2011; Zamboni & Martin, 2020). Socio-structural and cognitive theories operate in tandem and help conceptualize a better understanding of human behavior (Bandura, 1999). This paper will examine the association between social vulnerability, self-efficacy, and disaster readiness adjusting for prior experience of disaster, and disaster information seeking. Research questions guiding this paper are: 1. How is social vulnerability associated with disaster self-efficacy for households in the U.S.?

2. What role do social vulnerability and self-efficacy play in disaster readiness among U.S. households?

The first study hypothesis, informed by self-efficacy theory, is that there is a significant positive relationship between higher self-efficacy and social vulnerability. For the second hypothesis, a significant positive association between efficacy and preparedness and significant negative association between vulnerability and preparedness is expected. Figure 1 presents the conceptual model for paper 1; the key independent variables have a direct relationship with disaster preparedness. Prior disaster experience and information on disaster preparedness are the control variables to adjust for potential confounding effects. Based on the self-efficacy theory, the internal socio-cognitive factors and external contextual factors both play a role in determining behavior and stress response. In this model, belief in the importance and usefulness of taking action

(response efficacy), and confidence in one's abilities to take action in times of a crisis are hypothesized to directly be associated with disaster preparedness. Further, social vulnerability variables spanning socioeconomic status, minority status, and household composition are hypothesized to be directly associated with preparedness behaviors. In keeping with prior scholarship, having previously experienced a disaster, or having received information on disaster planning are used as controls to adjust for potential confounding.



Figure 2.1. Conceptual map

Methods

This paper used secondary data from the Federal Emergency Management Agency (FEMA) National Household Surveys (NHS) 2018 and applied a quantitative inferential design to investigate relationships between key variables of interest (FEMA, 2020b). The NHS is a nationally representative dataset assessing disaster readiness over time in the U.S. Though it started in 2007, it has been conducted every year since 2013. FEMA determines the number of survey respondents based on whether they were reached on landlines or cellphones, and phone preference. In 2018, the interviews were conducted in English and Spanish for 5003 respondents on both landlines and mobile phones after randomly selecting numbers across the country. Using this information in addition to the demographic subgroup tally, initial weights were calculated and then revised across selected demographic groups to rebalance the trimmed weights to get a representative sample of adults (18 and above) in the country (FEMA, 2018a). This paper examined correlates of disaster preparedness with an emphasis on social vulnerability and selfefficacy as predictors of preparedness through bivariate and multivariable statistical models. The data were first retrieved from the FEMA data center¹ and converted into the appropriate format for analysis in Stata 16. The study was evaluated by the Boston College Institutional Review Board and considered exempt from review.

Measures

Disaster Preparedness

The dependent variable is measured using nine indicators on multiple components of disaster preparedness such as having an emergency plan, communication plan, access

¹ FEMA and the Federal Government cannot vouch for the data or analyses derived from these data after the data have been retrieved from the Agency's website.

to supplies to get through three days without power or running water, and financial and document preparedness (Appendix Table 1.A, p 196). Similar to Malmin's (2020) analytic strategy, disaster preparedness was classified into cumulative, adequate, and minimal preparedness. The unweighted total score (0-9) across the nine items yielded the cumulative disaster preparedness.

Adequate preparedness was measured as an indicator variable with a score of 1 if the respondent answered yes to at least five items out of nine. Minimal preparedness was measured using variables on having food and water, funds, and access to a vehicle; those without any of these items were coded as 0 "Not minimally prepared" and those who are prepared for these minimal elements were coded as 1 (minimally prepared) (Malmin, 2020). The disaster preparedness measures were analyzed for scale reliability. Cronbach's alpha across preparedness measures was 0.66, similar to the range reported in other studies utilizing preparedness scales (Kohn et al., 2012) and deemed to hold acceptable internal consistency (Ursachi et al., 2015); the other two preparedness variables measured of preparedness were constructed from the cumulative measure.

Disaster Self-Efficacy

Efficacy is measured by respondents' beliefs in the importance of taking steps to prepare for a disaster and their perceived confidence in their ability to take action in the event of a disaster. Two indicators, 'Response efficacy' and 'self-confidence' in preparing for a disaster, both ordinal five-point Likert type scales, were recoded into a four-point scale for the study to maximize distribution within categories. For response efficacy, 'not at all' and 'very little' were combined into one category, and for confidence, 'not at all confident' and 'slightly confident' were combined into 'not too confident.'

Social Vulnerability

Social Vulnerability comprises the following group of indicators: *Socioeconomic Status*- Income measures monthly household income before taxes in seven discrete categories. Education measures the highest level of education obtained by respondents measured in five categories. *Household Composition* is measured by variables that examine the structure of the family such as caregiving responsibilities for a member with a disability or older adults in the house, sex, and age of the respondent, respondent's reduced capacity owing to disability or other health condition, number of adults, presence of children under 18 in the household, and whether the home was owned or rented. *Minority Status* includes Race, a categorical variable with five categories where categories of American Indian/Alaskan Native and Hawaiian/Pacific Islander were combined due to the smaller frequencies, and white was the reference group. The primary language was recoded into a dichotomous variable (English=1) measured if English was the primary language spoken at home (Flanagan et al., 2011).

Control Variables

Prior disaster experience was included as an indicator variable on whether or not the family experienced the impacts of a disaster in the past. Information on disaster planning was measured by a dichotomous variable gauging whether the respondent had seen, read, or heard information on disaster preparedness in the last six months. The variable FEMA region denoted the administrative divisions within the U.S. and was used for sensitivity analyses to include a regional component and test if results were similar in places more prone to disasters.

Data Management and Weighting

Key data management steps included recoding and labeling data to operationalize the variables. Data were further analyzed to ascertain patterns of missing information. Similar to other survey data, multiple variables in the study had two kinds of item nonresponse: "Don't know" and "Refused." Due to the use of secondary data, there was no way of finding out if these item nonresponses were systematic. Therefore a series of data management steps were undertaken to understand the nature of item nonresponse to infer the next analytic steps. The highest nonresponse occurred in the income variable, with nearly 43% of data missing. Treatment of 'don't know' and 'refused' items in survey data is the topic of much debate, and there is a lack of consensus about how to proceed in these circumstances. Waters et al. (2013) suggest that 'don't know' is more prevalent in populations affected by health disparities that can ostensibly be considered more vulnerable. However, an examination of descriptive statistics showed that most of the item nonresponse for income was in the category 'refused.' For complete case analysis, the 'don't know' and "refused" responses were recoded as missing since (1.) The number of 'don't know' responses were low, and (2.) There was no way of discerning a pattern between whether the respondents refused to answer or did not answer (Rivera, 2020). Nonresponse bias exists when non-respondents differ from the respondents in characteristics that could lead to sample biases (Whitehead et al., 1993). Best practices of dealing with missing data suggest multiple steps to choose the best

recourse (Nguyen et al., 2017), such as examining the differences between data's incompleteness and certain socioeconomic and demographic composition.

Since income had nearly 43% non-response, I examined the characteristics of respondents who were missing information for income to understand if data were indeed missing at random. This included checking the association of item response and non-response for income across demographic characteristics of education, sex, and race-based on previous scholarship. Education is often considered a proxy for socioeconomic status. Fisher's exact test showed no statistically significant relationship between income response and non-response and level of education or respondent's race. However, respondents' sex was significantly associated with whether they reported their income, with women being 19% more likely to not report income than male respondents. Further, the dependent variable disaster preparedness was not significantly associated with missing income categories. Therefore the data were assumed to be missing at random to then attempt steps to reduce nonresponse bias in the inferential analyses (S. Kim et al., 2007; Nguyen et al., 2017).

Income was a critical component to measure economic vulnerability. Owing to the absence of other proxy variables to substitute for income, multiple-imputation was the most unbiased method forward. Based on previous scholarship and suggested methods, all variables in the analysis model were included in the imputation models. The geographical variable, FEMA region, was included in the imputation models instead of state of residence to avoid potential convergence issues owing to multiple (50+) categories in the state variable during imputation. FEMA region had 2.34% missing information, which was deemed ignorable. Missing data were multiply imputed in two stages using chained equations, a switching regression method, and pooled imputations were stored for further analysis. In the pilot phase, I imputed 20 datasets using pooled chained regression equations. On examination of the fraction of missing information (FMI), the largest FMI was 0.74, suggesting the need for a higher number of imputations. Therefore in the second phase, I created 100 imputed datasets; a higher number of imputed datasets has been found to get more reliable standard error estimates and point estimates and is suggested as the current best practice for replicability (von Hippel, 2020). The final multivariable analyses were conducted on the 100 imputed datasets. Table 2.1.A in the appendix (p.199) shows the percentage of data that were multiply imputed. To get a more in-depth view of the data structure, regression models were built using complete case analysis and multiply imputed data.

Weighting

FEMA derived a set of weights for the entire sample assigned to each data record to calculate nationally representative estimates (FEMA, 2018a). For the purpose of this paper, the combined weight assigned to 4,743 of the 5003 data records in the 2018 NHS was used to obtain representative estimates of the entire survey population. FEMA reports that data records not assigned weights did not have sufficient information collected to allow for the calculation. These weights are used to summarize data from survey and lead to representative estimates for the survey's entire target population of adults living in the U.S.

Analysis Strategy

After providing descriptive statistics, the association between the vulnerability indicators and efficacy variables were assessed to answer the first research question. To

answer question two, Ordinary Least Squares (OLS) and logistic regression models tested the association of disaster preparedness with self-efficacy, social vulnerability, controlling for prior experience of disaster, and disaster preparedness information. Regression models span the three conceptualizations of preparedness as described earlier. *Model 1:* $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$

The dependent variable is cumulative disaster preparedness score, X_1 is Social Vulnerability (Socioeconomic Status, Minority Status, Household Composition), X_2 is Self-Efficacy comprising response efficacy and confidence in the ability to prepare, X_3 is Information on disaster preparedness, and X_4 is Prior Experience of Disaster.

Model 2:
$$\log\left(\frac{p}{1-p}\right) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$$

The dependent variable is adequate preparedness (Yes=1, No=0). Predictors are the same as the previous equation.

Model 3:
$$\log(\frac{p}{1-p}) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$$

The dependent variable is minimal preparedness (Yes=1, No=0), and predictors are the same as the first model. All tables were created using 'asdoc,' a Stata program written by Shah (2018).

Results

Weighted descriptive statistics describe overall disaster preparedness, selfefficacy, and social vulnerability measures as well as the control variables in the sample, with frequencies and measures of central tendency where applicable. In keeping with Hardt et al.'s (2013) recommendation, the summary statistics show the data as is, before imputations, and further inferential analyses are performed on both complete cases and imputed data to reduce potential muddying of interpretations owing to item nonresponse. The weighted representative sample comprises of 4743 respondents with an average score of 5.53 on nine items on cumulative disaster preparedness. Seventy-one percent of the sample was considered adequately prepared while the sample was split in half on minimal preparedness. About 7.11% of the sample earned less than USD 999 per month, and nearly 14% of the sample reported their income between 1000-2999 USD per month, falling under 200% of the federal poverty guidelines in 2017 for an average family of two. About 33% of the sample had a high school degree, and 8% had less than a high school degree. In terms of response efficacy, 38.27% of the sample reported that taking steps to prepare would help them "a great deal" in getting through a disaster in their area, and 37% were extremely confident that they would be able to take steps to prepare for a disaster. 13% of the sample reported a low response efficacy and about 9% reported low confidence in their ability to take preparatory action. Weighted descriptive statistics for all key variables in the study are presented in Tables 2.1 and 2.2.

Variable	Ν	Mean	Freq.	SD	Percent
Cumulative Preparedness	4743	5.53	4743	2.02	
Adequate Preparedness	4743				
0=No			1415		29.00
1=Yes			3328		71.00
Minimal Preparedness	4571				
0= No			2350		50.58
1=Yes			2221		49.42

Table 2.1. Weighted Descriptive Statistics for Dependent Variables (N=4743)

Table 2.2. Weighted Descriptive Statistics for Independent Variable and Covariates (N=4743)

Ν	Mean	Freq.	SD	Percent
4743				
		609		13.21
		1018		23.44
		1046		21.89
		1915		38.27
		142		2.85
		13		0.34
4743				
		477		8.96
	N 4743 4743	N Mean 4743 4743	<u>N Mean Freq.</u> 4743 4743 609 1018 1046 1915 142 13 4743 477	N Mean Freq. SD 4743 609 1018 1046 1046 1915 142 13 4743 477 477

2=somewhat confident	811	18.23
3=moderately confident	1555	33.65
4=extremely confident	1794	37.09
5=DK	96	1.80
6=Refused	10	0.27
Social Vulnerability		
Income 4	743	
1=0-999*	288	7.11
2=1,000-2,999	646	14.33
3=3,000-4,999	481	11.65
4=5,000-7,499	459	9.03
5=7,500-9,999	223	4.47
6=10,000-14,999	258	4.72
7=15,000 and over	345	6.40
8=DK	561	13.11
9=Refused	1482	29.18
<u>Education</u> 4	743	
1=Less than high school*	348	8.01
2=High school	998	33.05
3=Vocational school/some college	1222	30.82
4=College graduate	1272	17.09
5=Post grad	807	10.37
6=DK	18	0.06
7=Refused	78	0.59
Sex of Respondent 4	743	
0=Male*	2374	49.22
1=Female	2333	50.22
2=Other	6	0.13
3=DK	2	0.01
4=Refused	28	0.43
Elders or members with		
disability in home 4	743	
0=No	3854	81.82
1=Yes	812	17.58
2=DK	8	0.13
3=Refused	69	0.46
<u>Race</u> 4	743	
1=white*	3201	75.47
2=Black/African American	599	11.90
3=Asian	184	2.80
4=American Indian/Alaska Native	102	2.03
5=Hawaiian/Pacific Islander	35	0.38
6=DK	386	4.64
7=Refused	236	2.79
Primary Language English 4	743	
0=No	604	9.09
1=Yes	4032	89.85
2=DK	16	0.33
3=Refused	91	0.72
<u>Number of adults</u>	3.74	11.88
<u>Home-Own or rent</u> 4	743	
0=Rent*	1565	32.52
1=Own	2897	62.30
2=Other	81	1.88
3=DK	27	0.79
4=Refused	173	2.50

<u>Lower Capacity</u>	4653		
0=No		3839	81.86
1=Yes		814	18.14
Children under 18 at home			
0=No		3102	65.51
1=Yes		1540	34.49
Controls			
Experience of Disaster	4743		
0=No		2429	55.86
1=Yes		2292	43.67
2=DK		18	0.25
3=Refused		4	0.21
Disaster Information in last			
<u>six months</u>	4743		
0=No		2353	56.16
1=Yes		2340	43.12
2=DK		48	0.68
3=Refused		2	0.04

Note: Reference group indicated by an asterisk (*)

To answer the first research question, I conducted bivariate analyses between social vulnerability indicators and the two efficacy variables to test the association between these variables and response efficacy and confidence in carrying out action in times of disaster, respectively. Kruskall-Wallis equality of populations rank-test, Ranksum correlations, and spearman correlations were conducted depending on how the vulnerability indicator was measured. For instance, for vulnerability indicators, sex, language, and lower respondent capacity owing to disability, which are dichotomous variables, Wilcox-Mann-Whitney tests (independent samples t-test) were calculated, and for race, income, and education that are categorical variables, the Kruskall-Wallis tests were conducted.

The Kruskall-Wallis rank-test to examine the relation between race and efficacy variables showed significant differences in both response efficacy and confidence among racial groups (χ^2 = 35.86 p<0.001 df=3 and χ^2 = 30.74, p<0.001 df=3). Likewise, the test suggested statistically significant differences between response and confidence with respect to income and education levels (p<0.001), except between response efficacy and

income. In terms of language, the two-sample Wilcoxon rank-sum (Mann-Whitney U) test suggested a statistically significant distinction between those whose primary language was English or not with confidence but not with response efficacy. Male respondents differed from female respondents on both efficacy variables (p<0.001). However, caretaking responsibilities for older adults or persons with disability at home were not associated with response efficacy but were associated with respondent self-confidence in their ability to carry out preparatory action. A similar trend was observed with reduced personal capacity. Homeownership status was significantly associated with both efficacy variables, as was the number of adults living at home. Table 3 shows the results of the bivariate analyses across vulnerability indicators and the two efficacy variables.

Variable	Response efficacy	Confidence
Socioeconomic Status		
Education#	$\chi^2(4) = 17.850$	$\chi^2 = 147.362$ with 4 d.f.
	p<0.001	p<0.001
Income#	$\chi^2(6) = 8.306$	$\chi^2(6) = 86.251$
	p=0.22	p<0.001
Minority Status		
Language*	z=0.87	z=-15.69
	p=0.39	p<0.001
Race#	$\chi^2(3)=35.86$	$\chi^2(3)=30.74$
	p<0.001	p<0.001
Household Composition		
Sex*	z= -7.58	z=5.64
	p<0.001	p<0.001
Number of adults^	rho = 0.75	rho = -0.05
	p<0.001	p<0.001
Children under 18 at home	z= -8.36	z= 1.73
	p<0.001	p=0.08
Older adults/persons with disability in	z= -1.23	z= 2.85
home	p=0.22	p<0.001
Lower capacity	z=0.72	z= 5.35
	p=0.47	p<0.001
Home ownership	z=2.49	z= -10.72
	p<0.05	p<0.001

Table 2.3. Results of Bivariate Analyses between Social Vulnerability Factors and Efficacy

 Indicators

Chi Square or Kruskall-Wallis rank test; *(Wilcoxon Mann-Whitney U test); ^Non-parametric Spearmancorrelation

Multivariable analysis

While models were constructed using both complete cases and imputed data, the results discussed here pertain to the pooled imputed data. Previous scholarship suggests that Multiple Imputation is a robust mechanism to produce unbiased estimates with reliable confidence intervals (S. Kim et al., 2007; Schafer & Graham, 2002). While most relationships between key variables are similar across the complete case and imputed models, I discuss departures in the discussion section and include the tables and interpretations for the complete case analyses in the Appendix Tables 2.3.A -2.5.A (pp 201- 205). As expected, due to the high rate of missing data in the income variable, the Relative Variance Increase (RVI) was highest for income categories while the average RVI was 0.27, that is, the proportional increase in total sampling variance due to the missing information was 27% larger than the average variance had the data been complete.

Cumulative Preparedness

The regression of cumulative preparedness on key independent variables of efficacy and social vulnerability was statistically significant with F(28, 4323)= 83.20, p<0.001). The adjusted R-squared value for Model 1 was 0.39; that is, the independent variables and the controls in the model accounted for a 39% variance in the cumulative preparedness (R²=0.395, Adjusted R²=0.391). A statistically significant relationship exists between disaster self-efficacy and preparedness. Compared to those who reported 'not at all' in having the confidence to undertake preparatory action, being 'moderately confident' (b=0.91, t= 9.91, p<0.001, 95% CI [0.73,1.09]) and 'extremely confident' (b=1.47, t=15.72, p<0.001, 95% CI [1.29, 1.65]) were both associated with higher

cumulative preparedness, adjusting for other variables in the model. Those who reported 'quite a bit' on the importance of taking preparatory action scored 0.27 points higher on the preparedness score in comparison with those who answered 'not much' to response efficacy (b=0.27, t=3.14, p<0.01, 95% CI [0.10, 0.44]). Compared to the lowest income levels (0=999 USD per month), higher income levels were associated with a higher cumulative preparedness score. Compared to less than high school education, higher levels of education were associated with higher disaster preparedness (p<0.001). In terms of minority status, race was not significantly predictive of preparedness scores except for Asian respondents (b=-0.32, t=-2.39, p<0.05). The language spoken at home being English was significantly and positively associated with preparedness (b=0.49, t=5.86, p<0.001, 95% CI [0.33,0.66]). Among household composition factors, the number of adults, the presence of older adults or persons with disability, and presence of children under 18 in the house were not significantly associated with cumulative preparedness in the model. Women compared to male respondents were associated with 0.31 points lower preparedness score while adjusting for other covariates in the study (b = -0.31, t = -6.07, p<0.001, 95%CI [-0.40,-0.21]). Owning a home compared to renting a home was associated with 0.89 units higher preparedness (b=0.89, t=15.34, p<0.001). The two confounding variables, information on disaster preparedness and prior disaster experience were statistically significantly associated with higher scores of cumulative preparedness (p < 0.001). Having received information on disaster preparedness in the last six months was associated with 0.84 units higher preparedness score (b=0.84, t=16.45, p<0.001,95% CI [0.74,0.94]). As recommended when using imputed data, Fisher z transformation was used and standardized (beta) coefficients were also derived to get an estimate of the

relative importance of the key variables in the model (Harel, 2009). The absolute mean beta weights suggest that an income of 5000-7499 compared to under 999 and having received disaster information in the last six months had the highest individual association with cumulative preparedness (mean beta coefficient=0.21, 0.20). Additionally, the highest level of confidence in one's ability had relatively larger effect (mean beta coefficient= 0.34) compared to the other covariates. Table 4 includes the coefficients and the mean standardized coefficients for each independent variable.

 Table 2.4. Results for Linear Regression on Imputed Data for Cumulative Preparedness

 (N=4836)

Cumulative Prep.	Coef.	Mean Beta Coef.	St.Err.	p-value	95%	CI
Social Vulnerability						
<u>Income (0-999)</u>	0.000					
2.1000-2999	0.449	0.090	0.131	0.001	0.191	0.707
3. 3000-4999	1.009	0.184	0.136	0.000	0.740	1.277
4. 5000-7499	1.175	0.209	0.150	0.000	0.880	1.470
5.7500-9999	1.113	0.150	0.174	0.000	0.771	1.455
6.10000-15000	0.955	0.132	0.175	0.000	0.610	1.299
7.15000 and over	1.017	0.163	0.161	0.000	0.700	1.335
Education (Less than high school)	0.000					
High school	0.374	0.073	0.111	0.001	0.155	0.592
Vocational/Some College	0.612	0.128	0.115	0.000	0.387	0.837
College graduate	0.700	0.148	0.120	0.000	0.464	0.936
Post grad	0.648	0.116	0.130	0.000	0.392	0.904
<u>Sex(Male)</u>	0.000	•	•			
Female	-0.306	-0.073	0.050	0.000	-0.404	-0.207
<u>Race (white)</u>	0.000	•	•			
Black/African American	-0.121	-0.020	0.077	0.116	-0.273	0.030
Asian	-0.323	-0.034	0.135	0.017	-0.588	-0.058
AmIndian/Al.Native/Hawaiian/Pa	0.108	0.010	0.146	0.462	-0.179	0.395
c.Islander						
<u>Number of adults</u>	0.026	-0.002	0.023	0.264	-0.019	0.070
Older adults/Persons with	-0.004	-0.001	0.066	0.948	-0.134	0.125
<u>disability at home</u>						
Lower Capacity (No)	0.000					
Yes	-0.229	-0.042	0.068	0.001	-0.363	-0.096
<u>Children under 18 (No)</u>	0.000				•	
Yes	-0.106	-0.024	0.054	0.051	-0.212	0.001
<u>Language English (No)</u>					•	
Yes	0.497	0.082	0.085	0.000	0.331	0.664
Disaster Self-Efficacy		•			•	
<u>Response efficacy (not much)</u>	0.000	•			•	
2. somewhat	0.248	0.049	0.088	0.005	0.076	0.421

3. quite a bit	0.273	0.055	0.087	0.002	0.103	0.444
4. a great deal	0.355	0.083	0.080	0.000	0.198	0.512
<u>Confidence</u>	0.000					
2. somewhat confident	0.525	0.095	0.098	0.000	0.332	0.718
3. moderately confident	0.907	0.204	0.092	0.000	0.728	1.087
4. extremely confident	1.470	0.340	0.094	0.000	1.287	1.654
Covariates						
Experience of disaster (No)	0.000			•		
Yes	0.369	0.081	0.051	0.000	0.269	0.469
Disaster Information (No)	0.000					
Yes	0.839	0.200	0.051	0.000	0.739	0.939
Housing (Rent)	0.000					
Own	0.892	0.203	0.058	0.000	0.778	1.006
Constant	1.556		0.159	0.000	1.244	1.868
Number of Imputations	100					
R squared	0.395					
Adjusted R squared	0.391					

* *p*<.001, ** *p*<.01, *** *p*<.05

Adequate preparedness

The regression of adequate preparedness on the key independent variables and covariates was statistically significant with F(28,50494)=26.10. In general, higher response efficacy corresponded to being adequately prepared. Compared to 'not much' response efficacy, those who responded 'quite a bit' on the importance of taking preparatory action had 55% higher odds of being adequately prepared (OR= 1.55, t=3.29, p<0.01, 95% CI [1.19,2.01]). Compared to those who reported they were 'not confident' being 'moderately confident' was associated with two times higher chances of being adequately prepared (OR= 2.71, t=7.79, p<0.001, 95% CI [2.11, 3.48]) while being 'extremely confident' was associated with four times higher odds of being adequately prepared (OR=4.86, t=11.76, p<0.001, 95% CI [3.73,6.32]).

Similar to cumulative preparedness, monthly income levels of 3000 and above and higher education were associated with higher odds of being adequately prepared in the sample (p<0.001 - p<0.05). Race was not significantly associated with preparedness, but language was. Respondents who reported English as their main language were associated with 69% higher odds of being adequately prepared (OR= 1.69, t=4.43, 95% CI [1.34, 2.14]). Compared to men, women had 32% lower chances of being adequately prepared (OR= 0.69, t= -4.76, p<0.001, 95% CI [0.58, 0.80]). Caregiving responsibilities for older adults or the presence of persons with disability or children at home were not significantly associated with preparedness, and neither was the number of adults in the house. Owning a home compared to renting was associated with two times higher chances of being adequately prepared (OR= 2.53, t=11.19, p<0.001, 95% CI [2.15,2.98]), and both prior experience of disaster and receiving preparedness information were positively and significantly associated with adequate preparedness (p<0.001).

Table 2.5. Results of the Logistic Regression Model for Adequate Preparedness in Odds Ratios(N=4836)

Adequate preparedness	OR	St.Err.	p-value	95% CI	
Social Vulnerability					
Income (0-999)	1.000				
2.1000-2999	1.387	0.239	0.058	0.988	1.948
3. 3000-4999	2.494	0.483	0.000	1.704	3.651
4. 5000-7499	3.725	0.826	0.000	2.408	5.761
5.7500-9999	2.824	0.746	0.000	1.680	4.749
6.10000-15000	2.578	0.711	0.001	1.498	4.438
7.15000 and over	2.673	0.625	0.000	1.687	4.233
Education (Less than high school)	1.000				
High school	1.499	0.234	0.010	1.104	2.037
Vocational/Some College	1.868	0.298	0.000	1.366	2.555
College graduate	2.087	0.355	0.000	1.496	2.913
Postgrad	1.873	0.357	0.001	1.289	2.721
<u>Sex(Male)</u>	1.000				
Female	0.687	0.054	0.000	0.589	0.802
<u>Race (white)</u>	1.000				
Black/African American	0.862	0.099	0.196	0.688	1.080
Asian	0.863	0.164	0.437	0.594	1.252
AmIndian/Al.Native/Hawaiian/Pac.Is	1.026	0.228	0.907	0.664	1.586
lander					
<u>Number of adults</u>	1.011	0.035	0.759	0.945	1.080
<u>Older adults/Persons with disability</u>					
<u>at home (No)</u>					
Yes	1.013	0.104	0.903	0.828	1.238
Lower Capacity (No)	1.000				
Yes	0.838	0.085	0.081	0.687	1.022
<u>Children under 18 (No)</u>	1.000				
Yes	0.860	0.073	0.077	0.728	1.016
Language English (No)	1.000				
Yes	1.693	0.201	0.000	1.341	2.138

Disaster Self-Efficacy					
<u>Response efficacy (not much)</u>	1.000		•		
2. somewhat	1.429	0.190	0.007	1.101	1.855
3. quite a bit	1.551	0.207	0.001	1.194	2.014
4. a great deal	1.358	0.166	0.012	1.068	1.725
<u>Confidence</u>	1.000		•		
2. somewhat confident	1.843	0.252	0.000	1.410	2.408
3. moderately confident	2.710	0.347	0.000	2.109	3.483
4. extremely confident	4.857	0.652	0.000	3.733	6.320
Covariates					
Experience of disaster (No)	1.000				
Yes	1.446	0.114	0.000	1.238	1.688
Disaster Information (No)	1.000				
Yes	2.496	0.199	0.000	2.135	2.919
Home (Rent)	1.000				
Own	2.533	0.210	0.000	2.153	2.981
Constant	0.051	0.013	0.000	0.032	0.083
Number of imputations	100				
Mean Adjusted Pseudo R-squared	0.27				
F(28,50494)	26.10	p<0.001			
* <i>p</i> <.001, ** <i>p</i> <.01, *** <i>p</i> <.05		-			

Minimal Preparedness

The logistic regression for minimal preparedness on the key independent variables in the study was statistically significant (F(28, 44445)= 23.21, p<0.001). While the highest response efficacy levels were not significantly associated with minimal preparedness, thinking that taking action is 'somewhat' useful was associated with undertaking at least the minimal preparatory actions (OR= 1.35, t=2.41, p<0.05, 95 % CI [1.06, 1.73]). Higher confidence was associated with being minimally prepared, and this relationship was statistically significant at all higher confidence levels (p<0.05-0.001). A monthly income above 3000 USD was associated with the odds of being minimally prepared (p<0.001-p<0.01). Having a high school education and above was significantly associated with being prepared for at least the minimum preparatory actions. Minority status was associated with minimal preparedness; compared to white respondents, Black and Asian respondents reported significantly lower odds of being minimally prepared (p<0.001), and English being the primary language spoken at home was associated with twice the odds of being minimally prepared adjusting for other covariates (OR= 2.07, t=5.63, p<0.001, 95% CI [1.61, 2.67]).

Household composition indicators showed some variability in results. Women had 25% lower odds of reporting being prepared for the minimum actions compared to men (OR=0.75, t= -4.06, p<0.001, 95% CI [0.66,0.86]). Respondents who reported a reduced capacity due to mental illness or other disability had 34% lower odds of being at least minimally prepared when compared to their counterparts who did not report such reduced capacity (p<0.001) but having care responsibilities of older adults or person of disability at home was not associated with preparedness. Having a child under 18 in the house was associated with about 25% lower odds of being minimally prepared (OR=0.75, t=-3.59, p<0.001, 95% CI[0.65,0.88]). Those owning a home had two times higher odds of being prepared compared to those renting their home (OR=2.00, t=8.97, p<0.001, 95% CI[1.72,2.33]). Compared to those who did not receive information on preparedness in the last six months, receiving such information was associated with 45% higher odds of being minimally prepared (OR=1.45, t=5.25, 95% CI [1.26,1.66]).

Minimal Preparedness	OR.	L. St.Err.	p-value	95%	CI
Social Vulnerability					
Income (0-999)	1.000				
2.1000-2999	1.270	0.236	0.200	0.881	1.831
3. 3000-4999	1.917	0.380	0.001	1.297	2.831
4. 5000-7499	2.764	0.567	0.000	1.847	4.137
5.7500-9999	4.189	0.989	0.000	2.633	6.665
6.10000-15000	2.981	0.729	0.000	1.843	4.823
7.15000 and over	2.949	0.596	0.000	1.983	4.386
Education (Less than high school)	1.000				
High school	1.432	0.256	0.045	1.008	2.034
Vocational/Some College	1.869	0.336	0.001	1.314	2.658
College graduate	1.748	0.324	0.003	1.215	2.513
Postgrad	1.994	0.391	0.000	1.358	2.928
<u>Sex(Male)</u>	1.000				
Female	0.751	0.053	0.000	0.657	0.864
<u>Race (white)</u>	1.000				

Table 2.6. Results of the Logistic Regression Model for Minimal Preparedness (N=4836)

Black/African American	0.553	0.060	0.000	0.447	0.684
Asian	0.450	0.086	0.000	0.310	0.654
AmIndian/Al.Native/Hawaiian/Pac.Islander	1.060	0.212	0.769	0.717	1.568
<u>Number of adults</u>	1.039	0.033	0.235	0.976	1.106
Older adults/Persons with disability at					
<u>home</u>					
Yes	0.878	0.083	0.166	0.730	1.056
Lower Capacity (No)	1.000				
Yes	0.664	0.064	0.000	0.549	0.803
Children under 18 (No)	1.000				
Yes	0.758	0.058	0.000	0.652	0.882
Language English (No)	1.000				
Yes	2.073	0.269	0.000	1.608	2.672
Self-Efficacy					
<u>Response efficacy (not much)</u>	1.000				
2. somewhat	1.351	0.168	0.016	1.058	1.724
3. quite a bit	1.155	0.141	0.240	0.909	1.467
4. a great deal	1.155	0.130	0.202	0.926	1.441
<u>Confidence</u>	1.000				
2. somewhat confident	1.412	0.212	0.022	1.052	1.894
3. moderately confident	1.867	0.260	0.000	1.420	2.454
4. extremely confident	3.350	0.473	0.000	2.541	4.417
Covariates					
Experience of disaster (No)	1.000	•			
Yes	1.076	0.076	0.303	0.936	1.237
Disaster Information (No)	1.000	•			
Yes	1.452	0.103	0.000	1.264	1.669
<u>Home (Rent)</u>	1.000	•			
Own	2.005	0.155	0.000	1.722	2.334
Constant	0.041	0.011	0.000	0.024	0.069
Number of Imputations	100				
F(28, 44445)	23.21				
Mean Adjusted Pseudo R-squared	0.22	p<0.001			
* p<.001, ** p<.01, *** p<.05					

Regression Diagnostics

Model 1 was tested to ensure OLS assumptions, including linearity, normality, homoscedasticity, and multicollinearity, were met. A kernel density plot and standardized normal probability (P-P) plot revealed a slight deviation from normality for the model residuals, which was deemed minor (Figure 2.3.A, p 206). On visual inspection of the data, there were no influential outliers detected, however, the model was in violation of the assumption of homoskedasticity. There was no evidence of multicollinearity between the variables in model 1, and the variance inflation factor was 2.32. For models 2 and 3, variance inflation factor (vif) was 2.32, indicating no evidence of multicollinearity in the models. Further, post-estimation analysis to assess model specification and classification revealed no specification errors suggesting that all models were correctly specified across different conceptualizations of preparedness with the exception of Model 2 with imputed data. The area under the ROC curve for model 2 was 0.80 and 0.76 for model 3, suggesting very good and acceptable discrimination between the binary outcomes, with model 2 performing slightly better. Post-estimation imputation variance and relative efficiency for all variables was above 0.99 and a relative efficiency closer to 1 suggesting that the number of imputations was adequate to derive efficient estimates from the analyses. All data management and analyses are conducted using Stata version 16.

Sensitivity analysis

Two forms of sensitivity analyses were performed. The first one entailed running the analyses on both complete case and imputed models to examine differences owing to non-response and missing data. Second, the analyses using imputed data were conducted at smaller geographical regions to examine if the trends differed at a more granular geographical level. The results are explicated next:

 Since sex was associated with missing information in income, it was pertinent to examine if the trends were markedly different in complete case analysis and analysis with imputed data. As seen in the Appendix Tables 2.3.A -2.5.A (pp 201-206), in the complete case analyses, compared to male respondents, women respondents scored 0.39 points lower on cumulative preparedness, had 34% lower odds of being adequately prepared, and 33% lower odds of being minimally prepared. In comparison across analyses, the point estimates in complete case models were slightly higher, however the multiply imputed data had lower standard errors and are considered more credible due to the repeated nature of the estimations (Peterson & Martin, 2016). The predictive abilities for the logistic models 2 and 3 were also tested by examining the receiver operating characteristic (ROC) for the models with complete cases and suggested acceptable to very good discrimination between the dichotomous outcomes.

2. The three models were also replicated at the FEMA region level IV and VI to assess if the effect sizes were consistent in regions that are more vulnerable to extreme weather events. FEMA Region IV includes Alabama, Georgia, North Carolina, South Carolina, Tennessee, Kentucky, and Mississippi, and Region VI consists of Texas, Arkansas, Louisiana, New Mexico, and Oklahoma, regions highly prone to disasters. In FEMA region IV, compared to the reference group (white), belonging to Black and Asian racial groups emerged as a key indicator of lower minimal preparedness, and compared to men, women were 47% less likely to be adequately prepared and 52% less likely to be at least minimally prepared. For region VI, being Black was associated with decreased odds of being minimally prepared but being Asian was not, and the rest of the results followed a similar pattern as the analysis with the imputed sample.

Discussion

Globally, climate and weather-related disaster events have become an all-toocommon phenomenon owing to a mounting climate crisis. In the year 2017, three major hurricanes Harvey, Irma, and Maria, resulted in large-scale economic destruction and other human consequences in the U.S. in addition to 13 more billion-dollar events (NOAA National Centers for Environmental Information (NCEI), 2020; Pierre-Louis, 2018). The United Nations Disaster Risk Reduction framework emphasizes the need for engagement and participation at all levels of society to prepare for and manage disaster risk, which is a combination of hazard, exposure, and vulnerability (Highfield et al., 2014; UNDRR, 2019). Social inequities and imbalances are precursors to these disasters' uneven consequences (O'Keefe et al., 1976). Additionally, socio-cognitive and psychological determinants are also considered influential elements in risk reduction behaviors in previous studies (Grothmann & Reusswig, 2006; Y. C. Kim & Kang, 2010; Seebauer & Babcicky, 2020), and this paper combines the two aspects informed by the self-efficacy theory.

The federal U.S. government through FEMA, conducts the NHS to evaluate and inform a 'culture of preparedness' in the country (FEMA, 2018a). As a measure of the culture of preparedness in the U.S., therefore, results from this study deliver a mixed verdict. The association between efficacy dimensions and vulnerability indicators differed across socioeconomic status, minority status, and household composition in the current study. Multiple factors play into improving self-efficacy, including own experience and observing others' behaviors and actions (Mertens et al., 2018). The variance in response efficacy among racial groups and by sex found in this study needs further investigation to understand structural and systemic reasons for these differences in the U.S. context. Similarly, the relationship between vulnerability indicators and the level of self-confidence in carrying out preparatory action needs further consideration to glean how this difference plays out and whether there might be a multiplicative or mediating role played by self-efficacy among vulnerable communities in the context of disaster preparedness and response. There has been conjecture about the implausibility of

households not accounting for peripheral constrictions such as their socioeconomic status or household composition in reporting their self-efficacy around mitigating actions (Seebauer & Babcicky, 2020). This paper's findings add to the takeaways from Boardman & Robert's (2016) work on the linkages between socioeconomic status and self-efficacy. Boardman and Robert point to institutional discrimination and the resultant limitation in resources available to lower socioeconomic status neighborhoods that affect self-efficacy. The findings of bivariate analyses underscore the need for further investigation of the vulnerability factors and how they are related to self-efficacy.

Further, the three conceptualizations of preparedness presented variations in how the key covariates play into different operationalizations. Both response efficacy and confidence in ability to carry out activities were significantly associated with preparedness across cumulative and adequate preparedness, but not with minimal preparedness where only those who somewhat agreed that preparatory actions were useful were more likely to be prepared. Self-confidence, on the other hand, was consistently associated with being better prepared across all three operationalizations similar to previous scholarship (Adame & Miller, 2015; Adams et al., 2017). Less than 10 percent of the sample reported not being confident in their ability to act in the event of a disaster. The results underscore the need to improve individuals' and groups' sense of efficacy in terms of their abilities which is often a factor of their particular contexts and resources available to them. Self-efficacy theory posits the effect of confidence on the direction, influence, and persistence of a said behavior (Bandura, 1978; Taymoori et al., 2010). Further, studies have found that community cohesion and neighborhood belonging improves individual self-confidence (Y. C. Kim & Kang, 2010); focusing on vulnerable

groups such as persons with disabilities in understanding specific barriers they face and connecting them to resources and connections within the community can be examples of expansive strategies to boost their sense of efficacy overall. Including both outcome expectancy and efficacy expectations is critical in understanding the concurrent association of outcome and efficacy expectations with preparedness behaviors (Bandura, 1978) and this analysis lends further nuance to Rivera's (2020) study.

Socioeconomic status is a consistent factor in predicting preparatory behaviors even when studies are constrained to specific populations (Gibson et al., 2018; Hoffmann & Muttarak, 2017; Kohn et al., 2012) and this study had similar findings even if the relation was not directional owing to the cross-sectional data. Lower income was not associated with adequate or minimal preparedness but income above 3000 USD per month (about 36000 USD) annually was associated with higher preparedness. In terms of cumulative preparedness, even a slight jump from the lowest income group was associated with a higher readiness score in the sample. Those who attended a vocational college and higher had a higher preparedness score or were adequately prepared compared to those who had not completed high school and when it came to minimal preparedness, those having a high school degree and above were all more likely to have at least access to food, water, funds, and transportation in event of a disaster.

