AN ALL HAZARDS, ALL AGENCIES, ALL PEOPLE APPROACH TO ASSESS LOCAL-LEVEL HOUSEHOLD EMERGENCY PREPAREDNESS AND COMMUNITY DISASTER RESILIENCE

by

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Problem: Given the increasing frequency, intensity, and severity of disasters, and a gap in disaster research examining the interdependent systemic relationships between individuals and communities, we urgently need to establish local assessments of Household Emergency Preparedness (HEP) behaviors and perceived Community Disaster Resilience (CDR).

Purpose & Methods: Guided by the All Hazards, All Agencies and All People Conceptual Framework, the primary objective of this descriptive study, using secondary analysis of data from the East Carolina University's Pitt County Community Prevention And COVID-19 Testing (ComPACT) Study, collected with the Household Emergency Preparedness Instrument survey (HEPI) and the Communities Advancing Resilience Toolkit (CART) Assessment Survey, was to understand the complex relationships between individuals and their communities in a local context, by assessing HEP behaviors and perceived CDR among residents living in Pitt County, North Carolina, a geographical vulnerable inner coastal plain community.

Results: The mean score for the HEPI General Preparedness (GP) Scale was 18.34 (*SD* = 6.88) and only 5 out of 144 participants (3.5%) had GP total scores greater than 30, indicating most study participants were categorically unprepared for hazards in their community. There

were a variety of HEP behaviors and the identification of four different subgroups among study participants related to resources-specific and action-specific preparedness behaviors. The mean HEPI GP score, of participants who reported having an emergency plan and a disaster kit, was significantly higher than the GP mean scores for those with no plan and no kit. Out of the five CART Core Community Resilience (CR) domains, Disaster Management had the highest mean score ($M = 3.65$, $SD = .62$) and the Transformative Potential domain had the lowest mean score ($M = 3.36$, $SD = .62$) The overall perceived CR mean score was 3.48 ($SD = .62$). The CART items with the highest percentage of positive responses were: (a) *My community can provide emergency services during a disaster or community crises* (77.1%) and (b) *People in my community help each other* (74.8%). CART items with the lowest percentage of positive responses were: (a) *My community looks at its successes and failures to learn from the past* (35.4%) and (b) *People in my community trust local officials (24.3%)*. The highest level of community concern was related to health threats (73.6%), natural disasters (68.1%), and socio-economic issues (65.7%) and the lowest level of participant concern was related to unintentional disasters (20.1%). Socio-economic issues had a significant medium correlation with the CART CR domains: (a) Connection and Caring ($r = -.32$, $p < .001$), (b) Resources ($r = -.41$, $p < .001$), and (c) Transformative Potential ($r = -.33$, $p < .001$). There appears not be a relationship between individual HEP and perceived CDR with this study sample. It is possible that the specific elements of CDR that may be related to HEP are not sufficiently captured with the CART domains.

Discussion: The findings from this study offer insight into factors that may be related to overall low levels of HEP and perceived CDR among residents of Pitt County, such as lack of trust in local officials, beliefs that not all people are treated fairly, concern about socioeconomic

issues, and perceived lower transformative potential for community change. Critical analysis of collective community experiences, including disasters, is what community leaders and agencies need to design community-based interventions that effectively build CDR, increase disaster preparedness and reduce disaster risk. This study offers an example of how nurses can lead interprofessional disaster preparedness activities in their local communities, which will ultimately assist public health emergency preparedness and national health security efforts.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AFN is Access and Functional Needs and is a HEPI subscale

ASPR is the Assistant Secretary for Preparedness and Response

BRFSS is the Behavioral Risk Factor Surveillance System

HEP is Household Emergency Preparedness

HEPI is the H Household Emergency Preparedness Instrument

CART is Communities Advancing Resilience Toolkit

CBPR is community-based participatory research

CDR is Community Disaster Resilience

ComPACT is Community Prevention And COVID-19 Testing

COVID-19 is Coronavirus disease of 2019

CR is Community Resilience

DSR is Disaster Supplies and Resources and is a HEPI subscale.

FEMA is the Federal Emergency Management Agency

GP is General Preparedness and is a HEPI Scale.

HCP is healthcare provider

NHSS is the National Health Security Strategy

PAP is Preparedness Actions and Planning and is a HEPI subscale.

REDCap is Research Electronic Data Capture

SA is Special Actions 1 and 2; and are HEPI subscales.

USDHHS is the United States of Department of Health and Human Services

UNDRR is the United Nations Office for Disaster Risk Reduction

CHAPTER 1: INTRODUCTION

Despite numerous humanitarian emergencies that have occurred in the United States (U.S.) from a variety of hazards, public health emergency preparedness efforts have failed to adequately prepare and protect many communities from the negative impacts of disasters. Hazardous agents, whether natural processes or man-made, become disasters when these extreme events interface with vulnerable human populations and their built environments (Perry, 2018). Crippling disasters, such as Hurricane Katrina (2005), the September 11, 2001 terrorist attack in New York, and the ongoing COVID-19 Pandemic have shed light on how we need to protect and prepare all communities to avoid devastating outcomes going forward. Particular attention needs to be paid to vulnerable communities that disproportionately experience chronic daily stressors, such as health disparities and inequities related to the social determinants of health, as well as the addition of disaster-related stress (Lichtveld, 2018; Morton & Lurie, 2013; Couig et al., 2021). Lichtveld (2018) attributes a disconnect between policy and health to a failure in recognizing how chronic stressors, such as socioeconomic and health disparities, impact disaster preparedness and recovery.

To remedy the disconnect between policy and health, President George W. Bush, signed the Pandemic and All Hazards Preparedness Act (PAHPA) in 2006, which placed an emphasis on high-risk, vulnerable populations (U.S. ASPR, 2019a). This represented a paradigm shift, from traditional approaches with a focus on strengthening response infrastructure and disaster relief measures, to an *All-Hazards* Preparedness approach (Clements & Casani, 2016; Couig et al., 2021). The PAHPA emphasized disaster risk assessments of *all* hazards that may occur in a specific area (Clements & Casani, 2016), not just those hazards that have occurred previously or frequently in a community (Fitzpatrick, 2016). A comprehensive All Hazards approach was

intended to support disaster preparedness as a shared responsibility between All Agencies and All People, from the federal to the local-level (Clements & Casani, 2016). An All Agencies approach is meant to include all organizations and agencies ranging from the volunteer, non-profit to the private, for-profit sectors and not just traditional emergency management organizations, while an All People approach ensures the involvement of the local people in a specific area to create both shared understanding and responsibility for community disaster resilience (CDR) (Fitzpatrick, 2016). CDR is defined as a "community's capacity to adapt, to change, handle disruption, and respond in a positive and timely manner to emergencies, while continuing to sustain critical systems and maintain the community's unique character" (Fitzpatrick, 2016, p. 60).

The National Health Security Strategy (NHSS) is a major program in the PAHPA, under the direction of the Assistant Secretary for Preparedness and Response (ASPR) (U.S. ASPR, 2019a). The purpose of the NHSS is to establish a framework to strengthen the U.S. Public Health and Healthcare Systems to confront all hazards with the collaborative efforts of individuals, families, communities, and agencies at all levels (U.S. ASPR, 2019b). The NHSS was "built on a foundation of community resilience-healthy individuals, families, and communities with access to healthcare and with the knowledge and resources to know what to do to care for themselves and others in both routine and emergency situations" (Sebelius, 2009, p. 3). The 2019-2022 NHSS, the current and most recent strategy, moves this foundational work forward calling for a need to (a) protect at-risk individuals; (b) empower citizens to participate in preparedness efforts to reduce their risk; and (c) build individual and community resilience (U.S. ASPR, 2019b).

This research study used an inclusive, holistic All Hazards, All Agencies, All People (Fitzpatrick, 2016) approach to assess the current state of emergency preparedness behaviors, during the disaster response phase of the COVID-19 Pandemic, among residents living in Pitt County, North Carolina (NC), a geographically vulnerable inner coastal plain community. The long-term goal of this research is to inform the development of community-based disaster risk reduction and disaster preparedness capacity, as well as overall CDR to all hazards.

Background

Humans and their coexisting ecosystems are increasingly exposed to the adverse impacts of a multitude of hazardous events, threatening the health of communities and individuals across the U.S. (CDC, 2021; FEMA, 2021; NOAA, 2020; USGCRP, 2016). Disaster research shows several concerning disaster trends: (a) the frequency, intensity, and severity of disasters is increasing annually; (b) more people are affected by disasters; and (c) disasters are reported to be less deadly, but more costly (Coppola, 2021b). Given the increasing frequency, intensity, and severity of disasters, we urgently need to establish local assessment of emergency preparedness behaviors in order to enhance public health emergency preparedness efforts to build equitable, sustainable CDR.

Emergency preparedness is a broad approach to help individuals and households with the capacity and capability to remain in their homes when a hazard strikes and engage in behaviors that will help them survive the consequences of a hazard (Coppola, 2021a). For example, as winter approaches many residents living in northern climates will prepare for potential winter storms by collecting, splitting, and drying firewood, obtaining functional shovels and ice picks, and nonperishable food sources to name a few. Emergency preparedness behaviors may vary depending on the hazard type and some hazards are less predictable, such as earthquakes,

technological hazards (chemical spills), civil hazards (terrorism) or biological hazards (SARS-CoV-2) and can strike without forewarning (Coppola, 2021a). That said, there is an emphasis on preparedness because actions are most helpful and productive when implemented well in advance of a potential hazardous event to reduce risk and increase resilience (Coppola, 2021a).

The concept of CDR continues to evolve. A review of the disaster resilience literature, dating from 1970-2016, revealed conceptual confusion and confounding epistemological and methodological challenges related to the phenomenon of resilience (Manyena et al., 2019; Matyas & Pelling, 2015). Manyena and colleagues (2019) identified 83 different resilience definitions and "46 resilience frameworks, models, toolkits, and indexes from both academic and grey literature sources" (Manyena et al., 2019, p. 7). Eighty-three different resilience definitions were identified, while 81% mentioned "the ability or capacity of a community exposed to a destabilizing event to do something positive before, during, and after the destabilizing event in order to reduce its impact" (Manyena et al., 2019, p. 2). Community resilience, therefore, is viewed as a cohesive factor capable of preserving individual, social, and economic well-being before, during, and after a disaster (Carlson et al., 2019; West et al., 2020).

When we talk about empowering communities to take responsibility for emergency preparedness behaviors and building resilience, it becomes necessary to also adopt a definition of community that will allow this level of expression. Israel and colleagues (1994; 2018) define community as a socially constructed unit of analysis that reflects collective and individual identity and is characterized by: (a) a sense of identity and belonging; (b) common symbol systems; (c) shared values and norms; (d) bidirectional influence; (e) shared needs and a commitment to meeting those needs; (f) shared emotional connection (common history); and (g) may or not be bound by geographical boundaries, such as shared ethnic and gender groups. For

the purposes of this study, community was defined by geographical boundaries. Pitt County, NC was chosen as the designated unit of analysis for this study because of its socio-ecological vulnerability. The Federal Emergency Management Agency (FEMA) (n.d. a) has assigned a *relatively moderate* Risk Index score of 17.15 (0=lowest risk and 100=highest risk) for Pitt County, which exceeds both state (13.57) and national (10.60) averages. Pitt County is especially prone to several natural hazards, such as heat waves, meteorological and agricultural droughts, hurricanes, lightning, and tornadoes (FEMA, n.d. a). This does not include other hazards, such as biological, technological, industrial, political or civil hazards. Furthermore, FEMA (n.d. a) includes a disclaimer stating that the National Risk Index, calculated as *Risk Index=Expected Annual Loss* X *Social Vulnerability ÷ Community Resilience,* "was created for broad nationwide comparisons and is not a substitute for localized risk assessment analysis" (p. 15). Pitt County certainly also has other community characteristics shared by many members such as a common history, shared values and norms, and a bidirectional influence between collective and individual identities.

Indeed, communities are comprised of both collective and individual entities such as individuals, families, and family units. The NHSS Implementation Plan 2019-2022 (U.S. ASPR, 2019b) proposes that micro-level systems - individuals, families, and family units - are vital subsystems in advancing the Nation's physical and psychological health security. Effective navigation of disaster experiences requires micro-level systems to engage in household emergency preparedness (HEP) and community preparedness activities (McNeill et al., 2018). It is purported that HEP at these microsystem-levels contributes to overall community and national resilience (Killian et al., 2017). Collectively, HEP, family- and community-level resilience, and overall disaster risk reduction is necessary for homeland security (McNeill et al., 2018).

However, despite national preparedness efforts to increase household emergency preparedness (HEP) scholars report low states of readiness at the individual/family subsystem levels (Bodas, 2019; Clay et al., 2020; Ferguson et al., 2019; Killian et al., 2017; McNeill et al., 2018; Zamboni & Martin, 2020).

There is conceptual ambiguity in the literature related to the concept of HEP. Some scholars view preparedness at the individual-level, as actions that involve the stockpiling of resources and the development of evacuation plans that considered necessary for a disaster (Heagele et al., 2020; Kohn et al., 2012). Whereas, other scholars prefer a systems perspective describing household preparedness as (a) a dynamic state of readiness that is context dependent; (b) a social process; and (c) a process of completing activities to save lives and minimize the effect of disasters (Nojang & Jensen, 2020). Concept clarification is critical for selection of research designs involving the development of preparedness interventions, as well as to understand how preparedness efforts at the individual and family micro-level may influence larger disaster preparedness system outcomes (Wilcox et al., 2021). In the only published concept analysis of HEP, Wilcox and colleagues (2021) define HEP as a deliberate micro-level disaster risk reduction strategy that includes resource-specific and action-specific preparedness activities, by individual and family household units, with the intent to achieve a level of readiness that strengthens the household's capacity and capability to adapt, manage, and recover from a hazardous event. HEP is essential for individual, family, and CDR, especially among subpopulations that bear a higher burden of risk and vulnerability, such as people with chronic health issues and functional impairments, pregnant women and children (Hendriks et al., 2018). Although this may be true, several gaps in current disaster research related to HEP have stymied progress in overall disaster preparedness. To begin, scholars suggest the paucity of disaster

research examining the interdependent systemic relationships between individuals and communities is contributing to low preparedness rates (Buergelt & Paton, 2014). In other words, very little work has been done to examine the relationships between All People and All Agencies and how that may be contributing to low preparedness rates. Second, public health emergency preparedness leaders cannot expect to improve HEP readiness until there is empirical data supporting actual versus perceived HEP measures (Der-Martirosian et al., 2014; Donahue et al., 2014; McNeill et al., 2018). More specifically, "actual" HEP measures refer to preparedness actions and resources that can be objectively measured and evaluated, such as a face to face evaluation or photo of an individual's emergency supply kit that contains hard copies of emergency preparedness action and planning documents and verifiable amounts of water, non-perishable food, batteries, etc. "Perceived" HEP measures are subjective self-report surveys of HEP measures, which is currently the main source of HEP data in the literature. Low income households may struggle to stockpile food and supplies when living paycheck to paycheck (Lichtveld, 2018). Vulnerable households in high-risk disaster areas may perceive their households are prepared based on their preparedness capacity and capability, when their actual level of preparedness may be below standard. Finally, HEP, the smallest unit of analysis in the disaster preparedness system, is a micro-level phenomenon that occurs at the local level. National-level data serves a salient purpose in providing us with a broad snapshot of disaster preparedness in the U.S; however, a review of the literature revealed that the majority of the studies published in the U.S. between 2003 and 2021, examining HEP and community disaster resilience (CDR) were quantitative secondary analyses (n=11) of national-level (9) and state-level (2) data sets; see Chapter 2 for a full literature review. In order to promote equitable disaster-related CDR for all populations, more local-level community-based disaster

preparedness research is critically needed. It is hypothesized that by identifying and measuring All People and All Agencies factors that enhance HEP, the smallest unit of analysis in the disaster preparedness system, larger units will benefit due to the reciprocity of interdependent relationships.

Statement of the Problem

Disaster research trends indicate more people are affected annually by the increasing frequency, intensity, and severity of disasters (Coppola, 2021b). Despite national preparedness efforts to increase HEP, scholars report low states of readiness at the individual/family subsystem levels (Bodas, 2019; Clay et al., 2020; Ferguson et al., 2019; Killian et al., 2017; McNeill et al., 2018; Zamboni & Martin, 2020). Research suggests the paucity of disaster research examining the interdependent systemic relationships between individuals and communities is contributing to low preparedness rates (Buergelt & Paton, 2014). Given the increasing frequency, intensity, and severity of disasters, we urgently need to establish local assessment of emergency preparedness behaviors and perceived CDR in order to enhance public health emergency preparedness efforts to build equitable disaster risk reduction capacity and sustainable CDR.

Theoretical Framework

No one disaster or community is the same. As we seek to understand why, despite national preparedness efforts to increase HEP behaviors, low states of readiness at the individual/family subsystem levels persist (Bodas, 2019; Clay et al., 2020; Ferguson et al., 2019; Killian et al., 2017; McNeill et al., 2018; Zamboni & Martin, 2020), we need to consider the complex relationships and characteristics of socioecological systems, including both

environmental and human processes. The objective of this dissertation study was to better understand emergency preparedness behaviors and perceived CDR at the local-level.

The All Hazards, All Agencies, All People Conceptual Model (Fitzpatrick, 2016) was chosen for this research study in order to better understand the shared responsibility of all individuals, households, and agencies in emergency preparedness for all hazards. The model consists of eight domains: (a) All Hazards; (b) All Agencies; (c) All People; (d) Individual Preparedness; (e) Mitigation, Preparation, Response, and Recovery; (f) Supported Community Self-Reliance; (g) Collaborative Community Resilience Building; and (h) Community Disaster Resilience (CDR) (Fitzpatrick, 2016). This model recognizes the critical importance of local-level inclusivity and diversity of all community members in collaborative CDR building efforts, the benefits of participatory action research, and the value of self-reliant preparedness behaviors and perceived empowerment to survive hazardous events (Fitzpatrick, 2016).

This model also recognizes the interprofessional nature of disaster risk reduction and emergency preparedness. Interprofessional teamwork is defined as "a type of work involving different health or social care professionals who share a team identity and work together closely in an integrated and interdependent manner to solve problems, deliver services, and enhance health outcomes" (Institute of Medicine, 2015, p. xii). Collaborative CDR building is perceived to be an activity of interprofessional teamwork with a goal of achieving overall CDR, for all people exposed to any and all hazards.

Figure 1

All Hazards, All Agencies, All People Conceptual Model

FIGURE 3-3 The "all hazards, all agencies, all people" approach to emergency management.

All Hazards

Archeological discoveries show that hazards have been a consistent thread in the fabric of human civilization (Coppola, 2021c). As humans migrated to different locations throughout the world, they were forced to co-exist with hazardous processes in the regions where they desired to settle, live, work, and play (Paton & McClure, 2013a). Over many years, as populations continue to grow in hazard prone areas, hazard analysis would be needed to identify the characteristics and behaviors specific to each hazardous event (Paton & McClure, 2013a).

There are two major groups of hazards—natural and technological. Natural hazards consist of natural processes, such as biological or health-related hazards (COVID-19), hydrologic, and meteorological hazards; whereas technologic hazards are considered "the negative consequences of human innovation" (Coppola, 2021c, p. 124), such as oil spills,

collapses of bridges or rail accidents, computer network failures, radiological/chemical weapons, and terrorism. Knowledge of these hazards has helped disaster agencies in estimating adverse socio-ecological consequences when these hazards interact with humans and their built environments (Paton & McClure, 2013a).

The primary emphasis of the All Hazards Domain is the importance of adopting a broad proactive preparedness approach that doesn't limit emergency preparedness behaviors to prior disaster experiences but to the possibility of experiencing all hazards (Fitzpatrick, 2016). An All Hazards approach is needed in modern disaster risk reduction because two primary hazardous events can occur simultaneously or secondary hazards can be triggered (Coppola, 2021c). For example, a powerful Atlantic hurricane can trigger secondary catastrophic flooding in coastal communities. This can be especially problematic during a pandemic, such as COVID-19, when mass numbers of people are displaced and forced to reside in emergency shelters, thus increasing their exposure and risk to a biological hazard.

All Agencies

The All Agencies Domain reflects the involvement of all governmental, non-governmental, private sector, and volunteer emergency management agencies to be active during all phases of disaster mitigation, disaster preparedness, disaster response, and disaster recovery (Fitzpatrick, 2016). Community based agencies are identified as fire departments, law enforcement, emergency medical services, local public health departments, hospitals, academia, and local volunteer agencies, such as the American Red Cross. These locally based structures are usually familiar with community risks, needs, and capacities (Coppola, 2021d).

A policy brief published by the American Academy of Nursing holds that nurses and professional nursing organizations, in their workplaces and communities, share a responsibility, as well as a:

> Social contract to care for at-risk populations, as those more susceptible to illness, injury, or premature death due to hazards, requires nurses to assure that these at-risk populations are recognized, considered, and engaged in all-hazard preparedness and response at the community level. (Couig et al., 2021, p. 699)

The All Agency dimension contributes to CDR by offering critical community-based disaster related services with highly competent and knowledgeable teams that are able to make decisions that limit social disruption (Pfefferbaum et al., 2008). There is a desperate need to advance disaster nursing science, with nurses as agency leaders, having more nurses on boards of emergency management response teams, and disaster nursing curriculums being offered at all levels in order to ensure at risk patient populations are identified and considered in emergency preparedness agency planning.

All People

The evolution of the All Hazards, All Agencies approach to the All Hazards, All Agencies, All People Conceptual Model reflects a desire for sustainable social capacity building (Fitzpatrick, 2016). The original All Hazards, All Agencies model did not include the All People Domain and the addition provides an opportunity to include community members in developing holistic processes that share the responsibility of building CDR (Fitzpatrick, 2016). Fitzpatrick (2016) proposed that by expanding the All Hazards, All Agencies emergency management model to include All People creates a more inclusive, holistic approach to measuring CDR, which is context dependent, and places a strong emphasis on the shared responsibility of

preparedness on individuals, families, households, communities, and all agencies. According to

Herbert (2014) "the weakest link in many risk management strategies has been the lack of

involvement from the local people" (p. 10).

Pfefferbaum et al. (2008) also support that processes that foster individual resilience,

such as connectedness, communication, access to material and human resources, and support

also enhance CDR. If this is true, then CDR is a key strategy for individual or HEP and requires

all agencies to be aware of the local risks and vulnerability that all people in their community

face (Fitzpatrick, 2016). This statement echoes one of the public health-policy failures identified

by Lichtveld (2018), such that previous disaster experiences have taught us that we have ignored

the chronic stressors that individuals and communities manage on a daily basis. For example,

Lichtveld (2018) points out that Hurricane Katrina victims faced a "triple threat burden: historic

health disparities, persistent environmental health risks, and living in a disaster-prone area" (p.

28).

This new conceptual model stresses the value that all community members bring to

emergency preparedness. The All People Domain includes (a) individuals who are healthy and

living with chronic health conditions (Bethel et al., 2011; Eisenman et al., 2009; Heagele et al.,

2020; Kurkijian et al., 2017; Strine et al., 2013; Uscher-Pines et al., 2009); (b) all ages across the

lifespan, but especially children and elderly individuals (Killian et al., 2017; Malmin, 2021;

Zamboni & Martin, 2020); (c) all races and ethnicities, including English and non-English

speaking individuals (Clay et al., 2020; DeBastiani et al., 2015; Gargano et al., 2015; Glik et al.,

2014; (d) people of all socioeconomic status (DeBastiani et al., 2015; Lichtveld, 2018; McNeill

et al., 2020a); (e) veterans and civilians (Der-Martirosian et al., 2014); (f) all genders, including

women (Ekenga & Ziyu, 2019; Zamboni & Martin, 2020); and (g) people who are pet owners,

who may be unwilling to evacuate their household during a disaster (Baker et al., 2018). This is not an exhaustive list but a reflection of some of the vulnerable populations commonly identified in the literature.

Individual Preparedness

There is an assumption that the more people engage in HEP activities, the less harm they will incur when a destabilizing event hits (Bodas, 2019; McNeill et al., 2018; Nukpezah & Soujaa, 2018). Levac and colleagues (2012) offer a stipulative definition of preparedness, with a shared relationship with the concept of resilience–the cornerstone of disaster preparedness. Their relational statement of preparedness is "identifying the contextual issues and conditions which contribute to vulnerability, as well as the individual and collective strengths to respond effectively to an adverse situation" (Levac et al., 2012, p. 727). As risk to environmental and sociopolitical factors escalates, there is a greater need for multidisciplinary efforts to apply resilience promoting interventions, such as HEP, to mitigate adverse outcomes (McNeill, 2014).

Mitigation, Preparation, Response, and Recovery

The emergency management cycle consists of four phases–mitigation, preparedness, response, and recovery (Fitzpatrick, 2016). Mitigation and preparedness efforts take place in the pre-disaster phase, while response efforts occur during the disaster, and recovery takes place in the post-disaster phase (Markenson & Losinski, 2019). Mitigation, or prevention, is aimed at reducing the likelihood or consequences of a hazard (Coppola, 2021b). For example, land use planning may prohibit general contractors from building homes in known high-risk flood zones. Preparedness during the pre-disaster phase involves equipping all people and all agencies, who may be affected by a hazard, with actions, plans, supplies, and resources that are needed for survival during and after a disaster, when response and recovery agency services may not be

readily available or safe to be delivered (Coppola, 2021b). The response phase reflects actions taken by people and agencies during a disaster and in the post-disaster phase with the intent to prevent further injury, damages, or economic loss (Coppola, 2021b). Finally, the recovery phase, the longest emergency management phase, begins immediately after the disaster hits and can last for months or years (Coppola, 2021b).

All four of these emergency management phases play a critical role in disaster risk reduction. In the All Hazards, All Agencies, All People Model, effective preparedness strategies will be reflected by the quality of engagement between all people and all response and recovery agencies (Paton & McClure, 2013b). Fitzpatrick (2016) further describes the overlap of collaborative activities between All People and All Agencies in a community as (a) supported community self-reliance and (b) collaborative community resilience building.

Supported Community Self-Reliance

The Supported Community Self-Reliance Domain suggests there is a positive relationship between self-sufficiency and CDR; as self-sufficiency increases so does CDR (Fitzpatrick, 2016). Self-reliance refers to an individual's ability to rely on themselves as opposed to outside agencies or other people. Wilcox et al. (2021) suggest that an attribute of HEP is that it is a deliberate micro-level disaster risk reduction strategy to adapt, manage, and recover from a hazardous event with the adoption of action- and resource-specific preparedness activities. Consequences of such HEP actions are: (a) increased situational awareness; (b) increased capacity for self-sufficiency; (c) decreased disaster risk; (d) increased disaster-related survivability; and (e) increased disaster-related resilience (Wilcox et al., 2021). The success of the larger disaster preparedness unit depends on the success of the smaller HEP subsystems (Wilcox et al., 2021). For instance, if a neighborhood shares HEP knowledge and resources, a

greater number of people will be prepared for a hazard. As a result, this community area may be more self-reliant in the immediate time period after the disaster and will allow agencies to assist other community members in need.

Collaborative Community Resilience Building

The Collaborative Community Resilience Building Domain is a community-based approach to engage and empower diverse community members to be active participants in disaster preparedness (Fitzpatrick, 2016). This approach reflects the key elements underpinning community-based participatory research (CBPR), such as: (a) community as a unit of identity-an aspect of collective and individual identity; (b) community strengths and assets are valued; (c) equitable partnerships; (d) capacity building and co-learning; (e) mutual benefit of research findings for both community and academic partners; (f) CBPR addresses relevant public health concerns with a socioecological perspective; (g) systems development (micro- and macro-level systems); (h) knowledge democracy; (i) commitment to sustainability; (j) CBPR embraces cultural humility (Israel, 2018).

Social networks have also been identified as playing an important role in health outcomes, including illnesses and mortality (Johnson et al., 2010; Smith & Christakis, 2008). The United Nations Office for Disaster Risk Reduction (UNDRR) (n.d.) proposed that since we cannot control disasters, we need to understand how socioecological factors exacerbate conditions of exposure and vulnerability. This study recognized the interdependence between individuals, their health, and the social networks where they live, work, and play and how these factors may influence emergency preparedness behaviors. Paton and McClure (2013c) assert that the development of individual interpretations of disaster risk, preparedness, and partnership processes are influenced by social and community relationships. Community-academic CBPR

16

research provides community-based agencies and all people a safe place to come together to discuss the challenges that may impede CR building efforts, such as perceived mistrust of local officials or perceived lack of support and resources.