The assessment of vulnerability indicators relating to household composition offer multiple notable findings. The number of adults in the house was not a factor, and while the presence of older adults or persons with disability was not significantly associated, having children under 18 years of age was associated with lower odds of being minimally prepared. At nearly 33% of the sample, renters were consistently less prepared, in

keeping with previous literature. This presents an important avenue for integrated policy intervention (Ma & Smith, 2020; Rivera, 2020). Considerable evidence exists on the disproportionate impacts of disasters on renters (Fussell & Harris, 2014) and overwhelmingly, renters are more likely to be poorer, and persons of color who are often forced to spend up to half of their income on housing costs (Desmond, 2018). Investment in safe, good quality, and affordable public housing can go a long way in ensuring this demographic does not repeatedly fall through the cracks. Nearly 18% of the respondents had a disability or health condition that affected their capacity and were found to be less prepared in the event of an emergency. This study also found that respondent's reduced capacity as a result of a disability or health condition was associated with their confidence in their ability to take action. Previous studies centered on individuals with disability have conjectured lower levels of self-efficacy among this group could be a possible reason for lower preparedness (Eisenman et al., 2009; Marceron & Rohrbeck, 2019). While disaster policies in the U.S. since 2009 have prioritized housing, psychological, and medical support for persons with disability after a disaster (IOM, 2015), there is a potential and clear need to identify and work to improve access to resources and information for persons with disability before a disaster strikes to ensure the best chances for this group.

Race was inconsistently correlated with disaster readiness in this study. Belonging to Asian groups was associated with a decrease in the cumulative preparedness score. This finding must be interpreted keeping in mind the low number of observations for this group as well as the possibility that these groups likely face more stressors in the aftermath. In terms of being prepared with food and water supplies, funds, and access to vehicle in times of disaster, race became important. African Americans and Asians were both less likely than their white counterparts to have taken the steps necessary to be considered at least minimally prepared. Respondents were also less likely to be prepared when the primary language spoken at home was not English. Lower income households are more likely to be female headed, to be racial and ethnic minorities, and more likely to rent rather than own homes (Fussell & Harris, 2014). Therefore a more expansive view of including multiple vulnerabilities at the same time is an exercise in identifying groups with specific and intersecting needs and lends further nuance to identifying the gaps in preparedness.

Lastly, in the current study, while prior experience of disaster was associated with cumulative and adequate preparedness, it was not associated with minimal preparedness, which is a departure from multiple previous studies (Kohn et al., 2012) including Malmin's (2020) findings using 2013 data where previous experience of disaster was associated significantly with all three conceptualizations. In their conclusions, Malmin (2020) suggested that minimal preparedness might be key to assessing the changes in preparedness culture and practices, and therefore, this departure from their findings is striking. Receiving information related to disaster preparedness within the last six months reliably improved the score and odds of being prepared among respondents and is a testimony to the need for increased awareness and messaging on what to do in the event of various kinds of disasters. 56% of the sample reported not receiving any information. During the early weeks of the Covid-19 pandemic, multilingual information packets were distributed to every home in the city of Boston (J. C. Fox, 2020). This is an example of a

comprehensive public health messaging strategy aimed at informing people about the threat as well as the resources available to them. Promoting similar information on steps to take to avoid injury and about resources available from the local government or neighborhoods in times of a disaster is crucial, particularly among persons with disability, female headed households, and renters to ensuring information reaches those who are least prepared but are the most vulnerable. A holistic approach to building community resilience would require building efficacy across individual, household, and broader levels.

Limitations

The present study uses cross-sectional data and therefore stops short of offering causal inferences. Any significant association cannot be seen as directional in the context of this current study. Longitudinal studies following the same cohorts would help address this limitation and shifts in self-efficacy over time or due to adverse or positive experiences. Data are self-reported, and there is potential for bias, particularly with efficacy variables related to self-efficacy (Holbrook et al., 2003). However, self-reported measures are often considered reliable proxies for socio-cognitive data.

Previous scholarship suggests that self-efficacy mediates the relationship between self-rated health and disaster preparedness; however, there is no commensurate measure in the FEMA data; therefore, due to dataset limitations, self-rated health was not adjusted for. Another study suggests that self-efficacy could mediate the relationship between outcome expectancy and flood preparedness but uses a small sample (Samaddar et al., 2014). The current study only examines the additive or cumulative effects and does not examine the mediation or moderation effects of self-efficacy on social vulnerability in determining preparedness. While the use of cross-sectional data makes it difficult to do a true mediation analysis it has been done before (Domènech-Abella et al., 2018) and should be attempted upon appropriate data availability. Future analysis may also examine the multiplicative effects of self-efficacy in the context of social vulnerability and disaster preparedness.

With the exception of the model for adequate preparedness using imputed data, all models passed the test of model specification. A possible reason for this could be the low correlation between the variables in the model (Table 2.2.A. p198) that led to the specification error in the imputed model; however, the complete case model for adequate preparedness showed no specification errors. Given that multiple imputations are more accurate for estimating point and standard error estimates and that the models were theoretically informed, the results are presented as such.

This study used weighted descriptive analyses and multiple imputations for the multivariate analyses; therefore, some numbers differ from Rivera's (2020) study that used complete case analyses and focused on one aspect of preparedness, having an emergency plan. Inclusion of non-responses particularly in inferential analyses, might potentially bias the results, and to address this, the analyses were conducted on both complete cases and multiply imputed data and then a sensitivity analysis was performed to examine differences if any.

Implications

Awareness on steps to prepare for disasters and other shocks needs to reach communities most in need, and this study examined a national dataset on preparedness levels and associated socio-demographic and socio-cognitive factors. Similar to Malmin's deduction, minimal preparedness presents interesting and telling results in this study and indicates the minimum level of readiness required by households and the gaps therein. This paper can inform both micro and macro social work practice, particularly on the need for social workers to engage in socio-environmental topics with their clients. In terms of the hierarchy of needs, planning for a future, often unpredictable and hypothetical disaster scenario might take a back seat when faced with more urgent demands for survival. This is where helping professions and welfare policies can help fill the gaps. Social work and public health practitioners must consider both systemic and psychosocial factors of social vulnerability and self-efficacy when designing communication and working with populations in need (Zakour, 1997; Zanbar & Nouman, 2020).

The associations between efficacy and vulnerability indicators need to be understood further and present a crucial area for social work research and intervention. Results in this study suggest differences in efficacy levels by sex, race, and language spoken at home and since higher confidence levels are associated with better preparedness, this needs to be woven into disaster policy decisions when working with diverse communities. Probing why a certain group is feeling less confident in their abilities to take action in disasters can reveal systemic and contextual aspects that lawmakers and local organizers can take into cognizance. Social workers and helping professionals working with individuals and families can incorporate a range of interventions to improve client self-efficacy related to disasters. This is an important avenue for evidence-based stratagems to address socio-environmental challenges through behavioral change as underscored in the Grand Challenges of Social Work position paper that calls for further assessment of designated strategies that can be tailored to local contexts (Kemp & Palinkas, 2015). Some of these approaches could include increased exposure to disaster information to clients, including in languages they understand, verbal persuasion, as well as mastery and performance (Bandura, 1978; Marceron & Rohrbeck, 2019). For instance, preparedness mastery could be demonstrated through targeting and accomplishing smaller tasks by showing clients how they can plan for the basic minimum for their families or training the trainers on emergency preparedness measures. Bandura (1978) further suggests vicarious examples and verbal persuasion as sources of building self-efficacy and preparedness aspects can be incorporated into client casework with an eye toward enhanced efficacy.

A commitment toward a just, sustainable world necessitates moving people and communities out of harm's way, and disaster risk reduction in general, and disaster preparedness, in particular, are pieces of this complex puzzle. Disasters and disaster policies do not operate in isolation from the society; for disaster policies to remain equitable, administrators and organizers need to ensure resources are devoted to communities that have been historically disenfranchised and learnings from this paper add to our knowledge base to help inform facets of policy, practice, and research on predisaster interventions.

Chapter III. The Role of Social and Structural Vulnerabilities on Disaster Preparedness

Large-scale disasters in the U.S., such as Hurricane Katrina in 2005, are etched in public memory for the destruction they wrought and particularly for the inequities they drew to the surface (Gibson et al., 2018; Spence et al., 2007). While natural disasters have tremendous consequences for all, the impact is often unequal and worsens existing vulnerabilities (Al-Rousan et al., 2014; Elliott & Howell, 2017; Rivera & Miller, 2007). The U.S. federal agencies began implementing public education campaigns on community preparedness after successive tragedies such as the terror attacks on September 11 and Hurricane Katrina, though the former did not qualify as a natural disaster. This drive toward preparedness was designed to help groups sustain in the period before outside help arrived in the event of natural calamities and hazards (Kohn et al., 2012; Rogers, 2018). An examination spanning more than two decades of mitigation investments by federal agencies found that each \$1 spent in hazard mitigation saved \$6 in disaster costs post-facto (Multi-Hazard Mitigation Council, 2019). While this report was explicitly for disaster mitigation in the context of the built environment, similar projections on social aspects of disasters indicate that investments and planning before a disaster strikes significantly reduce disaster costs in the aftermath (Together We Stand, 2016).

The year 2020 was extraordinary in terms of a record number of hurricanes, wildfires, rain, and flooding events that captured the nation's attention (Thompson, 2020). Amid a once in a century pandemic, nearly 65% of those surveyed in a National Preparedness Poll in the U.S. reported a likelihood of themselves or their loved ones facing a major disaster in the next five years, with natural disasters being their greatest worry (Healthcare Ready, 2020), ostensibly a result of ongoing hardships due to the pandemic that had brought the distant threat of a future disaster, home, for many worldwide and here in the U.S. The apprehension overall is not unfounded; between 2011 and 2019, the U.S. experienced 119 billion-dollar-events, classified by the U.S. government's National Oceanic and Atmospheric Administration as weather and climate disasters where costs due to damage exceeded USD 1 billion (NOAA National Centers for Environmental Information (NCEI), 2020). However, what is particularly alarming was that despite this concern, less than 40% of those surveyed reported having an emergency plan in place to respond to such a disaster (Healthcare Ready, 2020). From over 51% the year before, the proportion of those with an emergency plan had improved over time. Yet, the parallel increase in apprehension from 54% in 2019 to 65% in 2020 suggests that this remains an unresolved issue of concern. Many U.S. residents do not have a strategy to deal with such eventualities (Healthcare Ready, 2019). This paper examines the role of contextual vulnerabilities in both the social and built environment, specifically housing quality, security, and neighborhood risk that could potentially impact disaster readiness among households in the U.S.

Literature Review

Disaster preparedness refers to the suite of measures including strategic and action-oriented activities that help individuals, households, businesses, and communities plan and prepare for the eventuality of a disaster (Council for Excellence in Government, 2006; FEMA, 2019a; Thomas et al., 2015) and this paper focuses on household preparatory action. The ability to plan for a disaster is associated with a range of contextual factors and, similar to disaster after-effects, often traverses several sites of inequalities, including socio-demographic and institutional disparities (Ardalan Sohrabizadeh, 2016; Cisternas & Bronfman, 2020; Murti et al., 2014; Zamboni & Martin, 2020). An appraisal of literature including a systematic review of 36 studies on disaster preparedness indicates that the association of socio-demographic predictors of sex, race, and ethnicity with disaster preparedness has varied, with some studies finding minority racial and ethnic groups and women more likely to be prepared for a disaster, and others submitting otherwise (Hoffmann & Muttarak, 2017; Kohn et al., 2012; Najafi et al., 2015). Social Vulnerability as defined by the Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) comprises of Census indicators spanning socioeconomic status (SES), minority status/language, household composition, and housing type and transportation (Flanagan et al., 2011). Per the CDC, the SVI is a useful tool in spatially isolating socially vulnerable populations. Multiple studies utilize the SVI as a composite variable to study social and health disparities and disaster-related outcomes (Flanagan et al., 2018; Rickless et al., 2021). Others (Lue & Wilson, 2017) have used components of the index to understand differential associations with additional indicators of vulnerability to get an in-depth understanding across different underserved and under-researched groups. Older age and higher socioeconomic status, marital status, and the presence of children at home have been linked to higher preparedness across multiple groups even when other vulnerabilities such as the presence of disability have been taken into account (K. Cox & Kim, 2018; Hoffmann & Muttarak, 2017; Kohn et al., 2012).
The mounting scarcity of affordable and safe housing in the U.S. presents an additional, significant social challenge with implications for overall quality of life, and security before, during, and after a natural disaster. An estimated 1.2 million new displacements occurred in 2018 due to hazard events such as hurricanes and wildfires (IDMC, 2019). These events threaten housing security (Comerio, 1997) and can, in extreme cases, result in homelessness (Sundareswaran et al., 2015), adding to the housing crisis in the U.S. Studies examining housing-related influences on social inequities hint at the association of social vulnerability with housing insecurity (Hughes et al., 2017; Ma & Smith, 2020). Living patterns in the US are often both the result of, and precursors to, problems faced by disadvantaged populations. A history of racialized housing policies has created segregation patterns with multiple ramifications through the life course (Metzger & Khare, 2019). The housing crisis itself has been associated with a range of adverse outcomes due to a convergence of demographics, discriminatory policy, and lopsided mechanisms that favor funding and investments to areas with higher income and opportunity (Fothergill et al., 1999; Metzger & Khare, 2019). Natural disasters make this already precarious situation, worse.

Housing insecurity is a wide-ranging term often comprising affordability, safety, quality of housing, instability or multiple moves (sometimes also known as environmental displacement), and loss of housing (Elliott & Howell, 2017; HUD, n.d.). A key driver of long-standing inequities in the U.S., housing inequities often fall along racial lines, (Metzger & Khare, 2019), and in turn, can affect how impacts are felt. Evidence suggests that post-disaster recovery often reinforces this discrimination (Rivera & Miller, 2007; Sundareswaran et al., 2015) thereby influencing how households can respond to future stressors. Most disaster-related mortality and injuries occur as a result of the destruction or collapse of housing as well as airborne wreckage (Ma & Smith, 2020) and poor housing quality, therefore, is an important component of pre-disaster vulnerability. Comerio (1997) found that housing loss as a result of natural disasters in the U.S. was commensurate with low- and middle-income countries. Multiple other studies have examined the association of housing insecurity with adverse disaster outcomes and found that insufficiencies in housing factors such as housing quality, affordable and safe housing, and overcrowding can heighten risks during and after disasters (Comerio, 1997; Fothergill et al., 1999; Murti et al., 2014).

Further, individual and neighborhood risk perception have been associated with better preparedness and action decisions for future uncertainties (Basolo et al., 2009; Gowan et al., 2015; Patterson et al., 2010). Neighborhood risk perception has been associated with a range of behavioral outcomes (Nebbitt & Lombe, 2010) and includes support for higher preparedness as a result of awareness and risk discernment (Hoffmann & Muttarak, 2017). While Nebbitt & Lombe (2010) focus on perceived risk relating to neighborhood crime, and this study focuses on perception of neighborhood risk pertaining to disaster, the processes of how these shape behavioral outcomes are parallel. Studies posit that prior disaster experience is associated with higher preparedness (Becker et al., 2017; Hoffmann & Muttarak, 2017; Y. C. Kim & Kang, 2010; Malmin, 2020; Mishra et al., 2009). The quality and category of information people get and believe in is also linked to housing conditions with the source of information related to credibility and preparedness intents and action (Burby et al., 2003; Y. C. Kim & Kang, 2010).

Conceptual Framework

Vulnerability is an established theoretical construct examining factors that impact the susceptibility of groups or individuals to natural disasters among other system-level shocks (Flanagan et al., 2011; O'Keefe et al., 1976; Quesada et al., 2011). These factors not only determine the pattern of access to resources that can help people cope but also relate to improved abilities to respond and bounce back after a disaster or stressful event (DFID, 2011; Mearns & Norton, 2009). As discussed previously, the CDC's social vulnerability index (SVI) includes structural factors such as infrastructure and housing characteristics within the ambit of vulnerability (Cutter et al., 2008; Flanagan et al., 2011). However, instead of combining them together, assessing these two sets of vulnerabilities distinctly might be more informative in parsing out co-occurring influences. While social vulnerability examines the socio-demographic factors affecting household resilience (Flanagan et al., 2011), structural vulnerability is understood as an artifact of the population; a positionality or social location that is a product of the precarity produced by social hierarchies (Bourgois et al., 2017; Lopez et al., 2018) and can extend to the built environment (Fleming et al., 2019). Structural vulnerability was defined by Quesada, Hart, & Bourgois (2011, p1) as "a product of the complementary forces of class-based economic exploitation and cultural, gender/sexual, and racialized discrimination and the process of symbolic violence and subjectivity formation that have increasingly punitive neoliberal discourses of individual unworthiness." It is theorized as the site of intersecting power hierarchies or historical policies as manifest in housing, immigration, or healthcare systems, that can affect an individual or group's probability of encountering barriers that can constrain decision-making as well as access to resources,

thus putting them at risk for negative outcomes (Bourgois et al., 2017). Housing insecurity, quality, and neighborhood risk are operationalized in this study as points of convergence of overlapping power hierarchies that can potentially affect household decision-making around disaster planning (Fussell & Harris, 2014; Metzger & Khare, 2019; Sundareswaran et al., 2015). In this study, social and structural factors are considered separately but concurrently to isolate their effects on disaster preparedness and to examine their potential interface.

Study Purpose and Aims

This paper examines concurrent and cross-cutting associations of social and structural vulnerability factors with disaster preparedness in the U.S. While multiple studies have investigated the effect of housing insecurity across a range of adverse outcomes after a natural disaster (Comerio, 1997; Fussell & Harris, 2014; Ma & Smith, 2020), fewer empirical studies have examined how housing insecurity is associated with disaster preparedness (Adams et al., 2019; Sundareswaran et al., 2015) and to the best of our knowledge, no nationally representative study has examined how social and structural vulnerabilities interact and simultaneously relate to preparedness among households in the U.S. Research questions guiding this paper are:

- How do social and structural vulnerabilities relate to disaster preparedness in the USA?
- How does housing insecurity modify the effects of social vulnerability factors on disaster preparedness?

Hypotheses

H1. Structural and social vulnerabilities are associated with household abilities to make provisions in preparation of disasters.

H2. Housing insecurity moderates the relationship between social vulnerability and disaster preparedness.

The motivations for not starting with directional hypotheses are due to the possibility that groups that have been historically disadvantaged might be less prepared as they face a range of other stressors and unanticipated disasters in the future are not the priority (Baker & Baker, 2010); on the other hand, they might be more equipped to deal with uncertainties owing to constantly being prepared for the worst (Kim & Zakour, 2017). This would then point to other factors such as ineffective response and rehabilitation systems making outcomes worse in event of disaster, despite household preparedness. Testing these hypotheses can illuminate preparedness behaviors within the constraints people have, to help ideate how education, interventions, and policy can lead to prevention of harm before a disaster. Figure 3.1 presents the conceptual framework for the paper where social and structural vulnerabilities are hypothesized to directly be associated with disaster preparedness with housing insecurity moderating the relationship between social vulnerability and disaster preparedness. Housing insecurity is posited to have both direct and multiplicative effects with social vulnerability factors on the dependent variable. Source of information is the control variable to account for possible confounding, as evidenced in previous scholarship (Ardalan & Sohrabizadeh, 2016; Becker et al., 2017; Malmin, 2020; Walters et al., 2019).



Figure 3.1. Concept Map Showing Association of Social and Structural Vulnerability with Disaster Preparedness

Methods

Data and Sample

This paper uses nationally representative data from the 2017 American Housing Surveys (AHS) Public Use Files (PUF). Conducted by the U.S. Census Division and Department of Housing and Urban Development (HUD), the AHS are the most comprehensive, longitudinal housing unit surveys to assess housing quality in the U.S. (American Housing Survey, 2018; Hughes et al., 2017). The AHS have been conducted since 1973 with questions on neighborhood and household characteristics among other topics. Respondents are interviewed by evaluators from the Census Bureau in person or on the phone. Interviews typically last about 40 minutes and the data universe comprises all residential housing units in the country at the time of the survey covering 50 U.S. states and the district of Columbia (AHS, 2017). Each housing unit in the sample represents 450-4000 housing units in the country with sample weights assigned to reduce errors. The current study sample was redrawn in 2015 and a module on disaster preparedness was administered in 2017 to half the sample. A total of 84,879 housing units were selected and after accounting for ineligible and non-response, 66,752 housing units were retained for analysis, resulting in the weighted response rate for the national sample in 2017 being 80.4%. All information collected by the U.S. Census Bureau is confidential and information from AHS respondents is protected by federal law (AHS, 2017). The sample for this paper is restricted to common households from 2017 that answered the topical module on disaster preparedness (N= 33,474). All data used in this study are deidentified to ensure respondent confidentiality and are publicly available. The study presented minimal risk owing to the use of secondary data and was exempted for review by the Boston College Institutional Review Board.

Measures

Dependent Variable

The dependent variable comprises of nine indicators on disaster preparedness (Appendix, Table 1.B., p. 196). Similar to previous scholarship (Malmin, 2020), the unweighted total score across the preparedness items is used for the conceptualization of cumulative preparedness. Additionally, preparedness is also conceptualized as a dummy variable, minimal preparedness, measured using variables on having food and water, finances, and access to a vehicle; those without any of these items are coded 0 "Not minimally prepared" and those who are prepared for all of these elements are coded as 1 (minimally prepared) (Malmin, 2020).

Independent Variables

Key explanatory variables for this paper are classified into social and structural vulnerabilities.

Structural Vulnerability. Structural vulnerability is measured by housing insecurity, housing inadequacy, and the neighborhood risk perception. Housing insecurity is a dichotomous variable combining mortgage, rent, and utilities related delinquency in the last three months (Respondents were asked whether they received notice of missed payment for mortgage, utilities, or were unable to pay rent in the last few months). Housing adequacy is a measure of housing quality assessed by HUD taking into account inadequacies on a range of measures on the quality of housing including plumbing, heating, electricity, and other maintenance and upkeep issues. Three categories, severely inadequate, moderately inadequate, and adequate, were recoded into a dichotomous variable for more meaningful interpretation (1= Adequate and 0= inadequate). Neighborhood risk was an indicator variable measuring respondent perception on whether they live in a neighborhood more at risk for floods or other natural disasters.

Social Vulnerability. Independent variables to measure social vulnerabilities include variables under three main groupings: Socioeconomic Status, Minority Status, and Household Composition. Socioeconomic status comprised of income and education. The AHS examine the total money income of the household in the 12 months before the interview; this was recoded into monthly income in seven categories to get a more granular look at monthly household finances. Education of the householder was a categorical variable measuring the highest level of school completed. Minority status

variables included householder race, ethnicity, and primary language used in the household. Race was a categorical variable, ethnicity a dichotomous variable measuring whether householder identified as Latinx or otherwise, and Language was measured by an indicator variable about the language the interview was conducted in. Household composition variables included multiple theory and literature informed variables. Age of householder was measured as the age reported as of their last birthday at the time of the interview sorted in four categories. Presence of older adults in the family was measured as a dichotomous variable created from a question on the number of adults over 65 living in the house unit. Similarly, presence of children younger than 6 years of age was a dichotomous variable. Presence of person with disability was a dichotomous variable measured as anyone in the household with hearing, vision, mental, physical, self-care disabilities as well as if a person has difficulty doing basic errands and needs assistance. Sex of the householder was a dichotomous variable. Marital status of the householder was a categorical variable with three categories: married, widowed/divorced/separated, and never married.

Control Variables. Source of information was a categorical variable of the preferred source of information in time of disaster.

Table 1 shows the operationalization of the key variables in the study

Туре	Indicator	Measurement
Dependent Variable	Cumulative Preparedness	Score 0-9. Cumulative score across nine preparatory items.
	Minimal Preparedness	0 = No/1 = Yes. Questions on preparedness for food, water, emergency-funds, and transportation.
Independent Variables		
	Structural Vulnerability	
	Housing Insecurity	0 = No/1 = Yes (Inability to pay mortgage/rent/utilities)
	Housing Adequacy	0= No/ 1=Yes (HUD housing quality assessment)

Table 3.1. List of Variables

	Neighborhood Risk	0= No/ 1=Yes (Respondent's opinion on neighborhood being high risk for floods and other disasters)
	Social Vulnerability	,
	Socio Economic Status	
	Income	Monthly household income in categories
		1=0-999*, 2=1000-2999, 3= 3000-4999, 4= 5000-7499, 5= 7500-10,436
	Education	Highest level of Education completed by householder
		1=Less than high school diploma*, 2= High school degree or some
		college, 3= Diploma/Associate's degree 4= Graduate or Postgraduate
	Household Composition	
	Age of householder	Age on last birthday in categories. 1= 15-35*, 2= 36-55, 3= 56-65, 4= 66-85
	Sex of householder	0= Male/ 1=Female
	Number of adults in HH	Continuous Variable denoting number of adults 18 and above in
		household
	Person with disability in HH	0 = No/1 = Yes
	Older adult (65+) in household	0 = No/1 = Yes
	Marital Status of householder	1= Married, 2= Widowed/Divorced/Separated,3= Never married
	Children under six in HH	0=No/1=Yes
	Minority Status	
	Race	In categories-1=White*; 2=Black/African-American; 3= American
		Indian/Alaska Native/Native Hawaiian/Pacific Islander; 4= Asian; 5=
		Two or more races
	Language (English)	0 = No/1 = Yes
	Ethnicity LatinX	0 = No/1 = Yes
Control	Source of Disaster Information	1= Family/Friends/Neighbors*;2= Radio/TV; 3= Internet
Note: *	Rafaranca Group	

Note: *- Reference Group.

Weighting

Sample weights provided by the AHS improve coverage and produce national estimates (American Housing Survey, 2018). For analytical purposes, split sample weights were applied for all descriptive statistics and across regression models for those who were administered the disaster preparedness module in 2017.

Analysis Strategy

Univariate statistics characterize the study sample, and a series of regression models test the two hypotheses. Sequential block-wise entry testing each group of independent variables (Structural Vulnerability, Socioeconomic Status, Minority Status, Household Composition) separately suggested minor incremental changes to the model per group, therefore the variables were included altogether in keeping with the conceptual framework for the study. Model 1 tested the main effects of the covariates on cumulative preparedness using ordinary least squares (OLS) regression. In the model, Y is

cumulative disaster preparedness, X_1 is Socioeconomic Status (Income, Education), X_2 is minority status (Race, English language) X_3 denotes household composition variables, X_4 is housing insecurity, X_5 spans structural vulnerability measures of housing inadequacy and neighborhood risk, X_6 includes the study control, source of information on disaster preparedness. The regression equation is:

Model 1:
$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + e$$

Model 2 used the logistic regression function to regress the dependent variable, minimal preparedness (Yes=1 and No=0), on the independent variables.

Model 2:
$$\log(\frac{p}{1-p}) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6$$

In the next set of models (Model 3), X_1X_4 , X_2X_4 , X_3X_4 describe the multiplicative properties of housing insecurity across the 12 social vulnerability variables on disaster preparedness.

Model 3:
$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_{14} X_1 X_4 + b_{24} X_2 X_4 + b_{34} X_3 X_4 + e$$

Model 4 represents the logistic regression models to test the moderating effect of housing insecurity on social vulnerability's association with minimal preparedness.

Model 4: $\log(\frac{p}{1-p}) = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_{14} X_1 X_4 + b_{24} X_2 X_4 + b_{34} X_3 X_4$

In all, for the second hypothesis, 11 OLS and 11 logistic regression models were run to independently test the moderating effects of housing insecurity for the eleven variables covering aspects of social vulnerability. Across the two conceptualizations, 24 regression models were built in all to answer the two research questions. All tables were created using 'asdoc,' a Stata program written by Shah (2018).

Results

The final weighted study sample consisted of 29,070 housing units with 52% male and 48% female householders. The mean preparedness score among the sample was just over five on a scale of 0-9. Fifty seven percent of the population was not minimally prepared that is, they reported not being prepared with food, water, funds, and means of transportation in event of a disaster. Housing adequacy had a low variability; about 5% of the sample could be classified as living in inadequate housing and 95% with adequate housing quality according to HUD criteria. About 17% of the sample could be classified as housing insecure due to an inability to pay rent, mortgage, or utilities. Eight percent (2183) of the sample perceived their neighborhood to be at high risk for floods or other disasters. About 36% of the sample earned below USD 2999 per month with about 11% of those with a monthly income under USD 999. Around eleven percent of the sample, (3494 respondents) had less than a high school degree, a little over 50% had between a high school degree to diploma or Associate's degree and 35% had graduate degrees or higher. Similar to the U.S. demographic distribution, 78% of the respondents were white and 14% Black or African American with about 5% Asian and about 3% identifying as American Indian/Pacific Islander/ Alaskan Native or belonging to two or more races and 13% of the households in the sample identified as LatinX. About half the respondents were married at the time of the survey, 10% had children under the age of six in their housing unit, 28% of the units indicated the presence of older adults and 22% had a person with disability at home. The most prevalent source of information during a

disaster was radio or television at 47% and 33% of the sample relied on the internet and

20% on friends, family, and neighbors for such information. More details on the

descriptive statistics for key variables in the study are displayed in Table 3.2.

 Table 3.2. Weighted Descriptive Statistics for all variables in the study (N=29070)

Variables	n	Mean/Prop.	Freq.	Percentage
Disaster Preparedness				
Cumulative preparedness (score 1-9)	29070	5.01		
Minimal Preparedness	27,713			
No			16015	57.08
Yes			11698	42.92
Structural Vulnerability				
Housing Adequacy	29070			
Not Adequate			1419	4.98
Adequate			27651	95.02
Housing Insecurity	29,070			
No			24,115	82.36
Yes			4955	17.64
Neighborhood risk perception	28061			
No			25878	92.27
Yes			2183	7.73
Social Vulnerability				
Monthly Income	29066			
1. 0-999*			3756	11.39
2. 1000-2999			7135	25.09
3. 3000-4999			5311	19.26
4. 5000-7499			4626	16.49
5. 7500-9999			2910	10.38
6. 10000-14999			2828	9.26
7. 15000 and over			2500	8.11
Householder education	29070			
1. Less than high-school			3494	10.88
2. high school or some college			11432	40.63
3. diploma or associate			3752	13.54
4. Grad/postgrad*			10392	34.95
Number of persons age 18 and over	29070	1.94		
Age of householder	29070			
15-35			5809	19.75
36-55			10750	36.50
55-65			5561	20.13
65 and older			6950	23.61
<u>Sex of householder</u>	29070			
Male			14708	51.74
Female			14362	48.26
<u>Marital Status</u>	29047			
Married			13904	49.53
Widowed/Separated/Divorced			8371	28.58
Never Married			6772	21.89
Children under 6 in the household	29070			
No			25969	89.36
Yes			3101	10.63

Older adults in the household	29070		
No		20493	71.07
Yes		8577	28.93
Persons with disability in household	28252		
No		21788	77.16
Yes		6464	22.84
<u>Race of Householder</u>	29070		
1. white Only*		22053	78.39
2. Black Only		4323	13.71
3. A.I /Al. Native/ Hawaiian/Pac. Islander		457	1.59
4. Asian Only		1843	4.85
5. two or more races		394	1.46
<u>Language</u>	27262		
English		26073	96.64
Other		1189	3.36
Ethnicity			
(Non LatinX)		24526	86.37
LatinX		4544	13.63
Control			
Source of Disaster information	26586		
1. Family/friends/Neighbors		5233	19.31
2. Radio/TV		12585	47.61
3. Internet		8768	33.07

*- Reference group

The results discussed in the next sections pertain to the main effects models that tested the first hypothesis of how structural and social vulnerabilities are connected with disaster readiness in the U.S. For the multivariable analyses, income was capped at two times the 2017 median monthly income at USD 10,436; income beyond 10,436 USD per month or USD 125,232 annually, was not considered in further analysis since higher income cushions against multiple other shocks. This analytic decision led to a loss of about ten percent of the cases which was considered acceptable given the focus of the study on vulnerabilities including financial vulnerability. Given the low variation in the national sample, the last three racial groups were combined into 'other racial minorities' for the multivariable analyses. Similarly, language was not included in further analyses owing to low variation in the variable.

Cumulative Preparedness

Cumulative preparedness was measured as the aggregate score across nine preparatory actions reported by a respondent for a given housing unit, similar to previous scholarship (Zamboni & Martin, 2020). The adjusted R-squared for Model 1 was 0.09; that is, the linear model explained nine percent of the variance in cumulative preparedness and the model was statistically significant (F (25, 22100)= 55.53, p<0.001). Structural vulnerability indicators were all significantly associated with preparedness (See Table 3). Adjusting for other variables in the model, those having adequate quality housing were associated with a 0.45 unit increase in cumulative preparedness (b=0.45, p<0.001, 95% CI [0.32,0.59]) compared to those who lived in houses classified inadequate by HUD. Rental, mortgage, or utility related delinquency on the other hand was inversely associated with preparedness. On average, households that lagged behind on their payments for rent, mortgage, or utilities scored 0.19 lower on cumulative preparedness score (b= -0.19, t=-4.66, p<0.001, 95% CI [-0.26,-0.11]) compared to those who were able to make their rental or mortgage payments on time, holding other variables constant. Respondents who reported living in an at-risk neighborhood, that is when they considered their neighborhood susceptible to floods and disasters, were also significantly associated with higher preparedness (b= 0.17, p<0.01, 95% CI [0.06, 0.28]) compared to respondents who did not perceive a threat from disasters to their vicinity.

Socioeconomic Status

As expected, income and education were positively associated with cumulative preparedness. All higher income categories were positively and significantly associated with preparedness compared to those earning less than USD 999 per month (p<0.001)

and higher education too was associated with a higher preparedness score. Higher monthly income was associated with progressively higher cumulative preparedness and having a high school or Associate's degree was associated with higher preparedness compared to those with less than a high school education.

Minority Status

Race was significantly and negatively associated with preparedness among Black householders compared to white householders (b= -0.10, t=-2.25, p<0.05, 95% CI [-0.19, -0.01]). Ethnicity comparing Spanish origin of householder versus other ethnic identities was also significantly associated with cumulative preparedness (b= -0.14, t=-2.92, p<0.01, 95% CI [-0.23,-0.05])

Household Composition

Compared to male householders, on average female headed households scored 0.14 units lower on the preparedness score while holding other variables constant (b= - 0.14, t= -4.46, p<0.001, 95% CI [-0.20,-0.08]). Compared to respondents in the age group 15- 35, preparedness scores increased among older respondents including adults aged 56- 65 (b= 0.29, t=5.32, p<0.001, 95% CI [0.19, 0.40]). Marital status was significantly associated with preparedness; widowed, separated, and divorced respondents as well as those who were never married had significantly lower preparedness scores compared to those who were married (p<0.001). The presence of older adults at home was significantly associated with 0.22 points higher preparedness (b= 0.22, t=3.26, p<0.01, 95% CI [0.09, 0.37]) while presence of a person with disability at home was associated with a lower score of preparedness by 0.24 units (b= -0.24, t= -6.43, p<0.001, 95% CI [-0.31,-0.17]). Source of information was not statistically significant in relation to

preparedness. The standardized coefficients suggest that income and marital status had relatively stronger associations with the dependent variable compared to other covariates. Results of the linear regression model regressing cumulative disaster preparedness on the key vulnerability covariates are presented in Table 3.3.

Cumulative Preparedness	Coef.	Beta Coef.	St.Err.	t-value	p-value	[95%	Conf
•						Inter	val]
Structural Vulnerability							
Housing Adequacy (Not	0.000						
Adequate)							
1. Adequate	0.451	0.056	0.068	6.60	0.000	0.317	0.586
Housing Insecurity (No)	0.000						
1. Yes	-0.186	-0.039	0.040	-4.66	0.000	-0.264	-0.108
Neighborhood Risk (No)	0.000						
1. Yes	0.169	0.025	0.056	3.01	0.003	0.059	0.286
Social Vulnerability							
Income (0-999)	0.000						
2. 1000-2999	0.236	0.058	0.053	4.42	0.000	0.131	0.340
3. 3000-4999	0.514	0.118	0.057	9.07	0.000	0.403	0.625
4. 5000-7499	0.585	0.130	0.060	9.81	0.000	0.468	0.702
5. 7500-10,436	0.652	0.130	0.064	10.19	0.000	0.526	0.777
Education (Less than high	0.000						
school)							
2. high school or some	0.312	0.084	0.051	6.15	0.000	0.213	0.411
college							
3. diploma or assoc. degree	0.412	0.079	0.061	6.71	0.000	0.292	0.532
4. grad/postgrad	0.260	0.064	0.056	4.67	0.000	0.151	0.370
Race (white)	0.000						
2. Black Only	-0.101	-0.020	0.045	-2.25	0.024	-0.189	-0.013
3.	-0.168	-0.024	0.057	-2.96	0.003	-0.280	-0.057
Asian/AmIndian/Pac.Island							
er							
Ethnicity Latinx (No)	0.000						
1. Yes	-0.137	-0.026	0.047	-2.92	0.003	-0.228	-0.045
Sex (Male)	0.000						
1. Female	-0.138	-0.038	0.031	-4.46	0.000	-0.198	-0.077
Age (15-35)	0.000						
36-55	0.199	0.051	0.046	4.29	0.000	0.108	0.290
56-65	0.295	0.064	0.056	5.32	0.000	0.186	0.404
66-85	0.166	0.039	0.087	1.91	0.056	-0.004	0.336
Marital Status (Married)	0.000						
Widowed/Divorced/Separat	-0.489	-0.124	0.041	-11.87	0.000	-0.570	-0.409
ed							
Never married	-0.579	-0.134	0.045	-12.76	0.000	-0.668	-0.490
Number of persons at home	0.074	0.034	0.022	3.44	0.001	0.032	0.117
Children at home (No)	0.000						
Yes	0.049	0.008	0.057	0.85	0.393	-0.063	0.160
Older adults at home (No)	0.000						
Yes	0.229	0.057	0.070	3.26	0.001	0.091	0.367

Table 3.3. Linear Regression Estimates for Cumulative Disaster Preparedness (n=22, 125)

Persons with disability at home (No)	0.000						
Yes	-0.241	-0.056	0.037	-6.43	0.000	-0.314	-0.168
Source of	0.000						
Information(family/friends)							
2. Radio/TV	0.062	0.017	0.041	1.50	0.133	-0.019	0.143
3. Internet	-0.041	-0.010	0.045	-0.91	0.361	-0.129	0.047
Constant	3.993		0.116	34.37	0.000	3.765	4.221
Mean dependent var	4.807						
R-squared	0.088						
F-test	55.526		p-value		0.000		

Note: Reference group in parentheses

Minimal Preparedness

Factors of housing adequacy and housing insecurity were significantly associated with being at least minimally prepared (F(25, 21909)= 35.52, p<0.001). On average, living in adequate quality housing was associated with 88% higher odds of being prepared with food, water, funds, and access to transportation in event of a disaster, compared to those whose housing did not meet the HUD criteria (OR=1.88, p<0.001, 95% CI [1.58,2.24]). Being housing insecure, which in this study meant being unable to pay rent, mortgage, or utilities, significantly lowered the odds of being minimally prepared by 21% (OR= 0.79, p<0.001, 95% CI [0.72,0.87]) adjusting for other variables in the model.

Socioeconomic Status

Compared to households with income under 999 USD, households with higher income were significantly associated with minimal preparedness holding other covariates in the study constant (p<0.05, p<0.001). Similarly, overall higher education was associated with higher odds of being at least minimally prepared compared to those who reported having less than a high school education (p<0.001).

Minority Status

Race of the householder was statistically significantly associated with being minimally prepared but not across all categories of race. Black householders had 15%

lower odds (OR= 0.85, p<0.01, 95% CI [0.77,0.95]) of being minimally prepared compared to white heads of household, adjusting for other variables in the study. Ethnicity was not significantly associated with preparedness in the model.

Household Composition

Women heads of household had 17% lower odds of being prepared compared to their counterparts who were men (OR=0.83, p<0.001, 95% CI [0.77, 0.89]) and in terms of the householder's marital status, the odds of being minimally prepared for divorced/widowed/separated and never married were 22% and 27% lower respectively, compared to those who were married (p < 0.001). The number of persons at home was statistically significantly associated with being minimally prepared; with an increase in the number of people at home the odds of being minimally prepared went down by 13% (OR = 0.87, p < 0.001, 95% CI [0.83, 0.91]). The presence of persons with disability at home decreased the chances of being minimally prepared by about 29% (OR= 0.71, p<0.001, 95% CI [0.65, 0.77]), and the presence of older adults at home increased the odds of being minimally prepared by 27% (OR= 1.27, p<0.01, 95% CI [1.07, 1.49]). Compared to getting information from friends and family, getting information from the internet was associated with lower odds of being minimally prepared by about 14% (OR= 0.86, p<0.001, 95% CI [0.77,0.95]). Results of the logistic regression analysis for minimal preparedness are presented in Table 3.4.

Table 3.4. Weighted Logistic Regression Analysis for Minimal Preparedness (N=21934)

Minimal Preparedness	O.R.	St.Err.	t-value	p-value	[95% Conf	Interval]
Structural Vulnerability						
Housing Adequacy (Not Adequate)	1.000		•	•		
1. Adequate	1.884	0.167	7.15	0.000	1.584	2.241
Housing Insecurity (No)	1.000					
1. Yes	0.791	0.037	-5.04	0.000	0.722	0.866

1. Yes 1.079 0.073 1.13 0.260 0.945 1.231 Social Vulnerability .	Neighborhood Risk (No)	1.000					
Social Vulnerability Income (0-999) 1.000 . <t< td=""><td>1. Yes</td><td>1.079</td><td>0.073</td><td>1.13</td><td>0.260</td><td>0.945</td><td>1.231</td></t<>	1. Yes	1.079	0.073	1.13	0.260	0.945	1.231
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Social Vulnerability						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Income (0-999)	1.000					
3. 3000-4999 1.806 0.123 8.66 0.000 1.579 2.064 4. 5000-7499 1.963 0.141 9.39 0.000 1.705 2.260 5. 7500-10436 2.008 0.156 8.97 0.000 1.724 2.338 Education (Less than high 1.000 .	2. 1000-2999	1.185	0.077	2.62	0.009	1.044	1.346
4. 5000-7499 1.963 0.141 9.39 0.000 1.705 2.260 5. 7500-10436 2.008 0.156 8.97 0.000 1.724 2.338 Education (Less than high school or some college 1.502 0.091 6.74 0.000 1.335 1.691 3. diploma or assoc. degree 1.754 0.127 7.78 0.000 1.322 2.021 4. grad/postgrad 1.555 0.105 6.54 0.000 1.362 1.775 Race (white) 1.000 3. Asian/Amln/AlaskaNative 1.067 0.071 0.99 0.324 0.938 1.215 Ethnicity Latinx (No) 1.000 . <td>3. 3000-4999</td> <td>1.806</td> <td>0.123</td> <td>8.66</td> <td>0.000</td> <td>1.579</td> <td>2.064</td>	3. 3000-4999	1.806	0.123	8.66	0.000	1.579	2.064
5. 7500-10436 2.008 0.156 8.97 0.000 1.724 2.338 Education (Less than high school or some college 1.502 0.091 6.74 0.000 1.335 1.691 3. diploma or assoc. degree 1.754 0.127 7.78 0.000 1.323 2.021 4. grad/postgrad 1.555 0.105 6.54 0.000 1.362 1.775 Race (white) 1.000 . <	4. 5000-7499	1.963	0.141	9.39	0.000	1.705	2.260
Education (Less than high school) 1.000 .	5. 7500-10436	2.008	0.156	8.97	0.000	1.724	2.338
2. high school or some college1.5020.0916.740.0001.3351.6913. diploma or assoc. degree1.7540.1277.780.0001.3232.0214. grad/postgrad1.5550.1056.540.0001.3621.775Race (white)1.0002. Black Only0.8540.045-3.000.0030.7700.9473. Asian/AmIn/AlaskaNative1.0670.0710.990.3240.9381.215Ethnicity Latinx (No)1.0001. Yes1.8860.0571.510.1320.9761.201Sex (Male)1.0001. Female0.8280.030-5.130.0000.7710.890Age (15-35)1.00056-551.3200.0725.070.0001.5412.00166-851.7560.1178.440.0001.5412.00166-851.7560.1075.210.0000.7090.856Never married0.7790.037-5.210.0000.8290.915Children at home (No)1.000Yes0.9520.662-0.750.4500.8371.082Older adults at home (No)1.000Yes0.7050.031 </td <td>Education (Less than high school)</td> <td>1.000</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Education (Less than high school)	1.000					
3. diploma or assoc. degree 1.754 0.127 7.78 0.000 1.523 2.021 4. grad/postgrad 1.555 0.105 6.54 0.000 1.362 1.775 Race (white) 1.000 . </td <td>2. high school or some college</td> <td>1.502</td> <td>0.091</td> <td>6.74</td> <td>0.000</td> <td>1.335</td> <td>1.691</td>	2. high school or some college	1.502	0.091	6.74	0.000	1.335	1.691
4. grad/postgrad 1.555 0.105 6.54 0.000 1.362 1.775 Race (white) 1.000 2. Black Only 0.854 0.045 -3.00 0.003 0.770 0.947 3. Asian/AmIn/AlaskaNative 1.067 0.071 0.999 0.324 0.938 1.215 Ethnicity Latinx (No) 1.000 1. Yes 1.083 0.057 1.51 0.132 0.976 1.201 Sex (Male) 1.000 . <	3. diploma or assoc. degree	1.754	0.127	7.78	0.000	1.523	2.021
Race (white) 1.000 .	4. grad/postgrad	1.555	0.105	6.54	0.000	1.362	1.775
2. Black Only 0.854 0.045 -3.00 0.003 0.770 0.947 3. Asian/AmIn/AlaskaNative 1.067 0.071 0.99 0.324 0.938 1.215 Ethnicity Latinx (No) 1.000 . <t< td=""><td>Race (white)</td><td>1.000</td><td></td><td></td><td></td><td></td><td></td></t<>	Race (white)	1.000					
3. Asian/Amin/AlaskaNative1.0670.0710.990.3240.9381.215Ethnicity Latinx (No)1.0001. Yes1.0830.0571.510.1320.9761.201Sex (Male)1.0001. Female0.8280.030-5.130.0000.7710.890Age (15-35)1.00036-551.3200.0725.070.0001.1861.47056-651.7560.1178.440.0001.5412.00166-851.8600.1945.960.0001.5172.282Marital Status (Married)1.000Widowed/Divorced/Separated0.7790.037-5.210.0000.6620.814Number of persons at home0.8710.022-5.510.0000.6620.814Number of persons at home1.2670.1052.850.0041.0771.491Persons with disability at home1.000Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.000Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.0002. Radio	2. Black Only	0.854	0.045	-3.00	0.003	0.770	0.947
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	3. Asian/AmIn/AlaskaNative	1.067	0.071	0.99	0.324	0.938	1.215
1. Yes 1.083 0.057 1.51 0.132 0.976 1.201 Sex (Male) 1.000 . <td< td=""><td>Ethnicity Latinx (No)</td><td>1.000</td><td></td><td></td><td></td><td></td><td></td></td<>	Ethnicity Latinx (No)	1.000					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1. Yes	1.083	0.057	1.51	0.132	0.976	1.201
1. Female0.8280.030-5.130.0000.7710.890Age (15-35)1.00036-551.3200.0725.070.0001.1861.47056-651.7560.1178.440.0001.5412.00166-851.8600.1945.960.0001.5172.282Marital Status (Married)1.000Widowed/Divorced/Separated0.7790.037-5.210.0000.6620.814Number of persons at home0.8710.022-5.510.0000.8290.915Children at home (No)1.000Yes0.9520.062-0.750.4500.8371.082Older adults at home (No)1.000Yes0.7050.031-7.820.0041.0771.491Persons with disability at home1.000Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.000Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.000Yes0.7050.031-7.820.0000.6460.770Source of	Sex (Male)	1.000					
Age (15-35)1.00036-551.3200.0725.070.0001.1861.47056-651.7560.1178.440.0001.5412.00166-851.8600.1945.960.0001.5172.282Marital Status (Married)1.000Widowed/Divorced/Separated0.7790.037-5.210.0000.7090.856Never married0.7340.039-5.850.0000.6620.814Number of persons at home0.8710.022-5.510.0000.8290.915Children at home (No)1.000Yes0.9520.062-0.750.4500.8371.082Older adults at home (No)1.000Yes1.2670.1052.850.0041.0771.491Persons with disability at home1.000(No)Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.0001. Radio/TV0.9530.045-1.030.3010.8691.0443. Internet0.8590.045-2.900.0040.7750.952Con	1. Female	0.828	0.030	-5.13	0.000	0.771	0.890
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Age (15-35)	1.000	•				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	36-55	1.320	0.072	5.07	0.000	1.186	1.470
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	56-65	1.756	0.117	8.44	0.000	1.541	2.001
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	66-85	1.860	0.194	5.96	0.000	1.517	2.282
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Marital Status (Married)	1.000					
Never married0.7340.039-5.850.0000.6620.814Number of persons at home0.8710.022-5.510.0000.8290.915Children at home (No)1.000Yes0.9520.062-0.750.4500.8371.082Older adults at home (No)1.000Yes1.2670.1052.850.0041.0771.491Persons with disability at home1.000(No)Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.0002. Radio/TV0.9530.045-1.030.3010.8691.0443. Internet0.8590.045-2.900.0040.7750.952Constant0.2180.031-10.750.0000.1650.288F (9,21925) $p<0.01$ Adj. Wald χ^2 35.52Goodness-of-fit χ^2 3.08 $p<0.05$ Pearson $\chi^2(12378)$ 12522.85 $p>0.05$	Widowed/Divorced/Separated	0.779	0.037	-5.21	0.000	0.709	0.856
Number of persons at home 0.871 0.022 -5.51 0.000 0.829 0.915 Children at home (No) 1.000 Yes 0.952 0.062 -0.75 0.450 0.837 1.082 Older adults at home (No) 1.000 Yes 1.267 0.105 2.85 0.004 1.077 1.491 Persons with disability at home 1.000 (No)Yes 0.705 0.031 -7.82 0.000 0.646 0.770 Source of Info. (family/friends) 1.000 2. Radio/TV 0.953 0.045 -1.03 0.301 0.869 1.044 3. Internet 0.859 0.045 -2.90 0.004 0.775 0.952 Constant 0.218 0.031 -10.75 0.000 0.165 0.288 F (9,21925) $p<0.01$ Adj. Wald χ^2 35.52 Goodness-of-fit χ^2 3.08 $p<0.05$ Pearson χ^2 (12378) 12522.85 $p>0.05$	Never married	0.734	0.039	-5.85	0.000	0.662	0.814
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Number of persons at home	0.871	0.022	-5.51	0.000	0.829	0.915
Yes 0.952 0.062 -0.75 0.450 0.837 1.082 Older adults at home (No) 1.000 Yes 1.267 0.105 2.85 0.004 1.077 1.491 Persons with disability at home 1.000 (No)Yes 0.705 0.031 -7.82 0.000 0.646 0.770 Source of Info. (family/friends) 1.000 2. Radio/TV 0.953 0.045 -1.03 0.301 0.869 1.044 3. Internet 0.859 0.045 -2.90 0.004 0.775 0.952 Constant 0.218 0.031 -10.75 0.000 0.165 0.288 F (9,21925) $p<0.01$ Adj. Wald χ^2 35.52 Goodness-of-fit χ^2 3.08 $p<0.05$ Pearson χ^2 (12378) 12522.85 $p>0.05$	Children at home (No)	1.000		•	•		•
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Yes	0.952	0.062	-0.75	0.450	0.837	1.082
Yes1.2670.1052.850.0041.0771.491Persons with disability at home1.000(No)Yes0.7050.031-7.820.0000.6460.770Source of Info. (family/friends)1.0002. Radio/TV0.9530.045-1.030.3010.8691.0443. Internet0.8590.045-2.900.0040.7750.952Constant0.2180.031-10.750.0000.1650.288F (9,21925) $p<0.01$ Adj. Wald χ^2 35.52Goodness-of-fit χ^2 3.08 $p<0.05$ Pearson χ^2 (12378)12522.85 $p>0.05$	Older adults at home (No)	1.000					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Yes	1.267	0.105	2.85	0.004	1.077	1.491
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Persons with disability at home (No)	1.000					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Yes	0.705	0.031	-7.82	0.000	0.646	0.770
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Source of Info. (family/friends)	1.000					
3. Internet 0.859 0.045 -2.90 0.004 0.775 0.952 Constant 0.218 0.031 -10.75 0.000 0.165 0.288 F (9,21925) $p<0.01$ Adj. Wald χ^2 35.52 Goodness-of-fit χ^2 3.08 $p<0.05$ $p>0.05$ Pearson χ^2 (12378)12522.85 $p>0.05$	2. Radio/TV	0.953	0.045	-1.03	0.301	0.869	1.044
$\begin{array}{cccc} Constant & 0.218 & 0.031 & -10.75 & \textbf{0.000} & 0.165 & 0.288 \\ F (9,21925) & p<0.01 & Adj. Wald \chi^2 & 35.52 \\ Goodness-of-fit \chi^2 & 3.08 & p<0.05 \\ Pearson \chi^2 (12378) & 12522.85 & p>0.05 \end{array}$	3. Internet	0.859	0.045	-2.90	0.004	0.775	0.952
F (9,21925)p<0.01Adj. Wald χ^2 35.52Goodness-of-fit χ^2 3.08p<0.05	Constant	0.218	0.031	-10.75	0.000	0.165	0.288
Goodness-of-fit χ^2 3.08 p<0.05	F (9,21925)		p<0.01			Adj. Wald χ^2	35.52
Pearson χ^2 (12378) 12522.85 p>0.05	Goodness-of-fit χ^2	3.08	p<0.05				
	Pearson χ^2 (12378)	12522.85	p>0.05				

*p < .001, **p < .01, ***p < .05; Reference group in parentheses

Moderating effects

The second research question examined if housing insecurity moderates the relationship between social vulnerability factors and disaster preparedness. Individual regression models with distinct interaction terms were run across the two conceptualizations of preparedness to test the moderating effects of housing insecurity between each social vulnerability indicator and disaster preparedness. Twenty-two models were built in all. In order to present the most pertinent results, predicted margins were used to graphically represent the moderating effects; models with statistically significant moderating effects are included. Tables of interaction and marginal effects are included in the appendix 3.A. as supplementary material (pp 208-220).

The X-axis shows the dichotomous variable of housing insecurity and the Y-axes show cumulative or minimal preparedness in corresponding figures. Figure 3.2 shows that the relationship between household income and disaster preparedness is positive and varies depending upon a family's housing insecurity status; the predicted preparedness score shows the association of household income with cumulative preparedness when not faced with housing insecurity (No on the X-axis), however this disparity changes when these income groups are housing insecure (Yes on the Y-axis). For those who are housing insecure, the relationship between household income and disaster preparedness is stronger with increased household income. As an example, housing insecure households in income category (2) were not statistically distinct from those in the reference group, whereas housing insecure households in income level (5) had 0.38 points higher preparedness score than the income category (1), controlling for other factors, and this relationship was statistically significant. In other worlds, housing insecure households relied more on household income for disaster preparedness than housing secure households.



Figure 3.2. Moderating effects of Housing Insecurity between Household Income and Cumulative Preparedness

The interaction between housing insecurity and income was significant in their association with minimal preparedness. Compared to those who were housing insecure in income category (1), those in income category (5) had 62% higher odds of being prepared, showcasing a higher reliance on household income when faced with housing insecurity. Figure 3.3 shows the predicted probability of preparedness for the different income groups; compared to the base category of 0 - 999 USD per month, having higher income is associated with a higher probability of being at least minimally prepared when households face housing insecurity. Holding other variables at sample means, the predicted probability of being prepared is 0.42 for income group (4) and 0.49 for income group (5) when they are housing insecure (Appendix 3.A, Tables 3.2.A-3.3.A, pp 209-210).



Figure 3.3. Moderating effects of Housing Insecurity between Household Income and Minimal Preparedness

The predicted probability of being at least minimally prepared by race was also moderated by housing insecurity that is, being housing insecure reduced the predicted likelihood of being minimally prepared across racial groups (Figure 3.4). We find racially differentiated associations with minimal preparedness, and this difference was statistically significant for Black/African American respondents and those belonging to other races compared to the reference group. Black/African American Household heads living with housing insecurity had reduced odds of being minimally prepared compared to housing insecure white heads of household. On average, the predicted probability of being minimally prepared for Black/African American householders who were housing secure was 40%, and it reduced to 30% for housing insecure Black/African American householders.



Figure 3.4. Moderating effects of Housing Insecurity between Race and Minimal Preparedness

The correlation of the sex of the householder with minimal preparedness was also moderated by housing insecurity, in that, householder sex was a differentiating factor in the probability of being at least minimally prepared. On average, women householders who were housing insecure had 20% lower odds of being minimally prepared compared to housing insecure householders who were men. Figure 3.5 suggests that male householders were more likely to be minimally prepared then female householders and this gap increased when housing insecurity came into the picture. Based on the logistic model, the average predicted probability of minimal preparedness would be 41% for male householders who were also housing insecure and 33% for female householders who were housing insecure.



Figure 3.5. Moderating effects of Housing Insecurity between Sex and Minimal Preparedness

The interaction between housing insecurity and marital status was also statistically significant. Those who were widowed, divorced, or separated and housing insecure were 24% less likely to be minimally prepared compared to married householders who were housing insecure. The average predicted probability of never married and housing insecure householders was 32%, and 33% if everyone in the sample were widowed or divorced and living with housing insecurity. Figure 3.6 shows the predicted probability of being minimally prepared by marital status.

The relationship between presence of older adults and preparedness differed by housing insecurity. On average, the likelihood of being minimally prepared was 45% for housing insecure households with an older adult at home and 34% for housing insecure homes without an older adult at home. Figure 3.7 shows the predicted probability of being minimally prepared; houses with older adults at home were able to maintain their preparedness even when they were housing insecure as opposed to those who did not have any older adults at home.



Figure 3.6. Moderating effects of Housing Insecurity between Marital Status and Minimal Preparedness



Figure 3.7. Moderating effects of Housing Insecurity between Presence of Older Adults and Minimal Preparedness

Diagnostics and Post-estimation

A visible inspection of the residuals after the OLS regression (Model 1) indicated that the assumption of normality of underlying residuals was not violated. The Breusch-Pagan and Cook-Weisberg test for heteroskedasticity had a high p-value (χ^2 (1)=1.30, p=0.25), suggesting that the error variance was not heteroskedastic enough to cause any problems with the test statistics. Post-estimation to assess model classification and specification errors revealed no classification errors but Model 2 regressing minimal preparedness suggested the presence of specification errors and therefore bias the estimated results. The Hosmer-Lemeshow test of model goodness of fit indicated that at (Pearson χ^2 (12378)= 12522.85, p=0.18), the data fit the logistic model well, however further analysis suggested only an acceptable diagnostic ability of the model (AUC= 0.66). For both models, the variance inflation factor indicated no concerns related to multicollinearity among the variables in the regression models (Model 1 vif= 2.38, Model 2 vif=2.02).

Sensitivity Analysis

In the AHS, census division is a categorical variable with nine categories (New England; Middle Atlantic; East North Central; West North Central; South Atlantic; East South Central; West South Central; Mountain and Pacific). To note regional differences in patterns and results of the regression analyses, models were replicated across all census divisions and the results for the West South-Central and South Atlantic divisions are included in the appendix (Tables 13A and 14A, pp 48-50). West South-Central division comprises states of Texas, Arkansas, Louisiana, and Oklahoma. South Atlantic comprises states of Delaware, District of Columbia; Florida; Georgia; Maryland; North Carolina,

South Carolina, Virginia, and West Virginia. Both these divisions include states such as Texas and Louisiana as well as Florida and the Carolinas that are highly susceptible to a number of natural disasters. In the South-Atlantic across both conceptualizations of preparedness holding other variables at constant, the housing variables were significantly associated with preparedness while the neighborhood risk perception was not. Income and education were significantly associated with higher preparedness except at the lower income levels for minimal preparedness. Women householders had lower odds of being minimally prepared and were less prepared than men. The age of the householder was significantly associated with higher cumulative preparedness except in the case of householders who were classified as senior citizens (above 65). In this region too, similar to the main model, with an increase in the number of adults in the home, the odds of being at least minimally prepared were lower by about 10%. By comparison, in region 7 which is the West South-Central census division, education was not significantly associated with being minimally prepared except at the graduate level but played a role in higher cumulative preparedness holding other variables constant. Interestingly the higher age range of the householder was significantly associated with higher preparedness compared to 15 to 35 age group, except when the householders were between the ages of 66 to 85. The presence of a person with disability at home was associated with lower preparedness in this region. Race was not a significant predictor in this region, in contrast with findings across the national sample.

Discussion

Recent studies have examined the association of sociodemographic factors with disaster preparedness using nationally representative data (Malmin, 2020; Rivera, 2020;

Zamboni & Martin, 2020); this study extends this work by including aspects of the built environment such as housing and neighborhood elements that often co-occur and interplay with social vulnerability factors. The present study sought to test two key hypotheses: the first hypothesis evaluated the role of social and structural vulnerabilities on disaster preparedness, and the second hypothesis tested the moderating effect of housing insecurity on social vulnerabilities' association with disaster preparedness. An examination of the data reveals several aspects to take cognizance of in terms of disaster readiness interventions and planning in the U. S. with implications for vulnerable groups as well as areas of intervention for helping professions.

Nearly 12% of the households in the sample earned under 1000 USD per month, severely curtailing abilities to make ends meet in regular times and likely extending this inability into planning for an uncertain eventuality such as a climate related disaster. One in two households in the U.S. have someone, an older adult or a person with disability, who requires specific attention in times of a disaster. In the literature on disaster impacts, older age and disability often are recurrent themes of vulnerability with older adults being more at risk for immediate and long-term harms such as social isolation, loss of networks and support systems and both older adults and persons with disability face higher mortality in times of disaster (M. H. Fox et al., 2010; Hikichi et al., 2016, 2017; Marceron & Rohrbeck, 2019).

The analysis for the first hypothesis reveals that housing security and quality were vital conditions for households being better prepared across both conceptualizations of preparedness. Housing insecurity is a key social justice issue in the U.S. and is severely threatened by climate uncertainty and associated environmental impacts such as increasing extreme weather events (Adams et al., 2019; Knowles et al., 2016; Lopez et al., 2018; Ma & Smith, 2020; Nebbitt & Lombe, 2010). The ability to not default on payments related to rent, mortgage, and utilities is a key factor in housing security (Murti et al., 2014). Policies to offer support for defaulting households is a crucial welfare policy issue that has emerged in the context of the Covid-19 pandemic and offers an example on what vulnerable households go through on a regular basis and when faced with additional stressors. This experience offers a portal into the future, into the role of structural inequities in household abilities to respond to stressors including planning for the eventuality of a disaster.

The HUD classifies housing as unaffordable if the monthly costs of housing and utilities are over 30% of the monthly household income (Bailey et al., 2016). As a result housing insecurity has witnessed an ascent in the U.S. in the last several decades and presents a persistent area of concern to improve household preparedness as well as overall wellbeing. In the current study, housing insecurity is limited in its scope and comprises a combination of delinquency related to rent, mortgage, and utility payments. The AHS developed and field-tested a housing insecurity index- a composite measure of housing insecurity including housing quality, inability to pay utility bills, threat of evictions or foreclosures - in the 2019 surveys. This index along with food security indices can provide a rich analytical measure of multiple vulnerabilities to test across a range of outcomes, including disaster preparedness for future studies. The housing adequacy variable in the sample was heavily skewed with about five percent of the sample reportedly living in poor quality housing (n=1419). However, this key structural vulnerability indicator might exacerbate other forms of contextual vulnerabilities. This is

especially significant since each housing unit in the sample represents up to 4000 other units in the U.S (American Housing Survey, 2018). Moreover, housing quality differs by social vulnerability with communities of color and those living in lower income or rental properties more likely to live in poor quality or unsafe housing, often as a result of historically racist housing policies (Hughes et al., 2017)

Respondent perception of higher neighborhood risk to natural disasters was correlated with slightly higher score on cumulative preparedness but was not significantly associated with being minimally prepared. While this suggests that perceived risk of disasters can help households be more prepared overall, in terms of the minimum preparedness of being ready with food, water, funds, and transportation, the neighborhood risk perception did not matter. This hints at factors other than risk perception such as income and other household composition variables that are more central in determining the likelihood of being underprepared with the most essential needs in times of disaster. To further investigate this, future studies should examine both the perceived and independent features of the environment such as number of climate and weather disasters experienced or exposure to environmental elements that could heighten risk in order to understand the associations between neighborhood risk and disaster preparedness.

In terms of social vulnerability, since many sociodemographic variables and associated identities and experiences do not occur in isolation, it is important to examine them concurrently to understand how they play out in the real world. Higher education levels were associated with better preparedness similar to previous scholarship (Adams et al., 2017; Rostami-moez et al., 2020; SAMHSA, 2017; Zamboni & Martin, 2020). Improved educational attainment secures multiple improved life consequences (Braveman & Barclay, 2009; Braveman & Gottlieb, 2017; Michalos, 2008; Pandey et al., 2012; Suryanarayana et al., 2011; Zhan & Pandey, 2004) and has also been linked to improved economic opportunities, health behaviors, and outcomes in the U.S. (Venkataramani et al., 2016); improved disaster preparedness then could be understood as an offshoot of these improved capabilities. Household income too was consistently associated with higher preparedness. Earning below 1000 USD or even under 3000 USD per month for larger households cannot go a long way in helping families meet their most basic requirements; therefore it is not unexpected that higher income was correlated with households being better prepared.

Poverty and systemic racism in the U.S. often coincide and are associated with worse outcomes particularly for racialized minorities including Black, Asian, and American Indian and Alaskan Native groups (Boardman et al., 2006; Williams, 2018). Anecdotal data and previous scholarship suggest that the ramifications of disaster adverse effects in the U.S. too fall along racial lines, disproportionately impacting the African American community as witnessed in the aftermath of Hurricane Katrina, through recent years, including during the 2020 pandemic (Chakraborty et al., 2019; Fothergill et al., 1999; Oppel et al., 2020; Rivera & Miller, 2007). The results of the current study reveal an association of racial identity and lower preparedness in terms of cumulative preparedness for all minority races, and lower only for Black householders in the case of minimal preparedness compared to whites. This alludes to the effects of systemic discrimination experienced by racialized minorities wherein multiple vulnerability factors coincide to create compounded challenges that create barriers to action in times of disaster. While the association of race with preparedness controlled for housing insecurity variables, it is recognized that more minority races face physical, economic, food, housing, and social insecurity compared to whites in the U.S. (Fothergill et al., 1999; Williams, 2018).

Across both conceptualizations, women householders were less prepared than men similar to many other studies that examined predictors of emergency preparedness in smaller groups (Bell et al., 2020; Thomas et al., 2015). This is particularly disquieting as it is well established in the literature that women and women headed households bear a disproportionate, often gendered impact of disasters (Ayeb-Karlsson, 2020; Elliott & Howell, 2017; Enarson, 1999). Being married was a protective factor in improving the score and likelihood of preparedness similar to previous scholarship (Bronfman et al., 2019; Zamboni & Martin, 2020). Thiede et al. (2017) found that differences in rates of work and marriage sustain the racial gaps in poverty and associated disadvantages, particularly among women headed households. In the U.S., women headed households are more likely to live in poverty and have a higher risk of uncertainties related to food and housing (Clay et al., 2018; R. Cox et al., 2017; National Women's Law Center, 2016; Thiede et al., 2017). In the aftermath of disasters too, female headed households especially from minority races face the brunt of the events and take longer to recover (SAMHSA, 2017). Single adults, especially female householders, single mothers, and those who are older or living with disability might feel less prepared for future uncertainties and would need specific resources and support mechanisms. An increase in number of adults in the house was associated with slightly higher cumulative preparedness, but lower chances of being minimally prepared. This finding could

interface with other forms of vulnerability as overcrowding is often related to poverty, and associated vulnerability elements that could lead to a dearth of access to financial and material resources (Murti et al., 2014; UNDRR, 2019, p144). At the same time, an increase in cumulative preparedness with the increase in number of adults at home could potentially indicate a more efficient distribution of responsibilities at home or higher perceived collective efficacy; the relationship needs to be examined more closely in future studies.

The presence of persons with disability in the home was related with lower preparedness, a finding similar to Al-Rousan et. al.'s (2014) study that discovered lower overall preparedness with increasing age and physical disability. Gibson et al. (2018) attributed some of this disparity to the burden of additional roles and responsibilities assumed by caregivers of family members with Alzheimer's and related dementia that precluded them from taking necessary action. In the main-effects models, the presence of an older adult at home was associated with higher preparedness suggesting a form of generational knowledge. While older adults have specific vulnerabilities when it comes to natural disasters (K. Cox & Kim, 2018; Hikichi et al., 2016; Tran et al., 2013) they can also be potential resources in enhancing preparedness owing to their existing networks, and reciprocal relationships in community as suggested by research among this subgroup in Australia (Howard et al., 2017). Further, the presence of an older adult could also at times be a proxy for prior experience of disaster if they have faced comparable situations. At the same time, older adults face heightened adversities after a disaster (Al-Rousan et al., 2014; Brilleman et al., 2017) and are therefore an important demographic to pay attention to and create support mechanisms around. The source of disaster related

information also emerged as a key aspect in terms of minimal preparedness with lower readiness among those who received information from the internet as opposed to social networks of friends and family. Improved social cohesion and networks are associated with a variety of desired outcomes both in disaster and non-disaster situations (Kousky, 2016; Patterson et al., 2010; Thiede & Brown, 2013). Stronger social and local ties were associated with a reduced tendency to evacuate in the case of Hurricane Katrina (Thiede & Brown, 2013). The departure from observed behavior found in the present analysis could be a result of changing preferences among households since 2005 with the internet becoming more prevalent or could also point to the prominence of different sources at different stages of a disaster. For instance, a study on disaster related 'information seeking behavior' indicates that the internet is most expedient in post-disaster scenarios to help coordinate and share information, while phone, radio, and face to face interactions with friends and family were more popular and prevalent across the disaster stages from preparation to response and recovery (Rahmi et al., 2019). Factors such as having smaller children at home, and householder's ethnicity did not relate to disaster preparedness in the national sample. In the sensitivity analysis, however, ethnicity came to matter in the South-Atlantic region of the country where householder being Latinx was associated with higher odds of being at least minimally prepared compared to non Latinx householders, controlling for other covariates; however the relationship was not uncovered for cumulative preparedness. This underlines the need for centering sociodemographic makeup when designing local preparedness policies and messaging across smaller geographies. Also important to note is that neighborhood risk which measures respondents' perception of risk for floods and natural disasters had a significant

relationship with preparedness in the national sample but was not significantly associated with preparedness in the constrained samples.

In the present study, the effect of socioeconomic status is moderated by housing insecurity across both conceptualizations of disaster preparedness. In essence, families that were housing insecure depended more on their monthly income to be better prepared. Similarly, the relationship between householder's race and preparedness also differed by housing insecurity particularly for African American householders and also for other minority races. In the literature, housing insecurity has been found to co-occur with employment insecurity and disproportionately affects African Americans (Desmond & Gershenson, 2016). Most lower income families in the U.S. depend on the rental market and we know from previous literature that renters have fewer means of being prepared than homeowners owing to more frequent movement, lower exposure to public education, and fewer resources and motivation to invest in mitigating action (Burby et al., 2003; Gupta & Thakur, 2018; Levac et al., 2012; National Academies of Sciences Engineering and Medicine, 2020). Women householders were less prepared overall, and this effect was exacerbated when they were also housing insecure. The relationship between presence of older adults and preparedness differed by housing insecurity. Households with older adults at home were able to maintain their preparedness even when they were housing insecure as opposed to those who did not have any older adults at home. The results suggest that housing insecurity aggravates the relationship between vulnerability factors and preparedness. This finding is in line with previous studies that have suggested that community advantage attenuates the relationship between activity limitations and preparedness. In the present study, disadvantage due to housing insecurity
exacerbates the effects of vulnerability factors in their association with preparedness except in the case of older adults. Other indicators of social vulnerability were not modified by housing insecurity in this sample, however, future studies should examine how alternate housing or neighborhood factors can influence preparedness and interact with other vulnerabilities.

Limitations

Some limitations need to be considered when interpreting the results and inferences drawn from this study.

- Data used in this study are cross-sectional and hence the findings do not lend themselves to causal interpretations, however, the AHS data offer the possibility of future longitudinal analyses to study national trends across these factors.
- 2. There is no established scale for disaster preparedness as explicated by others before (Kohn et al., 2012), however, the components of disaster preparedness used in this study fall within the ambit of FEMA's recommended steps qualifying as preparatory action and behavior and are theoretically informed.
- 3. Since data are self-reported, there is a possibility of response and desirability bias (Holbrook et al., 2003); nevertheless, the AHS are widely considered the most comprehensive estimate of housing related issues (R. Cox et al., 2017).
- 4. While the regional variable is not available in the public use dataset beyond the census division, the measure on neighborhood risk perception accounts for potential regional differences arising from higher risk of natural disasters and the sensitivity analyses further test the possibility of these differences in

preparative actions across regions. However, there is no measure of actual features of the environment included in the study. Future studies should, data permitting, include perceptions on the environment with independent features of the environment to understand both the actual and perceived effects and relationships.

- 5. The linear model regressing cumulative preparedness on key independent and control variables was weak with a low R-squared value. While the individual associations are still meaningful, models could be strengthened in future studies with the inclusion of other variables that have been found to be associated with preparedness in the literature. For instance, previous studies posit that experiencing prior disasters is associated with better preparedness overtime (Becker et al., 2017; Mishra et al., 2009). Although the AHS had a measure on whether respondents were forced to move because of disaster or experiencing a disaster in a rental unit, the number of observations was extremely small (512) and was not included in the study.
- 6. The model specification error in Model 2 could be a result of data idiosyncrasy as noted by (Skinner, 2012) in concerns about working with census data; the specification test is also sensitive to large sample sizes (Allison, 2013). This concern however is made up for, by the representativeness and timeliness of a comprehensive dataset such as the AHS. Further, this error could also be a result of key omitted variables such as experience of a major disaster.

7. The interaction terms were included sequentially to isolate specific relationships. The moderating relationships between housing insecurity and race, income, and sex were present in the individual interaction models, but not when all interaction terms were included in the same model except in the case of older adults and as seen in Table 12A (appendix, p55). This could be a result of over constraining the model and therefore, to answer the second research question, moderation effects were discussed only when the interaction between housing insecurity and social vulnerability factor was significant.

Implications for Social Work

Whereas the role of social work during and after disasters cannot be understated, it is also essential for social work scholarship and practice to assess pre-disaster vulnerabilities and engage in the development and deployment of preparedness plans to ensure it reaches those most in need (Kemp & Palinkas, 2015). In this study, social vulnerability indicators such as socioeconomic status, minority status, and aspects of household composition were associated with lower disaster preparedness. Low socioeconomic status has often been associated with housing and food insecurity in the U.S. states and is a marker of multiple racial, social, and health disparities (Njai et al., 2017). Identifying and assisting households and groups more likely to live in risk, therefore, is a key policy and professional imperative for social workers.

The study offers significant takeaways for social workers in identifying where to target resources and research funds to reduce multidimensional vulnerabilities before a disaster. A precarious housing situation can lead to adverse disaster impacts (Enarson, 1999; FEMA, 2019c; Ma & Smith, 2020; Malmin, 2020) and as evidenced in this study, lowers the capacities of socioeconomically weaker groups, as well as racial and gender minorities in being better prepared. While this study only examined the multiplicative effects of one dimension of structural vulnerability, there is scope for future investigations into different forms of vulnerability and how they factor into household disaster preparedness. Such analyses can advance our understanding of how vulnerabilities coincide and how such simultaneity amplifies the stress felt by communities leading to them being under prepared for future shocks.

For social work education, policy, and practice, integrating disaster readiness, response, and climate action into their agenda is vital in the coming years (Kemp & Palinkas, 2015; Mason et al., 2017; S. Rao & Teixeira, 2020; Teixeira & Krings, 2015). In keeping with our disciplinary goal of tackling social inequities, social workers are also tasked with addressing the root causes of these societal fissures (Krings et al., 2020; Mason et al., 2017). Housing rights and housing security are fundamental in a quest for racial justice, rooted in principles of equity and a correction of historical wrongs particularly in the case of the U.S. and ever more important in ensuring everyone gets a fighting chance in reaching their potential (Coates, 2014; Metzger & Khare, 2019). Increasingly seen as a basic human right, safe and affordable housing is also central to climate and environmental justice. Housing stress adds to multiple aspects that social workers interface with- including poor mental health, poverty, addiction and substance use (Metzger & Khare, 2019). Safe and affordable housing can therefore be a marker of resilience in communities as disasters become more frequent and intense owing to the global climate crisis (IPCC, 2018). Social workers can design, incorporate, and

disseminate disaster preparedness measures in collaboration with housing counseling agencies keeping specific vulnerabilities of groups in mind. The intersection of social and structural vulnerabilities manifest in housing inequities is expressly central in the context of disaster readiness and improving community resilience; this paper provides a snapshot of preparedness in the U.S. using nationally representative data and illuminates gaps that social workers and other helping professionals can address.

Conclusion

This paper examined structural and social vulnerability factors to understand how they relate to disaster preparedness among U.S. households. There have been a few investigations into the influence of disasters on housing and on existing vulnerabilities in addition to pre-disaster preparedness (Enarson, 1999; Gin et al., 2020; National Academies of Sciences Engineering and Medicine, 2020). This paper is one of the first nationally representative studies on multiple concurrent vulnerabilities related to housing, neighborhood, and social contexts, and their association with disaster preparedness. The use of AHS, a large, nationally representative administrative data from the U.S. Census Bureau presents the opportunity for future longitudinal analysis to track these associations over time to inform causal implications of these co-occurring vulnerabilities. This paper adds to scholarship and lays the ground for prospective analyses of questions related to the social, natural, and built environment and their interactions in ensuring social and environmental justice.

Chapter IV: Social protection and absorptive capacity: Policy insights for a changing world

Natural disasters push 26 million people into poverty every year (Hallegate et al., 2017). The Sendai Framework for Disaster Risk Reduction is a people-centered, nonbinding voluntary mechanism adopted by member nations in 2015, to reduce disaster risk and losses in lives and livelihood among other socioeconomic and environmental assets (Etinay et al., 2018; UNDRR, 2019; Wahlstrom, 2017). The crucial difference in outlook was a shift from the management of disasters post-facto, to a more preemptive stance of management and mitigation of the risk of disasters before they occur. Prioritized within this international framework is a need to understand disaster risk based on vulnerabilities, capacities, assets, and environments of communities and enhancing disaster preparedness, and it has substantial overlaps with the U.N. Sustainable Development Goals (U.N. General Assembly, 2015).

Any adversity in living memory in the U.S., from Hurricane Katrina to the ongoing Covid-19 pandemic lays bare the fissures in our societies; social inequalities and long-standing vulnerabilities are exacerbated, morbidity and mortality associated with such events as well as their unfavorable socio-economic consequences are felt disproportionately by communities that were living with systemic disadvantages (Artiga et al., 2020; Enarson, 1999; Oppel et al., 2020; Rivera & Miller, 2007). Multiple studies, including those that informed the Sendai Framework, propose that building resilience among individuals and communities can help improve abilities to withstand sudden fluctuations in the future, be it economic and livelihood related shocks, or shocks due to natural disasters (Béné et al., 2018; Davies et al., 2009; DFID, 2011). Often, this amounts

to having access to vital resources and knowing what to do in the event of a disaster, but also points to the ability of individuals, households, and communities to make these choices for themselves. However, most indications suggest that disaster planning and preparedness among communities remains inconsistent at best (FEMA, 2020a; E. C. Smith et al., 2018).

Scholars and practitioners have submitted that an expansion of social protection can be a mitigating factor that can help communities absorb and cope with natural disaster losses (Arnall et al., 2010; Hallegate et al., 2017). By their very raison-d'être, social protection, or social welfare policies are investments in reducing vulnerabilities and improving individual and community capabilities to withstand shocks in the present and in the future. There is merit, therefore, in exploring the relationship between social protection and disaster risk reduction. Despite common aims of vulnerability reduction and expanding capacities, disaster policies and welfare policies in the U.S. typically operate separately. Aspects of these come together occasionally after a disaster strikes as in the case of D-SNAP (Disaster-Supplemental Nutritional Assistance Program) and P-SNAP (Pandemic-Supplemental Nutritional Assistance Program), where food security safety net is extended to communities affected by a disaster or a pandemic or in the form of expanding unemployment insurance and cash transfers to meet the swell in needs during disasters (Coibion et al., 2020; Hammond et al., 2020; IOM, 2015). While not a new concept globally (Béné et al., 2018; Davies et al., 2013; World Bank, 2016), owing to a variety of reasons including negative cultural connotations of welfare policy recipience (Stuber & Schlesinger, 2006), the association between disaster risk reduction and welfare policy participation remains underexplored in the context of high-income

countries such as the United States (Godfrey-Wood & Flower, 2018; Healy, 2017; Karim & Noy, 2020). This paper aims to address this gap to explore linkages between welfare policy and social vulnerability factors and further investigate direct and indirect paths between them and one aspect of disaster risk reduction: disaster preparedness.