Community Disaster Resilience

Community Disaster Resilience is described as a "critical strategy for disaster readiness" (Fitzpatrick, 2016, p. 65) that reflects a shared responsibility between All People and All Agencies to prepare for All Hazards. In order to collaboratively build community resilience, community self-reliance, and overall CDR, it is important to conduct local-level community assessments, which identifies both community assets and vulnerabilities (Fitzpatrick, 2016). This overlapping All Agencies to All People and All People to All Agencies approach to build CDR, encourages communities to share the ownership of disaster preparedness and ensures that the diversity of the community is reflected in the disaster risk reduction programs and interventions designed. Community Disaster Resilience is considered as the "outcome of an integrated all hazards, all agencies, all people approach" (Fitzpatrick, 2016, p. 66).

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Purpose of the Study

</div>

The primary objective of this descriptive study, using secondary analysis of data collected with the Household Emergency Preparedness Instrument survey (HEPI) (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART) Assessment Survey (Pfefferbaum et al., 2020), was to understand the complex relationships between the All Hazards, All Agencies and All People domains in a local context, by assessing emergency preparedness behaviors, during the disaster response phase of the COVID-19 Pandemic, among residents living in Pitt County, NC, a geographical vulnerable inner coastal plain community. The long-term goal of this research study is to inform the development of community-based disaster risk reduction and

disaster preparedness capacity, as well as overall CDR to all hazards. Prior to this study, these baseline measures had not been studied in Pitt County, NC. An adaptation of the All Hazards, All Agencies, All People Model with associated concepts and research questions for this study can be found in Figure 2.

Figure 2

Research Model: All Hazards, All Agencies, All People Approach to Measure HEP and Perceived CR to Disasters in Pitt County, NC

All Hazards, All Agencies, All People Conceptual Model

Mitigation, Preparation, Response and Recovery

All Hazards | **Perceived** | All Agencies

Community Disaster Resilience

AIM 2. To examine perceived community resilience (CR) to disasters among study participants.

AIM 3. To examine relationships between perceived CDR, disaster-related characteristics, and emergency preparedness among study participants.

Supported Community Self-Reliance

All People

Collaborative Community Resilience Building

AIM 1. To examine household emergency preparedness (HEP) among study participants

Individual Preparedness

FIGURE 3-3 The "all hazards, all agencies, all people" approach to emergency management.

Note. The data for this research study was collected during the COVID-19 pandemic and includes participants self-report of prior disaster experiences. This study measured perceived community disaster resilience. Adapted from "Community Disaster Resilience," by T. Fitzpatrick, in B. W. Clements & J.P. Casani (Eds.), Disasters and public health: Planning and response (2nd ed., p. 65). Elsevier Inc.

Conceptual and Operational Definitions

All People

The All People Domain consists of all people residing in a community, in this case Pitt County, NC, as valuable partners in building CDR, regardless of perceived social or health vulnerability (Fitzpatrick, 2016). The All People variables in this study included (a) HEP, and (b) individual characteristics, such as demographic, socioeconomic, health status data, prior disaster exposure, and perceived tangible and intangible social capital. HEP is essential for individual, family, and CDR, especially among subpopulations that bear a higher burden of risk and vulnerability, such as people with chronic health issues and functional impairments, pregnant women and children (Hendriks et al., 2018).

Household emergency preparedness (HEP)

HEP is defined by Wilcox and colleagues (2021) as a deliberate micro-level disaster risk reduction strategy that includes resource-specific and action-specific preparedness activities, by individual and family household units, with the intent to achieve a level of readiness that strengthens the household's capacity and capability to adapt, manage, and recover from a hazardous event. For this study, HEP was operationalized with the application of the Household Emergency Preparedness Instrument (HEPI) Survey (Heagele et al., 2020).

Individual characteristics included the personal beliefs, values, motivations, and engagement of the people in the research study (Kastelic et al., 2018). In this study, the variable, individual characteristics, was operationalized with the application of both the HEPI (Heagele et al., 2020) and the CART Assessment Survey; Sections B, D, E, and F (Pfefferbaum et al., 2020).

All Agencies

All Agencies are represented in the conceptual model as government, non-governmental, private and volunteer agencies that are involved in the four phases of emergency management: mitigation, preparedness, response, and recovery (Fitzpatrick, 2016). In this study, All Agencies was operationalized with the application of the CART Assessment Survey. The CART survey measured resident's perceptions of local agencies.

Perceived Community Disaster Resilience

CDR is defined as a "community's capacity to adapt, to change, handle disruption, and respond in a positive and timely manner to emergencies, while continuing to sustain critical systems and maintain the community's unique character" (Fitzpatrick, 2016, p. 60). The conceptual definition of CDR more clearly reflects a community's capacity to maintain critical social, economic, and health functions when faced with a hazard (Cutter et al., 2008; Fitzpatrick, 2016). Because the concept of community resilience can describe many different systems, such as environmental and economic resilience in the community setting, this study adopted the concept of CDR, which has a narrower focus. A community's capacity to cope with a disaster is only one dimension of a community's overall resilience (Fitzpatrick, 2016). Furthermore, this study quantitatively measured *perceived* CDR, as assessed by individual community members in Pitt County, and was operationalized with the CART Assessment Survey (Pfefferbaum et al., 2020). It is important to note that the CART Assessment Survey uses the term Community Resilience (CR) to disasters and the All Hazards, All Agencies, All People Conceptual Model uses Community Disaster Resilience (CDR), so for this study, the language remains aligned with the original source as intended by the authors of each, although we assert they represent the same concept because resilience is being assessed in the context of disaster preparedness. Quantitative

evaluation of CDR will assist All Agencies and All People in determining if their community

becomes more resilient overtime to disasters (Chang & Shinozuka (2004).

All Hazards

This research study considered the contextual relevance of the current COVID-19

pandemic and the geographic disaster vulnerability of Pitt County being an inner coastal plains

community near the Atlantic coastline; on disaster preparedness behaviors among residents

living in this study setting, Pitt County, NC. The data for this research study was collected during

the COVID-19 pandemic and includes participants self-report of prior disaster experiences.

Please see Table 1 for a summary of research variables.

Table 1

Summary of Research Variables

Research Aims	Conceptual Domains	Variables	Data Source

Aim #1 To examine household emergency preparedness (HEP) among study participants.	All People & All Hazards Domain	• **IVs:** Demographics, Health Status, and Prior Disaster Exposure
		 • **DV:** HEP
			• HEPI Survey Subscales
			    o Preparedness Action & Planning (PAP)
			    o Disaster Supplies & Resources (DSR)
			    o Special Actions 1 (SA1)
			    o Special Actions 2 (SA2)
			    o Access & Functional Needs (AFN)
			 • CART Section F-Demographics and Individual Characteristics
			 • ComPACT Phase 3: Baseline Survey 2

Aim #2 To examine perceived community disaster resilience (CDR) among study participants.	All Hazards, All Agencies, & All People Domains	• **IVs:** Socioecological factors, Political leadership at the local-level, Health issue importance: Disaster risk reduction and disaster preparedness, Historic trust/mistrust,	• CART Section B-Core Resilience Domains
			    o Connection & Caring
			    o Resources
			    o Transformative Potential
			    o Disaster Management
			    o Information & Communication

		Disaster network adaptive capacities • **DV:** Perceived CDR	• CART Section C-Community Descriptions • CART Section D-Relationships • CART Section E-Activities • HEPI Survey Subscales
Aim #3 To examine relationships between perceived CDR, disaster-related characteristics, and emergency preparedness among study participants.	All Hazards, All Agencies, & All People Domains	• **IVs:** HEP, Personal disaster experiences, Disaster-related characteristics • **DV:** Disaster/ Crisis Plan	• CART Sections B, C, D, E, F • ComPACT Phase 3: Baseline Survey 2

Note: IVs=Independent Variables; DV: Dependent variable. ComPACT Phase 3 = The Pitt County Community

Prevention And COVID-19 Testing (ComPACT) Study (parent study).

Research Aims and Questions

Based on the adapted All Hazards, All Agencies, All People Model, the research aims and

questions for this study were:

Aim 1. To examine household emergency preparedness (HEP) among study participants.

RQ1.1 What is the level of Preparedness Actions and Planning (HEPI PAP subscale),

Disaster Supplies/Resources (HEPI DSR subscale), total General Preparedness (HEPI GP

scale), Access and Functional Needs (HEPI AFN subscale), and Special Actions (HEPI

SA subscale) among study participants?

RQ1.2 What is the relationship among HEPI subscale and total scores, personal

experience of a disaster, level of concern for disasters/crises that could affect the

community, having a personal disaster plan, gender, and age?

Aim 2. To examine perceived community disaster resilience (CDR) among study participants.

RQ2.1 What is the level of perceived CDR as measured by the five domains of CDR

from the Communities Advancing Resilience Toolkit (CART), percentage of positive

responses to the CDR items comprising the five CDR domains, and relationships among the five domains?

RQ2.2 What is the relationship between the perceived CDR domains and (1) study participant demographic characteristics to include gender, age, and home ownership; (2) CART items assessing participant descriptions of their community, participant self-descriptions and relationships to their community, and participation in social/community activities; and (3) CART items assessing reasons for living in their community and sources of connection to their community?

Aim 3. To examine relationships between perceived CDR, disaster-related characteristics, and emergency preparedness among study participants.

RQ3.1 What is the relationship between the perceived Core CR domains, disaster-related characteristics, and emergency preparedness among study participants?

RQ3.2 What is the relationship between perceived CART Core CR domain scores, HEPI subscale scores, and personal disaster experience (CART Section F26) in predicting whether a study participant has a disaster/crisis plan?

Relationships Between the All Hazards, All Agencies, All People Domains

Organizing HEP and perceived CDR knowledge into a framework based on dynamic contextual and relational assumptions, the following statements are proposed: (a) higher scores of HEP and higher levels of perceived CDR, may result in lower disaster-related risk in both the short- and long-term post-disaster phases due to effective and efficient emergency preparedness at both the individual, and agency/community level; (b) higher levels of HEP and lower perceived CDR may result in lower disaster-related risk in the short-term phase but higher disaster-related risk in the long term phase due to ineffective or inefficient agency processes at

the agency/community level; (c) lower levels of HEP and high perceived CDR may result in lower disaster-related risk during both the short and long-term post-disaster phases due to effective and efficient emergency preparedness processes at the agency/community level, despite ineffective emergency preparedness at the individual level; and (d) lower levels of HEP and lower levels of perceived CDR may result in overall higher disaster-related risk in both the short and long-term post-disaster phases due to ineffective and/or inefficient emergency preparedness at the individual and agency/community level.

Significance & Innovation of the Study

Disaster-related disruptions in communication, food, water, healthcare, and transportation infrastructure services, further threatens the health of vulnerable populations residing and working in geographically vulnerable regions (Dargin & Mostafavi, 2020). Research findings demonstrate the uneven geographic distribution of natural disasters, high disaster exposure rates, and adverse health outcomes in certain vulnerable communities (Lowe et al., 2019). Furthermore, some subpopulations are more sensitive to climate injustices, such as children, the elderly, and people with chronic health conditions (Davis et al., 2019). Disaster displacement further complicates their ability to meet daily self-care needs such as access to clean water and food, a place to sleep, and recovering lost or damaged medications, equipment, or supplies (Gillis et al., 2018). High-risk, highly vulnerable subpopulations require priority attention as mortality, morbidity, injury, and other disaster-related health impact rates can be minimized with comprehensive high-risk prevention, protection, mitigation, response, and recovery plans (Maini et al., 2019).

This dissertation research is innovative in that it represents a substantive departure from the status quo by (a) being the first study to measure local-level HEP and perceived CDR to

disasters, during the disaster response phase of the COVID-19 Pandemic, in Pitt County, NC; (b) presenting an opportunity for interprofessional healthcare providers to collaborate in establishing preliminary local-level emergency preparedness and CDR data that can be used for future community-based participatory research studies; and (c) generating local disaster preparedness knowledge that will benefit all people and all agencies in Pitt County and serve as an exemplar for local disaster preparedness assessment. Stallings (2002) asserts that "the uniqueness of the circumstances of research varies as a function of the phase of the disaster process one is studying" (p. e13). This dissertation study measured emergency preparedness behaviors and perceived community resilience during the *disaster response phase* of the COVID-19 Pandemic. To clarify, the disaster response phase is described as the most complex phase of emergency management and includes critical actions "aimed at limiting injuries, loss of life, damage to property and the environment, and economic impacts that are taken before, during, and immediately after a hazard event" (Coppola, 2021e, p. 395). The likelihood of quality disaster responses depends on disaster preparedness and planning, however, the COVID-19 Pandemic posed a unique situation, given the novelty of the biological hazard.

Disaster preparedness is also highly significant to the nursing profession within an interprofessional context as nurses constitute the largest cadre of professionals in the healthcare workforce. Nurses will play a key role in developing the nation's capacity for disaster risk reduction as *The Future of Nursing 2020-2030*: *Charting a Path to Achieve Health Equity* report calls on nurses to lead and advocate for comprehensive disaster preparedness efforts and safer post-disaster self-recovery, especially among high-risk vulnerable populations (National Academies of Sciences, Engineering, and Medicine, 2021). This study offers an example of how

nurses can lead interprofessional disaster preparedness activities in their local communities which will ultimately add to overall national preparedness efforts and national security.

CHAPTER 2: REVIEW OF LITERATURE

The following chapter reviews the current state of science concerning household emergency preparedness (HEP) and perceived community disaster resilience (CDR). Adopting an All Hazards, All Agencies, All People lens to examine the relationship of individual HEP to CDR requires an understanding of the complexity of the reciprocal relationships between human societies and natural ecosystems (Ungar et al., 2020). Household emergency preparedness is essential for individual, family, and CDR, especially among subpopulations that bear a higher burden of risk and vulnerability, such as people with chronic health issues and functional impairments, pregnant women and children (Hendriks et al., 2018). Collectively, HEP, CDR, and overall disaster risk reduction is necessary for national homeland security (McNeill et al., 2018). It is hypothesized that by identifying and measuring protective factors within the All People and All Agencies domains that enhance HEP, the smallest unit of analysis in the disaster preparedness system, larger units will benefit due to the reciprocity of interdependent relationships.