Literature Review

Social protection refers to policies and programs that are targeted toward poverty alleviation and vulnerability reduction by reducing and addressing pressures on people's lives and enhancing their capacities to manage multiple risks (Béne, 2012; Tenzing, 2020). Typically these risks comprise socio-economic distress that can create or exacerbate vulnerabilities such as unemployment, social exclusion, illness, hunger, disability and old age. A natural disaster is often an added stressor to existing strains; the rationale being that the poorest communities have lower freedoms or choices to make necessary adjustments and prepare for future shocks, owing to other more pressing concerns. Interventions in the fields of welfare policy, climate change adaptation, and disaster risk reduction have the common aim of increasing capacities and reducing exposures and vulnerabilities (Béne, 2012; Davies et al., 2009; Kuriakose et al., 2013) and therefore are naturally symbiotic. The key theoretical rationale guiding this paper is that a reduction in stressors through social protection can help families make better household decisions, including in preparation for natural disasters.

Adaptive Social Protection

With climate change variability leading to a mounting threat of extreme weather events, as well as dealing a blow to existing human and ecological systems, communities already vulnerable to shocks are more prone to vagaries that can prevent them from achieving their life's potential (Eckstein et al., 2019; N. Rao et al., 2019). The convergence of social protection, climate action, and disaster risk reduction has been termed 'adaptive social protection'; where social protection policies can strengthen mechanisms among communities to adjust to shocks both sudden and chronic, particularly by reducing vulnerabilities among the poorest and most vulnerable (Davies et al., 2009, 2013; DFID, 2011). An early school of thought suggests that an integrated approach to reducing vulnerability and improving capacities among communities can transform and promote livelihoods, tailor assistance to specific communities in need, include a rights-based rationale for policy action, incorporate a longer-term perspective into policy response, improve the synergy between the natural and social sciences, and include a social protection measure of resilience-building within policy and programs (Béne, 2012). Other scholars looking at adaptive social protection have identified essential features to develop adequate response strategies to improve community resilience to the impacts of environmental change; scalability and flexibility to respond to climate change, targeted response to climate events, enhancement of livelihoods or livelihood security, and stronger institution building for climate and disaster risk administration, designed to help the poorest communities reduce their sensitivity and exposure to current and future distresses (Davies et al., 2009; Kuriakose et al., 2013). Scholars and practitioners recognize that while social safety nets are not directly linked to adaptation or disaster preparedness, by contributing to reduced vulnerabilities, they create an effective prerequisite for future adjustments to take place by building resilience (Kaur et al., 2017; Kuriakose et al., 2013; Vincent & Cull, 2012).

In the United States, social protection is known by the complement of social welfare programs designed to aid and support individuals and groups in need. Welfare policy in the U.S. comprises both contributory and non-contributory programs. Contributory programs such as the Social Security, Medicare, unemployment insurance, worker's insurance, and retirement benefits require individuals to pay into a program through federal taxes. Non-contributory programs, on the other hand, are available without financial contribution to the federal government, and are designed to fight poverty and improve lives of low resource families in the U.S. These programs include earned income tax credits (EITC), Supplemental Nutrition Assistance Program (SNAP), Housing Assistance, Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF) among others, and are known to be associated with families with limited means to improve their well-being (B. V. Brown, 2008; Ratcliffe et al., 2011). Participation in welfare policy programs has been found to be associated with household and demographic factors owing to the target populations as well as the policy design (Foster & Rojas, 2018). For instance, the SSI is directed at providing cash assistance to older adults with low income, or persons with disability, including children with disabilities, while housing subsidies and vouchers set an income cap and are targeted at the most under-resourced families in the U.S. (Center on Budget Policy Priorities, 2020). Cash assistance such as TANF is aimed at families living in poverty and has seen a reduction in the number of participants over the years, but has the potential to play a crucial role in times of economic downturn (Burnside & Floyd, 2019).

The concept of social vulnerability traverses disasters, climate change, and wellbeing literature, and refers to socioeconomic and demographic characteristics that can potentially affect a person or group's ability to prepare for or withstand multiple stressors (Cutter et al., 2008; Flanagan et al., 2011; Hoogeveen et al., 2004; UNDRR, 2019). Scholars employ social vulnerability in their analysis in a multitude of ways. Some have included this as an index using a combination of indicators such as socioeconomic status and food security, and others have included such indicators independently to understand the differentiation between key populations of interest (Flanagan et al., 2011; Gaynor & Wilson, 2020; Rickless et al., 2021). Others have also used a qualitative approach to identify local risks, capacities, and priorities to design programs tailored to the needs of the community (Fleming et al., 2019). Many vulnerability assessments point to the fact that differential impacts of disasters follow a similar and parallel trajectory as systemic social discrimination and inequalities faced by the same communities (Hoogeveen et al., 2004; UNDRR, 2019). Scholarship in economics and social behavior suggest that reduced stress from poverty alleviation can lead to better household decision-making (Mani et al., 2013). Assuming that disaster preparedness is a household decision that is impacted by the level of stress assumed by families, this supposition furthers the idea that participation in social safety nets aimed at reducing stressors can help households improve their perceived or actual capacities to deal with a future threat such as a natural disaster. The aim of this paper, therefore, is to estimate the association of household vulnerabilities and participation in social welfare policy with disaster preparedness.

Theoretical Framework

Largely attributed to Nobel Laureate Amartya Sen and renowned philosopher Martha Nussbaum, the capability approach or human capabilities framework has been intellectualized by a long line of scholars (Robeyns, 2017). In its simplest form, Sen conceptualizes these capabilities as a set of freedoms to do and to be, referred by him as building blocks of society (Sen, 2000) with Resources, Capabilities, and Functionings as the fundamental components in this framework. Resources refer to the means to achieve a goal and encompass individual and contextual factors, including beliefs, characteristics, vulnerability, and policy influences. The capabilities segment is where preference formation takes place; they are the freedoms that act as influencers of decision-making, and Functionings are the achievements or operationalizations of those freedoms or choices. Some of Sen's earliest treatises on capabilities and freedoms were in the context of the 19th century Bengal famine where, despite an availability of resources, it was the lack of access that caused large scale suffering, and therefore, it is apt to use the framework in the context of this study (Sen, 1981; Verchick, 2012). This paper examines how communities prepare for a disaster and conceptualizes disaster preparedness as a capability at the household level. It is hypothesized that reducing a household's vulnerability through social protection policies aimed at building long-term resilience, strengthens freedoms from preventable injury and death that can help households make better decisions. This paper therefore focuses on resources and capabilities; resources being individual, household, and policy level factors, which can be converted into disaster preparedness capabilities which could be the agency and material means therein.

Study purpose and aims

Many countries have launched social protection policies that contribute to income and livelihood security, and poverty alleviation. There have been multiple studies globally that examine how these schemes tie in to climate action and disaster risk reduction, but this has been largely missing in the context of high income countries (Kaur et al., 2019; Wood, 2011). This study aims to address this gap to investigate the association of participation in social protection programs with disaster preparedness in the context of the United States. Two hypotheses guide this paper:

H1. Household participation in safety net programs is associated with disaster preparedness.

H2. Household participation in safety net programs statistically mediates the association between social vulnerability on disaster preparedness.

Figure 4.1 demonstrates the key conceptual elements on the study informed by the capabilities approach. Socioeconomic status, household composition, and minority status comprise the social vulnerability indicators hypothesized to be directly associated with disaster preparedness. These are the personal and contextual factors that affect a person's access to resources and consequently decision-making in the context of disaster preparedness. Welfare recipience or public assistance, is the hypothesized mediator in this study, also theorized to be associated with disaster preparedness; welfare recipience is posited to statistically mediate the association between social vulnerability factors (Socioeconomic status, household composition, and minority status) and disaster preparedness.



Figure 4.1. Conceptual Framework

Methods

Research Design and Sampling

This paper used secondary data from the American Housing Surveys (AHS) 2017. The AHS are nationally representative, comprehensive statistical surveys conducted by the US Census Bureau and the US Department of Housing and Urban Development (HUD) every two years and provide an estimate of how residents in the U.S. live, the physical conditions of homes and neighborhoods, characteristics and demographics of those who live in the house, and the costs associated with home maintenance (AHS, 2017). This integrated national survey includes a representative sample of housing units in the United States. Similar to all their surveys, the Census Bureau randomly selects addresses for the AHS through a scientific sampling from a list of all residential addresses in the U.S. (AHS, 2017). Every address that participates is representative of 450-4000 housing units in the country. The questionnaire takes an average of 40 minutes to administer, and interviews are conducted both in person by field representatives, or over the phone. To maintain representation, the census bureau adopts a stratified two stage sampling strategy, first selecting representative areas in the U.S., and then the housing units in those areas in the second stage. Every unit in the sample is asked a core questionnaire and sometimes samples are split and administered additional topical modules such as commuting, food security, housing counseling, and healthy homes. In 2017 the sample was split in half and a disaster preparedness module was administered to the second split sample (N=29070), the primary sample retained for this study. The Institutional Review Board at Boston College approved this research, and the study was exempted from full review owing to the minimal risk posed to human subjects due to the use of publicly available secondary data.

Measures

Dependent Variable

The dependent variable, disaster preparedness, is composed of nine indicators measuring basic supplies related preparedness, having evacuation or emergency plans, and financial preparedness. Preparedness is classified into two variables- cumulative and minimal preparedness (Malmin, 2020). A cumulative score of disaster preparedness places equal weight on each of the nine preparatory measures and is measured as a continuous variable (0-9). Minimal preparedness is measured using elements of food, water, funds, and access to a vehicle; those who are prepared for these fundamentals were coded as 1- minimally prepared, those who were not were coded 0-not minimally prepared (Malmin, 2020).

Independent Variables

Social Vulnerability

The independent variables span social vulnerability variables and comprise socioeconomic status measured by income and education, household demographics that include sex of householder, number of adults 18 years of age and older in the household, marital status of the householder, presence of older adults, and presence of persons with disability. Minority status is measured by two variables, race, and ethnicity of the householder.

Mediator

The hypothesized mediator is a composite variable measuring participation in social protection programs. The AHS include information on participation in Supplemental Security Income (SSI), Supplemental Nutritional Assistance Program (SNAP), Housing subsidy and vouchers, and Temporary Assistance to Needy Families (TANF) including other public assistance. These were combined to a composite dichotomous variable where participation in any program was coded 1 "Yes".

Weighting and Missing Data

The AHS 2017 integrated national sample was randomly split and administered separate topical modules of commuting and disaster planning respectively and assigned separate weights. The split sample weights were used to obtain descriptive statistics, regression, and decomposition models to minimize sampling errors and to ensure the representativeness of the data (American Housing Survey, 2018). Data were analyzed for

missing values. After recoding, the only variable with missing data over 10% was the income variable; these missing observations pertained to observations from higher income categories beyond USD 10,437 per month, that were excluded from our analyses. Other missing data were deemed ignorable and further analyses used complete cases.

Analysis Strategy

After providing weighted descriptive statistics, the two operationalizations of preparedness were regressed on welfare recipience and the other covariates spanning social vulnerability. These models tested the association between the independent variables and the dependent variable as well as the hypothesized mediator. Mediation in multiple regression models is tested through an examination of the coefficients. If the association between a vulnerability factor and preparedness is insignificant on accounting for welfare recipience, it would mean that the association was totally mediated by welfare recipience. If, however, there is only a slight variation in the coefficients, it can be inferred that the association is partially mediated or offset by the interceding factor. The potential mediating effects of welfare recipience were further assessed using the KHB-Karlson/Holm/Breen (Termed thus after creators: Kristian Bernt Karlson, Anders Holm, and Richard Breen) (Breen et al., 2013; Kohler et al., 2011).

The KHB method is a Structural Equation Modeling (SEM) based decomposition approach that allows for a wider flexibility in accounting for rescaling issues arising out of dichotomous mediators, helps to compare coefficients across nested models, and works equally well with continuous outcome variables (Hoffmann & Muttarak, 2017; Kohler et al., 2011; Linden & Yarnold, 2018). The method allows for comparisons of total, direct, and indirect effects and has been found to be robust to the potential bias and scaling inconsistencies owing to a dichotomous mediator (Breen et al., 2013; Constante et al., 2016). Further, KHB method is known to outperform other modeling approaches when it comes to mediation analyses across multiple circumstances (Breen et al., 2013; Linden & Karlson, 2013). KHB was also recently employed in understanding the effect of education and disaster preparedness and the potential mediation through social capital and disaster risk perception (Hoffmann & Muttarak, 2017) and was deemed ideal for the current study. All statistical procedures and analyses were conducted on Stata version 16. Tables were created using 'asdoc,' a Stata program written by Shah (2018).

Results

Descriptive Statistics

The average preparedness score across the nine preparatory actions was 5.01 on a scale of 0-9 (See Table 4.1). Fifty-seven percent were not prepared for the minimum preparedness actions of having food, water, funds, and access to transportation and about 43% were at least minimally prepared. About 13% of the sample received some form of welfare assistance spanning supplemental security income (SSI), housing subsidy, SNAP, TANF and other forms of welfare. Nearly 40% had a monthly income of under 3000 USD and about 11% had less than a high school degree. About 48% of the sample had women householders and nearly 30% had at least one older adult at home. One in five households had a person with a disability at home. The racial breakdown of the sample was similar to the U.S. Census numbers with 78% white, and 14% Black or African American. The categories American Indian/Alaska Native/Pacific Islander at about 2%, Asian at nearly 5%, and biracial and other categories at under 2 % were combined for the multivariable analyses owing to low variability. On average, there were two adults over

the age of 18 in every sampled household. The operationalization of all variables in the paper is shown in Table 4.1 including weighted descriptive statistics for the key variables in the study.

Variables	Ν	Prop/Mean	Frequency	Percentage
Disaster Preparedness				
Cumulative preparedness (0-9)	29070	5.01		
Minimal preparedness	27713			
0=No			16015	57.08
1=Yes			11698	42.92
Social Vulnerability				
Monthly Income	23879			
1=0-999*			3414	12.28
2=1000-2999			6677	28.12
3=3000-4999			5255	22.95
4=5000-7499			4817	20.88
5=7500-10 436			3716	15 76
Education	29070		5710	15.76
1=Less than high school*	29070		3494	10.89
2=high school or some college			11432	40.63
2-dialama an associata			2752	12 54
3=diploma or associate			3/32	13.34
4-grad/postgrad	20070		10392	54.95
<u>Sex of respondent</u> 0=Male	29070		14708	51 74
1=Female			14362	48.26
Older adult in household	29070		14502	40.20
0=No	29070		20493	71.07
1=Yes			8577	28.93
Person with disability in household	28252		0077	20000
0=No			21788	77.16
1=Yes			6464	22.84
<u>Marital Status</u>				
1= Married*	29047		13904	49.53
2= Widowed/Separated/Divorced			8371	28.58
3= Never Married			6772	21.89
<u>Age</u>	29070			
1=15-35*			5809	19.75
2=36-65			10750	36.50
3=56-65			5561	20.13
4=65 and over			6950	23.61
<u>Race</u>	29070			
1=white Only*			22053	78.39
2=Black Only			4323	13.71
3=Am.Indian/Al.Native/Hawaiian/Pac.Isl.			457	1.59

 Table 4.1. Operationalization of Variables and Weighted Descriptive Statistics

4=Asian			1843	4.85
5=Two or more races			394	1.46
Ethnicity Latinx				
0= No			24526	86.37
1 = Yes			4544	13.63
Number of adults in household	29070	1.94		
Mediator				
Welfare policy participation	29070			
0=No			24269	87.07
1=Yes			4801	12.93

Note: Asterisk (*) indicates reference group

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The mean cumulative preparedness score was higher for those with higher income and education, those who did not receive any welfare assistance, male headed households. The average cumulative preparedness also increased with householder age and was higher for married and white householders. Fifty-four percent of male and 61% of female householders were not minimally prepared. About 80% of those who received some form of welfare and more than half across income and education categories, were not prepared with food, water, funds, and means of transportation. Weighted descriptive statistics for key variables across the dependent variables are presented in Table 4.2.

Variables	Cumulative	Minimal Preparedness	
	Preparedness		
		No	Yes
	Observations (Mean)	Freq (%)	Freq (%)
Social Vulnerability			
Monthly Income			
1=0-999*	3414 (4.21)	2367 (70.10)	828 (29.90)
2=1000-2999	6677 (4.65)	4178 (64.91)	2192 (35.09)
3=3000-4999	5255 (5.16)	2771 (54.71)	2241 (45.29)
4=5000-7499	4817 (5.22)	2387 (52.65)	2203 (47.35)
5=7500-10,436	3716 (5.40)	1798 (51.17)	1743 (48.83)
<i>Education</i>			
1=Less than high school*	3494 (4.52)	2351 (69.64)	971 (30.36)
2=high school or some college	11432 (4.99)	6358 (57.54)	4525 (42.46)
3=diploma or associate	3752 (5.18)	1928 (53.30)	1660 (46.70)
4=grad/postgrad	10392 (5.13)	5378 (54.13)	4542 (45.87)
Sex of respondent	× /		
0=Male	14708 (5.17)	7534 (53.65)	6467 (46.35)
1=Female	14362 (4.85)	8481 (60.75)	5231 (39.25)
<u>Older adult in household</u>		. /	
0=No	20493 (4.98)	11746 (59.74)	7800 (40.26)

Table 4.2. Weighted Descriptive statistics for	Categorical Independent	Variables Disaggregated
by Dependent Variables		

1=Yes	8577 (5.09)	4269 (50.52)	3898 (49.48)
Person with disability in household			
0=No	21788 (5.10)	11857 (55.60)	9449 (44.40)
1=Yes	6464 (4.86)	4127 (61.99)	2232 (38.01)
<u>Marital Status</u>			
1= Married*	13904 (5.43)	6878 (51.94)	6418 (48.06)
2= Widowed/Separated/Divorced	8371 (4.69)	4852 (59.21)	3152 (40.79)
3= Never Married	6772 (4.48)	4273 (66.03)	2120 (33.97)
Age			
1=15-35*	5809 (4.68)	3700 (67.02)	1839 (32.98)
2=36-65	10750 (5.10)	6012 (58.76)	4224 (41.24)
3=56-65	5561 (5.17)	2851 (52.31)	2470 (47.69)
4=65 and over	6950 (5.02)	3452 (50.19)	3165 (49.81)
Race			· · · ·
1=white Only*	22053 (5.07)	11834 (55.76)	9216 (44.24)
2=Black Only	4323 (4.74)	2726 (64.79)	1382 (35.21)
3=Am. Indian /Alaska	457 (4.80)	284 (64.93)	148 (35.07)
Native/Hawaiian/Pac. Islander		. ,	· · · ·
4=Asian	1843 (4.92)	927 (53.25)	817 (46.75)
5=Two or more races	394 (4.98)	244 (59.93)	135 (40.07)
Ethnicity Latinx			
0= No	24,526 (5.05)	13338 (56.41)	10037 (43.59)
1 = Yes	4544 (4.80)	2677 (61.35)	1661 (38.65)
Mediator			
Welfare policy participation			
0=No	24269 (5.13)	12272 (53.73)	10804 (46.26)
1=Yes	4801 (4.24)	3743(80.72)	894 (19.28)
NI (D C) ()	1 • 11 1 4	11 1	

Note: Reference group for categorical variables denoted by asterisk

To test the effects of social vulnerability and participation in safety net programs on disaster preparedness, both conceptualizations of preparedness were regressed on the independent variables and mediator using the split sample. Specifically two regression models were built:

Model 1: Y = a + b1X1 + b2X2 + b3X3 + b4X4 + e

Model 2: $\log(\frac{p}{1-p}) = a + b1X1 + b2X2 + b3X3 + b4X4$

Model 1 was an OLS regression model where the dependent variable is a cumulative score of disaster preparedness. Model 2 examines minimal preparedness using a logistic regression model. Across both models, X1 was socioeconomic status, X2 was minority status, X3 denoted Household characteristics, and X4 was participation in safety net programs. Models were built block-wise to isolate the effects of the independent variables and the proposed mediator. In either case, extending the models with the combined welfare variable resulted in a statistically significant change in the coefficients or odds ratios of some vulnerability variables. Further, across both models the models with the welfare policy recipience variable had lower Akaike's Information Criteria (AIC) and Bayesian Information Criteria (BIC), suggesting the regression models with the welfare variable was preferable over the models without. The next section presents the results of models accounting for both social vulnerability and welfare recipience.

Model 1 regressing cumulative disaster preparedness on welfare recipience and key social vulnerability indicators was statistically significant. About eight percent of the variability in cumulative preparedness was explained by the independent variables in the model (F (20, 20693)= 69.70, p<0.001, R-squared 0.084, Adjusted R-squared 0.084). Controlling for other variables in the model, compared to those who did not receive welfare, families that reported obtaining some form of public assistance reported lower preparedness. For instance, families receiving welfare were 0.43 points less prepared than their counterparts who did not receive welfare and this difference was statistically significant (b= -0.43, t=-8.80, p<0.001 95% CI [-.52, -.33]). Higher socioeconomic status across both income and education was positively and significantly associated with disaster preparedness. Compared to householders under the age of 35, higher age was significantly associated with increased preparedness except in the case of older adults above 65 years of age, where this relationship was not statistically significant. Adjusting for other covariates, women headed households had a 0.10 point lower cumulative preparedness score compared to male householders (b=-0.10, t=-3.27, p<0.01, 95% CI [-

(0.16, -0.04)). Marital status was a significantly associated with cumulative preparedness when other variables were held constant. Compared to married householders, widowed divorced or separated householders scored 0.48 points lower on the preparedness score (b=-0.48, t=-11.96, p<0.001, 95% CI [-0.56, -0.40]) and those who were never married were significantly associated with 0.59-point lower score (b = -0.59, t = -13.41, p < 0.001, 95% CI [-0.68, -0.51]). Both race and ethnicity were significantly associated with lower cumulative preparedness for American Indian/ Pacific Islander/ Asian, and biracial groups and those who reported Spanish ethnicity compared to whites and non-Spanish ethnicity respectively. An increase in the number of adults over the age of 18 in the house corresponded with a 0.10-point increase in cumulative preparedness controlling for other variables in the study. The presence of older adults at home was associated with an increase in cumulative preparedness by 0.23 points (b=0.23, t=3.30, p<0.01, 95% CI [0.09, 0.37] while the presence of a person with disability was correlated with lower cumulative preparedness (b=-0.17, t=-4.53, p<0.001, 95% CI [-0.24,-0.10]. Results of the weighted OLS regression with linearized standard errors are presented in Table 4.3.

Cumulative Preparedness	Coef.	Beta Coef.	St.Err.	t- value	p-value	[95% Inter	Conf vall
Social Vulnerability		0000				111001	
Income (0-999)	0.000						•
1000-2999	0.218	0.051	0.053	4.11	0.000	0.114	0.322
3000-4999	0.434	0.096	0.058	7.54	0.000	0.321	0.546
5000-7499	0.505	0.108	0.061	8.33	0.000	0.386	0.624
7500-10436	0.572	0.110	0.065	8.77	0.000	0.444	0.700
Education(less than high school)	0.000						
Highschool/Some College	0.275	0.072	0.050	5.47	0.000	0.177	0.374
Diploma/Associate's	0.394	0.073	0.061	6.48	0.000	0.275	0.513
Grad/Postgrad	0.218	0.052	0.055	3.95	0.000	0.110	0.326
Age (15-35)	0.000						
36-55	0.190	0.047	0.044	4.33	0.000	0.104	0.276
56-65	0.278	0.058	0.052	5.37	0.000	0.176	0.379
65 and older	0.134	0.031	0.084	1.59	0.112	-0.031	0.299

Table 4.3. Weighted Regression Coefficients of Cumulative Preparedness by welfare and key covariates (N=23713)

0.000						
-0.101	-0.026	0.031	-3.27	0.001	-0.161	-0.040
0.000						
-0.484	-0.119	0.040	-11.96	0.000	-0.563	-0.404
-0.594	-0.133	0.044	-13.41	0.000	-0.681	-0.507
0.095	0.043	0.021	4.48	0.000	0.054	0.137
0.000						•
0.231	0.056	0.070	3.30	0.001	0.094	0.368
0.000						
-0.169	-0.039	0.037	-4.53	0.000	-0.243	-0.096
0.000						
-0.042	-0.008	0.045	-0.95	0.344	-0.130	0.045
-0.160	-0.022	0.056	-2.86	0.004	-0.270	-0.050
0.000						
-0.143	-0.027	0.046	-3.09	0.002	-0.234	-0.052
0.000						•
-0.426	-0.081	0.048	-8.80	0.000	-0.521	-0.331
4.461	•	0.090	49.52	0.000	4.285	4.638
		4.880) SD de	pendent var	r	2.058
		0.084	4 Adjus	ted R-squar	ed	0.084
		69.705	5 Prob >	> F		0.000
	$\begin{array}{c} 0.000\\ -0.101\\ 0.000\\ -0.484\\ -0.594\\ 0.095\\ 0.000\\ 0.231\\ 0.000\\ -0.169\\ 0.000\\ -0.042\\ -0.160\\ 0.000\\ -0.143\\ 0.000\\ -0.426\\ 4.461\\ \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Note: *Reference group in parentheses*

Model 2 regressed minimal preparedness on welfare recipience and social vulnerability indicators. The weighted logistic model regressing minimal preparedness on key vulnerability covariates and welfare recipience was statistically significant (F(20,23249) = 51.44, p < 0.001). To aid easier interpretation, odds ratios are presented in Table 4.4. An odds ratio greater than one indicated better chances of being at least minimally prepare compared to the reference group for categorical variables while an odds ratio lower than one suggested that the odds of being minimally prepared were lower. In terms of welfare recipience, compared to households that did not receive welfare households that received any of the social protections between SNAP, SSIP, TANF, and housing subsidies were associated with 56% lower odds of being minimally prepared holding other covariates in the model constant (OR=0.44, t=-13.84, p<0.001, 95% CI [0.39,0.49]). Compared to those earning under 1000 USD per month, higher income significantly increased the odds of being minimally prepared across the board,

except, it was not statistically significant for income category 2, 1000 to 2999 USD. Improved education and higher householder age were associated with better odds of being prepared with food, water, funds, and transportation adjusting for other variables in the model. Compared to heads of household who were married, widowed/divorced/separated or never married householders had lower odds of being minimally prepared holding other covariates constant. Compared to male heads of household, female householders were associated with 16% lower odds of being at least minimally prepared, and this relationship was statistically significant (OR=0.84, t=-4.72, p < 0.001, 95% CI [0.79,0.91]). Race and ethnicity of the householder were not significantly associated with minimal preparedness. Every unit increase in the number of adults in the house was associated with an 11% reduction in the odds of being minimally prepared (OR= 0.89, t=-4.62, p<0.001, 95% CI [0.85, 0.94]). Holding other variables in the model constant, the presence of an older adult at home was associated with 24% higher odds of being minimally prepared (OR= 1.24, t=2.69, p<0.01, 95% CI [1.06,1.46]), while the presence of a person with disability at home was associated with 24% lower chances of being minimally prepared (OR=0.76, t= -6.12, p<0.001, 95% CI [0.70, 0.83]). Other details of the logistic regression model including odds ratios and linearized standard errors are presented in Table 4.4.

Minimal Preparedness	OR	Linearized St.Err.	t-value	p-value	[95% Conf Interval]	
Social Vulnerability						
Income (0-999)	1.000					
1000-2999	1.023	0.065	0.35	0.724	0.903	1.159
3000-4999	1.441	0.098	5.36	0.000	1.261	1.647
5000-7499	1.551	0.111	6.11	0.000	1.347	1.785
7500-10436	1.575	0.122	5.88	0.000	1.353	1.832
Education(less than high	1.000					

Table 4.4. Weighted Logistic Regression for Minimal Preparedness by Key Covariates (N=23269)

school)						
Highschool/Some College	1.448	0.086	6.27	0.000	1.290	1.626
Diploma/Associate's	1.688	0.119	7.41	0.000	1.470	1.939
Grad/Postgrad	1.444	0.095	5.59	0.000	1.270	1.643
Age (15-35)	1.000					
36-55	1.364	0.070	6.03	0.000	1.233	1.508
56-65	1.836	0.112	10.00	0.000	1.630	2.069
65 and older	1.938	0.192	6.69	0.000	1.597	2.353
HH Sex (Male)	1.000					
Female	0.844	0.030	-4.72	0.000	0.787	0.906
Marital Status (Married)	1.000					
Widowed/separated/divorced	0.805	0.038	-4.65	0.000	0.735	0.882
Never married	0.759	0.038	-5.46	0.000	0.688	0.838
Number of adults in HH	0.891	0.022	-4.62	0.000	0.849	0.936
Presence of Older Adults (No)	1.000					
Yes	1.244	0.101	2.69	0.007	1.061	1.459
Presence of person with	1.000					
disability (No)						
Yes	0.764	0.034	-6.12	0.000	0.702	0.833
HH Race (white)	1.000				•	•
Black/African American	0.906	0.047	-1.90	0.058	0.818	1.003
Asian/AmInd/PacIsld/AlNat/B	1.053	0.068	0.80	0.422	0.928	1.195
iracial						
Ethnicity Latinx (No)	1.000	•	•		•	
Yes	1.098	0.057	1.80	0.071	0.992	1.216
Mediator						
Welfare (No)	1.000					
Yes	0.439	0.026	-13.84	0.000	0.391	0.493
Constant	0.441	0.046	-7.77	0.000	0.359	0.542
Adjusted Wald χ^2	51.436,	McFadder	n's R-square			0.070
F(20,23249)	p<0.001					
Goodness-of-fit χ^2 (7182)	7355.02, p>0.05					

Note: Reference group in parentheses

Regression Diagnostics

Model 1 was an OLS regression model. While the kernel-density plot of the residuals after the regression model indicated a slight deviation from normality, further examination of the normal quantile-plot examining normality in the middle and the standardized normal probability plot for residuals sensitive to normality at the tails indicated that this deviation was not extreme enough to be a cause for concern especially owing to the large sample size. The Breusch Pagan/Cook-Weisberg test for heteroskedasticity for Model 1 had a χ^2 (1)= 0.23 and the test was not statistically

significant suggesting that the null hypothesis of homoskedasticity could not be rejected. The variance inflation factor (vif) was 2.19 indicating no issues with multicollinearity in both models.

For Model 2, the area under the Receiver Operating Characteristic (ROC) curve indicated that 67% (Area Under the Curve (AUC)= 0.665) of the cases were correctly classified by the model suggesting only a modest level of discrimination in the logistic model; the goodness of fit test for the model had a high chi square (χ^2 (7182)= 7355.02 and was statistically insignificant (p>0.05) signifying that the observed and model predicted proportions were not statistically different and that the model had an acceptable goodness of fit. However, taking the complex survey design into account resulted in a significant Hosmer-Lemeshow/Archer Lemeshow F-adjusted mean residual goodness of fit statistic suggesting potential lack of fit (F(9,23260)= 1.93, p<0.05). The Hosmer-Lemeshow goodness of fit statistic can be sensitive to sample size (Allison, 2013; P. Paul et al., 2013). Fifty percent of the sample was randomly drawn from the overall sample and the test statistic after logistic regression indicated no issues with lack of fit (F(9,11602)= 1.616, p>0.05).

Sensitivity analysis

To verify and validate the robustness of the information from the models using the composite welfare recipience variable, each welfare policy – SNAP, SSIP, TANF or other public assistance, and housing subsidy, was separately included in the regression equations to understand individual policy associations with disaster preparedness. Results for minimal preparedness were consistent with the main model. The departures occurred with the variables race and number of adults, with race not being significantly associated with preparedness when controlling for housing subsidy, and number of adults not being significantly associated when controlling for SNAP recipience. The general direction remained consistent across the models.

Direct and Indirect Effects

The OLS and logistic regression models above tested the first hypothesis of the study and presented the direct effects of all key variables in the study on disaster preparedness. The addition of welfare recipience into the model changed the coefficients for key variables suggesting at least partial mediation emanating from the hypothesized mediator. The second hypothesis holds that household participation in safety net programs statistically mediates the association between social vulnerability and disaster preparedness. To test this hypothesis, the results were decomposed to compare the estimated coefficients between the reduced model without the mediator and the complete model with the mediator to assess if welfare recipience is a full mediator. The postulated path model is presented in Figure 4.2. In the model, disaster preparedness is the continuous outcome, social vulnerability measures are the key covariates and welfare recipience is a binary mediator. This helps estimate the exact nature and effect size of the mediating influence of participation in public assistance programs on disaster



Figure 4.2. Proposed Path-Model Showing Direct & Indirect Effects on Disaster Preparedness

Stata's user-written KHB method (Breen et al., 2013; Kohler et al., 2011) was used to decompose the total effects of a variable into direct and indirect effects to reveal underlying mechanisms that might shed light on observed associations in regression models. As specified before, the KHB method prevents common issues of rescaling and presents coefficients measured on the same scale (Brzoska et al., 2017; Kohler et al., 2011) and presents the estimated effect of the reduced and full model, as well as estimates for the indirect (difference) effect mediated by welfare recipience. In Table 5, 'total effect' is the reduced effect of the indicator controlling for social vulnerability factors. 'Direct' effect refers to how much of the full effect remains after controlling for welfare recipience and these coefficients are identical to the coefficients estimated in the OLS model (Model 1), and the 'indirect effect reports the change between the total and direct effects to provide the difference. Further, the KHB method also presents confounding ratios and percentage that measure the size of change taking into account the rescaling and the percentage change in the coefficient attributed to confounding respectively (Kohler et al., 2011; E. K. Smith et al., 2019). Figure 4.3 highlights the variables and relationships that were found to be mediated after the decomposition.





Figure 4.4 shows the reduced path model after the mediation analysis and only shows observed variables that were partially or fully mediated by welfare recipience. The direct, indirect, and total effect coefficients are displayed, and the significant effects are in bold.



Figure 4.4. Reduced Path Model showing Decomposition of Effects for Mediated Variables

We see in Table 4.5 that compared to those who earned under 1000 USD per month, earning 1000-2999 USD per month increased overall preparedness by 0.30 points. Controlling for welfare recipience, the effect of earning 1000-2999 USD reduced to 0.22, leaving an indirect effect of 0.08. The total effect was 1.4 times (confounding ratio in Table 5) larger than the direct effect, and 27% of the total effect was due to welfare recipience (confounding percentage in Table 5). For other income categories, over 20% of the total effect of income on preparedness was due to welfare recipience. Compared to not having a high school degree, the effect of having a graduate or postgraduate degree increased preparedness by 0.28, holding other variables constant. Including the effect of welfare recipience, this effect reduced slightly to 0.22. The confounding percentage suggests that 22% of the total effect of having a higher education degree on preparedness, was on account of welfare recipience and the indirect effect was statistically significant. Welfare recipience explains 17% of the association between female-headed households and disaster preparedness, and under 5% of the relationship between marital status and preparedness but the indirect effects were not statistically significant suggesting that welfare recipience did not mediate this relationship. Similarly, having a person with disability at home was associated with reduced cumulative preparedness by 0.23 (b=-0.23, p<0.001). Controlling for welfare recipience, this effect improved slightly to -0.16leaving an indirect effect of -0.06 which was statistically significant. As such, the confounding ratios and percentages in Table 4.5 show that the total effect was 1.34 times larger than the direct effect and 25% of the total effect was due to welfare recipience.

In the decomposition analysis, 55% of the total effect of race on preparedness was due to welfare recipience in the case of Black only households. While the direct effect of race was not statistically significant in the OLS model for the group, compared to white household heads, Black household heads were associated with 0.09-point lower preparedness score. The indirect effect for this group was -0.05 and this was statistically significant, suggesting potential suppression effect of welfare recipience resulting in an improvement in their preparedness. Taking Zhao et al.'s (2010) classification guide, this pointed to an indirect only mediation where a mediated effect happens but is no direct effect. Spanish origin of the householder accounted for a decrease in cumulative preparedness (b=-0.16, p<0.001) and this reduced slightly to -0.14 when controlling for welfare recipience. The indirect effect of -0.02, however, was not statistically significant. The effect of having an older adult at home on preparedness was arbitrated 8% by welfare recipience but the indirect effect was also not statistically significant. Table 4.5 shows the reduced, full, and difference estimates showing the total, direct, and indirect effects respectively.

Table 4.5. Decomposition of Total Effect of Social Vulnerability Indicators on Preparedness into Direct and Indirect Effects via Welfare Recipience

	Robust [95%Conf.					Conf.		
Preparedness	Coef.	Std.Err.	Z	р	Inte	rval]	Conf.	Conf. %
							Ratio	
Income (0-999)		(ba	ase outcome)				
<u>1000-2999</u>								
Total	0.297	0.052	5.670	0.000	0.194	0.400		
Direct	0.218	0.053	4.110	0.000	0.114	0.322		
Indirect	0.079	0.021	3.850	0.000	0.039	0.120	1.364	26.690
<u>3000-4999</u>								
Total	0.564	0.056	10.070	0.000	0.454	0.673		
Direct	0.434	0.058	7.530	0.000	0.321	0.547		
Indirect	0.130	0.024	5.480	0.000	0.083	0.176	1.299	23.040
<u>5000-7499</u>								
Total	0.647	0.059	10.980	0.000	0.531	0.762		
Direct	0.505	0.061	8.320	0.000	0.386	0.624		
Indirect	0.141	0.025	5.770	0.000	0.093	0.190	1.280	21.880
<u>7500-10436</u>								
Total	0.714	0.064	11.230	0.000	0.589	0.838		
Direct	0.572	0.065	8.770	0.000	0.444	0.700		
Indirect	0.142	0.025	5.770	0.000	0.094	0.190	1.248	19.860
Education (Less than high school)		(ba	ase outcome)				
High School/Some College								
Total	0.316	0.050	6.300	0.000	0.218	0.414		
Direct	0.275	0.050	5.470	0.000	0.177	0.374		
Indirect	0.040	0.019	2.110	0.035	0.003	0.078	1.146	12.740
<u>Diploma/Associate's</u>								
Total	0.437	0.061	7.230	0.000	0.319	0.556		
Direct	0.394	0.061	6.470	0.000	0.275	0.513		
Indirect	0.044	0.019	2.270	0.023	0.006	0.081	1.111	9.950
Graduate/Postgrad								
Total	0.279	0.055	5.110	0.000	0.172	0.387		
Direct	0.218	0.055	3.950	0.000	0.110	0.326		
Indirect	0.061	0.020	3.090	0.002	0.022	0.100	1.281	21.920
Age (15-35)		(ba	ase outcome)				
<u>36-55</u>		, ,						
Total	0.197	0.044	4.500	0.000	0.111	0.283		
Direct	0.190	0.044	4.330	0.000	0.104	0.276		

Indirect	0.007	0.019	0.390	0.696	-0.029	0.044	1.038	3.670
<u>56-65</u>								
Total	0.292	0.052	5.640	0.000	0.190	0.393		
Direct	0.278	0.052	5.360	0.000	0.176	0.379		
Indirect	0.014	0.019	0.760	0.445	-0.022	0.051	1.051	4.860
65 and older								
Total	0.165	0.084	1.950	0.051	-0.001	0.330		
Direct	0.134	0.084	1.590	0.112	-0.031	0.299		
Indirect	0.031	0.019	1.630	0.103	-0.006	0.068	1.230	18.670
Sex (Male)	01001	(h	ase outcome	0.102	01000	0.000	1.200	101070
Female		(01						
Total	-0.121	0.031	-3 940	0.000	-0.181	-0.061		
Direct	-0.101	0.031	-3 270	0.000	-0.161	-0.040		
Indirect	0.020	0.031	1 080	0.282	0.057	0.040	1 100	16 620
Marital Status (Married)	-0.020	0.01)	-1.000	0.202	-0.057	0.010	1.177	10.020
Sangrated/Divorced/Widowed		(04	ase outcome,	,				
<u>Separated/Divorcea/Widowed</u>	0.502	0.040	12 420	0.000	0.582	0 422		
Direct	-0.302	0.040	-12.430	0.000	-0.382	-0.423		
	-0.484	0.040	-11.950	0.000	-0.303	-0.404	1.020	2 750
Indirect	-0.019	0.019	-1.010	0.312	-0.055	0.018	1.039	3.750
<u>Never Marriea</u>	0 (11	0.044	12 000	0.000	0.007	0.524		
lotal	-0.611	0.044	-13.800	0.000	-0.697	-0.524		
Direct	-0.594	0.044	-13.400	0.000	-0.681	-0.507		
Indirect	-0.017	0.019	-0.890	0.371	-0.053	0.020	1.028	2.730
Number of Adults								
Total	0.081	0.021	3.820	0.000	0.039	0.123		
Direct	0.095	0.021	4.480	0.000	0.054	0.137		
Indirect	-0.014	0.019	-0.770	0.440	-0.051	0.022	0.849	-17.750
Elders at home (No)		(ba	ase outcome))				
<u>Yes</u>								
Total	0.250	0.070	3.580	0.000	0.113	0.387		
Direct	0.231	0.070	3.300	0.001	0.094	0.368		
Indirect	0.019	0.019	1.030	0.304	-0.017	0.056	1.083	7.660
Person with disability at home (No)		(ba	ase outcome))				
Yes		× ×	,					
Total	-0.226	0.037	-6.140	0.000	-0.298	-0.154		
Direct	-0.169	0.037	-4.530	0.000	-0.243	-0.096		
Indirect	-0.057	0.020	-2.900	0.004	-0.095	-0.018	1.336	25.170
Race (white)		(ha	ase outcome)				
Black		(01						
Total	-0.093	0 044	-2 110	0.035	-0.180	-0.007		
Direct	-0.093	0.044	-0.950	0.344	-0.130	0.045		
Indirect	-0.042	0.045	-0.550	0.009	-0.190	-0.013	2 203	54 610
Other	-0.031	0.017	-2.020	0.007	-0.007	-0.015	2.205	34.010
Total	0.172	0.056	3 070	0.002	0.282	0.062		
Direct	-0.172	0.056	-3.070	0.002	-0.282	-0.002		
Indiract	-0.100	0.030	-2.800	0.004	-0.270	-0.030	1.075	6 000
Huntot Ethnicity Lating (No)	-0.012	0.019	-0.030	0.517	-0.048	0.024	1.073	0.990
Linnicuy Luunx (190) Vos		(Da	ase outcome	1				
$\frac{Ies}{T_{-t-1}}$	0.170	0.046	2 4 4 0	0.001	0.251	0.070		
1 otal	-0.160	0.046	-3.440	0.001	-0.251	-0.069		
Direct	-0.143	0.046	-3.090	0.002	-0.234	-0.052	1 1 1 2	10.100
Indirect	-0.016	0.019	-0.870	0.382	-0.053	0.020	1.113	10.190

Note: Reduced effects refer to the total effects controlling for welfare recipience. Full effects refer to direct effects and Difference refers to the indirect effects.