Methods

The Whittemore and Knafl (2005) integrative review methodology was used to frame this review. The integrative review method examines diverse empirical and theoretical literature related to a phenomenon of interest utilizing five specific review strategies: (a) problem identification; (b) literature search; (c) data evaluation; (d) data analysis; and (e) presentation (Whittemore & Knafl, 2005). The purpose of this integrative review was to systematically search heterogenous peer-reviewed HEP and CDR literature, published between 2003 and 2021 to identify, evaluate, analyze, and summarize primary sources of literature. To attain these overall objectives, the following three aims were:

Aim 1: To identify the protective and risk factors within the All People domain that enhance or impede HEP levels.

Aim 2: To identify protective and risk factors within the All Agencies domain that enhance or impede perceived CDR to disasters.

Aim 3: To describe the interdependent relationships between HEP and CDR.

While examining the literature, factors within the All People and All Agencies domains were considered protective if the factor or dimension were perceived to enhance levels of HEP or CDR; or a risk factor if it was perceived to impede levels of HEP or CDR. The significance of this review is the identification and understanding of knowledge patterns and propositional relationships (Webber & Newby, 2015) between HEP and perceived CDR. The role of CDR is especially important in the field of nursing due to a growing concern for the relationships between the social determinants of health, environmental hazards, and human health (Bennett et al., 2018; CDC, 2020; Ferreira et al., 2018). The outcomes of this literary analysis inform the study design and analysis of the complex relationships between the All Hazards, All Agencies, and All People domains in a local context, among residents living in Pitt County, NC, a geographical vulnerable inner coastal plain community.

Design

The integrative review methodology was chosen over review methods because of the ability to include both experimental and non-experimental quantitative, qualitative, and mixed methods studies. Another reason is due to the evolving complex interdependent relationships between smaller units of disaster preparedness analysis, like HEP, with larger units of analysis, such as community disaster preparedness, and overall CDR. The appeal of the integrative review methodology with an evolving concept is that it provides a broad overview of different types of

literature when progressing through the stages of review: (a) problem identification, (b) literature search, (c) data evaluation, (d) data analysis, and (e) presentation (Whittemore and Knafl, 2005). Overall, the integrative review provides nurse-led disaster preparedness research teams a "comprehensive portrayal of complex concepts, theories, or health care problems of importance to nursing" (Whittemore and Knafl, 2005, p. 548).

Literature Search Methods

In order to develop a comprehensive understanding of the complex interdependent relationships between HEP and CDR, several databases were searched including the Cumulative Index of Nursing and Allied Health (CINAHL), PsycInfo, and PubMed. The key search terms were developed prior to initiating database searches and were refined as needed. The CINAHL search terms included: TI household emergency preparedness OR TI household preparedness OR TI household disaster preparedness OR TI disaster related community resilience. The abbreviation TI stands for *terms in the title*. PsycInfo search terms included: household emergency preparedness OR household preparedness OR household disaster preparedness OR disaster related community resilience. The search terms for PubMed included "household emergency preparedness" [tiab] OR "household preparedness" [tiab] OR" household disaster preparedness" [tiab] OR "household adaptive capacity" [tiab] OR "household and individual resilience" [tiab] OR "disaster related community resilience" [tiab] "Disaster vulnerable populations" [tiab] OR "Disaster household risk reduction" [tiab] OR "Mitigation of disaster related household risk" [tiab]. The abbreviation tiab stands for *limit to title or abstract*.

Inclusion and Exclusion Criteria

This integrative review was specific to peer reviewed literature published between 2003-2021 and written in English. This time period coincides with powerful natural disasters that

impacted socioecological systems on the east coast of the U.S. During these 18 years, NC alone experienced 24 Major Disaster Declarations, including hazards such as, the COVID-19 pandemic, hurricanes, tropical storms, flooding, landslides, mudslides, tornadoes, and even two severe winter storms (FEMA, n.d. b). Because there are increasing aggregate trends in disaster frequency, severity, and cost in this country (Brusentsev & Vroman, 2017; DHS, 2021a; Smith & Katz, 2013), all HEP and CDR studies conducted outside the U.S. were excluded. Literature reviews were not included in this review.

Data Evaluation

Whittemore and Knafl (2005) consider data evaluation of diverse primary resources for an integrative review, a complex process, that requires attention to the quality standards used for various research designs. The primary resources in this review were divided by research design and level of analysis. Therefore, different critical appraisal tools were used for the quantitative, qualitative, and mixed-methods subgroups. These appraisals are discussed in more detail below.

Quantitative Appraisal

The McMaster's Guidelines for Critical Review Form: Quantitative Studies (Law et al., 1998) was used for critical appraisal of selected journal articles and articles were included in this review: (a) if the study purpose was clearly stated and was relevant to the aims of this integrative review; (b) if a literature review was conducted and supported the researchers' aims and research questions; (c) no matter the research designs and their respective limitations due to the small amounts of research examining both HEP and CDR; (d) if research biases were assessed to the best of the author's ability; (e) if sample size, interventions, outcomes, results, and implications were reviewed.

Qualitative and Mixed-Methods Appraisal

The American Psychological Association's (2020) Journal Article Reporting Standards for Qualitative Research (JARS) was used to assess the methodological integrity of the qualitative studies in this review. The qualitative articles in this review were assessed for: (a) research design; (b) data collection strategies; (c) data analysis strategies, including validity checks with analyst triangulation; (d) researcher expertise with study phenomena; (e) sample size and participant characteristics. The search results produced three qualitative studies and one mixed-methods studies; all were included in this review (Diekman et al., 2007; Heagele et al., 2020; McNeill et al., 2020a; Zidek et al., 2014). In addition, all research studies were assessed for level of research analysis, such as at national, state, and local-levels; see Table A1.

The PRISMA (2021) flow diagram was used to illustrate studies screened, sought for retrieval, and assessed for eligibility. Initial search results based on previously identified key search terms and inclusion/exclusion criteria produced n=90 articles. After duplicate articles, literature reviews, and studies conducted outside the U.S. were excluded, n=21 studies were considered eligible for this integrative review. Five additional articles were hand searched, and one author was contacted via email to obtain a copy of the study. A total of n=26 articles were included in this review; see Appendix B for the PRISMA Flow Diagram.

Data Analysis

The data analysis stage in an integrative review is described as an evolving process and is considered by Whittemore and Knafl (2005) to be an error prone stage, requiring a scientist to declare a *systematic analytic method* before the review is conducted. Because the purpose of this review was to identify and measure protective and risk factors, within the All People and All Agencies Domains, that enhance or impede HEP, the smallest unit of analysis in the disaster

preparedness system, so that larger units will benefit due to the reciprocity of interdependent relationships, primary literature resources needed to be analyzed accordingly. A matrix method was used to structurally organize selected primary literature resources for individual characteristics, methodological design, conceptual or theoretical framework, independent and dependent variables, Evidence Hierarchy (Polit & Beck, 2021a), level of disaster preparedness analysis: national, state, or local-level. Subsequent quantitative, qualitative, and mixed-method submatrices were created to assess dominant methodologies examining HEP and CDR, and to document reported individual and community factors that enhanced levels of HEP and CDR, as well as factors that are reported to impede levels of HEP and CDR.

Results

After comparing across all primary literature sources, 2 major themes were identified. According to the All Hazards, All Agencies, All People Conceptual Model, the first theme, *individual factors*, is represented by the *All People* Domain (Fitzpatrick, 2016), and in this review will include: (a) individual characteristics, such as demographics, health status data, prior disaster exposure, perceptions of tangible and intangible resources, and motivations to participate in emergency preparedness activities; and (b) actual HEP behaviors. The next theme includes *community factors*, is represented by the All Hazards, All Agency, Collaborative Community Resilience Building, Supported Community Self-Reliance and Community Disaster Resilience domains in the conceptual model. Individual and community factors were considered for each article by using a within-case and cross-case analysis method (Miles et al., 2020).

Characteristics of Studies

The studies (n=26) in this integrative review were largely quantitative (22), with a few qualitative studies (3), and only one mixed-method study. The studies were initially group by

research design: (a) quantitative: 11 out of 22 studies were secondary analyses; non-experimental descriptive (6/22), non-experimental univariate descriptive (1/22), non-experimental retrospective (1/22), quasi-experimental (2/22), experimental random assignment (1/22); (b) qualitative: descriptive (3/3); and (c) a single mixed methods design, which included a predominant quantitative, nonexperimental, descriptive design with qualitative open-ended survey questions. Level of analysis for this review revealed that 54% of the studies were local-level, 35% were national-level, and 12% were state-level research studies; see Table A1.

Quantitative

Forty-five percent (45%) of the quantitative studies were secondary analyses. There were 9 secondary analyses of national survey data sets including (a) the 2006-2010 Conditions and Household Preparedness for Public Health Emergencies: Behavioral Risk Factor Surveillance System (BRFSS) (Bethel et al., 2011; DeBastiani et al., 2015; DerMartirosian et al., 2014; Ekenga & Ziyu, 2019; Ko et al., 2014; Strine et al., 2013;); (b) the 2008 General Social Survey (Nuzkpezah & Soujaa, 2018); (c) the 2010 Health and Retirement Study's: Emergency Preparedness Module Survey (Killian et al., 2017); and (d) the 2013 and 2017 American Housing Survey (Malmin, 2021). There were 2 studies including secondary analyses of state-level surveys: (a) the Public Health Response to Emergent Threats random digit-dial Survey (Eisenman et al., 2009); and (b) the 2016 Community Assessment for Public Health Emergency Response (CASPER) Survey (Ferguson et al., 2019).

Non-experimental Descriptive Studies: Local-Level.

A comparison across the primary quantitative sources, conducted at the local-level, revealed patterns and relationships from an individual or household perspective in relation to a variety of perceived individual or household vulnerabilities. For example, Hung (2017)

conducted a study with married, heterosexual couples living in Sarasota County, FL to examine the relationship between levels of HEP, preparedness decision making stages, and household and individual characteristics. Research findings indicate that households with joint decision making had high levels of preparedness.

Equally important, Gargano et al. (2015) sought to better understand how prior disaster experiences and population characteristics, such as 9/11-related post-traumatic stress disorder (PTSD), medical conditions, and living in an evacuation zone, influence subsequent levels of household emergency preparedness, among residents living in the Tri-State area of NY, NJ, and CT. Study findings indicate that greater personal preparedness activities were associated with (a) high 9/11 disaster exposure, regardless of PTSD and (b) higher levels of social support. Findings also suggest that 37.5% of respondents were considered "prepared," while only 18.8% of participants had all 8 preparedness items, and the least likely preparedness item was having an evacuation plan (30.2%) (Gargano et al., 2015).

Moreover, McNeill et al. (2018) expanded study variables to hypothesize that a positive relationship exists between participant's overall preparedness levels (dependent variable; DV) and independent variables: (a) age, (b) non-minority status, (c) income, (d) education, (e) being male, (f) being married, (g) having children at home, (h) perception of one's own preparedness, (i) prior disaster experience, (j) medical conditions, and (k) HCPs discussing emergency preparedness with individuals with medical conditions. Study findings from this study support a strong positive relationship between participants and healthcare providers who discuss emergency preparedness and participant preparedness levels (McNeill et al., 2018).

Uscher-Pines et al. (2009) conducted a descriptive correlational study to compare preparedness behaviors of households with and without special needs members. Their study was

conducted in southeastern Pennsylvania (PA), and included a stratified random digit dial sample of telephone numbers, N=501 adults, drawn from five southeastern PA counties. A limitation of this study was the extremely low response rate of 0.26. However, the research findings from this study indicate that residents with special needs had greater odds of (a) arranging a place to meet; (b) locating a disaster shelter; (c) packing an emergency evacuation bag; and (d) no differences related to an evacuation route, stockpiling of food and water, nor a written emergency plan (Uscher-Pines et al., 2009).

Lastly, Murti et al. (2014) examined the relationship between HEP and household characteristics (single homes versus multi-unit, children in household, residents >65 years of age, and pet ownership) medical conditions and needs, in Oakland County, MI. Research findings indicate that multi-unit dwellings were less prepared for disasters, having fewer disaster resources and engaging in less disaster planning activities, such as developing an evacuation plan (Murti et al., 2014).

The majority of these non-experimental studies conducted at the local-level examine HEP from the All People perspective and demonstrate how key vulnerabilities may influence preparedness levels. By comparison, McNeill and colleagues (2018) expanded this All People perspective to include All Agencies, such as the role of healthcare providers in enhancing participant levels of preparedness. Less is known about how the overlap between individual emergency preparedness, individual's perceptions of their community, and their community's role in enhancing emergency preparedness and CDR.

Non-Experimental Univariate Descriptive Study: Local-Level.

Although the objective of a non-experimental univariate descriptive study is to describe the frequency of a behavior, such as HEP, it is not to study correlations (Polit & Beck, 2017). A

univariate descriptive study "involves multiple variables, but the primary purpose is to describe the status of each and not to relate them to one another" (Polit & Beck, 2017, p. 206). The Kurkjian et al. (2016) article sought to estimate current household preparedness levels among residents living in Portsmouth VA. This study provides quantitative measurement of the residents' perceived HEP. For example, the residents of Portsmouth VA report that (a) 72% lived in single family households and 28% lived in multiple-unit structures (apartments, condos, and townhouses); (b) they had an evacuation plan (did not have to be written) (70%); (c) had a 3-day supply of food and water (67%); (d) a first aid kit (77%); and (e) heart disease (54%) and obesity (40%) were cited as the most frequent chronic health conditions (Kurkjian et al., 2016). This information was very useful when examining a dynamic, multidimensional concepts like HEP and CDR.

Quasi-Experimental Studies: Local-Level.

Quasi-experimental research designs include studies that usually involve an intervention without the randomization of study participants, such as a control group (Polit & Beck, 2017). This integrative review identified two quasi-experimental studies, conducted at the local-level. Both used a pre- and post-test design to deliver a face to face education intervention to enhance emergency preparedness levels among pet owners in Birmingham Alabama (AL) (Baker et L., 2018) and residents from Seattle Washington (WA), living in an area with high seismic (earthquake) activity (Joffe et al., 2019). Findings from these two studies suggests that agency-based educational offerings within the local context, can enhance preparedness behaviors. Joffe et al., (2019) note that homeownership, as a "sense of agency influences preparedness" (p. 453). Whereas, Baker and colleagues (2018) report that though their educational intervention increased

pet-specific preparedness, it did not reach statistical significance for HEP; suggesting households with pets may put their pet's needs above their own personal needs.

Experimental Random Assignment: Local-Level. In this review there was only one quantitative experimental random assignment study in this review. Glik et al. (2014) conducted an experimental study, using a randomized, longitudinal cohort design with two groups of low-income Latino residents (N=187) from Los Angeles County, California. The participants were randomized in two groups, a high intensity group and a low intensity group. The high intensity group, received face to face discussions on HEP, which were led by trained Latino community health workers, over a 4-week period. The low intensity group received print materials twice in the mail. The findings showed that this community-based disaster preparedness intervention study was effective in increasing HEP, despite low income resource constriction (Glik et al., 2014). Reported limitations of this study included: (a) small sample size; and (b) homogenous participant sample due to respondent-driven sampling technique (Glik et al., 2014).

Potential Bias. Survey designs are appropriate when researchers are interested in answering descriptive, relational, and predictive relational research questions (Creswell & Creswell, 2018). However, self-report surveys have limitations and concern for response bias (Polit & Beck, 2021b). It was found that the sample characteristics, from the studies that conducted a secondary data analyses of the same national-level dataset, the *Conditions and Household Preparedness for Public Health Emergencies: Behavioral Risk Factor Surveillance System (2006-2010)* (Bethel et al., 2011; Ko et al., 2014; DeBastiani et al., 2015; Ekenga & Ziyu, 2019; Strine et al., 2013), were primarily comprised of White, non-Hispanic, educated, employed females, ages 25-54 years of age, who were married and had health coverage at the time of the survey. Sample biases are a concern with these studies as there appears to be an

overrepresentation of a subgroup limiting generalizability of study findings to larger diverse populations (Polit & Beck, 2021c).

Qualitative

The search results produced three qualitative studies and one mixed-methods study. The qualitative sample sizes ranged from 13-33 participants. While the mixed-methods study reported N=128 participants, it is unclear how many participants responded to the open-ended survey questions. The predominant age of participants across the three studies ranged from 50-70 years of age. Two of the studies reported predominant female participants (Diekman et al., 2007; McNeill et al., 2020a) and one reported 60% male participants (Heagele et al., 2020). Demographic information was not available for the mixed-methods study (Zidek et al., 2014). Two out of the three qualitative studies report the use of nonprobability samples (convenience samples) and the mixed-methods study reported the use of a stratified random sampling method for participant recruitment (Zidek et al., 2014).

The study objectives were clearly articulated for all four studies and shared a common interest to better understand homeowners' experiences and perceptions of disaster preparedness. The predominant contexts for these studies included rural, urban, and metropolitan areas in the U.S. Three out of the four studies included participant characteristics that were identified as vulnerable subpopulations, such as (a) elderly and medical frail (Heagele & Pacquiao, 2019); (b) low income, uninsured, or under-insured individuals (McNeill et al., 2020a); and (c) rural dwelling residents who rely on electronic medical equipment in their homes (Zidek et al., 2014).

Overall, all four qualitative/mixed-methods studies in this review identified low levels of HEP contributed to gap between individuals and disaster preparedness, response, and recovery agencies. General consensus among the qualitative researchers (Diekman et al., 2007; Heagele,

2021; McNeill et al., 2020) is a need for local and state-level disaster preparedness education programs, preparedness interventions, and engagement of all people and all agencies to improve disaster outcomes. Another finding from review of these studies is the key importance of not making assumptions of vulnerable populations, as they should not be perceived as helpless. For example, McNeill et al. (2020a) conducted a descriptive qualitative study in rural East Texas to highlight participant experiences in becoming better prepared for emergencies. A convenience sample was recruited from a medical outreach program for low-income, uninsured, or under insured persons (N=13). Participant interviews reflected (a) a readiness to learn more about disaster preparedness; (b) self-reported positive emergency preparedness experiences after engaging with public health disaster preparedness staff and receiving emergency preparedness education materials; and c) increased HEP and situational awareness, despite low economic financial constraints (McNeill et al., 2020a). This qualitative study emphasized the critical importance of local-level qualitative research.

Potential Bias. Qualitative sampling is different from quantitative sampling and tends to be purposive and strategic (Miles et al., 2020). Convenience sampling is common in qualitative research and two out of the three studies reported the use of convenience sampling. Convenience samples with good justification are described as purposive (Bernard et al., 2017). Similarly, Heagele and colleagues (2020) purposively recruited elderly participants from a coastal urban community in New Jersey impacted adversely by Hurricane Sandy.

Outside of sampling there are other areas of qualitative research that are subject to bias. For example, analyst triangulation is a method used to improve the trustworthiness of data analysis, such as when one researcher does not agree with other co-investigators on interpretation

of a finding (Miles et al., 2020). It is unclear how data discrepancies were addressed in these three qualitative studies.

Researcher expertise with the phenomena under study was assessed for all four studies. All three qualitative studies were conducted by researchers considered to be expert content scholars in the field of injury prevention and emergency preparedness. However, the mixed-methods study was conducted by nurse educators and undergraduate nursing students from a College of Nursing from a University based in Pennsylvania (Zidek et al., 2014). One could argue that not all Registered Nurses are disaster experts, but they are frontline experts who care for patient populations who manage chronic health conditions and require home use of electronic medical equipment.

Setting and Sample Sizes

The sample sizes for the quantitative secondary analyses of national level data sets varied considerably ranging from N=1,137 to 104,654. Among the national-level studies that used the BRFSS general preparedness module data sets, there was variation in number of states included for analysis; ranging from 6 to 10 states (Bethel et al., 2011; DeBastiani et al., 2015; Der-Martirosian et al., 2014; Ekenga & Ziyu, 2019; Strine et al., 2013). The three state level studies in this review were conducted in New York, Georgia, and Rural Pennsylvania (Clay et al., 2020; Thomas et al., 2015; Zidek et al., 2014). The sample sizes for the state-level studies ranged from N=439 to 2,000. The quantitative local-level studies ranged in size from N=180 to 4,496. The local-level studies were conducted in Los Angeles County, CA (Eisenman et al., 2009); Oakland County, MI (Murti et al., 2014); NY City (Gargano et al., 2015); Portsmouth, VA (Kurkjian et al., 2016); northwest AR (McNeill et al., 2018); Sarasota County, FL (Hung, 2017); and Fairfax, VA (Ferguson et al., 2019). Prior to this dissertation study, no local-level

study, examining HEP and perceived CDR, had been conducted in eastern NC. The current state of HEP and perceived CDR knowledge was organized by the following: Aim 1: To identify the protective and risk factors within the All People domain that enhance or impede HEP levels; Aim 2: To identify protective and risk factors within the All Agencies domain that enhance or impede perceived CDR to disasters; and Aim 3: To describe the interdependent relationships between domains, HEP, and CDR.

Aim 1: To identify the protective and risk factors within the All People domain that enhance or impede HEP levels.

There were a number of similarities noted across study sample populations. Based on the All Hazards, All Agency, All People Conceptual Model (Fitzpatrick, 2016), studies were analyzed for All People factors, such as (a) individual characteristics, such as disaster risk perceptions, demographics, prior disaster experiences and health status data; and (b) actual HEP behaviors. Individual factors were considered protective if the factor or dimension was perceived to enhance levels of HEP or CDR; or a risk factor if it was perceived to impeded levels of HEP or CDR.

Disaster Risk Perceptions

Buergelt and Paton (2014) propose that understanding people's interpretative processes to prepare for a disaster, such as a stockpiling disaster supplies or developing a communication or evacuation plan requires understanding their interpretation of their ability to accomplish the required tasks. In general, there appeared to be trends related to what disaster resources and what disaster actions were needed to prepare one's household. The consistently reported items were: (a) 3-day supply of water, food, and prescription medication; (b) radio with batteries; (c) flashlight with batteries. An interesting pattern emerged when examining the work of Gargano et

al. (2015) and Thomas et al. (2015), which included personal care and hygiene items, as well as a phone charger in addition to the previously mentioned resource-based items. Personal care and hygiene items would be especially important for households with infants in diapers, people experiencing incontinence, and any kind of pressure ulcers or wounds treated in the home.

Less common resources considered in relation to HEP levels were housing type, owning a vehicle, and a gas-powered generator. Murti et al. (2014) asserts that people living in multi-unit dwelling houses, as compared to single detached homes, are less likely to be able to stockpile emergency preparedness supplies due to limited storage space and building code requirements. Back up gas generators were valued as key protective factors for populations reliant upon electronic medical devices (Zidek et al., 2014).

Action-based HEP variables were described as developing emergency evacuation and communication plans, and organization of important documents (Bethel et al., 2011; Der-Martirosian et al., 2014; Strine et al., 2013). According to Zamboni and Martin (2020) resource-based HEP was often reported as a more common practice as compared to action-based HEP, suggesting that people may perceive the risk of not having key resources greater than certain action-based activities. Uscher-Pines and colleagues (2009) conducted a non-experimental descriptive, correlational study and concluded that people with special needs requiring transportation assistance were more likely to engage in action-based activities than spend time on buying resource-based supplies. There is however, one significant limitation of this study, a response rate of only 26% was reported.

Demographics

Overall, there was general consensus among the research findings that there are subpopulations perceived as high risk: (a) women (Ekenga & Ziyu, 2019; Zamboni & Martin,

2020); (b) children (Malmin, 2021; Zamboni & Martin, 2020); (c) medically frail populations (Heagele et al., 2020); (d) elderly (Killian et al., 2017); (e) people living with disability or functional limitations (Kurkjian et al., 2016; Strine et al., 2013; Uscher-Pines et al., 2009); (f) chronic physical or psychological conditions (Bethel et al., 2011; Eisenman et al., 2009; Strine, et al., 2013); (g) being a pet owner (Baker et al., 2018); (h) ethnic minority (Clay et al., 2020; DeBastiani et al., 2015; Gargano et al., 2015; Glik et al., 2014)); (i) perceived fatalism (all events are due to fate) (Heagele, 2021; Joffe et al., 2019; and (j) low socioeconomic status (DeBastiani et al., 2015; McNeill et al., 2020a).

There was conflicting evidence linking level of HEP with certain sociodemographic characteristics. Some researchers reported age and gender to be a barrier to having adequate emergency preparedness supplies (Enkenga & Ziyu, 2019; Killian et al., 2017) and others reported older age as a protective factor when securing resources for HEP (Gargano et al., 2015; Thomas et al., 2015). For example, survey results for the Thomas and colleagues (2015) study reported higher HEP adoption rates for (a) participants ages 45 years and greater; (b) males; and (c) participants who owned their home. Whereas, Gargano and colleagues (2015) reported older age and higher socioeconomic status related to higher HEP adoption practices. There is insufficient evidence in these studies to support why sociodemographic factors, such as age, gender, and socioeconomic status result in higher HEP adoption rates.

Prior Disaster Experiences and Health Status Data

Other risk-perception factors were identified as prior disaster exposure, perceived higher quality of health and life, perceived ability to engage in preparedness behaviors, and physical and mental health. Higher risk perceptions were considered a protective factor, enhancing higher HEP levels (Gargano et al., 2015; Malmin, 2021). When people perceived the seriousness of a

disaster, had proper preparedness knowledge, and believed they had the capacity and capability

to prepare for a disaster they often demonstrated higher HEP levels (DeBastiani et al., 2015;

Diekman et al., 2007; Gargano et al., 2015; McNeill, 2018; Thomas et al., 2015).

Additional Vulnerable Categories: Perceived Gender-Related Preparedness and Pet Owners.

Two unexpected findings were *perceived* gender-related preparedness items (Hung,

2017) and pet-related preparedness. *Masculine preparedness items* were described as heavy

tools, such as (a) roof anchor, (b) a generator, (c) gas in car, and (d) a fire extinguisher (Hung,

2017). In contrast, feminine *preparedness items* were described as items such as (a) a 3-day

supply of canned food, (b) protective clothing, (c) sleeping bags, (d) extra bedding (Hung, 2017).

It is unclear how gender-related preparedness may enhance or impede a person's willingness to

engage in certain HEP behaviors. Ultimately, Hung (2017) determined that joint decision making

between partners was associated with higher levels of preparedness (Hung, 2017). Baker et al.

(2018) highlighted a unique perspective of the vulnerability of households with pets. They point

out that pet owners are considered a high-risk population because they are less likely to evacuate

during a disaster. A definite relationship between individual factors (All People) and community

factors (All Agencies) was addressed in this study as they relate pet ownership to increased risk

for community disaster relief systems and rescue teams (Baker et al., 2018).

Aim 2: To identify protective and risk factors within the All Agencies domain that enhance or

impede perceived CDR to disasters.

Based on the articles selected for this integrative review, All Agency or community

factors have received less attention than the All People factors previously discussed.

Approximately 23% of the studies addressed community factors when determining levels of HEP

(Glik et al., 2014; Kurkjian et al., 2016; McNeill et al., 2018; McNeill et al., 2020a; Thomas et al., 2015; Zidek et al., 2014). Social, economic, and political dimensions were identified as protective community factors and were described as community-based training programs, state-level disaster preparedness programs, school-based disaster preparedness programs, public health decision makers use of social media and technology platforms to disseminate preparedness and warning messages, and engagement of healthcare providers in disaster preparedness management for people managing chronic health conditions.

Support for community factors were evident in the majority of the studies reviewed, including HEP by housing type (Murti et al., 2014). However, the Zamboni and Martin (2020) article was the only article that addressed levels of HEP in relation to geographic region. Equally important, several studies did address the significance of prior disaster experiences and levels of HEP (Gargano et al., 2015; Heagele, 2021; Malmin, 2021).

Although there were two attempts to discuss the concept of fatalism (Heagele, 2021; Joffe et al., 2019) in relation to HEP, there were limited discussions of the role of faith-based organizations addressing religion and spiritual factors among communities. It is important to understand the importance of this dimension as "spiritual and religious beliefs strongly influence interpretive processes" (Buergelt & Paton, 2014, p. 595). Religious institutions have long been recognized as playing a key role in asset-based community development with an abundance of resources that can be used during an adverse event, such as a disaster (Kretzmann & McKnight, 1993).

Aim 3: To describe the interdependent relationships between domains, HEP, and CDR.