Discussion

Climate change and its impacts are known as 'threat multipliers' that exacerbate drivers of impoverishment (IPCC, 2018; UNDRR, 2019). Climate and weather-related disasters are some of the most visible forms of climate change impacts and constitute a substantial share of the humanitarian burden (IDS, 2017). It is well established that disasters do not occur naturally (O'Keefe et al., 1976); factors such as social inequality, poverty, rapid and unplanned urban expansion, and environmental degradation among others principally drive the losses that occur as a result of these events (Tselios & Tompkins, 2019). Social protection, or social welfare policy, is a way of helping communities deal with shocks, both economic and climatic. Preparing for disasters is part of risk mitigation and social protection and can provide preemptive support to communities dealing with intersecting and often co-occurring social, economic, and environmental risks. This can help build capacities among vulnerable groups to avoid bigger losses after a disaster. In the discussion that follows, some of the key findings of this study are highlighted.

First, nearly 60% of all respondents were not prepared with food, water, funds, and access to transportation in case of a disaster and considerable variation existed across the social vulnerability factors included in the study. Nearly 61% percent of women headed households and 65% of Black headed households were not minimally prepared. About 62% of the households with a person with disability and 50% with an older adult were not prepared with food, water, funds, and means of transportation in case of a disaster. Among those who participated in any of the four welfare policies included in the study, 80% reported not being minimally prepared. Cumulative preparedness seemed marginally better in terms of average preparedness, however there is still room for improvement through improved support systems especially for vulnerable communities. Women householders, households that had a person with disability, widowed/separated, divorced, unmarried, and younger householders, and racial and ethnic minorities reported lower average cumulative preparedness scores compared to men, households without a person with disability, married, older, and white householders.

Second, a higher proportion of women and racial minority headed households were less prepared compared to men and white-headed households. Across both conceptualizations of preparedness in the study, sex of the householder was a key factor with women householders being less prepared compared to their counterparts who were men. While this is consistent with many other studies, it remains a matter of concern and an avenue for policy intervention. On average, race and ethnicity were both significantly associated with cumulative preparedness but not with minimal preparedness. For example, white and Black householders did not differ in their preparedness, but white householders scored higher on a series of preparatory actions compared to racial minorities that included Asian, American Indian, Alaskan Native, Pacific Islander, and biracial groups. Multiple studies have shown this association and race and ethnicity remain key factors of differentiation across a range of health and social outcomes in the U.S. (Bethel et al., 2013; Chakraborty et al., 2019; Woo et al., 2019), and the differences in disaster preparedness seem to be an extension of these disparities.

Third, 62% of houses with a person with disability and 50% of households with older adults were underprepared. With one in two households having either a person with disability or an older adult at home, understanding the special needs and strengths of this

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group becomes critical. Owing to physical limitations among older adults and persons with disability, they typically face more adverse impacts after a disaster in terms of mortality and potential loss of housing, and income as well as other injuries (M. H. Fox et al., 2010; Hikichi et al., 2016; McDermott et al., 2016). Further there are disparities in their access to resources including those stemming from and exacerbated by lower socioeconomic standing (IOM, 2015). Regression analyses suggested that the presence of an older adult at home was associated with increased preparedness across both conceptualizations while having a person with disability at home was linked to lower preparedness. Prior experiences of disasters are often considered key determinants in preparedness and having an older adult at home might act as a proxy for this prior experience for households (Becker et al., 2017; Malmin, 2020). At the same time, since the effects on older adults seem to be disproportionate in the literature and in experience, heightened emphasis needs to be on ensuring localized relief and rehabilitation for households with older adults in helping deal with the aftermath of disasters. Concerted participation of older adults and persons with disability in community planning for disasters can reduce adverse impacts and improving community preparedness and contribute to equitable disaster risk management (Hallegatte et al., 2016; IOM, 2015). Householder's age was consistently and positively associated with higher preparedness except for the age group 65 and older in the case of cumulative preparedness. One reason could be this category's collinearity with the variable denoting presence of an older adult at home. The variance inflation factor for the variables age of householder (category 4, aged 65 and older) and presence of older adult at home was on the higher end at 6.45 and 4.90 respectively. While it is high it is still within acceptable limits and the statistical

software did not exclude either because of high collinearity. Further it was deemed useful to include both variables to account for the difference between an older adult as a householder and the presence of an older adult in the household as a proxy for caregiving responsibilities of a younger householder.

Fourth, welfare recipience served as a statistical mediator between preparedness and income, education, presence of person with disability, and race. While not a true mediation analysis owing to the cross-sectional nature of data, the mediation analysis offers takeaways that ought to be unpacked. Overall, preparedness was seen to reduce, albeit slightly, when welfare recipience was controlled for, except in the case of presence of person with disability, number of adults at home, race, and ethnicity. For households with a person with disability at home, the effect of receiving some form of welfare assistance constituted a quarter of the total effect on preparedness. It should be noted that the presence of a person with disability at home was only partially mediated by welfare recipience. This suggests the likelihood of an omitted mediator in the direct path (Zhao et al., 2010). Based on previous scholarship, this mediator could be self-efficacy (Adams et al., 2019; Marceron & Rohrbeck, 2019) or other welfare recipience related mediators. Further analysis is warranted to understand this relationship as persons with disability are a key vulnerable demographic and welfare policies ought to be designed for those most vulnerable.

Finally, the association of vulnerability factors of age and sex of the householder, number of adults, presence of older adults, and ethnicity with preparedness was not mediated by welfare recipience in our analysis. However, the relationship between race of householder and preparedness was mediated by welfare recipience; for Black headed

households, receiving some form of social protection formed an important feature of their ability to be prepared for disasters. It is pertinent to keep in mind the negative connotation of availing social safety nets in the U.S. Often deemed as 'handouts', safety nets are controversial and have been a source of stigma for recipients (Stuber & Schlesinger, 2006), despite the U.S. having a relatively well-defined social safety net structure encompassing a range of social protections. Safety nets and issues of poverty have often been racialized in the U.S. (Gilens, 1999; Krings et al., 2019) which has led to the framing of welfare recipients as undeserving (Gilens, 1999; Stuber & Schlesinger, 2006). Many welfare policies including those in the current analysis such as SNAP and housing or rental subsidies have been associated with racial minorities in the U.S. (Gilens, 1999). The judgement against welfare in fact coincides with the racial stereotyping and bias against the Black and African American population in the U.S. (Coates, 2014; Gilens, 1999). The disparate load of adverse outcomes of a disaster on racial minorities too has been found to be a result of the very same systemically racist historical attitudes translating into policies related to disasters and social welfare (Coates, 2014; Elliott & Howell, 2017; Fothergill et al., 1999; Thiede & Brown, 2013; Zottarelli, 2008). The hypothesis advanced by this analysis, that receiving public assistance can potentially improve the capabilities of African Americans to be better prepared for a disaster, points to the potential shock absorber effects inherent in the concept of Adaptive Social Protection (Béné et al., 2018; Wood, 2011), but also points to the need to assist households in having a chance to improve their living conditions in the first place. The central theoretical premise that prompted this study was on how welfare policies can be made more intentional to help specific vulnerable groups deal with multiple shocks

including economic and climate related shocks. The mediation analysis helps understand the mechanism of the association between vulnerability and preparedness and the potential role of welfare policies to offset the vulnerabilities experienced by different demographic groups and offers a hypothesis to be tested further in future studies.

Limitations

Data used in this study are cross-sectional and the directionality of the association cannot be determined; therefore we caution against causal inferences from this study. As such the use of cross-sectional data in this study helps provide a snapshot of the key associations between the variables in this study. Mediation analyses using cross-sectional data are rife with potential biases owing to violations of underlying assumptions (Fairchild & McDaniel, 2017). However, the exploratory nature of the hypothesis and the findings present an opportunity for future longitudinal mediation analysis using the same data source. Moreover, multiple mediation studies reviewed for this study also utilized cross-sectional data in their analysis (Domènech-Abella et al., 2018; Han et al., 2021; Van Der Velde et al., 2020). This study uses the AHS Public Use Files (PUF) which do not include a regional variable except at the census division level. Future research should examine differences in states and districts that faced major disasters or have better safety nets or higher participation rates to examine the granular differences in readiness across geographies and policy jurisdictions. Further, this study included only four types of welfare policies and future studies should examine other policies in this context. Policies such as Medicare and Earned Income Tax Credits, or other short term cash assistance should also be examined to understand their role in disaster readiness and response capabilities. With self-reported data, there is a possibility of response bias that must be

taken into cognizance (Holbrook et al., 2003). This might be particularly true around questions on welfare recipience which is routinely stigmatized and can be under-reported owing to fear of repercussions (Meyer et al., 2009; Stuber & Schlesinger, 2006), especially in recent years in the U.S. with heightened public denigration of welfare recipience (Angel & Berlinger, 2018; Bleich & Fleischhacker, 2019). Lastly, known predictors and correlates of disaster preparedness such as prior experience of disaster should be added into the model, data permitting, to improve the regression models.

Study Implications

Disaster preparedness is a small, but key aspect of reducing harm in the context of climate related disasters for households and communities. A recent study spanning nearly six decades surmised that low-and middle-income countries are more disaster prone compared to high income countries (Tselios & Tompkins, 2020). However, the researchers also suggest that the social and economic characteristics and political volatility in countries might cause hazards to metamorphize into disasters. The U.S. with its large physical landmass and a historical legacy of inequality across several domains is an example of how natural disasters are socially constructed and have differential outcomes for different groups especially women, older adults, racial and ethnic minorities, persons with disability, and those living in economic insecurity (Blanchflower & Oswald, 2020; O'Keefe et al., 1976; Zottarelli, 2008). Race and ethnicity, among other dimensions such as sex, age, and disability are sites of inequality that impede those living in poverty from being able to partake in adaptive decision-making including preparatory action for disasters (Hallegatte et al., 2016).

The study offers several takeaways for theory, policy, and practice. The capabilities-framework provides an overarching moral and theoretical framework for designing policies and is central to social policies including those focused on disasters (Verchick, 2012). Adaptive social protection's focus on reducing vulnerabilities and improving capacities can be understood as a potential extension of this approach, with its aim of ensuring everyone's entitlement to thrive and avoid a life of destitution and harm due to disasters (Béne, 2012; Davies et al., 2009). In order to have the best possible chance at participating in life and have the capability to withstand shocks including from disasters, policies need to be designed with multiple objectives in mind, including, dealing with increasingly common social, economic, environmental, and technological shocks. Scholars of social welfare policy in the U.S. can further employ this framework as a means to consider and identify populations that need assistance, to study where social safety nets can make the biggest difference across outcomes to explicate the interconnections between social and environmental systems.

Rather than a perfunctory role in service delivery, a key focus area for social work scholars and practitioners working on welfare policy is to tackle the root causes of inequality and the adverse socioeconomic and environmental consequences for vulnerable populations (Healy, 2017; Mason et al., 2017; Wahlstrom, 2017). Welfare policies or public assistance programs are designed to help those who fall through the cracks. Devoting resources to support families and households comprising racial minorities or having individuals that need an extra hand of support such as those caring for a family member with disability is an important preventative step to improve overall lives with some potential co-benefits such as being better prepared for a disaster or being able to bounce back after such an event. For macro policy practice in social work, this can be an example of how policies and services can be streamlined in order to build overall resilience in the community that can help in times of duress, including being better prepared to deal with a natural disaster in the future. An exemplar would be connecting households at risk, such as women headed households, or households with specialized caregiving responsibilities of persons with disability or older adults and very young children, with relevant programs that can safeguard against short- and long-term shocks.

Another important feature would be to reimagine social safety nets to be more responsive to a range of shocks to preempt potential losses due to climate change. There is a consensus on how environmental crises affect the same groups that are historically underserved and lack resources and stressors, both sudden like natural disasters and prolonged, such as economic slowdowns and droughts, are no exception (Gee & Payne-Sturges, 2004; Mearns & Norton, 2009; Méndez et al., 2020). Combining public education campaigns on preparatory action with a robust, expansive safety net is a policy imperative that will have repercussions beyond the immediate goal of being able to withstand a disaster that will aid communities in improving their capabilities. This can hold communities in good stead, not just against the more visible forms of crises such as extreme weather events, but also for other social, economic, and less visible environmental predicaments enflamed by climate change that intersect to affect lives and livelihoods. Improved disaster preparedness across scales in the U.S. will help vulnerable communities reduce their losses and can be a marker of community resilience.

Conclusion

To the best of our knowledge this is the first study to explicitly investigate the association of welfare policy participation and social vulnerability with disaster readiness in the context of the U.S. With the country experiencing some of the biggest and most destructive disasters in recent history (E. C. Smith et al., 2018; Thompson, 2020), improved social protection can buffer households against immediate shocks as well as reduce risks associated with future disasters. As a globally acknowledged concept, adaptive social protection highlights how policies can be synergized to respond to intersecting crises faced by communities (Davies et al., 2013). This study helps inform how these two worlds of welfare policy and disaster risk reduction are associated in the context of the U.S. This helps identify patterns of preparedness and their welfare policy and vulnerability correlates. Using data disaggregated by income, age, sex, race, ethnicity, and disability helps characterize and uncover disparities within in-country analyses that can be useful in determining differentiated vulnerabilities in terms of underpreparedness. This analysis helped understand that a robust welfare policy could play a role in improving people's preparedness for shocks particularly for racial minorities and for households with persons with disability.

The Sendai framework for Disaster Risk Reduction centers the importance of improving women's participation and leadership in reducing risks associated with disasters (Serrao et al., 2019; UNEP & IUCN, 2018). Similarly, older adults, minorities, and persons with disabilities are also key to include in any household and community preparedness plans (UNDRR, 2019). As a key priority globally and nationally, gender and societal equality is integral to advancing social justice. In understanding the gender environment nexus too, the disparity in effects of environmental stressors on women and women-headed households is well documented.

The case for improving social protection in the coming decades is strong. A welldesigned, future-oriented, and rights and equity-based social safety net is critical to ensure communities are able to check their exposure to risks and loss from shocks and multiple stressors (Arnall et al., 2010). While the policies considered in this paper can play the role of buffering against short-term shocks, in order for them to be responsive to a changing climate and long-term resilience, welfare policies need to be even more expansive. They need to be augmented to aid long-term adaptation to cope with socioeconomic and environmental shocks (Béne, 2012; Hallegatte et al., 2016). Some examples include basic social transfers such as food and cash transfers, public works programs, diversification of livelihoods, and expanding insurance programs with an eye toward an equitable transition toward a regenerative system of development that centers its most vulnerable (Arnall et al., 2010; S. Rao & Teixeira, 2020).

Risk is a complex phenomenon, and it is important to enhance preparatory capacity at various levels to reduce losses and improve chances of building back better after a shock such as from a disaster. The 2019 global assessment report on disaster risk reduction suggests that 'the time of hazard-by hazard risk reduction is over' suggesting a need for overall risk reduction and improvement in capabilities (UNDRR, 2019, p36). While building state capacities to respond equitably to a disaster is critical, it is also increasingly clear that much of the attention should be on reducing vulnerabilities and expanding preparedness capacities in order to diminish risks and adverse impacts. Identification of hazards, planning for and taking mitigating action, and therefore reducing chances of loss and injury is imperative at individual, household, and community levels. An integrated approach to reducing vulnerabilities would entail a fuller role of the state in reducing barriers and improving capacities. The systemic nature of risks experienced by vulnerable groups means that understanding and responding to both present and future sources of risk is significant. In the ten years left for the Sendai Framework goals, preparedness remains a central tenet in bolstering communities' chances of withstanding unfavorable impacts of disasters.

Chapter V. Conclusion

We can get ready. That's what we've got to do now. Get ready for what's going to happen, get ready to survive it, get ready to make a life afterward.

Octavia E. Butler (1995, p55)

Climate change, climate chaos, climate breakdown, and climate crisis. In recent time, these terms have come to appear more often in the public consciousness. In the last few years alone, the world and the U.S. witnessed historic wildfires, a record number of hurricanes, flood events, and increasingly intensified weather and climate disasters with a devastating winter storm affecting much of the U.S. in the early months of the new decade (AghaKouchak et al., 2018; Thompson, 2020). The adage of prevention being better than cure, and a dearth of nationally representative studies examining precursors of a disaster to understand household readiness and vulnerability were the chief motivations for embarking on this three-paper dissertation project.

Disaster management is vital at different time points: before a disaster occurs, to during, to short and long-term recovery. As discussed in Chapter I, there are multiple levels of disaster preparedness- at the policy level, preparedness helps anticipate and address needs before a disaster and create adequate response mechanisms following the event, preparedness at the mezzo levels might seek to invest in commensurate infrastructure in terms of health, housing, and neighborhoods to be best equipped to resist damages due to disaster, and at the household and individual levels to have the capacity and resources to withstand a disaster and be able to restore functions after. This dissertation focused on the socio-cognitive, contextual, and policy correlates of disaster preparedness at the household level.

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In an ideal world, the multiple dimensions examined in the three papers would have been included in the same research question. However, secondary data are seldom all-encompassing and enable the examination of only certain aspects. Therefore each of these three papers assessed distinct but related factors which, taken together, offer takeaways that can inform policy, practice, and research on disaster readiness and emergency management. This chapter offers overall considerations from the dissertation and key implications for social work policy, practice, and scholarship.

While many of the reflections offered in this chapter focus on household preparedness, the associated factors traverse individual, contextual, and policy dimensions. It is also important to understand that many aspects at the other scales need to be in place for these household preparatory actions to work, and it will vary by the type of disaster as well (Zamboni & Martin, 2020). For instance, in a disaster like the one that took place in Texas in February 2021, homes without adequate heating and a lack of experience with severe cold rendered other preparatory actions insufficient. Further, looking at preparedness as separate and independent from issues of tackling inequality, climate change, and poverty is perhaps misguided and will only treat the symptom and not the underlying dimension of systemic and institutional barriers and inequities.

Key questions after a large-scale disaster boil down to who is able to evacuate, who finds themselves stranded with little access to reserves, services, and help, and who is able to access the resources that can hold them and their families through a rough period. Personal responsibility during these events is key but will often encounter impediments if other infrastructure fails. In weather and climate extremes that led to the levee breaches in New Orleans during Hurricane Katrina and the failure of the electric grid robbing people of electricity and heating in the severe winter storm in Texas in the early 2021, the commonalities of unequal impacts and disparate abilities of communities to respond owing to systemic injustices was heightened by the unheeded responsibility by the state to provide basic rights of water, electricity, and sound infrastructure (Klein, 2021). In the absence of government administered systems in place, individual capacity is nearly almost always reliant on one's socioeconomic status. Lower socioeconomic status does not make one less capable, but it certainly curtails the freedom to make quick modifications and adjustments when needed.

This three-paper dissertation examined micro, mezzo, and macro correlates of disaster preparedness. Chapter I laid the foundation of the study, outlined key terms and constructs, and presented the overall flow of the dissertation and the specific aims. The dependent variable across the three papers was disaster preparedness at the household level. Chapter II examined individual socio-cognitive features of disaster self-efficacy, and contextual vulnerability factors; Chapter III examined social vulnerability and included structural aspects of housing and neighborhood, and Chapter IV expanded the discussion by including social welfare policy and social vulnerability factors in understanding the relationship with disaster preparedness.

Implications for Social Work

The Grand Challenges of Social Work underscore key societal challenges that social workers are faced with (GCSW, 2021). The challenge on Creating Social Responses to a Changing Environment is particularly cogent to this research and identifies disaster preparedness and response as a chief priority area for social work (Kemp & Palinkas, 2015). Further, takeaways from the research include improving the reach and communication of timely disaster information through improved communication and technology, enhancing and ensuring economic and housing security to tide over shocks, and findings underscore the lasting impacts of racism and related oppression on households, depriving them of a fighting chance in the event of an added stressor such as a disaster. Consequently, this research has implications for multiple social work grand challenges such as harnessing technology for social good, building financial capability and assets for all, achieving equal opportunity and justice through fair housing and building inclusive communities with inferences for several other grand challenges such as eliminating racism and reducing extreme economic inequality (Coulton et al., 2015; GCSW, 2021; Lein et al., 2016; Metzger & Khare, 2019). A few practice, education, policy, and scholarship implications are discussed next.

Practice

As a practice-based profession, social work is uniquely positioned to reach communities most in need and connect them to resources and information about multiple facets of human services (Kemp & Palinkas, 2015; Mason et al., 2017). Particularly, for communities that are underserved and face a series of shocks and stressors, incorporating disaster preparedness and management information in the social work practitioner lexicon is vital in the face of dynamic social and environmental changes and worsened inequities in their wake. Disaster self-efficacy was associated with disaster preparedness in this study. Interventions aimed at improving clients' and communities' disaster self-efficacy as well as improving their preparedness through access to information, resources, interventions, and identification of barriers are examples of evidence based and cognitively informed strategies to tackle challenges that disasters could exacerbate. This is especially important to advance the discipline's presence in environmental social work because clinical social work tends to be underrepresented compared to macro social work on questions dealing with coupled natural and social environmental issues (Mason et al., 2017). Practice interventions could take the form of improved disaster preparedness knowledge among social workers working with individuals, families, and households so that they can ensure their clients are well prepared for these additional, often unplanned for adverse events. These could also involve including questions on disaster self-efficacy and preparedness in routine hospital or client surveys particularly in disaster-prone areas.

Social workers are also well positioned to identify populations in need and to ensure that resources and services are equitably distributed to aid households' ability to deal with disasters. Social work practitioners can improve their own understanding of disaster preparedness and response in order to best examine where they can make the necessary connections to communities they work with or are embedded in, to build collaborative teams to aid community led and informed preparatory mechanisms.

Higher socioeconomic status was associated with higher preparedness across the three studies. Housing is considered to be an important factor in advancing a mitigation strategy centered on creating and maintaining assets to deal with emergent environmental and social stresses (Fussell & Lowe, 2014; Kemp & Palinkas, 2015). Similar to previous studies (Lee & Van Zandt, 2019; Murti et al., 2014; Reale & Handmer, 2011) renters were less prepared than homeowners, and low quality homes and housing insecurity were associated with lower preparedness for socially vulnerable groups. Renters and those living in housing insecurity are statistically more likely to be people of color or those with limited means and have cascading effects such as employment insecurity which

further push households into poverty (Desmond, 2018; Desmond & Gershenson, 2016). This finding underscores the need to understand multiple sources of vulnerability that can compound to create intractable situations for communities in need. Safe and affordable housing is a human right and social work practitioners working on housing counseling services can be key conduits to ensuring disaster readiness elements are incorporated into housing decisions.

The study also found that a reduction in respondents' abilities or having caregiving responsibilities for a person with disability at home were associated with lower preparedness. Disaster policies in the U.S. prioritize support for persons with disability after a disaster (IOM, 2015) and social workers can play the role of a connector and interpreter of client needs to ensure the policies are responsive and preemptive. Results in Chapters III and IV suggest that social workers working with older adults can look to them as a reserve of past experience and need to ensure they have the necessary means and support in times of a disaster.

Social workers are tasked with more than just service delivery. We work to build capacities among individuals, families, and communities, and are also mandated to advocate for changes in the social order that disenfranchise individuals, groups, and communities. As climate change affects these communities and cuts across multiple areas of work that social workers interface with, it is ever more important to understand the ramifications of these changes but also work to address the root causes. For instance, the fossil fuel industry is historically responsible for much of the greenhouse gas emissions that caused climate change. Examining the role of social work in promoting alternative, people centered approaches to degrowth or a regenerative growth model become important points of consideration (Perera, 2017; Powers et al., 2019). Building capabilities at the local level and ensuring climate action while strengthening the social fabric through employment guarantees, housing, and healthcare among other social imperatives will be paramount in ensuring the best chances for all communities and individuals, and social workers can play a major role in organizing, advocating, and centering the needs of underserved communities (Alcott, 2013; Recognizing the Duty of the Federal Government to Create a Green New Deal, 2019; S. Rao & Teixeira, 2020).

Education

Social work education does not yet meet the needs of the day in terms of building future social workers' skills and knowledge on issues of global environmental change including disaster management and response (Teixeira & Krings, 2015). The Educational Policy and Accreditation Standards (EPAS) from the CSWE have come to incorporate environmental justice as an important goal for social work education in addition to advancing human rights, social, and economic justice (Council on Social Work Education, 2015). Given that the environmental and social systems often work in tandem, it is imperative to appreciate the interconnections between social inequities, environmental degradation, and several biased outcomes. Infusing information on climate change, disaster impacts, and adaptive solutions in the upstream is important in kindling an interest in environmental social work among future practitioners and researchers (Kemp & Palinkas, 2015). Training of practitioners in schools of social work should expand the established person-in-environment perspective to include the natural environment (Kemp & Palinkas, 2015; Mason et al., 2017; S. Rao & Teixeira, 2020; Teixeira & Krings, 2015) to inculcate interest and exposure to the roles that social workers can play across all ecological dimensions of the discipline.

Policy and Scholarship

The CSWE mandates social workers to work toward surmounting the root causes of inequality in society and by extension the social and environmental consequences of climate and weather related disasters for vulnerable populations (Healy, 2017; Krings et al., 2020; Mason et al., 2017). The emphasis of this study on social and contextual vulnerability and associations with disaster readiness falls squarely in an area where social workers can and should be more involved across scales (Krings et al., 2020).

There is less than a decade left in the timeframe to achieve the United Nations Sustainable Development Goals and much of the progress has been less than adequate to meet the timeline. Many of these goals directly or indirectly address aspects of poverty alleviation, disaster readiness, response, and building community resilience to withstand shocks where social workers can distinctly make a difference (Healy, 2017; IASSW, 2016). As articulated before, the social work grand challenge of creating social responses to a changing climate identifies disaster preparedness as a key priority and there is progression in studies and explorations on environmental and disaster related social work research in the U.S and internationally (Kemp & Palinkas, 2015; Krings et al., 2020; Mason et al., 2017). At the same time social work's presence in disaster preparedness, response, and mitigation of factors contributing to climate change remains less prominent (IASSW, 2016). Opportunities abound to transform that, and it is vital to bring social work values and strengths to interdisciplinary collaborative interventions and research in improving public health messaging and preparedness activities at the individual, household, and community levels. This is especially critical in the coming decade which is largely seen as a crucial time of investment and action in mitigating the impacts of runaway climate change to prevent the intensification of environmental disasters and associated impacts (IPCC, 2012, 2018; UNDRR, 2019).

While this dissertation adds to scholarship on disaster preparedness using two nationally representative datasets, the analysis, results, and discussion highlight multiple avenues for further exploration. Some suggestions for future research to extend this work and address some limitations are discussed next.

Disaster self-efficacy differed across socio-demographic groups, but Chapter II did not examine the multiplicative or mediating roles of self-efficacy. This relationship should be further examined to understand the mediating effects of self-efficacy on disaster preparedness among vulnerable groups. The NHS are nationally representative but cross-sectional, therefore while they present important and updated account of the preparedness culture in the U.S., longitudinal data examining some of these aspects of disaster self-efficacy can be useful in probing potentially causal relationships and whether efficacy can offset the effects of social vulnerability factors on disaster readiness.

The AHS on the other hand, allow for longitudinal analysis of multiple housing and social vulnerability factors along with disaster preparedness. This presents the opportunity of an inquiry into social and structural inequities as well as how they factor into disaster readiness. This can include the long-term effects of multiple contextual vulnerability factors on disaster preparedness and also the effect of improved preparedness on changes in housing, neighborhood, or other social outcomes. The role of welfare policies in disaster risk reduction as well as improving household and community resilience in the face of global environmental change needs to be examined further in the U.S. context (Béné, 2011). This can be done through qualitative and quantitative studies that can lend further nuance to the converging pressures faced by households and can inform how the safety net can be strengthened to better respond to emergent needs of the 21st century. Future studies should also examine the role of other welfare policies and their association with climate and environmental resilience. For instance, preliminary results from the Universal Basic Income (UBI) study in Stockton, California suggest that cash transfers to impoverished households reduced the income volatility and immediately improved the abilities of households to take decisions to better their lives (Lowrey, 2021). Internationally, studies suggest that expanding social protection helps improve capabilities among communities and assists them in absorbing distresses due to climate change including disasters (Davies et al., 2013; Tenzing, 2020) and therefore this is a promising area of study in the U.S. context.

A perturbing outcome across all the three papers in the dissertation was around women consistently being less prepared than men. Since women and feminine-presenting persons are traditionally underserved and discriminated in society and are also most disproportionately impacted by disasters, this is a key area that merits continuing attention. Despite growing interest and focus on a gendered analysis of social and environmental topics, gender-disaggregated data tends to be difficult to come by and even when present, seldom goes beyond the gender binary, thus rendering many gender and sexual minorities invisible (Gaillard, Gorman-Murray, et al., 2017; Gaillard, Sanz, et al., 2017). This is a critical area of work where social work researchers can focus on ensuring these understudied and underserved groups are represented and understood in order to design interventions specific to their needs in the disaster continuum. Further, social workers should advocate for more expansive data collection procedures to understand the experiences of gender and sexual minorities through both quantitative and qualitative data.

Last, within group analysis is important in order to understand the factors most relevant for particular race and ethnic groups and not necessarily in comparison with one another. For instance, for this study, the race variable was collapsed into three categories -white, Black, and a third category comprising Asian, Alaskan Native, Pacific Islanders, and American Indian owing to a highly skewed distribution with the last category having a small percentage in the national estimate. While done for statistical convenience, this can be problematic and erase the diversity within these groups. For instance, Asians comprised less than 5% of the AHS sample and include Chinese, Filipino, Asian Indians, Japanese, Korean, and multiple other nationalities and ethnicities. Including them with other groups obviates any potential for understanding how the key correlates examined in the dissertation pertain to these populations specifically in order to suggest policy direction. This study examined all the racial groups and therefore the comparisons were to those who identified as white only. This is not to ascribe this group with the position of the norm but was owing to the higher percentage of white only identified respondents in both nationally representative data. Further, due to many of the systemic factors of racism and inequities especially as identified in chapters III and IV, the policies and institutional support systems are not always cognizant of the needs of racial and ethnically disadvantaged groups and this contrast can highlight this difference. Future studies

should examine within-group disaster preparedness to understand the specificities of racial and ethnic minorities as well as those groups that were collapsed into a single category owing to a small sample size.

Conclusion

Climate change is now known to be the leading cause of more frequent and more intense extreme weather events. Preparedness at multiple levels to build capabilities to withstand these events and bounce back better is as crucial as tackling the processes that are causing these shifts to take place. Social vulnerability refers to the key sociopolitical, economic processes that shape power differentials in society and also factor into stress response. A common thread throughout this dissertation, social vulnerability is a key feature of the entitlements and capabilities of actors and needs to be centered in policy, practice, and scholarship to ensure social and environmental justice. At the same time, micro, mezzo, and macro level contextual realities cooccur, and interplay with these social vulnerabilities in their relationship with disaster preparedness. The three papers in the dissertation examine socio-cognitive, housing and neighborhood context, and welfare policy associations of disaster preparedness and presents implications for climate and disaster research. Specifically, the dissertation uses this ecological framing to posit that disaster self-efficacy, secure and good quality affordable housing, safe neighborhoods, and a robust social welfare policy are critical for improving capacities especially when they transpire, meet, and interact with social vulnerabilities among groups. Welfare and climate policies in the next decades need to tackle multiple faces of vulnerability to safeguard and build capabilities at all levels to ensure weather and climate related

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disasters do not further push the historically and socially underserved into deprivation and peril.

Bibliography

- Adame, B. J., & Miller, C. H. (2015). Vested Interest, Disaster Preparedness, and Strategic Campaign Message Design. *Health Communication*, 30(3), 271–281. https://doi.org/10.1080/10410236.2013.842527
- Adams, R. M., Eisenman, D. P., & Glik, D. (2019). Community advantage and individual self-efficacy promote disaster preparedness: A multilevel model among persons with disabilities. *International Journal of Environmental Research and Public Health*, *16*(15), 1–18. https://doi.org/10.3390/ijerph16152779
- Adams, R. M., Rivard, H., & Eisenman, D. P. (2017). Who Participates in Building Disaster Resilient Communities: A Cluster-Analytic Approach. *Journal of Public Health Management and Practice*, 23(1), 37–46.
 https://doi.org/10.1097/PHH.00000000000387
- Adger, W. N., & Kelly, P. M. (1999). Social vulnerability to climate change and the architecture of entitlements. *Mitigation and Adaptation Strategies for Global Change*, 4(3–4), 253–266. https://doi.org/10.1023/A:1009601904210
- AghaKouchak, A., Huning, L. S., Chiang, F., Sadegh, M., Vahedifard, F., Mazdiyasni,
 O., & H. M., & Mallakpour, I. (2018). How do natural hazards cascade to cause disasters? *Nature*, *561*(December), 458–460.
 https://www.nature.com/articles/d41586-018-06783-6

Al-Rousan, T. M., Rubenstein, L. M., & Wallace, R. B. (2014). Preparedness for Natural Disasters Among Older US Adults: A Nationwide Survey. *American Journal of Public Health*, 104(3), 506–511. https://doi.org/10.2105/AJPH.2013.301559

Alcott, B. (2013). Should degrowth embrace the Job Guarantee? Journal of Cleaner

Production, 38, 56-60. https://doi.org/10.1016/j.jclepro.2011.06.007

- Alkire, S. (2005). Subjective quantitative studies of human agency. *Social Indicators Research*, 74(1), 217–260. https://doi.org/10.1007/s11205-005-6525-0
- Alkire, S., & Deneulin, S. (2009). The Human Development and Capability Approach. In
 S. Deneulin & L. Shahani (Eds.), *An Introduction to the Human Development and Capability Approach*. Earthscan.
- Allison, P. (2013). *Hosmer-Lemeshow Test for Logistic Regression* | *Statistical Horizons*. Statistical Horizons. https://statisticalhorizons.com/hosmer-lemeshow
- American Housing Survey. (2018). 2017 AHS Integrated National Sample : Sample Design , Weighting, and Error Estimation. https://www2.census.gov/programssurveys/ahs/2017/2017 AHS National Sample Design, Weighting, and Error Estimation.pdf?
- Angel, J. L., & Berlinger, N. (2018). The Trump Administration's assault on health and social programs: potential consequences for older Hispanics. *Journal of Aging and Social Policy*, 30(3–4), 300–315. https://doi.org/10.1080/08959420.2018.1462678
- Ardalan, A., & Sohrabizadeh, S. (2016). Assessing Households Preparedness for
 Earthquakes: An Exploratory Study in the Development of a Valid and Reliable
 Persian-version. *PLoS Currents DIsasters*, 8, 1–12.

https://doi.org/10.1371/currents.dis.ccc8697279713e66887b928b839d0920

Arnall, A., Oswald, K., Davies, M., Mitchell, T., & Coirolo, C. (2010). Adaptive Social Protection: Mapping the Evidence and Policy Context in the Agriculture Sector in South Asia. *IDS Working Papers*, 2010(345), 01–92. https://doi.org/10.1111/j.2040-0209.2010.00345_2.x

- Artiga, S., Orgera, K., Olivia Pham, & Corallo, B. (2020). Growing Data Underscore that Communities of Color are Being Harder Hit by COVID-19 | KFF. Kaiser Family Foundation (KFF). https://www.kff.org/coronavirus-policy-watch/growingdata-underscore-communities-color-harder-hit-covid-19/
- Ashida, S., Zhu, X., Robinson, E. L., & Schroer, A. (2018). Disaster preparedness networks in rural Midwest communities: Organizational roles, collaborations, and support for older residents. *Journal of Gerontological Social Work*, 61(7), 735–750. https://doi.org/10.1080/01634372.2018.1474157
- Ayeb-Karlsson, S. (2020). When the disaster strikes: Gendered (im)mobility in Bangladesh. *Climate Risk Management*, 29(June), 100237. https://doi.org/10.1016/j.crm.2020.100237
- Bailey, K. T., Cook, J. T., Ettinger de Cuba, S., Casey, P. H., Chilton, M., Coleman, S. M., Cutts, D. B., Heeren, T. C., Rose-Jacobs, R., Black, M. M., & Frank, D. A. (2016). Development of an Index of Subsidized Housing Availability and its Relationship to Housing Insecurity. *Housing Policy Debate*, *26*(1), 172–187. https://doi.org/10.1080/10511482.2015.1015042
- Baker, L. R., & Baker, M. D. (2010). Disaster Preparedness Among Families of Children
 With Special Health Care Needs. *Disaster Medicine and Public Health Preparedness*, 4(3), 225–232. https://doi.org/10.1017/dmp.2015.159

Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. Self-Efficacy: Toward a Unifying Theory of Behavioral Change, 1(4). https://doi.org/https://doi.org/10.1016/0146-6402(78)90002-4

Bandura, A. (1999). Social cognitive theory : An agentic Albert Bandura. Asian Journal

of Social Psychology, 2, 21–41.