Approximately 54% of the studies in this review mentioned the concept of resilience or CDR. However, none of the studies offered a conceptual definition of resilience or CDR, nor did

they identify an evidenced-based instrument to measure CDR when discussing HEP. Four studies in this review recognized the overlap between HEP and resilience to disasters (Glik et al., 2014; Killian et al., 2017; McNeill et al., 2018; Thomas 2015). Researchers supported that individual preparedness factors are determinants in promoting resilience to disasters (Enkenga & Ziyu, 2019; Glik et al., 2014; Killian et al., 2017; McNeill et al., 2020b).

Discussion

Over the past 18 years, there appears to be a general consensus in multidisciplinary, peer-reviewed, disaster preparedness literature, that examines both HEP and CDR, that despite national preparedness efforts to increase emergency preparedness at the household level, scholars report low states of readiness at the individual/family subsystem levels (Bodas, 2019; Clay et al., 2020; Ferguson et al., 2019; Killian et al., 2017; McNeill et al., 2018; Zamboni & Martin, 2020). The majority of the studies published here in the U.S. between 2003 and 2021, examining HEP and CDR, were quantitative secondary analyses (n=11) of national-level (9) and state-level (2) data sets. These findings support the work of Buergelt and Paton (2014), who report a paucity of disaster research examining relationships between individual and community factors. Moreover, sample biases are a concern with these studies as there appears to be an overrepresentation of a subgroup limiting generalizability of study findings to larger diverse populations (Polit & Beck, 2021a). In this review, the predominant participant demographics included White, non-Hispanic, educated, employed females, ages 25-54 years of age, who were married and had health coverage.

Meanwhile, disaster preparedness scholars suggest certain subpopulations as high risk, including (a) women (Ekenga & Ziyu, 2019; Zamboni & Martin, 2020); (b) children (Malmin, 2021; Zamboni & Martin, 2020); (c) medically frail populations (Heagele et al., 2020); (d)

elderly (Killian et al., 2017); (e) people living with disability or functional limitations (Kurkjian et al., 2016; Strine et al., 2013; Uscher-Pines et al., 2009); (f) chronic physical or psychological conditions (Bethel et al., 2011; Eisenman et al., 2009; Strine, et al., 2013); (g) being a pet owner (Baker et al., 2018); (h) ethnic minority (Clay et al., 2020; DeBastiani et al., 2015; Gargano et al., 2015; Glik et al., 2014)); (i) perceived fatalism (all events are due to fate) (Heagele et al., 2020; Joffe et al., 2019; and (j) low socioeconomic status (DeBastiani et al., 2015; McNeill et al., 2020a). However, only two studies in this review used experimental and quasi-experimental designs to further explore these relationships. For example, Glik et al. (2014) conducted an experimental study with random assignment to assess the effectiveness of a disaster preparedness intervention among low-income Latinos in Los Angeles County. The findings of their study support the importance of using community-based participatory approaches to foster trusting relationships in immigrant and low-income neighborhoods where there is already mistrust for the government, even prior to a disaster (Glik et al., 2014). This review highlights the critical need for more local-level, community-based research, including qualitative, mixed-methods, and quantitative studies, as populations appear responsive to engaging with community stakeholders to develop HEP behaviors and skills.

When considering the work of Baker et al. (2018) about animal ownership, the implications of this work is especially useful for generating disaster preparedness research for agricultural communities, such as eastern NC, where residents may perceive they are unable to evacuate their farms because they do not want to leave their crops, livestock, and livelihoods behind. Animal ownership adds additional vulnerability to rural households who already have less access to healthcare providers and key preparedness resources (Zidek et al., 2014). Language barriers may also prevent effective translation of disaster preparedness information for migrant

farm workers and their families; exacerbating disaster risk for this vulnerable population if they are unable to evacuate the farms where they work and possibly live. Overall, vulnerable populations are considered at higher risk of experiencing adverse disaster outcomes. Rural households have less access to healthcare providers and resources (Zidek et al., 2014). The combination of the many variables across all studies, highlights the complexity of assessing the All People domain.

It appears that conceptual and theoretical ambiguity and current research designs are factors limiting disaster preparedness efforts to accurately measure the All People domain, such personal motivation, belief, and values related to HEP; specifically, among high-risk, vulnerable populations. In order to enhance local public health emergency preparedness efforts to build disaster risk reduction capacity and CDR to decrease mortality and morbidity rates, and to reduce risk of re-traumatization among vulnerable subpopulations, that are highly sensitive to climate injustices, we urgently need to understand the complex social characteristics and relationships between All Hazards, All Agencies, and All People at the local-level. An additional focus on community-based participatory disaster preparedness research is needed to close the knowledge-practice gap between vulnerable populations and disaster preparedness stakeholders. The current state of the science supports a need for HEP, as a risk reduction strategy that enables household adaptive capacity before, during, and after an adverse ecological event, enhancing community and national resilience to disasters.

The outcome of this integrative review is a need to expand our understanding of HEP and CDR beyond the predominant individual characteristics of White, educated, females that are >40 years of age. Expanding qualitative and mixed-methods studies at the local level can help disaster preparedness researchers to develop a richer understanding of the lived experiences of

ethnic minority and diverse populations living in high-risk disaster regions. Community-based participatory research is a means to improve the HEP and CDR scientific knowledge base.

The results of this integrative review are consistent with Buergelt and Paton (2014) proposal that low preparedness rates may be related to the paucity of disaster research examining the interdependent systemic relationships between the All People and All Agencies domains (i.e., individual and community domains). National-level data serves a salient purpose in providing us with a broad snap-shot of disaster preparedness in the U.S. However, in order to promote equitable disaster-related CR for all populations, more local-level community-based disaster preparedness research is needed in order to better understand contextually and culturally relevant emergency preparedness protective factors that promote both the capacity of All People and All Agencies to adapt during adverse hazardous events.

Conclusion

Household emergency preparedness, an individual disaster risk reduction strategy with a reciprocal impact on communities, will be critical as the severity and frequency of natural disasters continues to escalate. A deeper understanding of the relationships between All Hazards, All Agencies, and All People is needed to develop sustainable HEP interventions and programs in order to build overall CDR. Nurses will play a key role in developing the nation's capacity for disaster risk reduction as *The Future of Nursing 2020-2030*: *Charting a Path to Achieve Health Equity* report calls on nurses to lead and advocate for comprehensive disaster preparedness efforts and safer post-disaster self-recovery, especially among high-risk vulnerable populations (National Academies of Sciences, Engineering, and Medicine, 2021). An additional focus on community-based participatory disaster preparedness research is needed to close the knowledge-practice gap between vulnerable populations and disaster preparedness stakeholders. The

outcomes of this integrative review support HEP, as a risk reduction strategy that enables

household adaptive capacity before, during, and after an adverse ecological event, enhancing

community and national resilience to disasters.

CHAPTER 3: METHODS

The primary objective of this descriptive study, using secondary analysis of data collected with the Household Emergency Preparedness Instrument survey (HEPI) (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART) Assessment Survey (Pfefferbaum et al., 2020), was to understand the complex relationships between the All Hazards, All Agencies and All People domains in a local context, by assessing individual-level emergency preparedness behaviors, such as HEP (Heagele et al., 2020) and perceived CDR (Pfefferbaum et al., 2020), among residents living in Pitt County, NC, a geographically vulnerable inner coastal plain community. The chosen research method was a secondary analysis of data from the ComPACT study, an ongoing community-based cohort study conducted in Pitt County, NC.

Secondary data analysis has not always been considered a popular method among nurse researchers (McArt & McDougal, 1985; Dunn et al., 2105). Polit and Beck (2021d) define a secondary analysis as the reanalyzing of existing data to answer different research questions. Over the last three decades, a paradigm shift has occurred with an uptick in the use of secondary analysis of existing data sets (O'Connor, 2020). There appears to be several factors responsible for the growing popularity of secondary analysis in nursing research.

The explosion of electronic data and electronic health records has for one, given a variety of nurse researchers opportunities to examine a multitude of health-related databases and large-scale surveys (Feeg & Rienzo, 2015). Open data initiatives and policies have also enhanced the use of secondary data analysis (O'Connor, 2020) and has increased funders returns on their research investments (Conway & VanLare, 2010; Weston et al., 2019). The COVID-19 pandemic is another situation that has encouraged the analysis of existing data sets. Unprecedented nation-wide shutdowns challenged traditional research strategies and

unexpectedly positioned secondary data analysis as "ripe for consideration when using research methods that require close physical proximity simply are not possible" (Spurlock, 2020, p. 245).

The phenomena of teamwork involving multiple disciplines has also evolved our national healthcare landscape influencing health research, service, education, and policy (Brownson et al., 2018; Choi et al., 2006; Higginsons & Lake, 2017). Conceptual ambiguity among terms, such as multidisciplinary, interdisciplinary, interprofessional, and transdisciplinary (Choi et al., 2006), necessitates the need to define the collaborative efforts of this research study. Interprofessional teamwork is defined as "a type of work involving different health or social care professionals who share a team identity and work together closely in an integrated and interdependent manner to solve problems, deliver services, and enhance health outcomes" (Institute of Medicine, 2015, p. xii). Interprofessional teamwork is the best descriptor of the disciplinary efforts of the public health epidemiologists, nurses, statistician, and pediatrician from the parent observational study, the Pitt County Community Prevention And COVID-19 Testing (ComPACT) Study, that generated the data for this secondary analysis.

The ComPACT study is a community-based cohort study conducted in Pitt County, NC from September 2020 through August 2022. The study is led by East Carolina University (ECU) Department of Public Health with funding from the NC Department of Health and Human Services (NC DHHS). The primary objective of the parent study is to describe community impact and behaviors related to a biologic hazard, COVID-19, as the pandemic naturally occurred. Using an interprofessional approach to conduct a secondary analysis of a parent study exploring the health impacts of a biologic hazard, increases perspectives of disaster risk reduction and addresses some of the methodological challenges related to disaster research, such as (a) limited time for field data collection, (b) limited access to disaster participants, (c) limited

generalizability, and more specifically (d) the overlap of scholars interested in studying a physical hazard and society (Donner & Diaz, 2018).

In order to enhance All Agencies and All People's emergency preparedness efforts to build disaster risk reduction capacity and CDR, to decrease mortality and morbidity rates, and to reduce risk of re-traumatization among vulnerable subpopulations, that are highly sensitive to climate injustices, we urgently need to understand the complex social characteristics and relationships in the context of perceived CDR. The term CDR, distinguishes it from other applications of resilience in other systems, such as environmental and economic resilience in the community setting. Utilizing a holistic All Hazards, All Agencies, All People Model (Fitzpatrick, 2016), to assess HEP and perceived CDR, aids our understanding of disaster-related interdependent systemic relationships at the local level.

The integrative review results for this study were consistent with Buergelt and Paton (2014) proposal that low preparedness rates may be related to the paucity of disaster research examining the interdependent systemic relationships between individual and community factors (i.e., All People and All Agencies). National-level data serves a salient purpose in providing us with a broad snap-shot of disaster preparedness in the U.S. However, to promote equitable CDR for all populations, more local-level community-based disaster preparedness research is needed in order to better understand contextually and culturally relevant emergency preparedness protective factors that promote both individual and community capacity to adapt during adverse hazardous events. This study was a secondary analysis of existing data from a public health study conducted in Pitt County NC, to establish quantitative baseline assessment of individual HEP and perceived CDR.

Design

This quantitative assessment of Pitt County offers the foundational information needed for future disaster preparedness research processes. The chosen research method was a secondary analysis of data from the ComPACT study, an ongoing community-based cohort study conducted in Pitt County, NC. The research aims and questions were:

Aim 1. To examine household emergency preparedness (HEP) among study participants.

> **RQ1.1** What is the level of Preparedness Actions and Planning (HEPI PAP subscale), Disaster Supplies/Resources (HEPI DSR subscale), total General Preparedness (HEPI GP scale), Access and Functional Needs (HEPI AFN subscale), and Special Actions (HEPI SA subscale) among study participants?

> **RQ1.2** What is the relationship among HEPI subscale and total scores, personal experience of a disaster, level of concern for disasters/crises that could affect the community, having a personal disaster plan, gender, and age?

Aim 2. To examine perceived community disaster resilience (CDR) among study participants.

> **RQ2.1** What is the level of perceived CDR as measured by the five domains of CDR from the Communities Advancing Resilience Toolkit (CART), percentage of positive responses to the CDR items comprising the five CDR domains, and relationships among the five domains?

> **RQ2.2** What is the relationship between the perceived CDR domains and (1) study participant demographic characteristics to include gender, age, and home ownership; (2) CART items assessing participant descriptions of their community, participant self-descriptions and relationships to their community, and participation in social/community

activities; and (3) CART items assessing reasons for living in their community and sources of connection to their community?

Aim 3. To examine relationships between perceived CDR, disaster-related characteristics, and emergency preparedness among study participants.

> **RQ3.1** What is the relationship between the perceived CDR domains, disaster-related characteristics, and emergency preparedness among study participants?

> **RQ3.2** What is the relationship between perceived CART Core CR domain scores, HEPI subscale scores, and personal disaster experience (CART Section F26) in predicting whether a study participant has a disaster/crisis plan?

Strengths and Limitations of Design

Disaster research has identified several methodological and ethical challenges, such as (a) timing of data collection (rapid field entry); (b) access to disaster participants; (c) generalizability of findings that are context and hazard specific; and (d) the overlap of interdisciplinary scholars trying to better understand the impacts of hazards on natural and man-made environments, as well as on human health (Donner & Diaz, 2018). Furthermore, Kelly et al. (2019) recognize "diverse disciplinary languages" (p. 149) and time constraints as a barrier to interprofessional approaches to socio-ecological research. A secondary analysis of an existing data set that measured CDR to disasters offered this doctoral student, as part of an interprofessional team, an exploratory opportunity to: (a) develop a shared language with researchers outside their discipline; (b) enhance a mindset that is open to diversity; (c) engage in the iterative cycles of problem solving across the all research phases; and (d) be an interprofessional research champion (Kelly et al., 2019)

Strengths

There are several major benefits to conducting a secondary analysis, such as cost-effectiveness, time efficiency, and convenience associated with not having to recruit participants and collect data (Johnston, 2014). Some researchers believe that a secondary analysis decreases risk and burden to study participants (Doolan & Froelicher, 2009; Dunn et al., 2015). This can be true for individuals and families who have experienced a hazardous event and possibly suffered physical and psychological trauma.