Basolo, V., Steinberg, L. J., Burby, R. J., Levine, J., Cruz, A. M., & Huang, C. (2009). The effects of confidence in government and information on perceived and actual preparedness for disasters. *Environment and Behavior*, 41(3), 338–364. https://doi.org/10.1177/0013916508317222

Becker, J. S., Paton, D., Johnston, D. M., Ronan, K. R., & McClure, J. (2017). The role of prior experience in informing and motivating earthquake preparedness. *International Journal of Disaster Risk Reduction*, 22(March), 179–193.
https://doi.org/10.1016/j.ijdrr.2017.03.006

Bell, S. A., Singer, D., Solway, E., Kirch, M., Kullgren, J., & Malani, P. (2020).
Predictors of Emergency Preparedness Among Older Adults in the United States. *Disaster Medicine and Public Health Preparedness*, 1–7.
https://doi.org/10.1017/dmp.2020.80

Béne, C. (2012). Social protection and resilience to climate and disaster. In *IDS Programme Briefing: Presenting development issues for policymakers and practitioners from the Institute of Development Studies* (Issue March).
http://www.ids.ac.uk/idspublication/social-protection-and-resilience-to-climate-anddisaster%5CnBene2012 IDS SocProtectClimateResil.pdf

- Béné, C. (2011). Social Protection and Climate Change. *IDS Bulletin*, 42(6), 67–70. https://doi.org/10.1111/j.1759-5436.2011.00275.x
- Béné, C., Cornelius, A., & Howland, F. (2018). Bridging humanitarian responses and
 long-term development through transformative changes-some initial reflections from
 theWorld Bank's adaptive social protection program in the Sahel. *Sustainability*

(Switzerland), 10(6). https://doi.org/10.3390/su10061697

- Benight, C. C., Antoni, M. H., Kilbourn, K., Ironson, G., Kumar, M. A., Fletcher, M. A., Redwine, L., Baum, A., & Schneiderman, N. (1997). Coping Self-Efficacy Buffers
 Psychological and Physiological Disturbances in HIV-Infected Men Following a
 Natural Disaster. *Health Psychology*, *16*(3), 248–255. https://doi.org/10.1037/0278-6133.16.3.248
- Bethel, J. W., Burke, S. C., & Britt, A. F. (2013). Disparity in disaster preparedness between racial/ethnic groups. *Disaster Health*, 1(2), 110–116. https://doi.org/10.4161/dish.27085
- Blanchflower, D. G., & Oswald, A. J. (2020). Trends in Extreme Distress in the United States, 1993-2019. American Journal of Public Health, 110(10), 1538–1544. https://doi.org/10.2105/AJPH.2020.305811
- Bleich, S. N., & Fleischhacker, S. (2019). Hunger or Deportation: Implications of the Trump Administration's Proposed Public Charge Rule. *Journal of Nutrition Education and Behavior*, 51(4), 505–509. https://doi.org/10.1016/j.jneb.2019.01.019
- Boardman, J. D., Finch, B. K., Ellison, C. G., Williams, D. R., & Jackson, J. S. (2006). Neighborhood Disadvantage, Stress, and Drug Use among Adults. *Journal of Health* and Social Behavior, 42(2), 151. https://doi.org/10.2307/3090175
- Boardman, J. D., & Robert, S. A. (2016). Neighborhood Socioeconomic Status and Perceptions of Self-Efficacy. *Sociological Perspectives*, 43(1), 117–136.
- Botzen, W. J. W., Deschenes, O., & Sanders, M. (2019). The economic impacts of natural disasters: A review of models and empirical studies. *Review of Environmental Economics and Policy*, 13(2), 167–188.

https://doi.org/10.1093/reep/rez004

Bourgois, P., Holmes, S. M., Sue, K., & Quesada, J. (2017). Structural Vulnerability:
Operationalizing the Concept to Address Health Disparities in Clinical Care. *Academic Medicine*, 92(3), 299–307.
https://doi.org/10.1097/acm.00000000001294

Braveman, P., & Barclay, C. (2009). Health Disparities Beginning in Childhood: A Life-Course Perspective. *Pediatrics*, 124(Supplement 3), S163–S175. https://doi.org/10.1542/peds.2009-1100D

- Braveman, P., & Gottlieb, L. (2017). The Social Determinants of Health: It's Time to Consider the Causes of the Causes. *Public Health Reports*, *129*(1_suppl2), 19–31. https://doi.org/10.1177/00333549141291s206
- Breen, R., Karlson, K. B., & Holm, A. (2013). Total, Direct, and Indirect Effects in Logit and Probit Models. *Sociological Methods and Research*, 42(2), 164–191. https://doi.org/10.1177/0049124113494572
- Brilleman, S. L., Wolfe, R., Moreno-Betancur, M., Sales, A. E., Langa, K. M., Li, Y.,
 Daugherty Biddison, E. L., Rubinson, L., & Iwashyna, T. J. (2017). Associations
 between community-level disaster exposure and individual-level changes in
 disability and risk of death for older Americans. *Social Science and Medicine*, *173*,
 118–125. https://doi.org/10.1016/j.socscimed.2016.12.007
- Bronfman, N. C., Cisternas, P. C., Repetto, P. B., & Castañeda, J. V. (2019). Natural disaster preparedness in a multi-hazard environment: Characterizing the sociodemographic profile of those better (worse) prepared. *PLoS ONE*, *14*(4), 1–18. https://doi.org/10.1371/journal.pone.0214249

- Brown, P., Daigneault, A. J., Tjernström, E., & Zou, W. (2018). Natural disasters, social protection, and risk perceptions. *World Development*, 104, 310–325. https://doi.org/10.1016/j.worlddev.2017.12.002
- Brown, B. V. (2008). The Single-Father Family Demographic, Economic, and Public Transfer Use Characteristics. *Marriage & Family Review*, 29(2–3), 23–42. https://doi.org/10.1300/J002v29n02
- Brzoska, P., Sauzet, O., & Breckenkamp, J. (2017). Unobserved heterogeneity and the comparison of coefficients across nested logistic regression models: how to avoid comparing apples and oranges. *International Journal of Public Health*, 62(4), 517– 520. https://doi.org/10.1007/s00038-016-0918-5
- Burby, R. J., Steinberg, L. J., & Basolo, V. (2003). The Tenure Trap: The Vulnerability of Renters to Joint Natural and Technological Disasters. *Urban Affairs Review*, 39(1), 32–58. https://doi.org/10.1177/1078087403253053
- Burnside, A., & Floyd, I. (2019). *More States Raising TANF Benefits to Boost Families* ' *Economic Security*. 1–26.

Butler, O. E. (1995). Parable of the Sower. Warner Books.

- Center on Budget Policy Priorities. (2020). Research. https://www.cbpp.org/research
- Chakraborty, J., Collins, T. W., & Grineski, S. E. (2019). Exploring the environmental justice implications of Hurricane Harvey flooding in greater Houston, Texas. *American Journal of Public Health*, 109(2), 244–250.

https://doi.org/10.2105/AJPH.2018.304846

Chari, R., Petrun Sayers, E. L., Amiri, S., Leinhos, M., Kotzias, V., Madrigano, J., Thomas, E. V., Carbone, E. G., & Uscher-Pines, L. (2019). Enhancing Community Preparedness: An Inventory and Analysis of Disaster Citizen Science Activities. BMC Public Health, 19(1), 1–15. https://doi.org/10.1186/s12889-019-7689-x

- Cisternas, P., & Bronfman, N. (2020). Understanding the Relationship Between Direct Experience and Risk Perception of Natural Hazards. 1–33. https://doi.org/10.1111/risa.13526
- Clay, L. A., Papas, M. A., Gill, K. B., & Abramson, D. M. (2018). Factors Associated with Continued Food Insecurity Among Households Recovering from Hurricane Katrina. *International Journal of Environmental Research and Public Health*, 15(8), 1–10. https://doi.org/10.3390/ijerph15081647
- Coates, T.-N. (2014). The Case for Reparations. *The Atlantic*. https://www.theatlantic.com/magazine/archive/2014/06/the-case-for-reparations/361631/
- Coibion, O., Gorodnichenko, Y., & Weber, M. (2020). How Did U.S. Consumers Use Their Stimulus Payments? In NBER Working Paper Series (Issue Working paper 27693). http://www.elsevier.com/locate/scp
- Comerio, M. C. (1997). Housing Issues After Disasters. *Journal of Contingencies and Crisis Management*, 5(3), 166–178. https://doi.org/10.1111/1468-5973.00052
- Constante, H. M., Peres, M. A., Schroeder, F. C., & Bastos, J. L. (2016). Mediators Between Education and Dental Pain: A Cross-sectional Study to Assess the Role of Dental Services Utilization. *European Journal of Oral Sciences*, *124*(1), 62–67. https://doi.org/10.1111/eos.12242
- Coulton, C. J., Goerge, R., Putnam-Hornstein, E., & de Haan, B. (2015). Harnessing Big Data for Social Good: A Grand Challenge for Social Work. In *American Academy of*

Social Work & Social Welfare, Working Paper (American Academy of Social Work & Social Welfare, Working Paper, Vol. 11). https://doi.org/10.1016/j.jempfin.2007.12.002

- Council for Excellence in Government. (2006). Are We Ready ? Introducing the Public Readiness Index: A Survey-Based Tool to Measure the Preparedness of Individuals, Families and Communities. https://www.fema.gov/media-library-data/20130726-1910-25045-5489/public_readiness_index.pdf
- Council on Social Work Education. (2015). 2015 Educational Policy and Accreditation Standards. 1–16.
- Cox, K., & Kim, B. R. (2018). Race and Income Disparities in Disaster Preparedness in Old Age. *Journal of Gerontological Social Work*, 61(7), 719–734. https://doi.org/10.1080/01634372.2018.1489929
- Cox, R., Rodnyansky, S., Henwood, B., & Wenzel, S. (2017). Measuring Population Estimates of Housing Insecurity in the United States: A Comprehensive Approach. SSRN Electronic Journal, December. https://doi.org/10.2139/ssrn.3086243
- Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008). A Place-based Model for Understanding Community Resilience to Natural Disasters. *Global Environmental Change*, 18(4), 598–606.
 https://doi.org/10.1016/j.gloenvcha.2008.07.013
- D'Amico, S., Marano, A., Geraci, M. A., & Legge, E. (2013). Perceived Self-Efficacy and Coping Styles Related to Stressful Critical Life Events. *PLoS ONE*, 8(7), 1–7. https://doi.org/10.1371/journal.pone.0067571

Datar, A., Liu, J., Linnemayr, S., & Stecher, C. (2013). The Impact of Natural Disasters

on Child Health and Investments in Rural India. *Social Science and Medicine*, 76(1), 83–91. https://doi.org/10.1016/j.socscimed.2012.10.008.

- Davies, M., Béné, C., Arnall, A., Tanner, T., Newsham, A., & Coirolo, C. (2013).
 Promoting Resilient Livelihoods through Adaptive Social Protection: Lessons from 124 programmes in South Asia. *Development Policy Review*, 31(1), 27–58.
 https://doi.org/10.1111/j.1467-7679.2013.00600.x
- Davies, M., Guenther, B., Leavy, J., Mitchell, T., & Tanner, T. (2009). Climate Change Adaptation, Disaster Risk Reduction and Social Protection: Complementary Roles in Agriculture and Rural Growth? *IDS Working Papers*, 2009(320), 01–37. https://doi.org/10.1111/j.2040-0209.2009.00320 2.x
- Desmond, M. (2018). Heavy is the House: Rent Burden among the American Urban Poor. *International Journal of Urban and Regional Research*, *42*(1), 160–170. https://doi.org/10.1111/1468-2427.12529
- Desmond, M., & Gershenson, C. (2016). Housing and Employment Insecurity among the Working Poor. *Social Problems*, *63*(1), 46–67.

https://doi.org/10.1093/socpro/spv025

DFID. (2011). Defining Disaster Resilience: A DFID Approach Paper. In UKAid Department for International Development.

https://doi.org/https://www.gov.uk/government/uploads/system/uploads/attachment_ data/file/186874/ 10

Domènech-Abella, J., Mundó, J., Leonardi, M., Chatterji, S., Tobiasz-Adamczyk, B., Koskinen, S., Ayuso-Mateos, J. L., & Haro, J. M. (2018). The Association between Socioeconomic Status and Depression among Older Adults in Finland, Poland and Spain: A Comparative Cross-sectional Study of Distinct Measures and Pathways. Journal of Affective Disorders, 241(August), 311–318. https://doi.org/10.1016/j.jad.2018.08.077

Ebi, K. L., Kovats, R. S., & Menne, B. (2006). An Approach for Assessing Human Health Vulnerability and Public Health Interventions to Adapt to Climate Change. *Environmental Health Perspectives*, *114*(12), 1930–1934. https://doi.org/10.1289/ehp.8430

Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2019). Global Climate Risk Index 2020: Who suffers Most from Extreme Weather Events? Weather-related Loss Events in 2018 and 1999 to 2018. In *Germanwatch e.V.*https://germanwatch.org/sites/germanwatch.org/files/20-2-01e Global Climate Risk Index 2020 14.pdf

- Eisenman, D. P., Zhou, Q., Ong, M., Asch, S., Glik, D., & Long, A. (2009). Variations in Disaster Preparedness by Mental Health, Perceived General Health, and Disability Status. *Disaster Medicine and Public Health Preparedness*, 3(1).
- Elliott, J. R., & Howell, J. (2017). Beyond disasters: A Longitudinal Analysis of Natural Hazards' Unequal Impacts on Residential Instability. *Social Forces*, *95*(3), 1181–1207. https://doi.org/10.1093/sf/sow086

Ellis, K. N., Mason, L. R., & Gassert, K. N. (2019). Public Understanding of Local Tornado Characteristics and Perceived Protection from Land-surface Features in Tennessee, USA. *PLoS ONE*, 14(7), 1–16.

https://doi.org/10.1371/journal.pone.0219897

Enarson, E. (1999). Women and Housing Issues in Two U.S. Disasters : Hurricane

Andrew and the Red River Valley Flood. In *International Journal of Mass Emergencies and Disasters* (Vol. 17, Issue 1, pp. 39–63).

- Engle, N. L. (2011). Adaptive Capacity and its Assessment. *Global Environmental Change*, *21*(2), 647–656. https://doi.org/10.1016/j.gloenvcha.2011.01.019
- Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing Adaptation: The
 Political Nature of Climate Change Adaptation. *Global Environmental Change*, 35, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014
- Etinay, N., Egbu, C., & Murray, V. (2018). Building Urban Resilience for Disaster Risk Management and Disaster Risk Reduction. *Proceedia Engineering*, 212(2017), 575– 582. https://doi.org/10.1016/j.proeng.2018.01.074
- Fairchild, A. J., & McDaniel, H. L. (2017). Statistical Commentary Best (but offforgotten) practices: mediation analysis 1,2. *Am J Clin Nutr*, 105, 1259–1271. https://doi.org/10.3945/ajcn.117.152546.Am
- FEMA. (2018a). 2018 National Household Survey Results: Preparedness in America. https://community.fema.gov/resource/1567780926000/ICPD_AP_2018_National_H ousehold Survey
- FEMA. (2018b). Emergency Preparedness | FEMA.gov. Emergency Preparedness. https://www.fema.gov/disaster/4339/emergency-preparedness
- FEMA. (2019a). 2019 National Preparedness Report Executive Summary. https://www.fema.gov/national-preparedness-report
- FEMA. (2019b). *National Response Framework*. https://www.fema.gov/media-librarydata/1582825590194-

2f000855d442fc3c9f18547d1468990d/NRF_FINALApproved_508_2011028v1040.

FEMA. (2019c). Planning Considerations : Disaster Housing (Issue May).

FEMA. (2020a). 2019 National Household Survey Results.

https://community.fema.gov/AP_2019_National_Household_Survey

- FEMA. (2020b). *National Household Survey 2018* | *FEMA.gov*. Open FEMA. https://www.fema.gov/about/openfema/data-sets/national-household-survey
- Flanagan, B. E., Gregory, E. W., Hallisey, E. J., Heitgerd, J. L., & Lewis, B. (2011). A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security* and Emergency Management, 8(1). https://doi.org/10.2202/1547-7355.1792
- Flanagan, B. E., Hallisey, E. J., Adams, E., & Lavery, A. (2018). Measuring Community Vulnerability to Natural and Anthropogenic Hazards: The Centers for Disease Control and Prevention's Social Vulnerability Index. *Journal of Environmental Health*, 80(10), 34–36.
- Fleming, T., Damon, W., Collins, A. B., Czechaczek, S., Boyd, J., & McNeil, R. (2019).
 Housing in crisis: A Qualitative Study of the Socio-legal Contexts of Residential
 Evictions in Vancouver's Downtown Eastside. *International Journal of Drug Policy*, 71, 169–177. https://doi.org/10.1016/j.drugpo.2018.12.012
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C., & Walker, B. (2002).
 Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations. *AMBIO*, *31*(5), 437–440. https://doi.org/10.4324/9780080519449-33
- Foster, A. C., & Rojas, A. (2018). Program Participation and Spending Patterns of Families Receiving Government Means-tested Assistance. *Monthly Labor Review*,
2018(1), 1–22. https://doi.org/10.21916/mlr.2018.3

Fothergill, A., DeRouen Darlington, J. A., & Maestas, E. G. M. (1999). Race, Ethnicity and Disasters in the United States: A Review of the Literature. *Disasters*, 23(2), 156–173. https://doi.org/10.1111/1467-7717.00111

Fox, J. C. (2020, March 21). Boston Delivers Multilingual Pamphlets on Coronavirus to Homes Across City. *Boston Globe*. https://www.bostonglobe.com/2020/03/21/nation/boston-delivers-multilingualpamphlets-coronavirus-homes-across-city/

- Fox, M. H., White, G. W., Rooney, C., & Cahill, A. (2010). The Psychosocial Impact of Hurricane Katrina on Persons With Disabilities and Independent Living Center Staff Living on the American Gulf Coast. *Rehabilitation Psychology*, 55(3), 231–240. https://doi.org/10.1037/a0020321
- Fussell, E., & Harris, E. (2014). Homeownership and Housing Displacement after Hurricane Katrina among Low-Income African-American Mothers in New Orleans. Soc Sci Q, 95(4), 1086–1100. https://doi.org/10.1111/ssqu.12114.Homeownership
- Fussell, E., & Lowe, S. R. (2014). The Impact of Housing Displacement on the Mental Health of Low-income Parents after Hurricane Katrina. *Social Science and Medicine*, 113, 137–144. https://doi.org/10.1016/j.socscimed.2014.05.025
- Gaillard, J. C., Gorman-Murray, A., & Fordham, M. (2017). Sexual and Gender Minorities in Disaster. *Gender, Place and Culture*, 24(1), 18–26. https://doi.org/10.1080/0966369X.2016.1263438
- Gaillard, J. C., Sanz, K., Balgos, B. C., Dalisay, S. N. M., Gorman-Murray, A., Smith, F.,& Toelupe, V. (2017). Beyond Men and Women: A Critical Perspective on Gender

and Disaster. Disasters, 41(3), 429-447. https://doi.org/10.1111/disa.12209

- Gallo, H. B., Karimi, B., Abdulridha, M., Howard, J. L., Kiani, H., Maico, J. R., Peace, M. V., Sicley, B. S., Yoo, J., & Wilber, K. (2018). Social Workers can help Older
 Adults Prepare for and Respond to Natural and Man-made Emergencies. *Journal of Gerontological Social Work*, *61*(7), 697–700.
 https://doi.org/10.1080/01634372.2018.1432737
- Gamble, J. L., Hurley, B. J., Schultz, P. A., Jaglom, W. S., Krishnan, N., & Harris, M.
 (2013). Climate Change and Older Americans: State of the Science. *Environmental Health Perspectives*, *121*(1), 15–22. https://doi.org/10.1289/ehp.1205223
- Gaynor, T. S., & Wilson, M. E. (2020). Social Vulnerability and Equity: The Disproportionate Impact of COVID-19. *Public Administration Review*. https://doi.org/10.1111/puar.13264
- GCSW. (2021). Progress and Plans for the Grand Challenges: An Impact Report at Year 5 of the 10-year Initiative. In *Grand Challenges for Social Work*. https://grandchallengesforsocialwork.org/publications/grand-challenges-5-yearimpact-report/
- Gee, G. C., & Payne-Sturges, D. C. (2004). Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts. *Environmental Health Perspectives*, 112(17), 1645–1653. https://doi.org/10.1289/ehp.7074
- Gibson, A., Walsh, J., & Brown, L. M. (2018). A Perfect Storm: Challenges Encountered by Family Caregivers of Persons with Alzheimer's Disease during Natural Disasters. *Journal of Gerontological Social Work*, 61(7), 775–789. https://doi.org/10.1080/01634372.2018.1474158

- Gilens, M. (1999). Why Americans Hate Welfare: Race, Media, and the Politics of Antipoverty Policy. University of Chicago Press. https://doi.org/10.7208/chicago/9780226293660.001.0001
- Gin, J. L., Levine, C. A., Canavan, D., & Dobalian, A. (2020). Including Homeless Populations in Disaster Preparedness, Planning, and Response: A Toolkit for Practitioners. 00(00), 1–11. https://doi.org/10.1097/PHH.00000000001230
- Godfrey-Wood, R., & Flower, B. C. R. (2018). Does Guaranteed Employment promote Resilience to Climate Change? The Case of India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). *Development Policy Review*, *36*(August), 0586–0604. https://doi.org/10.1111/dpr.12309
- Gowan, M. E., Sloan, J. A., & Kirk, R. C. (2015). Prepared for What? Addressing the Disaster Readiness Gap beyond Preparedness for Survival. *BMC Public Health*, *15*(1), 1–5. https://doi.org/10.1186/s12889-015-2440-8
- Grothmann, T., & Reusswig, F. (2006). People at Risk of Flooding: Why Some Residents Take Precautionary Action While Others Do Not. *Natural Hazards*, *38*(1–2), 101– 120. https://doi.org/10.1007/s11069-005-8604-6
- Gupta, A., & Thakur, N. (2018). Infant and young feeding practices in India: Current status and progress towards SDG Targets. *Proceedings of the Indian National Science Academy*, 84(4), 853–865. https://doi.org/10.16943/ptinsa/2018/49440
- Recognizing the duty of the Federal Government to create a Green New Deal, (2019). https://www.congress.gov/116/bills/hres109/BILLS-116hres109ih.pdf
- Hallegate, S., Vogt-Schilb, A., Bangalore, M., & Rozenburg, J. (2017). Unbreakable:Building the Resilience of the Poor in the Face of Natural Disasters. In *Climate*

Change and Development Series. https://doi.org/10.1596/978-1-4648-1003-9.

- Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg,
 J., Treguer, D., & Vogt-Schilb, A. (2016). *Shock waves-Managing the Impacts from Climate Change and Poverty (Climate Change and Development Series)*. World
 Bank Group. https://doi.org/10.1596/978-1-4648-0673-5
- Hallegatte, S., Rentschler, J., & Rozenberg, J. (2020). Adaptation Principles. Adaptation Principles. https://doi.org/10.1596/34780
- Hamann, C. J., Mello, E., Wu, H., Yang, J., Waldron, D., & Ramirez, M. (2016). Disaster Preparedness in Rural Families of Children with Special Health Care Needs. *Disaster Medicine and Public Health Preparedness*, 10(2), 225–232. https://doi.org/10.1017/dmp.2015.159
- Hammond, A., Jurow Kleiman, A., & Scheffler, G. (2020). How the COVID-19
 Pandemic Has and Should Reshape the American Safety Net. SSRN Electronic
 Journal, 154–188. https://doi.org/10.2139/ssrn.3625965
- Han, Y., Wei, J., & Zhao, Y. (2021). Long-term Effects of Housing Damage on Survivors' health in rural China: Evidence from a survey 10 Years after the 2008 Wenchuan earthquake. *Social Science and Medicine*, *270*(December 2020), 113641. https://doi.org/10.1016/j.socscimed.2020.113641
- Hardt, J., Herke, M., Brian, T., & Laubach, W. (2013). Multiple Imputation of Missing
 Data: A Simulation Study on a Binary Response. *Open Journal of Statistics*, 03(05),
 370–378. https://doi.org/10.4236/ojs.2013.35043
- Harel, O. (2009). The Estimation of R-sq and Adjusted R-sq in Incomplete Data Sets Using Multiple Imputation. *Journal of Applied Statistics*, *36*(10), 1109–1118.

Healthcare Ready. (2019). 2019 Domestic Poll Key Findings.

Healthcare Ready. (2020). 2020 National Preparedness Poll (Issue May).

Healy, L. M. (2017). Situating social work within the post-2015 Global Agenda. *European Journal of Social Work*, 20(1), 5–16.
https://doi.org/10.1080/13691457.2016.1168788

Highfield, W. E., Peacock, W. G., & Van Zandt, S. (2014). Mitigation Planning: Why Hazard Exposure, Structural Vulnerability, and Social Vulnerability Matter. *Journal* of Planning Education and Research, 34(3), 287–300. https://doi.org/10.1177/0739456X14531828

- Hikichi, H., Aida, J., Kondo, K., Tsuboya, T., Matsuyama, Y., Subramanian, S. V., & Kawachi, I. (2016). Increased risk of dementia in the aftermath of the 2011 Great East Japan Earthquake and Tsunami. *Proceedings of the National Academy of Sciences of the United States of America*, 113(45), E6911–E6918. https://doi.org/10.1073/pnas.1607793113
- Hikichi, H., Tsuboya, T., Aida, J., Matsuyama, Y., Kondo, K., Subramanian, S. V., & Kawachi, I. (2017). Social capital and cognitive decline in the aftermath of a natural disaster: a natural experiment from the 2011 Great East Japan Earthquake and Tsunami. *The Lancet Planetary Health*, *1*(3), e105–e113.
 https://doi.org/10.1016/S2542-5196(17)30041-4
- Hinkel, J. (2011). "Indicators of vulnerability and adaptive capacity": Towards a clarification of the science–policy interface. *Global Environmental Change*, 21(1), 198–208. https://doi.org/10.1016/j.gloenvcha.2010.08.002

Hoffmann, R., & Muttarak, R. (2017). Learn from the Past, Prepare for the Future:

Impacts of Education and Experience on Disaster Preparedness in the Philippines and Thailand. *World Development*, *96*, 32–51. https://doi.org/10.1016/j.worlddev.2017.02.016

- Holbrook, A. L., Green, M. C., & Krosnick, J. A. (2003). Telephone versus face-to-face Interviewing of National Probability Samples with Long Questionnaires: Comparisons of Respondent Satisficing and Social Desirability Response Bias. *Public Opinion Quarterly*, 67(1), 79–125. https://doi.org/10.1086/346010
- Hoogeveen, J., Emil, T., Vakis, R., & Stefan, D. (2004). A guide to the analysis of risk, vulnerability and vulnerable groups.

http://siteresources.worldbank.org/INTSRM/Publications/20316319/RVA.pdf

- Howard, A., Blakemore, T., & Bevis, M. (2017). Older People as Assets in Disaster Preparedness, Response and Recovery: Lessons from Regional Australia. *Ageing* and Society, 37(3), 517–536. https://doi.org/10.1017/S0144686X15001270
- HUD. (n.d.). Measuring Housing Insecurity in the American Housing Survey. Retrieved June 3, 2020, from https://www.huduser.gov/portal/pdredge/pdr-edge-frm-asst-sec-111918.html
- Hughes, H. K., Matsui, E. C., Tschudy, M. M., Pollack, C. E., & Keet, C. A. (2017).
 Pediatric Asthma Health Disparities: Race, Hardship, Housing, and Asthma in a National Survey. *Academic Pediatrics*, *17*(2), 127–134.
 https://doi.org/10.1016/j.acap.2016.11.011
- IASSW. (2016). Global Agenda for Social Work and Social Development IASSW Statement Theme 3: Promoting environmental and community sustainability. In *Global Agenda for Social Work and Social Development IASSW Statement*.

https://www.iassw-aiets.org/wp-content/uploads/2015/10/IASSW-Theme-3-Statement-24-August-2016.pdf

- Id, S. K., Yamaguchi, Y., & Kawachi, I. (2020). Assessment of Community Vulnerability and Medical Surge Capacity in a Foreseeable Major Disaster. *PLoS ONE*, 15(7), 1– 15. https://doi.org/10.1371/journal.pone.0235425
- IDMC. (2019). *Global Report on Internal Displacement (GRID)*. https://www.internaldisplacement.org/global-report/grid2020/
- IDS. (2017). Courting Catastrophe: Humanitarian Policy and Practice in a Changing Climate. In *IDS Bulletin* (Vol. 48, Issue 4). https://doi.org/10.19088/1968-2017.158
- IHCAP. (2018). Climate Vulnerability and Risk Assessment: Framework, Methods and Guidelines.
- IOM. (2015). Healthy, Resilient, and Sustainable Communities After Disasters: Strategies, Opportunities, and Planning for Recovery (Vol. 1). https://doi.org/10.1017/CBO9781107415324.004
- IPCC. (2012). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. In *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. https://doi.org/10.1017/cbo9781139177245
- IPCC. (2018). Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to. In *Ipcc - Sr15*. http://www.ipcc.ch/report/sr15/
- Karim, A., & Noy, I. (2020). Risk, poverty or politics? The determinants of subnational public spending allocation for adaptive disaster risk reduction in Bangladesh. *World*

Development, 129, 104901. https://doi.org/10.1016/j.worlddev.2020.104901

- Kaur, N., Agrawal, A., Steinbach, D., Panjiyar, A., Saigal, S., Manuel, C., Barnwal, A., Shakya, C., Norton, A., Kumar, N., Soanes, M., & Venkataramani, V. (2019).
 Building resilience to climate change through social protection: Lessons from MGNREGS, India. In *IIED Working Paper* (Issue June).
- Kaur, N., Steinbach, D., Agrawal, A., Manuel, C., Saigal, S., Panjiyar, A., Barnwal, A.,
 Shakya, C., & Norton, A. (2017). *Building Resilience to Climate Change:*MGNREGS and Climate-induced Droughts in Sikkim (Issue November).
- Kemp, S. P., & Palinkas, L. A. (2015). Strengthening the Social Response to the Human Impacts of Environmental Change. In *American Academy of Social Work and Social Welfare: Grand Challenges of Social Work Initiative*. http://aaswsw.org/wpcontent/uploads/2015/03/Social-Work-and-Global-Environmental-Change-3.24.15.pdf
- Kim, H., & Zakour, M. (2017). Disaster Preparedness among Older Adults: Social Support, Community Participation, and Demographic Characteristics. *Journal of Social Service Research*, 43(4), 498–509. https://doi.org/10.1080/01488376.2017.1321081
- Kim, S., Egerter, S., Cubbin, C., Takahashi, E. R., & Braveman, P. (2007). Potential implications of missing income data in population-based surveys: An example from a postpartum survey in California. *Public Health Reports*, *122*(6), 753–763. https://doi.org/10.1177/003335490712200607
- Kim, Y. C., & Kang, J. (2010). Communication, Neighbourhood Belonging and Household Hurricane Preparedness. *Disasters*, 34(2), 470–488.

https://doi.org/10.1111/j.1467-7717.2009.01138.x

- Kishore, N., Marqués, D., Mahmud, A., Kiang, M. V., Rodriguez, I., Fuller, A., Ebner,
 P., Sorensen, C., Racy, F., Lemery, J., Maas, L., Leaning, J., Irizarry, R. A., Balsari,
 S., & Buckee, C. O. (2018). Mortality in Puerto Rico after Hurricane Maria. *New England Journal of Medicine*, *379*(2), 162–170.
 https://doi.org/10.1056/NEJMsa1803972
- Klein, N. (2021). Opinion | Why Texas Republicans Fear the Green New Deal The New York Times. *The New York Times*.

https://www.nytimes.com/2021/02/21/opinion/green-new-deal-texas-blackout.html

- Knowles, M., Rabinowich, J., Ettinger de Cuba, S., Cutts, D. B., & Chilton, M. (2016).
 "Do You Wanna Breathe or Eat?": Parent Perspectives on Child Health
 Consequences of Food Insecurity, Trade-Offs, and Toxic Stress. *Maternal and Child Health Journal*, 20(1), 25–32. https://doi.org/10.1007/s10995-015-1797-8
- Kohler, U., Karlson, K. B., & Holm, A. (2011). Comparing coefficients of nested nonlinear probability models. *Stata Journal*, 11(3), 420–438. https://doi.org/10.1177/1536867x1101100306
- Kohn, S., Eaton, J. L., Feroz, S., Bainbridge, A. A., Hoolachan, J., & Barnett, D. J. (2012). Personal Disaster Preparedness: An Integrative Review of the Literature. *Disaster Medicine and Public Health Preparedness*, 6(3), 217–231. https://doi.org/10.1001/dmp.2012.47
- Kousky, C. (2016). Impacts of Natural Disasters on Children. *Future of Children*, *26*(1), 73–92. https://doi.org/10.1353/foc.2016.0004

Krings, A., Fusaro, V., Nicoll, K. L., & Lee, N. Y. (2019). Social Work, Politics, and

Social Policy Education: Applying a Multidimensional Framework of Power. Journal of Social Work Education, 55(2), 224–237. https://doi.org/10.1080/10437797.2018.1544519

- Krings, A., Victor, B. G., Mathias, J., & Perron, B. E. (2020). Environmental Social Work in the Disciplinary Literature, 1991–2015. *International Social Work*, 63(3), 275–290. https://doi.org/10.1177/0020872818788397
- Kuriakose, A. T., Heltberg, R., Wiseman, W., Costella, C., Cipryk, R., & Cornelius, S. (2013). Climate-responsive Social Protection. *Development Policy Review*, 31(SUPPL.2), 19–34. https://doi.org/10.1111/dpr.12037
- Lee, J. Y., & Van Zandt, S. (2019). Housing Tenure and Social Vulnerability to Disasters: A Review of the Evidence. *Journal of Planning Literature*, 34(2), 156– 170. https://doi.org/10.1177/0885412218812080
- Lein, L., Romich, J. L., & Sherraden, M. (2016). Reversing Extreme Inequality. In American Academy of Social Work and Social Welfare: Grand Challenges of Social Work Initiative.
- Levac, J., Toal-Sullivan, D., & O'Sullivan, T. L. (2012). Household Emergency Preparedness: A Literature Review. *Journal of Community Health*, 37(3), 725–733. https://doi.org/10.1007/s10900-011-9488-x
- Lindell, M. K., & Perry, R. W. (2012). The Protective Action Decision Model: Theoretical Modifications and Additional Evidence. *Risk Analysis*, 32(4), 616–632. https://doi.org/10.1111/j.1539-6924.2011.01647.x
- Linden, A., & Karlson, K. B. (2013). Using mediation analysis to identify causal mechanisms in disease management interventions. *Health Services and Outcomes*

Research Methodology, *13*(2–4), 86–108. https://doi.org/10.1007/s10742-013-0106-5

- Linden, A., & Yarnold, P. R. (2018). Identifying causal mechanisms in health care interventions using classification tree analysis. *Journal of Evaluation in Clinical Practice*, 24(2), 353–361. https://doi.org/10.1111/jep.12848
- Lopez, A. M., Comfort, M., Powers, C., Kral, A. H., & Lorvick, J. (2018). Structural Vulnerability and Supplemental Security Income: Subtle Modes of Punitive Governance within Federal Social Welfare. *Human Organization*, 77(4), 302–311. https://doi.org/10.17730/0018-7259.77.4.302
- Lowrey, A. (2021). Stockton's Basic-Income Experiment Pays Off. *The Atlantic*. https://www.theatlantic.com/ideas/archive/2021/03/stocktons-basic-incomeexperiment-pays-off/618174/
- Lue, E., & Wilson, J. P. (2017). Mapping fires and American Red Cross aid using demographic indicators of vulnerability. *Disasters*, 41(2), 409–426. https://doi.org/10.1111/disa.12198
- Ma, C., & Smith, T. (2020). Vulnerability of Renters and Low-Income Households to Storm Damage: Evidence From Hurricane Maria in Puerto Rico. *American Journal* of Public Health, 110(2), 196–202. https://doi.org/10.2105/AJPH.2019.305438
- Malmin, N. P. (2020). Historical Disaster Exposure and Household Preparedness across the United States. *Disaster Medicine and Public Health Preparedness*, 1–7. https://doi.org/10.1017/dmp.2019.123
- Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty Impedes Cognitive Function. *Science*, *341*.

- Marceron, J. E., & Rohrbeck, C. A. (2019). Disability and disasters: the role of self-efficacy in emergency preparedness. *Psychology, Health and Medicine*, 24(1), 83–93. https://doi.org/10.1080/13548506.2018.1492730
- Mason, L. R., Shires, M. K., Arwood, C., & Borst, A. (2017). Social work research and global environmental change. *Journal of the Society for Social Work and Research*, 8(4), 645–672. https://doi.org/10.1086/694789
- McDermott, S., Martin, K., & Gardner, J. D. (2016). Disaster response for people with disability. *Disability and Health Journal*, 9(2), 183–185. https://doi.org/10.1016/j.dhjo.2015.12.005
- Mearns, R., & Norton, A. (2009). The Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World. In *The Social Dimensions of Climate Change*. The World Bank. https://doi.org/10.1596/978-0-8213-7887-8
- Méndez, M., Flores-Haro, G., & Zucker, L. (2020). The (in)visible victims of disaster:
 Understanding the vulnerability of undocumented Latino/a and indigenous
 immigrants. *Geoforum*, *116*(July 2020), 50–62.
 https://doi.org/10.1016/j.geoforum.2020.07.007
- Mertens, K., Jacobs, L., Maes, J., Poesen, J., Kervyn, M., & Vranken, L. (2018). Disaster risk reduction among households exposed to landslide hazard: A crucial role for self-efficacy? *Land Use Policy*, 75(March), 77–91. https://doi.org/10.1016/j.landusepol.2018.01.028
- Metzger, M. W., & Khare, A. T. (2019). Fair Housing and Inclusive Communities: How Can Social Work Move Us Forward?

Meyer, B. D., Mok, W. K. C., & Sullivan, J. X. (2009). The Under-Reporting of

Transfers in Household Surveys: Its Nature and Consequences. *NBER Working Paper*, *15181*(June), 1–47. http://www.nber.org/papers/w15181

- Michalos, A. C. (2008). Education, Happiness and Wellbeing. Social Indicators Research, 87(3), 347–366. https://doi.org/10.1007/s11205-007-9144-0
- Mishra, S., Suar, D., & Paton, D. (2009). Is externality a mediator of experiencebehaviour and information-action hypothesis in disaster preparedness? *Journal of Pacific Rim Psychology*, 3(1), 11–19. https://doi.org/10.1375/prp.3.1.11
- Mizelle, R. M. (2014). Burning Waters Rise: Richard Wright's Blues Voice and the Double Environmental Burden of Race. In *Backwater Blues: The Mississippi Flood* of 1927 in the African American Imagination. University of Minnesota Press. https://www.jstor.org/stable/10.5749/j.ctt7zw69r.6
- Multi-Hazard Mitigation Council. (2019). *Natural Hazard Mitigation Saves: 2019 Report*. www.nibs.org
- Murti, M., Bayleyegn, T., Stanbury, M., Flanders, W. D., Yard, E., Nyaku, M., & Wolkin, A. (2014). Household Emergency Preparedness by Housing Type from a Community Assessment for Public Health Emergency Response (CASPER), Michigan. *Disaster Medicine and Public Health Preparedness*, 8(1), 12–19. https://doi.org/10.1017/dmp.2013.111

Najafi, M., Ardalan, A., Akbarisari, A., Noorbala, A. A., & Jabbari, H. (2015).
Demographic Determinants of Disaster Preparedness Behaviors Amongst Tehran Inhabitants, Iran. *PLoS Currents*, 7(DISASTERS), 1–14.
https://doi.org/10.1371/currents.dis.976b0ab9c9d9941cbbae3775a6c5fbe6

Nath, P. K., & Behera, B. (2011). A critical review of impact of and adaptation to climate

change in developed and developing economies. *Environment, Development and Sustainability*, 13(1), 141–162. https://doi.org/10.1007/s10668-010-9253-9

- National Academies of Sciences Engineering and Medicine. (2020). Implications of the California Wildfires for Health, Communities, and Preparedness. In *Implications of the California Wildfires for Health, Communities, and Preparedness*. https://doi.org/10.17226/25622
- National Women's Law Center. (2016). National Snapshot: Poverty Among Women & Families, 2014. *National Women's Law Center, September*, 1–5.
- Nebbitt, V., & Lombe, M. (2010). Urban African American Adolescents and
 Adultification. *Families in Society: The Journal of Contemporary Social Services*,
 91(3), 234–240. https://doi.org/10.1606/1044-3894.4000
- Nguyen, C. D., Carlin, J. B., & Lee, K. J. (2017). Model checking in multiple imputation: An overview and case study. *Emerging Themes in Epidemiology*, *14*(1), 1–12. https://doi.org/10.1186/s12982-017-0062-6
- Njai, R., Siegel, P., Yin, S., & Liao, Y. (2017). Prevalence of Perceived Food and Housing Security — 15 States, 2013. *MMWR. Morbidity and Mortality Weekly Report*, 66(01), 12–15. https://doi.org/10.15585/mmwr.mm6601a2
- NOAA National Centers for Environmental Information (NCEI). (2020). *Billion-Dollar Weather and Climate Disasters: Overview*. NCDC. https://doi.org/10.25921/stkw-7w73
- Nojang, E. N., & Jensen, J. (2020). Conceptualizing Individual and Household Disaster Preparedness: The Perspective from Cameroon. *International Journal of Disaster Risk Science*, *11*(3), 333–346. https://doi.org/10.1007/s13753-020-00258-x

- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L.
 (2008). Community Resilience as a Metaphor, Theory, Set of Capacities, and
 Strategy for Disaster Readiness. *American Journal of Community Psychology*, 41(1–2), 127–150. https://doi.org/10.1007/s10464-007-9156-6
- O'Keefe, P., Westgate, K., & Wisner, B. (1976). Taking the naturalness out of natural disasters. *Nature*, *260*(5552), 566–567. https://doi.org/10.1038/260566a0
- Onuma, H., Shin, K. J., & Managi, S. (2017). Household Preparedness for Natural Disasters: Impact of Disaster Experience and Implications for Future Disaster Risks in Japan. *International Journal of Disaster Risk Reduction*, 21(July 2016), 148–158. https://doi.org/10.1016/j.ijdrr.2016.11.004
- Oppel, R. A., Gebeloff, R., Lai, K. K. R., Wright, W., & Smith, M. (2020, July). The Fullest Look Yet at the Racial Inequity of Coronavirus. *The New York Times*. https://www.nytimes.com/interactive/2020/07/05/us/coronavirus-latinos-africanamericans-cdc-

data.html?action=click&algo=top_conversion&block=trending_recirc&fellback=fal se&imp_id=899784849&impression_id=239821379&index=3&pgtype=Article® ion=footer&req_i

- Otto, I. M., Reckien, D., Reyer, C. P. O., Marcus, R., Le Masson, V., Jones, L., Norton, A., & Serdeczny, O. (2017). Social Vulnerability to Climate Change: A Review of Concepts and Evidence. *Regional Environmental Change*, 17(6). https://doi.org/10.1007/s10113-017-1105-9
- Pandey, S., Lama, G., & Lee, H. (2012). Effect of women's empowerment on their utilization of health services: A case of Nepal. *International Social Work*, *55*(4),

554–573. https://doi.org/10.1177/0020872811408575

- Paton, D. (2003). Disaster preparedness: A social-cognitive perspective. *Disaster Prevention and Management: An International Journal*, 12(3), 210–216. https://doi.org/10.1108/09653560310480686
- Paton, D., & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management: An International Journal*, 10(4), 270–277. https://doi.org/10.1108/EUM000000005930
- Patterson, O., Weil, F., & Patel, K. (2010). The Role of Community in Disaster Response: Conceptual Models. *Population Research and Policy Review*, 29(2), 127– 141. https://doi.org/10.1007/s11113-009-9133-x
- Paul, B. K., Stimers, M., & Caldas, M. (2015). Predictors of compliance with tornado warnings issued in Joplin, Missouri, in 2011. *Disasters*, 39(1), 108–124. https://doi.org/10.1111/disa.12087
- Paul, P., Pennell, M. L., & Lemeshow, S. (2013). Standardizing the power of the Hosmer-Lemeshow goodness of fit test in large data sets. *Statistics in Medicine*, 32(1), 67–80. https://doi.org/10.1002/sim.5525
- Perera, F. P. (2017). Multiple Threats to Child Health from Fossil Fuel Combustion:
 Impacts of Air Pollution and Climate Change. *Environmental Health Perspectives*, *125*(2), 141–148. https://doi.org/10.1289/EHP299
- Peterson, A., & Martin, E. (2016). *Filling in the Gaps : Using Multiple Imputation to Improve Statistical Accuracy.* 17(2).
- Pierre-Louis, K. (2018). These Billion-Dollar Natural Disasters Set a U.S. Record in 2017. The New York Times. https://www.nytimes.com/2018/01/08/climate/2017-

weather-disasters.html

- Piguet, E., & Laczko, F. (2014). Migration and Environmental Change in North America (USA and Canada) Springer. In *People on the Move in a Changing Climate* (Vol. 2, Issue 2005, p. 253). https://doi.org/10.1007/978-94-007-6985-4
- Pollock, M. J., Wennerstrom, A., True, G., Everett, A., Sugarman, O., Haywood, C., Johnson, A., Meyers, D., Sato, J., Wells, K. B., Arevian, A. C., Massimi, M., Berry, J., Riefberg, L., Onyewuenyi, N., & Springgate, B. (2019). Preparedness and Community Resilience in Disaster-Prone Areas: Cross-Sectoral Collaborations in South Louisiana, 2018. *American Journal of Public Health*, *109*, S309–S315. https://doi.org/10.2105/AJPH.2019.305152
- Powers, M. C. F., Rambaree, K., & Peeters, J. (2019). Degrowth for transformational alternatives as radical social work practice. *Critical and Radical Social Work*, 7(3), 417–433. https://doi.org/10.1332/204986019X15688881497178
- Quesada, J., Hart, L. K., & Bourgois, P. (2011). Structural Vulnerability and Health: Latino Migrant Laborers in the United States. *Medical Anthropology*, 30(4), 339– 362. https://doi.org/10.1038/jid.2014.371
- Rahmi, R., Joho, H., & Shirai, T. (2019). An Analysis of Natural Disaster-Related Information-Seeking Behavior Using Temporal Stages. *Journal of the Association for Information Science and Technology*, 70(7), 715–728. https://doi.org/10.1002/asi.24155
- Rao, N., Mishra, A., Prakash, A., Singh, C., Qaisrani, A., Poonacha, P., Vincent, K., &Bedelian, C. (2019). A qualitative comparative analysis of women's agency andadaptive capacity in climate change hotspots in Asia and Africa. *Nature Climate*

Change, 9(12), 964–971. https://doi.org/10.1038/s41558-019-0638-y

- Rao, S., & Teixeira, S. (2020). The Green New Deal: Social Work's Role in Environmental Justice Policy. *Social Work*. https://doi.org/10.1093/sw/swaa004
- Ratcliffe, C., McKernan, S. M., & Zhang, S. (2011). How Much Does the Supplemental Nutrition Assistance Program Reduce Food Insecurity? *American Journal of Agricultural Economics*, 93(4), 1082–1098. https://doi.org/10.1093/ajae/aar026
- Reale, A., & Handmer, J. (2011). Land tenure, Disasters and Vulnerability. *Disasters*, 35(1), 160–182. https://doi.org/10.1111/j.1467-7717.2010.01198.x
- Rickless, D. S., Wilt, G. E., Sharpe, J. D., Molinari, N., Stephens, W., & Leblanc, T. T. (2021). Social Vulnerability and Access of Local Medical Care During Hurricane Harvey : A Spatial Analysis.
- Ritchie, H., & Roser, M. (2019). Natural Disasters. OurWorldInData.Org. https://ourworldindata.org/natural-disasters#natural-disasters-kill-on-average-60-000-people-per-year-and-are-responsible-for-0-1-of-global-deaths
- Rivera, J. D. (2020). The likelihood of having a household emergency plan: understanding factors in the US context. *Natural Hazards*, 0123456789. https://doi.org/10.1007/s11069-020-04217-z
- Rivera, J. D., & Miller, D. M. S. (2007). Continually neglected: Situating Natural
 Disasters in the African American Experience. *Journal of Black Studies*, *37*(4), 502–522. https://doi.org/10.1177/0021934706296190
- Robeyns, I. (2016). The Capability Approach. In *The Stanford Encyclopedia of Philosophy (Winter 2016 Edition)*, (Edward N.). https://plato.stanford.edu/entries/capability-approach/

- Robeyns, I. (2017). Wellbeing, Freedom and Social Justice : The Capability Approach Re-Examined. Cambridge, UK : Open Book Publishers.
- Rogers, A. (2018). The Science Behind Home Disaster Preparedness Kits Is a Disaster | WIRED. *Wired*. https://www.wired.com/story/the-science-behind-home-disasterpreparedness-kits-is-a-disaster/
- Rostami-moez, M., Rabiee-yeganeh, M., Shokouhi, M., & Dosti-irani, A. (2020). Earthquake preparedness of households and its predictors based on health belief model. 1–8.
- Russell, L. A., Goltz, J. D., & Bourque, L. B. (1995). Preparedness and Hazard Mitigation Actions Before and After Two Earthquakes. *Environment and Behavior*, 27(6), 744. https://search.proquest.com/docview/1292719872?accountid=9673&pqorigsite=primo&imgSeq=1
- Samaddar, S., Chatterjee, R., Misra, B., & Tatano, H. (2014). Outcome-expectancy and self-efficacy: Reasons or results of flood preparedness intention? *International Journal of Disaster Risk Reduction*, 8, 91–99.

https://doi.org/10.1016/j.ijdrr.2014.02.002

SAMHSA. (2017). Greater Impact: How Disasters Affect People of Low Socioeconomic Status. In Disaster Technical Assistance Center Supplemental Research Bulletin (Issue July).

https://www.samhsa.gov/sites/default/files/programs_campaigns/dtac/srb-low-ses.pdf

Sandifer, P. A., & Walker, A. H. (2018). Enhancing Disaster Resilience by Reducing Stress-Associated Health Impacts. *Frontiers in Public Health*, 6(DEC), 1–20. https://doi.org/10.3389/fpubh.2018.00373

- Schafer, J. L., & Graham, J. W. (2002). Missing Data: Our View of the State of the Art. Psychological Methods, 7(2), 147–177. https://doi.org/10.1037/1082-989X.7.2.147
- Schleicher, J., Schaafsma, M., Burgess, N. D., Sandbrook, C., Danks, F., Cowie, C., & Vira, B. (2018). Poorer without It? The Neglected Role of the Natural Environment in Poverty and Wellbeing. *Sustainable Development*, *26*(1), 83–98. https://doi.org/10.1002/sd.1692
- Seebauer, S., & Babcicky, P. (2020). The Sources of Belief in Personal Capability: Antecedents of Self-Efficacy in Private Adaptation to Flood Risk. *Risk Analysis*, 40(10), 1967–1982. https://doi.org/10.1111/risa.13531
- Sen, A. (1981). Poverty and Famines: An Essay on Entitlement and Deprivation. In Poverty and Famines An Essay on Entitlement and Deprivation. https://doi.org/10.1086/451432
- Sen, A. (2000). Development as Freedom. Anchor.
- Sen, A. (2003). Development as Capability Expansion. Readings in Human Development: Concepts, Measures and Policies for a Development Paradigm, 41– 58. https://doi.org/10.1093/0198287976.001.0001
- Serrao, S., Valero, S. D., Campbell, J., & Gilligan, M. (2019). Mainstreaming Gender in Environment Statistics for the SDGs and Beyond: Identifying Priorities in Asia and the Pacific. https://data.unwomen.org/publications/mainstreaming-genderenvironment-statistics-sdgs-and-beyond-identifying-priorities
- Shah, A. (2018). ASDOC: Stata Module to Create High-Quality Tables in MS Word from Stata Output. (Revised September 9, 2020). Statistical Software Components

S458466, Boston College Department of Economics.

- Singh, C., Dorward, P., & Osbahr, H. (2016). Developing a holistic approach to the analysis of farmer decision-making: Implications for adaptation policy and practice in developing countries. *Land Use Policy*, *59*, 329–343. https://doi.org/10.1016/j.landusepol.2016.06.041
- Skinner, C. (2012). State Immigration Legislation and SNAP Take-Up Among Immigrant Families with Children. *Journal of Economic Issues*, 46(3), 661–682. https://doi.org/10.2753/jei0021-3624460304
- Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16(3), 282–292. https://doi.org/10.1016/j.gloenvcha.2006.03.008
- Smith, E. C., Burkle, F. M., Aitken, P., & Leggatt, P. (2018). Seven decades of disasters:
 A systematic review of the literature. *Prehospital and Disaster Medicine*, 33(4),
 418–423. https://doi.org/10.1017/S1049023X18000638
- Smith, E. K., Lacy, M. G., & Mayer, A. (2019). Performance simulations for categorical mediation: Analyzing khb estimates of mediation in ordinal regression models. *Stata Journal*, 19(4), 913–930. https://doi.org/10.1177/1536867X19893638
- Spence, P. R., Lachlan, K. A., & Griffin, D. R. (2007). Crisis Communication, Race, and Natural Disasters. *Journal of Black Studies*, 37(4), 539–554. https://doi.org/10.1177/0021934706296192
- Spittal, M. J., Walkey, F. H., McClure, J., Siegert, R. J., & Ballantyne, K. E. (2006). The Earthquake Readiness Scale: The Development of a Valid and Reliable Unifactorial Measure. *Natural Hazards*, 39(1), 15–29. https://doi.org/10.1007/s11069-005-2369-

Stuber, J., & Schlesinger, M. (2006). Sources of stigma for means-tested government programs. *Social Science and Medicine*, 63(4), 933–945. https://doi.org/10.1016/j.socscimed.2006.01.012

Sundareswaran, M., Ghazzawi, A., & O'sullivan, T. L. (2015). Upstream disaster management to support people experiencing homelessness. *PLoS Currents*, 7(DISASTERS), 1–10.

https://doi.org/10.1371/currents.dis.95f6b76789ce910bae08b6dc1f252

- Suryanarayana, M. H., Agrawal, A., & Prabhu, K. S. (2011). Inequality- adjusted Human Development Index for India's States 2011 United Nations Development Programme 55, Lodi Estate New Delhi -110003 India. UNDP India, 1–31. http://www.in.undp.org/content/dam/india/docs/inequality%7B_%7Dadjusted%7B_ %7Dhuman%7B_%7Ddevelopment%7B_%7Dindex%7B_%7Dfor%7B_%7Dindias %7B_%7Dstate1.pdf
- Sutton, J., & Tierney, K. (2006). Disaster Preparedness : Concepts , Guidance , and Research. In *Disaster Preparedness*. http://www.colorado.edu/hazards
- Taymoori, P., Rhodes, R. E., & Berry, T. R. (2010). Application of a social cognitive model in explaining physical activity in Iranian female adolescents. *Health Education Research*, 25(2), 257–267. https://doi.org/10.1093/her/cyn051
- Teixeira, S., & Krings, A. (2015). Sustainable Social Work: An Environmental Justice Framework for Social Work Education. *Social Work Education*, 34(5), 513–527. https://doi.org/10.1080/02615479.2015.1063601

Tenzing, J. D. (2020). Integrating social protection and climate change adaptation: A

review. *Wiley Interdisciplinary Reviews: Climate Change*, *11*(2), 1–16. https://doi.org/10.1002/wcc.626

The World Bank. (2012). Making Women's Voices Count: Integrating Gender Issues in Disaster Risk Management. Overview and Resources for Guidance Notes.

Thiede, B. C., & Brown, D. L. (2013). Hurricane Katrina: Who Stayed and Why? Population Research and Policy Review, 32(6), 803–824. https://doi.org/10.1007/s11113-013-9302-9

- Thiede, B. C., Kim, H., & Slack, T. (2017). Marriage, Work, and Racial Inequalities in Poverty: Evidence From the United States. *Journal of Marriage and Family*, 79(5), 1241–1257. https://doi.org/10.1111/jomf.12427
- Thomas, T. N., Leander-Griffith, M., Harp, V., & Cioffi, J. P. (2015). Influences of Preparedness Knowledge and Beliefs on Household Disaster Preparedness. *Morbidity and Mortality Weekly Report*, 64(35), 965–971. https://doi.org/10.15585/mmwr.mm6435a2
- Thompson, A. (2020). A Running List of Record-Breaking Natural Disasters in 2020 -Scientific American. Scientific American.

https://www.scientificamerican.com/article/a-running-list-of-record-breakingnatural-disasters-in-2020/

Together We Stand. (2016). Forecast-based financing: climate science and timely funding of early actions in an anticipatory humanitarian system. https://www.drk.de/fileadmin/user_upload/FBF/Together_We_Stand_Forecastbased_Financing_PDF.pdf

Tran, T. V, Lee, H. N., Nguyen, T.-N., & Chan, K. (2013). Perceived Community

Efficacy, Social Networks and Depression in a Sample of Vietnamese Americans Living in Post-Hurricane Katrina Areas. *Race, Gender & Class, 20*(3–4), 291–298. http://search.proquest.com/docview/1512220519?accountid=13042%5Cnhttp://oxfo rdsfx.hosted.exlibrisgroup.com/oxford?url_ver=Z39.88-

2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&sid=ProQ:ProQ%3 Asocabsshell&atitle=PERCEIVED+COMMUNITY+EFFICACY%2C

- Tripathi, A. (2017). Socioeconomic backwardness and vulnerability to climate change: evidence from Uttar Pradesh state in India. *Journal of Environmental Planning and Management*, 60(2), 328–350. https://doi.org/10.1080/09640568.2016.1157059
- Tselios, V., & Tompkins, E. L. (2019). What causes nations to recover from disasters? An inquiry into the role of wealth, income inequality, and social welfare provisioning. *International Journal of Disaster Risk Reduction*, 33(October 2018), 162–180. https://doi.org/10.1016/j.ijdrr.2018.10.003
- Tselios, V., & Tompkins, E. L. (2020). Can we prevent disasters using socioeconomic and political policy tools? *International Journal of Disaster Risk Reduction*, 51(November 2019), 101764. https://doi.org/10.1016/j.ijdrr.2020.101764
- Transforming our world: the 2030 Agenda for Sustainable Development, 16301 1 (2015).
- UN General Assembly. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations.

https://sustainabledevelopment.un.org/content/documents/21252030 Agenda for Sustainable Development web.pdf

UNDRR. (2019). *Global Assessment Report on Disaster Risk Reduction*. United Nations Office for Disaster Risk Reduction (UNDRR).

https://gar.unisdr.org/sites/default/files/reports/2019-05/full gar report.pdf

UNEP & IUCN. (2018). Gender and environment statistics: Unlocking information for action and measuring the SDGs.

http://www.un.org/Depts/Cartographic/english/htmain.htm

- UNFCCC. (2011). Assessing the Costs and Benefits of Adaptation Options. An Overview of Approaches.
- UNISDR, & UNOCHA. (2008). Disaster Preparedness for Effective Response Guidance and Indicator Package for Implementing Priority Five of the Hyogo Framework Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters.

https://www.unisdr.org/files/2909 Disasterpreparednessforeffectiveresponse.pdf

- Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How Reliable are Measurement Scales? External Factors with Indirect Influence on Reliability Estimators. *Procedia Economics and Finance*, 20(15), 679–686. https://doi.org/10.1016/s2212-5671(15)00123-9
- Van Der Velde, L. A., Nyns, C. J., Engel, M. D., Neter, J. E., Van Der Meer, I. M., Numans, M. E., & Kiefte-De Jong, J. C. (2020). Exploring food insecurity and obesity in Dutch disadvantaged neighborhoods: a cross-sectional mediation analysis. *BMC Public Health*, 20(1), 1–11. https://doi.org/10.1186/s12889-020-08611-x
- Venkataramani, A. S., Brigell, R., O'Brien, R., Chatterjee, P., Kawachi, I., & Tsai, A. C. (2016). Economic opportunity, health behaviours, and health outcomes in the USA: a population-based cross-sectional study. *The Lancet Public Health*, *1*(1), e18–e25. https://doi.org/10.1016/S2468-2667(16)30005-6

- Verchick, R. R. M. (2012). Disaster Justice: The Geography of Human Capability. *Duke Environmental Law and Policy Forum*, 23(1), 23–71.
- Vincent, K., & Cull, T. (2012). Adaptive Social Protection: Making concepts a reality (Guidance notes for practitioners) (Issue 877338).
- von Hippel, P. T. (2020). How Many Imputations Do You Need? A Two-stage
 Calculation Using a Quadratic Rule. *Sociological Methods and Research*, 49(3),
 699–718. https://doi.org/10.1177/0049124117747303
- Wahlstrom, M. (2017). Social work and the Sendai Framework for Disaster Risk Reduction. *European Journal of Social Work*, 20(3), 333–336. https://doi.org/10.1080/13691457.2017.1314936
- Walker, M., Kublin, J. G., & Zunt, J. R. (2009). *NIH Public Access*. 42(1), 115–125. https://doi.org/10.1086/498510.Parasitic
- Walters, J. E., Mason, L. R., & Ellis, K. N. (2019). Examining patterns of intended response to tornado warnings among residents of Tennessee, United States, through a latent class analysis approach. *International Journal of Disaster Risk Reduction*, 34(December 2018), 375–386. https://doi.org/10.1016/j.ijdrr.2018.12.007
- Waters, E. A., Hay, J. L., Orom, H., Kiviniemi, M. T., & Drake, B. F. (2013). "Don't Know" Responses to Risk Perception Measures: Implications for Underserved Populations. *Medical Decision Making*, *33*(2), 271–281. https://doi.org/10.1177/0272989X12464435
- Whitehead, J. C., Groothuis, P. A., & Blomquist, G. C. (1993). Testing for non-response and sample selection bias in contingent valuation. Analysis of a combination phone/mail survey. *Economics Letters*, 41(2), 215–220.

https://doi.org/10.1016/0165-1765(93)90200-V

- Williams, J. H. (2018). Race and Poverty: Growth Areas for the Social Work Research Agenda. Social Work Research, 42(2), 67–70. https://doi.org/10.1093/swr/svy009
- Wirtz, P. W., & Rohrbeck, C. A. (2018). The dynamic role of perceived threat and selfefficacy in motivating terrorism preparedness behaviors. *International Journal of Disaster Risk Reduction*, 27(November 2017), 366–372. https://doi.org/10.1016/j.ijdrr.2017.10.023
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003). At Risk: Natural Hazards, People's Vulnerability, and Disasters. Routledge. https://doi.org/10.2202/1547-7355.1131
- Witrago, E., & Perez, M. A. (2011). Preparing for an Influenza Pandemic: Policy
 Implications for Rural Latino Populations. *Journal of Health Care for the Poor and Underserved*, 22(SUPPL. 3), 58–71. https://doi.org/10.1353/hpu.2011.0105
- Woo, B., Kravitz-Wirtz, N., Sass, V., Crowder, K., Teixeira, S., & Takeuchi, D. T.
 (2019). Residential Segregation and Racial/Ethnic Disparities in Ambient Air
 Pollution. *Race and Social Problems*, *11*(1), 60–67. https://doi.org/10.1007/s12552-018-9254-0
- Wood, R. G. (2011). Is there a Role for Cash Transfers in Climate Change Adaptation? *IDS Bulletin*, 42(6), 79–85. https://doi.org/10.1111/j.1759-5436.2011.00277.x

World Bank. (2016). Adaptive Social Protection for Effective Disaster Risk Management.

Zakour, M. J. (1997). Disaster Research in Social Work. *Journal of Social Service Research*, 22(1–2), 7–25. https://doi.org/10.1300/J079v22n01_02

Zakour, M. J., & Gillespie, D. F. (2013). Community Disaster Vulnerability: Theory,

Research, and Practice. In Springer. https://doi.org/10.1007/978-1-4614-5737-4

- Zamboni, L. M., & Martin, E. G. (2020). Association of US Households' Disaster Preparedness With Socioeconomic Characteristics , Composition , and Region. *JAMA*, 3(4), 1–12. https://doi.org/10.1001/jamanetworkopen.2020.6881
- Zanbar, L., & Nouman, H. (2020). Predictors of self-efficacy among residents of lowincome neighborhoods: Implications for social work practice. *Journal of Social Work*. https://doi.org/10.1177/1468017320911503
- Zhan, M., & Pandey, S. (2004). Economic Well-being of Single Mothers: Work First or Post secondary Education? *Journal of Sociology and Social Welfare*, *31*(3), 87–112.
- Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197–206. https://doi.org/10.1086/651257
- Zottarelli, L. K. (2008). Post-Hurricane Katrina Employment Recovery: The Interaction of Race and Place. *Social Science Quarterly*, 89(3), 592–607. https://doi.org/10.1111/j.1540-6237.2008.00550.x

Appendix A

Disaster Preparedness Questions for Chapter II

Table 1.A. Disaster Preparedness Indicators for Chapter II (National Household Surveys, 2018) Ouestion (Yes/No)

1	Has your household developed and discussed an emergency plan that includes instructions for household members about where to go and what to do in the event of a local disaster?
2	In the event of a disaster that required you to leave your area, would you need to rely on public transportation or the local authorities for transportation in order to leave?
3	Do you know how you will get real-time alerts and warnings for disasters in your community?
4	Do you have homeowners or renter's insurance for your residence?
5	Do you have a flood insurance policy from the National Flood Insurance Program or from a private insurance company?
6	Do you have money set aside for an emergency?
7	Do you have enough supplies set aside in your home to get you through three days or more without power or running water and without transportation?
8	Do you have emergency supplies already packed that you can grab easily in case you have to evacuate your home quickly?
9	Do you have copies of critical documents, such as identification, insurance, and banking information, stored in a fireproof/waterproof location or stored electronically?

Questions for disaster efficacy and control variables

Response Efficacy: How much would taking steps to prepare, such as creating a household emergency plan, developing an evacuation and shelter plan, signing up for alerts and warning

systems, or stocking up on supplies help you get through a disaster in your area? Would it help (read 1-5)? **Self Confidence:** How confident are you that you can take the steps to prepare for a disaster in your area? Would you say you are (read 1-5)?

Experience of Disaster: Have you or your family ever experienced the impacts of a disaster? **Information on disaster preparation:** In the past six months, have you read, seen, or heard any information about how to get better prepared for a disaster?

Disaster Preparedness Questions for Chapters III and IV

Table 1.B. Disaster Preparedness Indicators for Chapters III and IV (American Housing Survey 2017)

- 1 Does household have available non-perishable food for 3 days?
- 2 Does household have available at least 3 gallons or 24 bottles of water per person?
- 3 In some disasters, household members will need to evacuate separately. Does your household have an agreedupon meeting point if that should happen?
- 4 Do the members of your household have a plan for communicating in the event that cell phone service is disrupted?
- 5 If you had to evacuate from your town or city to a safe place at least 50 miles away do you have enough reliable vehicles to carry all of your household members and a small amount of supplies such as clothes and food?
- 6 Does your household have emergency supplies readily available to take with you if you have to evacuate your

home?

- 7 Would you have access to your vital financial information and contact numbers if you had to evacuate your home?
- 8 If you had to evacuate from your town or city to a safe place at least 50 miles away, do you have the financial resources, in terms of savings or available credit card balances, to meet expenses of up to \$2,000?
- 9 Do you have a generator to provide electricity in case there is a power outage?

Note: (All questions are yes/no)

Appendix 2.A.

Appendix for Chapter II



Figure 2.1.A. Distribution of Cumulative Preparedness (Chapter II)



Figure 2.2.A. Distribution of Adequate Preparedness



Figure 2.3.A. Distribution of Minimal Preparedness

Variable	Complete	Incomplete	Imputed	Total
Income	2813	2190	2190	5003
Race	4293	710	710	5003
Response efficacy	4849	154	154	5003
Confidence	4835	168	168	5003
Sex	4887	116	116	5003
Older adults/persons				
with disability at home	4950	53	53	5003
Number of adults at				
home	4862	141	141	5003
Language	4831	172	172	5003
Housing	4631	372	372	5003
Previous Experience of				
disaster	4978	25	25	5003
Disaster Information	4950	53	53	5003

 Table 2.1.A. Details of Multiple Imputation

(complete + incomplete = total; imputed is the minimum across m of the number of filled-in observations.)

Table 2.2.A. Correlation Matrix for study variables for chapter II

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
			(-)		(-)	(-)	(.)	(-)	(-)				(-)
Preparedness	1.000												
Income	0.194	1.000											
Education	0.180	0.371	1.000										
HH Sex	-0.090	-0.105	0.040	1.000									
	0.014	0.005	0.06	0.000	1 0 0 0								
Number of Adults	0.014	0.097	-0.067	-0.026	1.000								
Older	0.013	-0.051	-0.087	0.036	0.173	1.000							
adults/Person with													

disability													
Lower capacity	-0.101	-0.156	-0.139	0.045	-0.039	0.127	1.000						
Language	0.144	0.180	0.257	0.007	-0.146	-0.104	0.039	1.000					
Response Efficacy	0.125	-0.021	0.031	0.114	0.081	0.032	-0.001	0.004	1.000				
Self Confidence	0.341	0.160	0.174	-0.059	-0.073	-0.052	-0.098	0.241	0.114	1.000			
Experience of dis.	0.195	0.060	0.125	-0.032	-0.020	0.044	0.054	0.079	0.071	0.191	1.000		
Disaster Info.	0.311	0.073	0.141	0.050	0.005	0.013	-0.035	0.002	0.097	0.181	0.158	1.000	
Rent	0.279	0.243	0.227	0.014	0.001	0.003	-0.046	0.171	-0.027	0.160	0.068	0.117	1.000
Children in HH	-0.019	0.052	-0.019	0.035	0.141	0.016	-0.136	-0.110	0.135	-0.015	-0.038	-0.009	-0.056

Supplementary Material:

Tables 2.3.A- 2.5.A. Complete Case Analysis Models for Chapter II

Results of Multiple Regression Models (Complete Case Analyses)

In the complete case analysis (n=2,261), higher response efficacy and all levels of confidence in carrying out preparatory action were associated with cumulative preparedness. Compared to those who reported low response efficacy respondents reporting "a great deal" on the importance of taking preparatory action were 0.48 points more prepared (p<0.05), adjusting for social vulnerability indicators and other covariates. In terms of their self-assurance in being able to carry out these activities, compared to those who were not too confident, respondents who were somewhat, moderately, and extremely confident were all positively associated with higher preparedness. Among vulnerability indicators, there were a few statistically significant associations between socioeconomic status and household composition variables and disaster preparedness. Compared to the lowest income category, all levels of higher income were more likely to be better prepared (p<0.05) however education was not significantly associated with disaster readiness in the sample. Minority status was not significantly associated with preparedness when controlling for other covariates. Respondent sex and home ownership status however had a statistically significant association with preparedness. Compared to

men, women were -0.38 points less prepared, after adjusting for other variables in the study (p<0.001). Compared to those who rent, owning a home was associated with 0.78 points higher disaster preparedness in the sample (p<0.001). The presence of a person with disability or older adults in the home, was not significantly associated with preparedness but respondent's own reduced capacity was associated with lower cumulative preparedness (p<0.01). In terms of the control variables, receiving information on disaster preparedness within the last six months and prior experience of a disaster were both significantly associated with higher disaster preparedness (p<0.001) and p<0.01).

Cumulative Prep.	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
<u>Income (0-999)</u>	0.000					
2.1000-2999	0.710	0.240	2.96	0.003	0.239	1.011
3. 3000-4999	0.937	0.254	3.69	0.000	0.440	1.019
4. 5000-7499	1.281	0.254	5.05	0.000	0.783	1.430
5.7500-9999	1.199	0.281	4.27	0.000	0.649	1.374
6.10000-15000	1.017	0.277	3.67	0.000	0.474	1.289
7.15000 and over	0.957	0.271	3.53	0.000	0.426	1.303
Education (Less than high	0.000					
school)						
High school	0.153	0.391	0.39	0.696	-0.614	0.920
Vocational/Some College	0.405	0.392	1.03	0.302	-0.364	1.173
College graduate	0.269	0.394	0.68	0.495	-0.504	1.042
Post grad	0.202	0.407	0.50	0.620	-0.596	1.000
<u>Sex(Male)</u>	0.000					
Female	-0.388	0.106	-3.67	0.000	-0.596	-0.181
<u>Race (white)</u>	0.000					
Black/African American	-0.187	0.161	-1.16	0.245	-0.502	0.128
Asian	-0.388	0.270	-1.43	0.152	-0.918	0.142
AmIndian/Al.Native/Hawaiian	-0.259	0.323	-0.80	0.424	-0.893	0.375
/Pac.Islander						
Number of adults	0.013	0.050	0.26	0.792	-0.084	0.110
Older adults/Persons with	0.000					
disability at home (No)						
Yes	-0.009	0.144	-0.07	0.947	-0.291	0.272
<u>Lower Capacity (No)</u>	0.000					
Yes	-0.384	0.138	-2.79	0.005	-0.654	-0.114

Table 2.3.A. Regression of cumulative preparedness over key covariates (complete case) n=2261

Housing (Rent)	0.000		•			
Own	0.777	0.119	6.54	0.000	0.544	1.010
<u>Children under 18 (No)</u>	0.000					
Yes	-0.220	0.113	-1.95	0.052	-0.441	0.002
<u>Language English (No)</u>	0.000					
Yes	0.021	0.235	0.09	0.930	-0.441	0.482
Response efficacy (not much)	0.000					
2. somewhat	0.350	0.179	1.96	0.051	-0.001	0.700
3. quite a bit	0.302	0.189	1.59	0.111	-0.069	0.673
4. a great deal	0.488	0.170	2.87	0.004	0.155	0.820
<u>Confidence</u>	0.000					
2. somewhat confident	0.550	0.240	2.29	0.022	0.080	1.020
3. moderately confident	0.955	0.209	4.57	0.000	0.545	1.365
4. extremely confident	1.318	0.209	6.31	0.000	0.909	1.728
Experience of disaster (No)	0.000					
Yes	0.325	0.107	3.04	0.002	0.115	0.534
Disaster Information (No)	0.000					
Yes	0.748	0.107	7.02	0.000	0.539	0.957
Constant	3.200	0.427	7.49	0.000	2.362	4.038
Mean dependent var		5.746	SD depen	dent var		1.953
R-squared		0.3015	Number o	of obs		2261.000
F-test		17.64	Prob > F			0.000

Adequate Preparedness

The logistic regression model regressing adequate preparedness on the key covariates was significant (F (28, 2233)= 6.86, p<0.001). In terms of adequate preparedness, those who reported quite a bit for response efficacy were two times more likely to be prepared compared to those who answered, 'not much' (p<0.05). Compared to those who were not confident about carrying out preparatory action, moderately confident and extreme confident respondents were two and four times more likely to be adequately prepared (p<0.001).

Compared to those earning less than 1000 USD per month higher monthly income was two to seven times more likely to be prepared with the income category 5000-7499 being most well prepared compared to the reference group after adjusting for other covariates in the study (p<0.01). Similar to cumulative preparedness, education was not significantly predictive of adequate preparedness. Race and language were not associated

with adequate preparedness. Women compared to men were 34% less likely to be adequately prepared (p<0.05). The number of adults at home, presence of older adults/persons with disability or children under 18 at home, and respondent's own disability or reduced capacity were not significantly associated with adequate preparedness. Owning a house compared to renting the house was significantly predictive of being adequately prepared (OR= 2.57, t=5.18, p<0.001). Among the control variables only receiving information on disaster preparedness was statistically associated with adequate preparedness (p<0.001).

(Complete Case) $N = 2261$									
Adequate Prep.	OR	St.Err.	t-value	p-value	[95% Conf	Interval]			
<u>Income (0-999)</u>	1.000			•					
2.1000-2999	2.646	0.794	3.24	0.001	1.469	4.765			
3. 3000-4999	3.147	1.016	3.55	0.000	1.671	5.928			
4. 5000-7499	7.011	2.571	5.31	0.000	3.415	14.390			
5.7500-9999	5.384	2.182	4.15	0.000	2.432	11.918			
6.10000-15000	3.569	1.363	3.33	0.001	1.688	7.549			
7.15000 and over	3.444	1.169	3.64	0.000	1.770	6.700			
Education (Less	1.000								
than high school)									
High school	1.627	0.693	1.14	0.253	0.706	3.750			
Vocational/Some	2.162	0.916	1.82	0.069	0.942	4.961			
C 11.									

Table 2.4.A. Logistic Regression of Adequate Preparedness over Key Covariates (Complete Case) N= 2261

6.10000-15000	3.569	1.363	3.33	0.001	1.688	7.549
7.15000 and over	3.444	1.169	3.64	0.000	1.770	6.700
Education (Less	1.000					
<u>than high school)</u>						
High school	1.627	0.693	1.14	0.253	0.706	3.750
Vocational/Some	2.162	0.916	1.82	0.069	0.942	4.961
College						
College graduate	1.514	0.645	0.97	0.331	0.657	3.491
Post grad	1.239	0.558	0.48	0.635	0.512	2.997
<u>Sex(Male)</u>	1.000					
Female	0.656	0.118	-2.34	0.020	0.461	0.935
<u>Race (white)</u>	1.000					
Black/African	0.803	0.197	-0.90	0.369	0.497	1.297
American						
Asian	1.104	0.499	0.22	0.827	0.455	2.678
AmIndian/Al.Nati	0.602	0.293	-1.04	0.298	0.231	1.566
ve/Hawaiian/Pac.I						
slander						
<u>Number of adults</u>	1.102	0.088	1.22	0.224	0.942	1.288
<u>Older</u>	1.000			•		
adults/Persons						
with disability at						
home						
Yes	0.804	0.201	-0.87	0.384	0.492	1.314
Lower Capacity	1.000					
• •						
<u>(No)</u>						
--------------------------------	---------------------	---------	-------	---------	-------	-------
Yes	0.829	0.174	-0.89	0.372	0.548	1.252
Children under 18	1.000					
<u>(No)</u>						
Yes	0.718	0.140	-1.69	0.090	0.489	1.054
<u>Language English</u>	1.000					
<u>(No)</u>						
Yes	1.000	0.314	0.00	0.999	0.541	1.850
<u>Response efficacy</u>	1.000					
<u>(not much)</u>						
2. somewhat	1.708	0.529	1.73	0.084	0.931	3.135
3. quite a bit	2.090	0.683	2.25	0.024	1.101	3.968
a great deal	1.570	0.429	1.65	0.099	0.918	2.683
<u>Confidence</u>	1.000		•			
2. somewhat	1.842	0.610	1.84	0.065	0.962	3.526
confident						
3. moderately	2.914	0.872	3.58	0.000	1.621	5.240
confident						
4. extremely	4.526	1.414	4.83	0.000	2.453	8.352
confident						
<u>Experience of</u>	1.000					
<u>disaster (No)</u>						
Yes	1.316	0.205	1.76	0.079	0.969	1.787
<u>Disaster</u>	1.000					
Information (No)						
Yes	1.407	0.247	1.95	0.052	0.997	1.984
<u>Housing (Rent)</u>	1.000		•			
Own	2.574	0.470	5.18	0.000	1.800	3.681
Constant	0.062	0.037	-4.66	0.000	0.019	0.199
F adjusted test statis	stic F(9,2252)	1.331		p>0.05		
Goodness of fit Pear	$rson \chi^2(2240)$	2187.68		p>0.05		
Model F(28,2233)		6.86		p<0.001		

Minimal Preparedness

The logistic model regressing minimal preparedness over independent and control variables in the study was statistically significant (F(28,2185) = 6.07, p<0.001, N=2213). Respondents were considered minimally prepared based on the literature that considers the minimal preparatory measures to include food and water for a few days, adequate funds, and access to transportation. In the complete case analysis, higher levels of response efficacy were associated with higher likelihood of being at least minimally prepared compared to those who reported not much on response efficacy (p<0.05). Moderate and extreme confidence in ability to carry out preparatory action was

associated with 97% to up to three times the chances of being prepared on the bare minimum measures (p<0.05). Compared to the lowest income category, all other income categories were more likely to be minimally prepared (p < 0.01 - p < 0.001). Respondents who had attended some college or vocational school were two times more likely to be minimally prepared compared to those who had completed less than high school (p<0.05). Women compared to men were 33% less likely to be at least minimally prepared (p < 0.05). Compared to the base category, being Black or Asian decreased the chances of being at least minimally prepared (p<0.05). Having a child in the house under 18 was associated with 42% lower likelihood of being prepared (p < 0.01) when adjusting for other covariates. Compared to respondents who were renting their home, home ownership was associated with double the chances of being prepared for food, water, funds and access to transportation (p < 0.01). Receiving information on preparedness in the previous months increased the chances of being at least minimally prepared (OR=1.46, p<0.05). Results of the logistic regression of minimal preparedness on independent variables are presented in Table 2.E.