Another benefit of a secondary analysis design is the ability to analyze a larger dataset, that might not be feasible in a dissertation study. In this study, the parent study was supported with state level funding and conducted by an experienced interprofessional public health research team. This level of funding and interprofessional collaborative practice can provide a rich learning experience for health professional graduate students (Dunn et al., 2015; Higginson & Lake, 2017). There were other benefits related to this research study, including the opportunity to: (a) conduct a local-level assessment of HEP and perceived CDR; and (b) engage in an interprofessional public health emergency preparedness approach.

Stalling (2002) asserts that what makes disaster research unique is not so much the methodologies employed by a researcher but "a function of the phase of the disaster process one is studying" (p. e13). This research study examined secondary survey data, collected at the local-level, during the disaster response phase of the COVID-19 pandemic.

Local-Level Assessment.

Conceptual and theoretical ambiguity, as well as methodological challenges were noted in the literature review for this study. This innovative study sought to fill a scientific gap in the disaster risk reduction and public health emergency preparedness with the secondary analysis of

a local-level data set, collected in eastern NC, that included the validated measures of HEPI survey (Heagele et al., 2020) and the CART Assessment Survey (Pfefferbaum et al., 2020), in order to understand the complex relationships between the All Hazards, All Agencies and All People domains in a local context. These validated measures were used to standardize measurement of HEP and CDR and avoid further ambiguity in measuring these concepts, as noted in the review of literature for this study. Comprehensive conceptual, theoretical, and operational definitions frame this research study. This dissertation study addresses the limitations of past studies that have failed to explore the relational overlap between individuals, community agencies, and overall community disaster to resilience. There is an abundance of national-level disaster preparedness research examining demographic characteristics and perceived levels of HEP but no studies were identified that have used the All Hazards, All Agencies, All People Conceptual Model to better understand a knowledge-practice gap between vulnerable populations and disaster preparedness, response, and recovery agencies at the local-level in eastern NC.

Interprofessional Public Health Emergency Preparedness Approach.

Interprofessional teamwork is the best descriptor of the disciplinary efforts of the public health epidemiologists, nurses, statistician, and pediatrician from the parent observational study, the Pitt County Community Prevention And COVID-19 Testing (ComPACT) Study, that generated the data for this secondary analysis. The dissertation committee for this research study was also an interprofessional team comprised of nurses, an epidemiologist, and biostatistician An interprofessional approach helps to decrease study bias as it represents the perspectives of more than one discipline (Donner & Diaz, 2018; Lawson et al., 2018). Furthermore, sharing existing data sets among a variety of health science disciplines "fosters inter- and intraprofessional

collegiality" (Dunn et al., 2015, p. 1297), and health systems science with the shared objective of improving individual and community health (Higginson & Lake, 2017). Interprofessional collaboration also supports a multifaceted, non-siloed, social justice approach to address the healthcare needs of vulnerable populations (McNeill et al., 2020a).

Limitations

As with any research design, secondary analyses do have a set of limitations. Polit and Beck (2021e) identify several limitations of using secondary data sets, such as (a) deficiency in the data, (b) the possibility of outdated data, and (c) the quality of the data. Dunn et al. (2015) also point out that most secondary data sets are nonexperimental, descriptive research and lack causality. Lastly, Doolan and Froelicher (2009) remind researchers considering the use of secondary data sets that methods and measures used in the parent study may influence research questions and outcomes, so data sets should be critically evaluated for appropriateness.

Although these limitations may be true, we anticipated minimal impact from these particular limitations because the Principal Investigator (PI) in the parent study is an experienced, NIH funded scientist, who administered the Communities Advancing Resilience Toolkit (CART): Assessment Survey (Pfefferbaum et al., 2020) and the Household Emergency Preparedness Instrument (HEPI) (Heagele et al., 2020) recently in October 2021. There were only a few missing data values from the HEPI and CART data sets.

Another limitation of this study is the use of a self-report HEP survey that only provides subjective data. As noted previously, "perceived" HEP measures are subjective self-report surveys of HEP measures, which is currently the main source of HEP data in the literature. However, using the validated HEPI provides an opportunity to establish baseline HEP measurement for this study sample.

Setting

      The parent observational study is based in Pitt County, NC. The ComPACT COVID-19 study is an ongoing community-based cohort study conducted in Pitt County, NC. The primary objective of the parent study is to describe community impact and behaviors related to a biologic hazard, COVD-19, as the pandemic naturally occurs.

      The ComPACT COVID-19 data set was chosen for this research study because of Pitt County's socio-ecological vulnerability. The Federal Emergency Management Agency (FEMA) (n.d. a) has assigned a *relatively moderate* Risk Index score of 17.15 (0=lowest risk and 100=highest risk) for Pitt County, which exceeds both state (13.57) and national (10.60) averages. Pitt County is especially prone to several natural hazards, such as heat waves, meteorological and agricultural droughts, hurricanes, lightning, and tornadoes (FEMA, n.d. a). This does not include other hazards, such as biological, technological, industrial, political or civil hazards. Furthermore, FEMA (n.d. a) includes a disclaimer stating that the National Risk Index, calculated as *Risk Index=Expected Annual Loss* X *Social Vulnerability ÷ Community Resilience,* "was created for broad nationwide comparisons and is not a substitute for localized risk assessment analysis" (p. 15). This study sought to increase understanding of localized risk in Pitt County, NC.

      The CDC (2018) has assigned Pitt County a Social Vulnerability Index (SVI) rating of 0.8242 (scores 0 to 1, with higher values = greater vulnerability). Furthermore, Pitt County is reported to have a severe housing cost burden of 19% which exceeds the state average of 13% (UWPHI, 2021a); and an average rate of 24% of children, ages 18 years and younger, living in poverty; exceeding the state average of 19% (UWPHI, 2021b). There is a paucity of research at the local-level examining the interrelationships between socioeconomic and geographic

vulnerabilities, HEP, perceived CDR, and the overall health impacts on individuals living in this inner coastal plain community.

Sample

Recruitment, Sampling and Data Collection

> *Phase 1 and 2.*

The ComPACT research team recruited Phase 1 study participants with an online flier; see Appendix C. The Phase 1 sample consisted of Pitt County residents, greater than or equal to 18 years of age, who spoke either English or Spanish, who had been residing in one of the 14 Pitt County zip codes, since at least March 1, 2020 and planned to reside in the county through August 2022, the study completion. After completing a 20-30-minute, online Pitt County ComPACT recruitment survey, the self-selected Phase 1 participants were asked to provide contact information, such as either a phone number or email address, if they were interested in volunteering to be in a COVID-19 research study (Phase 2). The participants were asked if they were able to perform study-related tasks and were able to provide informed consent to participate. The parent research team then utilized a stratified selection approach by selecting an over-representation of ethnic minorities and other demographic characteristics, such as gender, age, zip code, income level, and chronic comorbidities, that would result in a heterogeneous sample for Phase 2 of the study. Phase 2 study participants were purposively selected from this stratified pool of individuals. Originally the ComPACT research team enrolled n=177 participants for Phase 2 but by April 2021 that number decreased to 164 due to participant attrition. The participants were separated into two study cohorts.

Phase 3.

In April 2021, trained ComPACT study personnel asked Phase 2 participants if they were interested in continuing with Phase 3 of the study, which started in October 2021 and ran until August 2022. Phase 3 of the ComPACT study included continued collection of biospecimens, COVID-19 nasal swabs, and survey data. If the participant expressed interest they were consented in person with a paper consent. The ComPACT team collectively consented and retained about 79% of Phase 2 participants, resulting in an initial Phase 3 sample size of n=138 which further declined to n=128 at the first Phase 3 study visit in October 2021. The ComPACT study team either re-contacted additional Phase 2 participants (n=3) or recruited additional, new Phase 3 participants (n=13) between November 2021 and February 2022 to diversify the sample. This resulted in the final Phase 3 sample size of n=144 for this research study, which sought to examine survey data collected between October 2021 and February 2022, using the ECU Research Electronic Data Capture (REDCap) clinical software application. More information on these survey measures are included in the Instruments Section.

Human Subjects Protection

The parent research team demonstrated commitment to the IRB protection of human subjects and study objectivity, by identifying threats to internal validity, such as (a) selection (returning participants), (b) history (hurricane season in eastern NC and uncertainty of Fall 2021-Spring 2022 COVID-19 rates), (c) maturation threats (longitudinal parent study), (d) mortality/attrition (longitudinal parent study). This research study, involving the secondary analysis of ComPACT Phase 3 survey data, complied with IRB protections. For example, data was analyzed using the All Hazards, All Agencies and All People Model that is focused on including community members in developing holistic processes that share the responsibility of

building CDR (Fitzpatrick, 2016). Equally important, best data management practices regarding the storing, handling, and protection of parent study data were followed. Prior to the collection and management of any parent survey data, exempt approval of the study and all interprofessional team members were obtained by the ECU's University and Medical Center Institutional Review Board (UMCIRB).

Instruments

The focus of this secondary analysis was electronic survey data that was collected with the Household Emergency Preparedness Instrument (HEPI) Survey Version 2 (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART): The CART Integrated System[©] Assessment Survey (Pfefferbaum et al., 2020). These two electronic surveys were used to assess HEP and CDR levels among residents of Pitt County, NC.

Household Emergency Preparedness Instrument (HEPI)

The first survey, the Household Emergency Preparedness Instrument (HEPI) (Heagele et al., 2020) is a relatively new survey. The HEPI formative scale is a 51-item dichotomous (yes/no) self-administer survey that was developed with a panel of interdisciplinary experts (N=154) from 36 countries, using the Delphi technique (Heagele et al., 2020); see Table A2. The HEPI is a resource- and action-based assessment survey that looks at five subscales: (a) Preparedness Action and Planning (PAP), (b) Disaster Supplies and Resources (DSR), (c) Special Actions 1 (SA), (d) Special Actions 2, and (e) Access and Functional Needs (AFN) (Heagele et al, 2020). The PAP and DSR subscales are combined to give an overall General Preparedness (GP) score. A strength of the HEPI is the content validation obtained from the collaborative efforts of interdisciplinary disaster response and research experts. Qualitative and quantitative strategies were used by the expert panel to obtain in-depth information related to

question clarity and relevance to the concept of HEP. (Heagele et al., 2020). Further structure and function of the concept HEP was developed utilizing Walker and Avant's (2019) concept analysis process (Wilcox et al., 2021). Together, this conceptual and operational HEP work will guide disaster preparedness researchers in measuring individual/family level of emergency preparedness.

The Delphi technique helped to establish face and content validity, however, more empirical data is needed to provide additional validity and reliability (Heagele et al., 2020). A limitation surrounding measurement of individual/family level HEP is the lack of a gold standard and psychometric properties of other HEP instruments, resulting in a lack of criterion validity (Heagele et al., 2020). However, Polit and Yang (2016) recognize that the lack of a gold standard is a reason in itself to develop a new measure based on five different categories: (a) expense, (b) efficiency, (c) risk and discomfort, (d) criterion unavailable, and (e) prediction. Based on these five categories, HEPI was chosen for this secondary analysis because it is an all-hazards self-administered, time efficient instrument developed by interprofessional disaster preparedness experts; and offers a replicable approach to assess individual-level HEP.

General Preparedness Scale=Preparedness Actions and Planning (PAP) Subscale + Disaster Supplies and Resources (DSR) Subscale

Heagele and colleagues (2020) report that the score range of the General Preparedness Scale (PAP + DSR) is 0 to 41. The first PAP Subscale consists of 19 (#1-19) questions with *yes/no* response choices; one point assigned for each *yes* response and zero points for each *no* response. The DSR subscale consists of twelve questions (#20-31) and has different response options consisting of: *I do not have this item (scored as 0)*, *I have this item in my home (1)*, *I have this item in my disaster supply kit (2)*. There are ten DSR questions, with the third response

option, *I have this item in my disaster supply kit*, that allows for an additional point if the item is included in a disaster supply kit versus just in the home; see Table A2.

Special Actions 1 and 2 (SA)

The Special Actions 1 Subscale represents six questions (#32-37), with the same response options noted in the DSR subscale, that gives points from 0-2. This subscale asks questions related to (a) homeownership versus an apartment; (b) households with infants; and (c) households with pets. Special Actions 2 Subscale consists of five questions (#38-42), with response options: *I do not have this item (scored as 0)*, *I have this item in my home (1)*, *I have this item in my disaster supply kit (2)*. The SA2 subscale asks questions related to (a) household utility management; (b) community emergency alert systems; (c) family and friend support; and more items related to (d) households with pets; see Table A2.

Access and Functional Needs (AFN) Subscale

The Access and Functional Needs (AFN) Subscale consists of nine questions (#43-51) related to health conditions and social support. The response options for this subscale are *yes)/no* and *this does not apply to me*, that gives 0-1 points; see Table A2. Heagele and colleagues (2020) report that the maximum HEPI score would need to be expanded if the SA and AFN Subscales are used. For example, if all 5 subscales are used, the range of possible scores would be 0-65 points.

The higher the HEPI score, the higher the level of preparedness (Heagele et al., 2020). Currently, there is not enough data to determine a threshold score for this instrument. However, a developer of the HEPI reports that preparedness is a dynamic characteristic and suggest a GP score of 0-30=unprepared and 31-41=prepared (T. Heagele, personal communication, February 22, 2022).

CART Assessment Survey

The second survey is the CART Assessment Survey (Pfefferbaum et al., 2011). The development of the CART assessment survey was guided by the principles of participatory action research including (a) a multi-hazard approach, (b) community assessment, (c) community engagement, (d) bioethics, (e) asset and need focus, and (f) nurturement and empowerment of local skill (Pfefferbaum et al., 2013a; Pfefferbaum et al., 2015a). According to the CART developers, the theoretical foundation of this instrument evolved from public health and social psychology literatures, the theory of community capacity and community competence, and theory of psychosocial stress (Norris et al., 2008; Pfefferbaum et al., 2013a; Pfefferbaum et al., 2013b).