Minimal Prep.	OR	St.Err.	t-	p-value	[95% Conf	[Interval]
_			value		-	_
<u>Income (0-999)</u>	1.000					
2.1000-2999	1.921	0.554	2.26	0.024	1.091	3.383
3. 3000-4999	2.356	0.693	2.91	0.004	1.323	4.196
4. 5000-7499	3.833	1.159	4.44	0.000	2.118	6.936
5.7500-9999	5.678	1.978	4.99	0.000	2.868	11.242
6.10000-15000	3.232	1.098	3.45	0.001	1.660	6.292
7.15000 and over	3.766	1.194	4.18	0.000	2.023	7.012
Education (Less than high	1.000					
<u>school)</u>						
High school	1.455	0.711	0.77	0.443	0.558	3.792
Vocational/Some College	2.795	1.361	2.11	0.035	1.076	7.264
College graduate	1.824	0.892	1.23	0.219	0.700	4.757
Post grad	2.131	1.085	1.49	0.137	0.785	5.784

Table 2.5.A. Weighted Logistic Regression of Minimal Preparedness over Key Covariates (Complete Case) N = 2213

<u>Sex(Male)</u>	1.000					
Female	0.674	0.103	-2.58	0.010	0.500	0.910
Race (white)	1.000					
Black/African American	0.560	0.131	-2.48	0.013	0.354	0.886
Asian	0.512	0.169	-2.03	0.043	0.268	0.978
AmIndian/Al.Native/Hawaii	0.850	0.358	-0.39	0.699	0.372	1.941
an/Pac.Islander						
Number of adults	0.979	0.070	-0.30	0.767	0.851	1.126
Older adults/Persons with	1.000					
disability at home (No)						
Yes	0.940	0.193	-0.30	0.762	0.627	1.407
Lower Capacity (No)	1.000					
Yes	0.700	0.144	-1.74	0.082	0.468	1.047
<u>Children under 18 (No)</u>	1.000					
Yes	0.586	0.093	-3.37	0.001	0.430	0.800
Language English (No)	1.000					
Yes	0.976	0.318	-0.07	0.941	0.516	1.848
Housing (Rent)	1.000					
Own	2.054	0.337	4.39	0.000	1.489	2.833
<u>Response efficacy (not</u>	1.000	•				
much)						
2. somewhat	2.016	0.516	2.74	0.006	1.220	3.332
3. quite a bit	1.764	0.468	2.14	0.033	1.048	2.969
4. a great deal	1.737	0.408	2.35	0.019	1.096	2.753
<u>Confidence</u>	1.000	•				
2. somewhat confident	1.559	0.565	1.23	0.221	0.766	3.171
3. moderately confident	1.976	0.654	2.06	0.040	1.032	3.783
4. extremely confident	3.365	1.108	3.69	0.000	1.764	6.417
Experience of disaster (No)	1.000	•				
Yes	0.995	0.151	-0.04	0.972	0.738	1.341
Disaster Information (No)	1.000					
Yes	1.467	0.223	2.52	0.012	1.089	1.977
	0.051	o oo -	4 50	0.000	0.016	0.100
Constant	0.054	0.035	-4.58	0.000	0.016	0.190
F adj. test statistic $F(9,2204)$	0.592	p>0.05				
Goodness-of-fit Pearson	2213.88	p>0.05				
$\chi^{2}(2193)$	<i></i>	0.007				
Model F(28,2185)	6.07	p<0.001				

 Table 2.6.A. Variance Inflation Factor for Preparedness Across Conceptualizations

	VIF	1/VIF
Income		
2.1000-2999	2.586	.387
3. 3000-4999	2.491	.402
4. 5000-7499	2.558	.391
5.7500-9999	1.882	.531
6.10000-15000	2.045	.489
7.15000 and over	2.274	.44
Education		
High school	3.53	.283
Vocational/Some	4.348	.23

College		
College graduate	4.76	.21
Post grad	3.912	.256
Female	1.055	.948
Number of adults	1.091	.916
Older	1.074	.931
adults/Persons with		
disability at home		
Lower Capacity	1.094	.914
Language	1.261	.793
2. somewhat	2.226	.449
3. quite a bit	2.339	.427
4. a great deal	2.747	.364
Confidence		
2. somewhat	2.335	.428
confident		
3. moderately	3.18	.314
confident		
4. extremely	3.504	.285
confident		
Experience of	1.086	.921
disaster		
Disaster Info	1.09	.917
Home ownership	1.133	.883
Mean VIF	2.317	



Figure 2.3.A. Studentized Residuals Plot for OLS Regression of Cumulative Preparedness

Appendix 3.A.

Supplementary material for Chapter III

 Table 3.1.A.
 Correlation Matrix for Disaster Preparedness Measures Chapters III and

 IV

	11								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) altcom_n	1.000								
(2) foodav_n	0.098	1.000							
(3) emwater_n	0.225	0.273	1.000						
(4) evfin_n	0.032	0.144	0.088	1.000					
(5) evinfo_n	0.143	0.180	0.119	0.227	1.000				
(6) evkit_n	0.331	0.253	0.347	0.111	0.247	1.000			
(7) evvehic_n	0.020	0.088	0.042	0.209	0.106	0.059	1.000		
(8) evsep_n	0.522	0.118	0.185	0.052	0.160	0.305	0.048	1.000	
(9) genert_nn	0.044	0.109	0.101	0.119	0.077	0.117	0.053	0.061	1.000





Figure 3.1.A. Distribution of Cumulative Preparedness (Chapter III and IV)



Figure 3.2.A. Distribution of Cumulative Preparedness (Chapter III and IV)

Tables 3.2.A.-3.3.A. Interaction Models: Cumulative Preparedness

Table 3.2.A.	Regressing	Cumulative	Preparedness	over Key (Covariates,	Housing 1	Insecurity
Interacting w	ith Income						

C.Prep.	Coef.	Coef. St.Err. t-v.		p-value	[95% Conf Interval]	
Structural Vulnerability						
Housing Adequacy (Not	0.000					
Adequate)						
1. Adequate	0.449	0.068	6.56	0.000	0.315	0.583
Housing Insecurity (No)	0.000	•	•	•		
1. Yes	-0.370	0.113	-3.29	0.001	-0.590	-0.149
Social Vulnerability						
Income (0-999)	0.000					
2. 1000-2999	0.183	0.059	3.10	0.002	0.067	0.299
3. 3000-4999	0.485	0.062	7.87	0.000	0.364	0.606
4. 5000-7499	0.554	0.064	8.60	0.000	0.428	0.681
5. 7500-9999	0.581	0.069	8.49	0.000	0.447	0.716
1.hinsecurity#2.income	0.247	0.132	1.87	0.061	-0.012	0.505
1.hinsecurity#3.income	0.125	0.141	0.88	0.377	-0.152	0.402
1.hinsecurity#4.incpme	0.130	0.144	0.90	0.367	-0.152	0.412
1.hinsecurity#5.income	0.384	0.151	2.54	0.011	0.087	0.680
Neighborhood Risk (No)	0.000					
1. Yes	0.170	0.056	3.02	0.003	0.059	0.280
Education (Less than high	0.000					

F-test	48.0)8			p-valı	ie- 0.000
R-squared	0.08	39		Nu	umber of ob	s. 22125
Constant	4.037	0.119	33.99	0.000	3.805	4.270
3. Internet	-0.043	0.045	-0.95	0.340	-0.131	0.045
2. Radio/TV	0.061	0.041	1.48	0.140	-0.020	0.142
Information(family/friends)						
Source of	0.000			•	•	•
home						
Persons with disability at	-0.241	0.037	-6.44	0.000	-0.315	-0.168
Older adults at home	0.227	0.070	3.24	0.001	0.090	0.364
Children at home	0.049	0.057	0.86	0.388	-0.063	0.161
Number of persons at home	0.073	0.022	3.40	0.001	0.031	0.116
Never married	-0.579	0.045	-12.77	0.000	-0.668	-0.490
Widowed/Divorced/Separated	-0.490	0.041	-11.88	0.000	-0.571	-0.409
Marital Status (Married)	0.000					
66-85	0.166	0.087	1.91	0.056	-0.004	0.336
56-65	0.296	0.055	5.34	0.000	0.187	0.405
36-55	0.198	0.046	4.28	0.000	0.107	0.289
Age (15-35)	0.000					
1. Female	-0.137	0.031	-4.45	0.000	-0.198	-0.077
Sex (Male)	0.000					
1. Yes	-0.136	0.047	-2.92	0.004	-0.228	-0.045
Ethnicity Latinx (No)	0.000					
3. AmIn/AlaskaNative	-0.168	0.057	-2.96	0.003	-0.279	-0.057
2. Black Only	-0.102	0.045	-2.28	0.023	-0.190	-0.014
Race (white)	0.000					
4. grad/postgrad	0.261	0.056	4.68	0.000	0.152	0.370
3. diploma or assoc. degree	0.414	0.061	6.76	0.000	0.294	0.535
2. high school or some college	0.313	0.051	6.17	0.000	0.213	0.412
school)						

 Table 3.3.A. Predictive Margins (Housing Insecurity#Income) Cumulative Preparedness

	Margin	Linearized Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#incomer	•					
0#1. 0-999	4.673	0.052	89.830	0.000	4.571	4.775
0#2. 1000-2999	4.856	0.034	144.660	0.000	4.790	4.922
0#3. 3000-4999	5.158	0.033	155.700	0.000	5.093	5.223
0#4. 5000-7499	5.227	0.035	150.510	0.000	5.159	5.295
0#5.7500-10436	5.254	0.039	133.400	0.000	5.177	5.331
1#1. 0-999	4.303	0.103	41.870	0.000	4.101	4.504
1#2. 1000-2999	4.733	0.063	75.610	0.000	4.610	4.855
1#3. 3000-4999	4.913	0.079	62.150	0.000	4.758	5.068
1#4. 5000-7499	4.987	0.084	59.610	0.000	4.823	5.151
1#5.7500-10436	5.268	0.095	55.330	0.000	5.081	5.455

Tables 3.4.A- 3.14.A. Interaction Models: Minimal Preparedness

Minimal Prep	OR	St.Err.	t-value	p-value	[95% Conf	Interval]
Structural Vulnerability						
Housing Adequacy (Not	1.000					
Adequate)						
1. Adequate	1.878	0.167	7.10	0.000	1.578	2.235
Housing Insecurity (No)	1.000					
1. Yes	0.676	0.097	-2.74	0.006	0.511	0.895
Social Vulnerability						
Income (0-999)	1.000					
2. 1000-2999	1.159	0.083	2.06	0.040	1.007	1.333
3, 3000-4999	1.780	0.133	7.69	0.000	1.536	2.061
4, 5000-7499	1.919	0.150	8.32	0.000	1.646	2.237
5. 7500-10436	1.854	0.155	7.36	0.000	1.573	2.185
1.hinsecurity#2.income	1.133	0.189	0.75	0.453	0.817	1.572
1.hinsecurity#3.income	1.078	0.185	0.44	0.659	0.771	1.509
1.hinsecurity#4.income	1.129	0.199	0.69	0.491	0.799	1.595
1.hinsecurity#5.income	1.624	0.302	2.61	0.009	1.128	2.339
Neighborhood Risk (No)	1 000	0.0002		0.007	11120	
1 Yes	1.000	0.073	1 12	0.262	0 945	1 231
Education (Less than high	1.000					
school)	1.000	·	•		•	•
2 high school or some college	1.504	0.091	6.76	0.000	1.336	1.693
3 diploma or assoc degree	1 758	0.127	7 80	0.000	1 526	2.026
4 grad/nostgrad	1.750	0.127	6 54	0.000	1 363	1 775
Race (white)	1.000	0.105	0.54	0.000	1.000	1.775
2 Black Only	0.853	0.045	-3 00	0.003	0 770	0 946
3 AmIn/AlaskaNative/Asian	1.069	0.043	-5.00	0.005	0.939	1 217
Ethnicity Latinx (No)	1.009	0.071	1.01	0.510	0.959	1.217
1 Ves	1.000	0.057	151	. 0.130	0.977	1 202
Sev (Male)	1.005	0.057	1.71	0.150	0.977	1.202
1 Female	0.830	. 0.030	-5.00			0 801
A = (15-35)	1 000	0.050	-3.07	0.000	0.772	0.071
Age (15-55)	1.000	. 0.072	5.05		. 1 195	1 460
56 65	1.319	0.072	5.05 8.47	0.000	1.105	2 004
50-05 66 85	1.737	0.117	0.47 5.07	0.000	1.545	2.004
Marital Status (Married)	1.001	0.174	5.91	0.000	1.310	2.202
Widowed/Divorced/Separated	0.777	. 0.037	5.24	0.000		
Nover married	0.777	0.037	-3.24	0.000	0.708	0.034
Number of adults at home	0.733	0.039	-5.04	0.000	0.002	0.013
Children at home (No)	1.000	0.022	-3.34	0.000	0.029	0.914
1 Vec	1.000	. 0.062	. 0.72		. 0.020	. 1.094
1. Yes	0.933	0.003	-0.75	0.465	0.838	1.084
1 Var	1.000	. 105			1.074	1.496
1.1 CS Demon with dischility of how of	1.204	0.105	2.83	0.005	1.0/4	1.400
rerson with disability at nome	1.000	•	•	•		
(1NO) 1 X	0.705	0.021	7.02	0 000	0 (1 (0 7/0
1. $f es$	U./US	0.031	-/.83	0.000	0.646	0.769
Source of Info (Family/Iriends)	1.000					
2.Kad10/1V	0.952	0.045	-1.06	0.289	0.868	1.043
3.Internet	0.857	0.045	-2.94	0.003	0.774	0.950

Table 3.4.A. Logistic Regression Analysis of Minimal Preparedness over Covariates, Housing

 Insecurity Interacting with Income

Constant	0.226	0.033	-10.28	0.000	0.170	0.300
Number of observations	21934			F-test		30.774

 Table 3.5.A. Predictive Margins Housing Insecurity#Income Minimal Preparedness

	Margin	Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#incomer	r					
0#1. 0-999	0.331	0.013	24.670	0.000	0.305	0.358
0#2. 1000-2999	0.363	0.009	41.840	0.000	0.346	0.380
0#3.3000-4999	0.462	0.009	49.000	0.000	0.444	0.481
0#4. 5000-7499	0.480	0.010	47.550	0.000	0.460	0.500
0#5.7500-10436	0.472	0.012	40.140	0.000	0.449	0.495
1#1. 0-999	0.254	0.024	10.610	0.000	0.207	0.301
1#2. 1000-2999	0.307	0.016	18.980	0.000	0.275	0.338
1#3. 3000-4999	0.389	0.019	19.950	0.000	0.351	0.427
1#4. 5000-7499	0.417	0.022	18.890	0.000	0.373	0.460
1#5.7500-10436	0.494	0.026	18.660	0.000	0.442	0.546

Table 3.6.A. Regressing Minimal Preparedness over covariates, Housing Insecurity interactingwith Race

Minimal prep.	Coef.	St.Err.	t-value	p-value	[95% Inter	Conf val]
Structural Vulnerability						
Housing Adequacy (Not Adequate)	1.000					
1. Adequate	1.878	0.167	7.10	0.000	1.578	2.235
Housing Insecurity (No)	1.000					
1. Yes	0.853	0.045	-3.00	0.003	0.769	0.946
1.hinsecurity#2.race	0.728	0.096	-2.41	0.016	0.562	0.942
1.hinsecurity#3.race	0.649	0.120	-2.34	0.019	0.452	0.932
Neighborhood Risk (No)	1.000					
1. Yes	1.079	0.073	1.13	0.259	0.945	1.232
Social Vulnerability						
Income (0-999)	1.000					
2. 1000-2999	1.189	0.077	2.67	0.008	1.047	1.350
3. 3000-4999	1.812	0.124	8.70	0.000	1.585	2.072
4. 5000-7499	1.966	0.141	9.40	0.000	1.708	2.264
5. 7500-10436	2.012	0.157	8.99	0.000	1.728	2.344
Education (Less than high school)	1.000					
2. high school or some college	1.502	0.091	6.74	0.000	1.334	1.691
3. diploma or assoc. degree	1.758	0.127	7.80	0.000	1.526	2.026
4. grad/postgrad	1.554	0.105	6.53	0.000	1.362	1.774
Race (white)	1.000					
2. Black Only	0.906	0.056	-1.61	0.108	0.803	1.022
3. AmIn/AlaskaNative/Asian	1.148	0.085	1.85	0.064	0.992	1.327
Ethnicity Latinx (No)	1.000					
1. Yes	1.080	0.057	1.46	0.144	0.974	1.198
Sex (Male)	1.000					
1. Female	0.829	0.030	-5.11	0.000	0.772	0.891
Age (15-35)	1.000					
36-55	1.322	0.072	5.09	0.000	1.187	1.472
56-65	1.762	0.117	8.49	0.000	1.546	2.008
66-85	1.863	0.194	5.97	0.000	1.519	2.285

Marital Status (Married)		1.000					
Widowed/Divorced/Separated		0.779	0.037	-5.21	0.000	0.709	0.855
Never married		0.735	0.039	-5.82	0.000	0.663	0.815
Number of persons at home		0.871	0.022	-5.52	0.000	0.829	0.915
Children at home (No)		1.000					
Yes		0.956	0.063	-0.69	0.488	0.840	1.087
Older adults at home (No)		1.000					
Yes		1.268	0.105	2.86	0.004	1.078	1.493
Persons with disability at home	(No)	1.000					
Yes		0.705	0.031	-7.82	0.000	0.646	0.770
Source of		1.000					
Information(family/friends)							
2. Radio/TV		0.953	0.045	-1.02	0.308	0.870	1.045
3. Internet		0.860	0.045	-2.87	0.004	0.776	0.953
Constant		0.215	0.031	-10.83	0.000	0.163	0.284
Number of obs	21934					F(27,2190	7)
				32.98	***		

 Table 3.7.A. Predictive Margins Hinsecurity##Race

	Margin	Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#racerec						
0#1. white Only	0.426	0.005	83.480	0.000	0.416	0.436
0#2. Black Only	0.403	0.012	33.540	0.000	0.380	0.427
0#3. Other races	0.457	0.016	28.680	0.000	0.426	0.488
1#1. white Only	0.390	0.011	36.290	0.000	0.369	0.411
1#2. Black Only	0.301	0.022	13.670	0.000	0.258	0.344
1#3. Other races	0.325	0.034	9.560	0.000	0.258	0.392

Table 3.8.A. Regressing Minimal Preparedness over Covariates, Housing Insecurity## Sex ofHouseholder

Minimal prep	OR		t-value	n-	[95% (Conf
Winning prop	OR.	Linearized	t-value		[JJ/0 C	
		Children St Err		value	Interv	aij
		St.EII.				
Structural Vulnerability						
Housing Adequacy (Not Adequate)	1.000			•		
1. Adequate	1.881	0.167	7.12	0.000	1.581	2.238
Housing Insecurity (No)	1.000				•	
1. Yes	0.878	0.058	-1.96	0.051	0.771	1.000
H.Insecurity#Female	0.810	0.075	-2.26	0.024	0.675	0.972
Neighborhood Risk (No)	1.000				•	
1. Yes	1.079	0.073	1.13	0.258	0.946	1.232
Social Vulnerability						
Income (0-999)	1.000				•	
2. 1000-2999	1.186	0.077	2.63	0.009	1.044	1.346
3. 3000-4999	1.806	0.123	8.66	0.000	1.580	2.065
4. 5000-7499	1.963	0.141	9.38	0.000	1.705	2.260
5. 7500-9999	2.006	0.156	8.95	0.000	1.722	2.336
Education (Less than high	1.000					
school)						
2. high school or some	1.502	0.091	6.73	0.000	1.334	1.691
college						

3. diploma or assoc. degree	1.753	0.127	7.77	0.000	1.522	2.020
4. grad/postgrad	1.553	0.105	6.52	0.000	1.360	1.773
Race (white)	1.000					
2. Black Only	0.854	0.045	-3.00	0.003	0.770	0.947
3. AmIn/AlaskaNative/Asian	1.070	0.071	1.02	0.310	0.939	1.218
Ethnicity Latinx (No)	1.000					
1. Yes	1.081	0.057	1.48	0.139	0.975	1.200
Sex (Male)	1.000					
Female	0.859	0.034	-3.80	0.000	0.794	0.929
Age (15-35)	1.000					
36-55	1.319	0.072	5.06	0.000	1.185	1.469
56-65	1.757	0.117	8.45	0.000	1.541	2.002
66-85	1.861	0.194	5.96	0.000	1.517	2.283
Marital Status (Married)	1.000					
Widowed/Divorced/Separated	0.779	0.037	-5.20	0.000	0.709	0.856
Never married	0.734	0.039	-5.85	0.000	0.662	0.815
Number of persons at home	0.871	0.022	-5.50	0.000	0.830	0.915
Children at home (No)	1.000					
Yes	0.953	0.063	-0.74	0.462	0.838	1.084
Older adults at home (No)	1.000		•		•	
Yes	1.265	0.105	2.83	0.005	1.075	1.489
Persons with disability at home	1.000					
(No)						
Yes	0.704	0.031	-7.85	0.000	0.645	0.769
Source of Info(family/friends)	1.000					
2. Radio/TV	0.952	0.045	-1.04	0.297	0.869	1.044
3. Internet	0.860	0.045	-2.88	0.004	0.776	0.953
Constant	0.215	0.031	-10.83	0.000	0.163	0.284
Number of obs	21934		F-tes	st	34	4.36***

 Table. 3.9.A. Predictive Margins Housing Insecurity#Sex Minprep

	Margin	L. Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#sex						
0#0. Male	0.443	0.006	68.150	0.000	0.430	0.455
0#1. Female	0.408	0.006	64.410	0.000	0.395	0.420
1#0. Male	0.413	0.014	29.750	0.000	0.385	0.440
1#1. Female	0.333	0.013	26.350	0.000	0.308	0.357

Table. 3.10.A. Regressing Minimal Preparedness over Covariates, housing insecurity#maritalstatus

Minimal prep	OR	Linearized St.Err.	t- valu e	p- value	[95%	Conf
Structural Vulnerability Housing Adequacy (Not Adequate) 1. Adequate Housing Insecurity (No)	1.000 1.878 1.000	0.166	7.12	0.000	1.579	2.235

1. Yes	0.907	0.063	-1.41	0.160	0.791	1.039
H.Insecurity#2.married	0.763	0.082	-2.51	0.012	0.618	0.942
H.insecurity#3. married	0.796	0.095	-1.90	0.057	0.630	1.007
Neighborhood Risk (No)	1.000					
1. Yes	1.078	0.073	1.12	0.264	0.945	1.230
Social Vulnerability						
Income (0-999)	1.000					
2. 1000-2999	1.182	0.077	2.58	0.010	1.041	1.342
3. 3000-4999	1.800	0.123	8.60	0.000	1.574	2.058
4. 5000-7499	1.958	0.141	9.34	0.000	1.701	2.255
5.7500-10436	2.005	0.156	8.94	0.000	1.721	2.335
Education (Less than high	1.000					
school)						
2. high school or some	1.502	0.091	6.74	0.000	1.334	1.691
college						
3. diploma or assoc. degree	1.754	0.127	7.78	0.000	1.523	2.021
4. grad/postgrad	1.553	0.105	6.52	0.000	1.360	1.773
Race (white)	1.000		•	•		•
2. Black Only	0.854	0.045	-3.00	0.003	0.770	0.947
3. AmIn/AlaskaNative/Asian	1.069	0.071	1.01	0.314	0.939	1.217
Ethnicity Latinx (No)	1.000					
1. Yes	1.080	0.057	1.45	0.146	0.974	1.198
Sex (Male)	1.000		•			•
Female	0.829	0.030	-5.12	0.000	0.771	0.890
Age (15-35)	1.000					
36-55	1.318	0.072	5.04	0.000	1.184	1.468
56-65	1.756	0.117	8.44	0.000	1.541	2.001
66-85	1.859	0.194	5.95	0.000	1.516	2.281
Marital Status (Married)	1.000					
2. Divorced/Separated	0.816	0.042	-3.96	0.000	0.737	0.902
3. Never Married	0.763	0.043	-4.76	0.000	0.683	0.853
Number of persons at home	0.872	0.022	-5.48	0.000	0.830	0.916
Children at home (No)	1.000					
Yes	0.951	0.062	-0.76	0.445	0.836	1.082
Older adults at home (No)	1.000					
Yes	1.265	0.105	2.84	0.005	1.075	1.489
Persons with disability at home	1.000					
(No)						
Yes	0.704	0.031	-7.85	0.000	0.645	0.769
Source of Info(family/friends)	1.000					
2. Radio/TV	0.953	0.045	-1.04	0.298	0.869	1.044
3. Internet	0.858	0.045	-2.92	0.003	0.774	0.951
Constant	0.215	0.030	-10.86	0.000	0.163	0.284
Number of obs	21934		F-test		33.	.099***

 Table. 3.11.A. Predictive Margins Housing Insecurity#Marital Status

	Margin	L. Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#married						
0#Married	0.455	0.007	61.350	0.000	0.440	0.469

0#Widowed/Divorced/Se parated	0.407	0.009	47.850	0.000	0.391	0.424
0#Never married	0.392	0.010	39.040	0.000	0.373	0.412
1#Married	0.432	0.015	28.690	0.000	0.402	0.461
1#Widowed/Divorced/Se parated	0.326	0.016	20.370	0.000	0.295	0.357
1#Never married	0.321	0.019	17.070	0.000	0.284	0.358

Table 3.12.A. Regressing Minimal Preparedness over Covariates, Hinsecurity#Older Adults at Home

Structural Vulnerability Housing Adequacy (Not 1.000 .
Housing Adequacy (Not 1.000 .<
Adequate) 1. Adequate 1. Adequate 1. B86 0.167 7.15 0.000 1.585 2.245 Housing Insecurity (No) 1.000
1. Adequate 1.886 0.167 7.15 0.000 1.585 2.245 Housing Insecurity (No) 1.000 1.000 1.585 2.245
Housing Insecurity (No) 1000
1. Yes 0.718 0.040 -5.88 0.000 0.643 0.802
H.Insecurity#older adults at 1.397 0.142 3.27 0.001 1.143 1.706
home
Neighborhood Risk (No) 1.000
1. Yes 1.081 0.073 1.15 0.250 0.947 1.233
Social Vulnerability
Income (0-999) 1.000
2. 1000-2999 1.183 0.077 2.59 0.010 1.042 1.343
3 . 3000-4999 1 .800 0.123 8.60 0.000 1.574 2.057
4. 5000-7499 1.954 0.141 9.31 0.000 1.697 2.250
5. 7500-9999 1.999 0.156 8.90 0.000 1.716 2.328
Education (Less than high 1.000
school)
2. high school or some college 1.499 0.091 6.70 0.000 1.331 1.687
3. diploma or assoc. degree 1.751 0.127 7.74 0.000 1.519 2.017
4. grad/postgrad 1.550 0.105 6.48 0.000 1.357 1.769
Race (white) 1.000
2. Black Only 0.854 0.045 -2.99 0.003 0.771 0.947
3. AmIn/AlaskaNative/Asian 1.066 0.071 0.97 0.334 0.936 1.214
Ethnicity Latinx (No) 1.000
1. Yes 1.085 0.058 1.54 0.124 0.978 1.204
Sex (Male) 1.000
Female 0.830 0.030 -5.09 0.000 0.772 0.891
Age (15-35) 1.000
36-55 1.322 0.073 5.09 0.000 1.187 1.473
56-65 1.759 0.117 8.46 0.000 1.543 2.005
66-85 1.858 0.193 5.97 0.000 1.516 2.277
Marital Status (Married) 1.000
2. Divorced/Separated 0.778 0.037 -5.23 0.000 0.708 0.855
3. Never Married 0.734 0.039 -5.86 0.000 0.661 0.814
Number of persons at home 0.870 0.022 -5.56 0.000 0.828 0.914
Children at home (No) 1.000
Yes 0.954 0.063 -0.71 0.475 0.839 1.085
Older adults at home (No) 1.000

Yes	1.203	0.101	2.19	0.028	1.020	1.419
Persons with disability at home	1.000					
(No)						
Yes	0.708	0.032	-7.73	0.000	0.649	0.773
Source of Info(family/friends)	1.000					
2. Radio/TV	0.955	0.045	-0.98	0.329	0.872	1.047
3. Internet	0.861	0.045	-2.85	0.004	0.777	0.954
Constant	0.223	0.032	-10.60	0.000	0.169	0.294
Number of obs		21934	F-test			34.35

 Table 3.13.A. Predictive Margins Housing Insecurity#Older Adults

	Margin	Std.Err.	t	P>t	[95%Conf.	Interval]
hinsecure#old	leradults at home					
0#No	0.412	0.008	54.210	0.000	0.397	0.427
0#Yes	0.455	0.014	32.050	0.000	0.427	0.482
1#No	0.339	0.012	28.400	0.000	0.315	0.362
1#Yes	0.455	0.022	20.870	0.000	0.413	0.498

Table 3.14.A.	Regressing Minin	nal Preparednes	s Over Covari	ates, With All Sig	znificant
Interactions					

Minprep	OR.	Lineari	t-	p-	[95%	Interval]
		zed SE	value	value	Conf	-
Structural Vulnerability						
Housing Adequacy (Not Adequate)	1.000					
1. Adequate	1.872	0.167	7.04	0.000	1.572	2.229
Housing Insecurity (No)	1.000					
1. Yes	0.799	0.144	-1.24	0.214	0.560	1.139
Social Vulnerability						
Income (0-999)	1.000					
2. 1000-2999	1.209	0.086	2.66	0.008	1.051	1.391
3. 3000-4999	1.908	0.142	8.66	0.000	1.649	2.209
4. 5000-7499	2.102	0.163	9.59	0.000	1.806	2.447
5. 7500-9999	2.051	0.170	8.68	0.000	1.744	2.412
1.hinsecure#2.income	1.054	0.179	0.31	0.758	0.755	1.471
1.hinsecure#3.income	1.013	0.180	0.08	0.940	0.716	1.435
1.hinsecure#4.income	1.027	0.189	0.14	0.885	0.716	1.474
1.hinsecure#5.income	1.483	0.292	2.00	0.045	1.008	2.181
Race (white)	1.000					
2. Black Only	0.876	0.051	-2.26	0.024	0.782	0.982
3. AmIn/AlaskaNative/Asian	1.132	0.081	1.73	0.083	0.984	1.304
1.hinsecure#2.race	0.792	0.107	-1.72	0.086	0.608	1.033
1.hinsecure#3.race	0.658	0.124	-2.22	0.026	0.454	0.952
Sex (Male)	1.000					
Female	0.868	0.035	-3.51	0.000	0.802	0.939
1.hinsecure#1.sex	0.867	0.085	-1.45	0.147	0.715	1.052
Marital Status (Married)	1.000					
2. Divorced/Separated	0.799	0.041	-4.34	0.000	0.722	0.884
3. Never Married	0.740	0.042	-5.31	0.000	0.662	0.827

1.hinsecure#2.marr~d	0.790	0.093	-2.00	0.045	0.627	0.995
1.hinsecure#3.marr~d	0.950	0.121	-0.40	0.688	0.741	1.219
Older adults at home (No)	1.000					
Yes	1.204	0.102	2.20	0.028	1.021	1.420
1.hinsecure#olderadults	1.495	0.164	3.68	0.000	1.207	1.853
Neighborhood Risk (No)	1.000					
1. Yes	1.077	0.073	1.10	0.270	0.944	1.230
Ethnicity Latinx (No)	1.000					
1. Yes	0.976	0.050	-0.47	0.639	0.883	1.079
Age (15-35)	1.000					
36-55	1.299	0.071	4.78	0.000	1.167	1.446
56-65	1.732	0.115	8.25	0.000	1.520	1.973
66-85	1.782	0.185	5.58	0.000	1.455	2.184
Number of persons at home	0.854	0.021	-6.35	0.000	0.813	0.897
Children at home (No)	1.000					
Yes	0.954	0.063	-0.72	0.474	0.839	1.085
Persons with disability at home	1.000					
(No)						
Yes	0.698	0.031	-8.06	0.000	0.640	0.762
Source of Info (family/friends)	1.000					
2. Radio/TV	0.967	0.045	-0.71	0.475	0.883	1.060
3. Internet	0.883	0.046	-2.40	0.016	0.797	0.977
Constant	0.325	0.045	-8.20	0.000	0.248	0.425
Number of obs	21934	F-test				26.324

 Table 3.15.A. Sensitivity Analysis: Preparedness in Census Division 5- South Atlantic

_	Cumulative Prep.					Minimal Prep.					
Variables	Coef.	SE	p-	[95% C	I]	OR	SE	p-value	95%		
			value	-	-			-	CI		
Structural Vulnerability											
Housing Adequacy (Not	0.000					1.000					
Adequate)											
1. Adequate	0.778	0.162	0.000	0.460	1.096	0.162	0.548	0.000	1.636	3.851	
Housing Insecurity (No)	0.000										
1. Yes	-0.153	0.083	0.067	-0.317	0.011	0.083	0.079	0.032	0.672	0.983	
Neighborhood Risk (No)	0.000										
1. Yes	0.092	0.113	0.414	-0.129	0.314	0.113	0.114	0.298	0.675	1.128	
Social Vulnerability											
Income (0-999)	0.000					1.000					
2. 1000-2999	0.340	0.116	0.003	0.114	0.567	1.215	0.165	0.151	0.931	1.586	
3. 3000-4999	0.606	0.123	0.000	0.364	0.848	1.709	0.247	0.000	1.287	2.269	
4. 5000-7499	0.624	0.129	0.000	0.371	0.877	1.775	0.270	0.000	1.317	2.391	
5. 7500-9999	0.771	0.138	0.000	0.500	1.042	1.818	0.300	0.000	1.316	2.511	
Education (Less than high	0.000					1.000					
school)											
2. high school or some	0.368	0.106	0.001	0.160	0.576	1.848	0.237	0.000	1.437	2.376	
college											
3. diploma or assoc. degree	0.438	0.127	0.001	0.189	0.686	2.049	0.310	0.000	1.523	2.755	
4. grad/postgrad	0.450	0.115	0.000	0.225	0.674	2.180	0.309	0.000	1.650	2.879	
Race (white)	0.000					1.000					
2. Black Only	-0.227	0.080	0.005	-0.385	-0.070	0.854	0.080	0.090	0.712	1.025	
3.	0.286	0.142	0.045	0.007	0.565	1.527	0.257	0.012	1.097	2.124	
AmIn/AlaskaNative/Asian											
Ethnicity Latinx (No)	0.000					1.000					
1. Yes	0.031	0.100	0.756	-0.165	0.227	1.326	0.155	0.016	1.054	1.669	

Sex (Male)	0.000					1 000				
1. Female	-0.164	0.068	0.015	-0.297	-0.032	0.767	0.060	0.001	0.658	0.894
Age (15-35)	0.000					1.000				
36-55	0.295	0.100	0.003	0.099	0.491	1.489	0.175	0.001	1.183	1.875
56-65	0.562	0.123	0.000	0.320	0.804	2.041	0.295	0.000	1.537	2.711
66-85	0.279	0.194	0.150	-0.101	0.658	1.811	0.400	0.007	1.175	2.792
Marital Status (Married)	0.000					1.000				
Widowed/Divorced/Separat	-0.481	0.089	0.000	-0.656	-0.305	0.879	0.089	0.206	0.721	1.073
ed										
Never married	-0.477	0.098	0.000	-0.669	-0.285	0.792	0.092	0.044	0.632	0.994
Number of persons at home	0.040	0.047	0.398	-0.052	0.132	0.829	0.045	0.000	0.746	0.921
Children at home (No)	0.000					1.000				
Yes	0.075	0.119	0.531	-0.159	0.308	0.968	0.135	0.815	0.737	1.272
Older adults at home (No)	0.000					1.000				
Yes	0.331	0.160	0.039	0.017	0.645	1.571	0.276	0.010	1.114	2.217
Persons with disability at	0.000					1.000				
home (No)										
Yes	-0.217	0.081	0.007	-0.375	-0.058	0.688	0.066	0.000	0.570	0.830
Source of	0.000					1.000				
Information(family/friends)										
2. Radio/TV	0.199	0.094	0.035	0.014	0.384	0.930	0.097	0.491	0.758	1.143
3. Internet	0.171	0.106	0.108	-0.037	0.380	1.058	0.126	0.639	0.837	1.336
Constant	3.403	0.260	0.000	2.894	3.913	0.137	0.045	0.000	0.072	0.262
R-squared			0.110							
F(25, 4596)		1	5.22***					F(25	5, 4558)= 9	9.82***
Observations			4621							4583

*** p<.001, ** p<.01, * p<.05

Table 3.16.A. Sensitivi	ty Analysis:	Preparedness in	Census Division	7- West	South Central
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Cumulative Prep.						Minimal Prep.					
Coef.	St.Err.	p-value	value [95% Conf Interval]		OR.	St.Err.	p-value	[95% Conf Interval]			
0.000					1.000						
0.341	0.153	0.026	0.041	0.640	1.739	0.342	0.005	1.183	2.557		
0.000					1.000						
-0.205	0.106	0.053	-0.413	0.002	0.766	0.092	0.026	0.605	0.969		
0.000					1.000						
-0.077	0.124	0.532	-0.320	0.165	0.830	0.120	0.197	0.626	1.102		
0.000					1.000						
0.341	0.135	0.012	0.076	0.606	1.320	0.218	0.094	0.954	1.825		
0.522	0.145	0.000	0.238	0.806	1.738	0.308	0.002	1.228	2.459		
0.592	0.160	0.000	0.279	0.906	2.142	0.407	0.000	1.476	3.109		
0.807	0.168	0.000	0.478	1.136	2.559	0.530	0.000	1.705	3.840		
0.000					1.000						
0.303	0.130	0.020	0.048	0.557	1.301	0.191	0.073	0.975	1.735		
0.451	0.163	0.006	0.132	0.771	1.410	0.264	0.067	0.976	2.036		
0.223	0.148	0.131	-0.066	0.512	1.446	0.246	0.030	1.036	2.018		
0.000					1.000						
0.098	0.105	0.351	-0.108	0.305	0.990	0.127	0.938	0.770	1.273		
-0.117	0.152	0.440	-0.415	0.180	1.094	0.209	0.640	0.752	1.591		
0.000					1.000						
-0.177	0.108	0.099	-0.389	0.034	0.877	0.107	0.284	0.690	1.115		
0.000		•			1.000				•		
	Coef. 0.000 0.341 0.000 -0.205 0.000 -0.077 0.000 0.341 0.522 0.592 0.807 0.000 0.303 0.451 0.223 0.000 0.303 0.451 0.223 0.000 0.098 -0.117 0.000 -0.177 0.000	Curr Coef. St.Err. 0.000 0.341 0.153 0.000 -0.205 0.106 0.000 -0.205 0.106 0.000 -0.077 0.124 0.000 0.341 0.352 0.145 0.592 0.160 0.807 0.168 0.000 . 0.303 0.130 0.451 0.163 0.223 0.148 0.000 . 0.098 0.105 -0.117 0.108 0.000	Cumulative Pr Coef. p-value st.Err. p-value 0.000 . . 0.341 0.153 0.026 0.000 . . -0.205 0.106 0.053 0.000 . . -0.077 0.124 0.532 0.000 . . 0.341 0.135 0.012 0.522 0.145 0.000 0.592 0.160 0.000 0.807 0.168 0.000 0.303 0.130 0.020 0.451 0.163 0.006 0.223 0.148 0.131 0.000 . . 0.098 0.105 0.351 -0.117 0.152 0.440 0.000 . . -0.177 0.108 0.099 0.000 . .	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		

1. Female	-0.095	0.086	0.269	-0.263	0.073	0.830	0.082	0.060	0.683	1.008
Age (15-35)	0.000					1.000				
36-55	0.288	0.124	0.020	0.046	0.530	1.326	0.186	0.044	1.007	1.745
56-65	0.416	0.149	0.005	0.124	0.708	1.678	0.300	0.004	1.182	2.383
66-85	0.208	0.245	0.395	-0.271	0.688	1.909	0.565	0.029	1.069	3.412
Marital Status (Married)	0.000					1.000				
Widowed/Divorced/Separate	-0.677	0.122	0.000	-0.916	-0.438	0.692	0.091	0.005	0.534	0.896
d										
Never married	-0.664	0.128	0.000	-0.915	-0.413	0.729	0.104	0.027	0.552	0.964
Number of persons at home	0.005	0.061	0.941	-0.114	0.123	0.843	0.057	0.012	0.739	0.963
Children at home (No)	0.000					1.000				
Yes	-0.017	0.148	0.907	-0.308	0.273	0.890	0.146	0.475	0.645	1.226
Older adults at home (No)	0.000					1.000				
Yes	0.191	0.197	0.332	-0.195	0.576	1.106	0.268	0.679	0.687	1.779
Persons with disability at	0.000					1.000				
home (No)										
Yes	-0.336	0.105	0.001	-0.541	-0.130	0.612	0.075	0.000	0.481	0.778
Source of	0.000					1.000				
Information(family/friends)										
2. Radio/TV	0.039	0.118	0.741	-0.192	0.270	0.891	0.113	0.365	0.695	1.143
3. Internet	-0.163	0.129	0.209	-0.416	0.091	0.818	0.120	0.170	0.614	1.090
Constant	4.391	0.299	0.000	3.805	4.978	0.357	0.123	0.003	0.182	0.700
Observations			3	108						3081
R-squared			0.	103						
F(25, 3083)= 9.84, p<0.001								F(25, 30)56)= 6.17	′, p<0.001