Similar to the HEPI Delphi study, the initial CART Assessment survey was refined using both qualitative and quantitative strategies. The qualitative strategy employed a panel of experts from community leadership, education, public health, research, and service (Pfefferbaum et al., 2013b). The CART survey was piloted in four separate field tests (Pfefferbaum et al., 2013b). Exploratory factor analysis (EFA) with oblique (Promax) rotation, was used after pilot, resulting in the following four construct domains: (a) Connection and Caring, (b) Resources, (c) Transformative Potential, and d) Disaster Management (Pfefferbaum et al., 2013b). Further field application of this instrument resulted in an updated survey, CART version 2020, and includes a 5th domain titled *Information and Communication* (Pfefferbaum et al., 2020). Pfefferbaum and colleagues (2013b) report assessing reliability of their instrument by using statistical techniques such as, Cronbach's alpha (values greater than 0.7); the composite reliability index (values greater than or equal to 0.6); and the average variance extracted (AVE) (values greater than or

equal to 0.5). The developers also assessed validity using face, convergent, and discriminant validity (Pfefferbaum et al., 2013b).

The baseline assessment survey used in this study is part of the CART Integrated System$^©$ which utilizes a mixed-methods approach to engage community members in assessing their communities in relation to disaster preparedness, response, and recovery (Pfefferbaum et al., 2011). The CART Assessment Survey established quantitative baseline levels of CR in Pitt County across the five domains mentioned previously (Pfefferbaum et al., 2020). This survey includes 28 core resiliency items with a Likert 5-point scale with a range from *strongly disagree (1), disagree (2), neither disagree or agree (3), agree (4), to strongly agree (5)* choices (Pfefferbaum et al., 2020); see Appendix Table A3. The survey developers recommend the use of means and standard deviations for each of the CR items, domain scores, and overall perceived CR score; with the highest mean score representing the "primary community resilience strength" and the lowest mean score representing the "primary community resilience challenge" (Pfefferbaum et al., 2016, p. 48).

The CART Assessment Survey (Pfefferbaum et al., 2020) is divided into five sections B through F. Section B includes 27 core resiliency items and measures the previously discussed five CART Domains: (a) Connection and Caring, (b) Resources, (c) Transformative Potential, d) Disaster Management, (e) Information and Communication (Pfefferbaum et al., 2020). Survey Section C consists of 8 items and measures the participants' perceived descriptions of their local community. Survey Section D includes 10 items and examines the participant's description of themselves and their relationship with their community. In Section E, there are 10 items that ask participants to describe their engagement in community-level activities. Finally, Section F consists of 29 items related to participant demographics, socioeconomic characteristics, their

health status, and prior disaster experiences; see Appendix Table A3 for a summary of the CART Assessment Survey. Relationships between all CART items in sections B through F were analyzed.

Key Variables

See Table 1 for a summary of research variables.

Procedures

After IRB approval was obtained, deidentified data files were obtained from ECU REDCap and formatted in an excel file for data analysis with SPSS (version 27). Data spreadsheets are stored on the ECU PIRATE drive, which is a password-protected, backed up, secure server folder that is also HIPAA compliant, and firewall protected. Data management best practices were and will continue to be demonstrated, such as: (a) data was examined for identifiable private information; (b) data is protected and stored on a secure server, such as ECU REDCap and PIRATE Drive; (c) raw data is protected in an unedited, easily identified file format; and (d) files were organized in a logical manner (USCB, 2016).

Data Analyses

All analyses were conducted using SPSS, version 26. Before investigating the research questions, the secondary data file was investigated for missing data and out-of-range values for all categorical and quantitative variables. All scale and subscale scores were computed according to the scale scoring guidelines. Statistical tests were evaluated for statistical significance using a $p < .05$. Appropriate effects sizes were conducted for all significance tests. The analytical methods used to explore each research question are as follows.

RQ1.1: What is the level of Preparedness Actions and Planning (HEPI PAP subscale), Disaster Supplies/Resources (HEPI DSR subscale), total General Preparedness (HEPI GP scale), Access

and Functional Needs (HEPI AFN subscale) and Special Actions (HEPI SA subscale) among study participants?

RQ 1.1 Statistical Analysis: Scale, subscales, and scale item score distributions, means and standard deviations were computed for the participant sample. Investigation of the HEPI included using two items from the scale, having a disaster plan and having a disaster kit, and forming four subgroups based on yes/no answers to the two items. A one-way analysis of variance was used to compare mean PAP, DSR, and GP scores in the four groups.

RQ1.2: What is the relationship among HEPI subscale and total scores, personal experience of a disaster, level of concern for disasters/crises that could affect the community, having a personal disaster plan, gender, and age?

RQ1.2 Statistical Analysis: Bivariate Pearson correlations were used to evaluate relationships between HEPI scale and subscale scores and level of concern for disasters/crises that could affect the community, those who have experienced a disaster or not, between those having a personal disaster plan or not, gender, and age.

RQ2.1 What is the level of perceived CDR as measured by the five domains of CDR from the Communities Advancing Resilience Toolkit (CART), percentage of positive responses to the CDR items comprising the five CDR domains, and relationships among the five domains?

RQ2.1 Statistical Analysis: Descriptive means and standard deviations were computed for each domain and the domain items, including percentage of positive responses for each domain item. Pearson correlations were used to investigate the interrelationships among the five CDR domains.

RQ2.2 What is the relationship between the perceived CDR domains and (1) study participant demographic characteristics to include gender, age, and home ownership; (2) CART items

assessing participant descriptions of their community, participant self-descriptions and relationships to their community, and participation in social/community activities; and (3) CART items assessing reasons for living in their community and sources of connection to their community?

RQ2.2 Statistical Analysis: Pearson correlations were used to describe relationships between dimension scores and Likert-type score items assessing participant descriptions of their community, participant self-descriptions and relationships to their community, and participation in social/community activities.

RQ3.1 What is the relationship between the perceived Core CR domains, disaster-related characteristics, and emergency preparedness among study participants?

RQ3.1 Statistical Analysis: Pearson correlations were used to describe relationships between CR domains and level of concern for different types of disasters. Pearson correlations were also used to describe relationships between domain scores and HEPI subscale scores.

RQ3.2 What is the relationship between perceived CART Core CR domain scores, HEPI subscale scores, and personal disaster experience (CART Section F26) in predicting whether a study participant has a disaster/crisis plan?

RQ3.2 Statistical Analysis: A direct binary logistic regression was planned for this research question, to determine whether there is a statistically significant relationship between having a disaster/crisis plan and the predictor variables of CR domain scores, HEPI subscale scores, and personal disaster experience.

CHAPTER 4: FINDINGS

The relationships between Household Emergency Preparedness (HEP) and Community Disaster Resilience (CDR) are not well understood. The primary objective of this descriptive study, using secondary analysis of data collected with the Household Emergency Preparedness Instrument survey (HEPI) (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART) Assessment Survey (Pfefferbaum et al., 2020), was to understand the complex relationships of variables within an All Hazards, All Agencies, and All People framework, in a local context, by assessing emergency preparedness behaviors, such as HEP and perceived CDR, during the disaster response phase of the COVID-19 pandemic, among residents living in Pitt County, NC, a geographical vulnerable inner coastal plain community. This chapter presents the findings of this study in order of each research question.

Instrument Characteristics

The focus of this secondary analysis was electronic survey data that was collected with the Household Emergency Preparedness Instrument (HEPI) Survey Version 2 (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART): The CART Integrated System, [©] Assessment Survey (Pfefferbaum et al., 2020). These two electronic surveys were used to assess HEP and CDR levels among residents of Pitt County, NC. According to Heagele et al. (2022), the HEPI has good internal consistency, with a Cronbach alpha coefficient for the Preparedness and Planning (PAP) Subscale reported of .86; the Disaster Supplies and Resources (DSR) Subscale of .80; and the overall combined (PAP + DSR) General Preparedness (GP) Scale of .89. In the current study, the Cronbach alpha coefficient for the PAP subscale was .90, the DSR subscale was .74, and the combined overall GP was .89.

The CART Assessment Survey also has good internal consistency. Pfefferbaum and colleagues (2015b) reported the following Cronbach' alpha for the five core CR domains: (a) Connection and Caring .83 (95% CI = 0.75, 0.89); (b) Resources .75 (95% CI = 0.64, 0.84); (c) Transformative Potential .90 (95% CI = 0.85, 0.93); (d) Disaster Management .91 (95% CI = 0.87, 0.94); and (e) Information and Communication .83 (95% CI = 0.75, 0.89). In this study, the Cronbach's alpha coefficients for the CART Domains were: (a) Connection and Caring .85; (b) Resources .86; (c) Transformative Potential .89 (d) Disaster Management .89; and (e) Information and Communication .90.

Missing Data

In this current study, the HEPI and CART Assessment Survey data files were examined for missing values. For the HEPI PAP subscale: (a) 134 participants answered all 19 items; (b) 8 participants answered 18 of the 19 items; and (c) 2 participants answered 17 of the 19 items. Since all individuals answered at least 17 of the 19 PAP items, a PAP mean subscale score for all 144 individuals was calculated. Similarly, for the HEPI DSR subscale: (a) 143 participants answered at least 10 of the 12 DSR items; and (b) one participant did not answer any of the items. Therefore, a mean DSR subscale score for 143 of the 144 participants in this study sample was calculated.

There were only a few missing data among the CART Domain Items (Section B) and these Domain mean scores were computed based on all the non-missing subscale items. For example, if a participant answered 4 of the 5 items in a domain, their mean score was based on n = 4, not n = 5. There was only one participant that did not answer any of the CART items. In summary, for the CART CR items, (a) 134 participants answered all 28 of the CART Section B items; (b) 9 participants answered 27 out of the 28; and (c) 1 participant answered 26 out of the

28 items. No one of those 10 participants, with missing values, responded with more than one missed item per scale – thus we calculated a mean scale score for all 144 individuals. In summary, the final sample analyzed for this study included N = 144 residents from Pitt County, NC.

Demographics and Descriptive Statistics

The final study sample (*N*=144) consisted predominantly of White (90.3%), Non-Hispanic (99.3%), Females (67.4%). There were 97 Females (67.4%) and 45 Males (31.3%), with ages ranging from 19-84 years of age (*M* = 51.8, *SD* = 16.9). The sample was generally educated with the majority of respondents reporting graduate-level education (56.9%); college-level education (25.7%); some college (13.2%); and high school education (3.5%). Employment status was reported as: (a) working full time (30 or more hours/week) (61.8%); (b) retired (20.1%); (c) part-time (<30 hours/week) (10.4%); and (d) with 44.5% working in education or healthcare. Fifteen households (10.5%) reported having children under the age of 10 years. Table 2 summarizes the demographic characteristics for this study sample.

Table 2

Sociodemographic Characteristics of Participants (N = 144)

Baseline Characteristics	n	%
Age		
19-29	15	10.4
30-49	50	34.7
50-64	37	25.7
65-84	41	28.5
Missing	1	<1.0
Gender		
Female	97	67.4
Male	45	31.3
Other	2	1.4
Race		
Black/African American	10	6.9
White	130	90.3
Other	4	2.8
Education		
<High School	1	<1.0
High School	5	3.2
Some College	19	13.2
College Graduate	37	25.7
Graduate School	82	56.9
Employment		
Full-Time	89	61.8
Part-Time	15	10.4
Retired	29	20.1
Other	11	7.6
Job Description		
Education	40	38.5
Healthcare	24	23.1
Management, Business or Finance	12	11.5
Service	11	10.6
Technical	10	9.6
Other	7	6.7
Individuals in Household		
1	31	21.5
2	66	45.8
3	24	16.7
4+	20	13.9
Missing	3	2.1

Baseline Characteristics	n	%
Children < 10 in the Household		
No	127	88.2
Yes	17	10.5
Income		
<$10,000	2	1.4
$10,000-$19,999	5	3.5
$20,000-$29,999	6	9.0
$30,000-$49,999	18	12.5
$50,000-$74,999	24	16.7
$75,000 +	81	56.2
Other	8	5.6

Analysis of Research Questions

Research Question 1.1

What is the level of Preparedness Actions and Planning (HEPI PAP subscale), Disaster

Supplies/Resources (HEPI DSR subscale), total General Preparedness (HEPI GP scale), Access

and Functional Needs (HEPI AFN subscale), and Special Actions (HEPI SA subscale) among

study participants?

HEPI PAP, DSR, and GP Subscales

The Preparedness Actions/Planning (PAP) and Disaster Supplies/ Resources (DSR)

subscales comprise the General Preparedness (GP) Scale and measures basic disaster knowledge,

actions, and kit items applicable to all respondents. The total score for the PAP subscale was the

sum of 19 items scores where 0 = no, meaning the participant has not implemented the

preparedness plan/action and 1 = yes, the participant has implemented the preparedness

action/plan. The total score for the DSR subscale was the sum of 12 items scored as 0 = do not

have the item in the house; 1 = have the item in the house. For 10 of the items, an extra point was

given if the item was also kept in a disaster supply kit. There were no missing data on any of the

PAP and DSR items. Table 3 presents the proportion of study respondents who answered *yes* to each of the PAP and DSR items

The means for the HEPI subscales ranged from 7.94 on the PAP (7.94, *SD* = 5.245 to 10.40 on the DSR (*SD* = 2.62). The mean score for the total GP Scale, which is the sum of PAP and DSR scores, was 18.34 (*SD* = 6.88). The HEPI developers (Heagele et al., 2020) report there is no evidence-based threshold GP for determining those prepared or unprepared for disasters. The HEPI author guidelines suggested that the GP total score could be categorized into scores of 0 – 30 as "unprepared" and scores from 31 – 41 as "prepared". In this study, only 5 (3.5%) GP total scores were greater than 30.

The average percentage of positive responses (a "yes" response) to the 19 PAP items (41.8%) was much lower than the average positive responses ("I have the item in my home") to the 12 DSR items (83.1%). The PAP items least likely to be endorsed with an "yes" response included PAP item 2 (18.8%): "have practiced emergency procedures at home" and PAP item 14 (23.1%): "do you have a family meeting place in case of separation." Despite the low percentage of positive responses to these two PAP items, most respondents (82.6%) did respond positively with item 5: "know disaster types likely in your community."

The DSR items with the highest positive responses included items 20 (98.6%): "have working smoke detectors" and item 21 (96.5%): "have source of transportation if have to leave your neighborhood quickly in the event of a necessary evacuation of your home." The DSR items least likely to be positively endorsed included DSR item 22 (56.9%) "have a way to receive information if power lost" and item 23 (68.7%) "have 1-week supply of ready-to-eat food".

Table 3

Percentage of Positive Responses to HEPI PAP and DSR Subscale Items (N=144)

HEPI Subscale/Item	%
Preparedness Actions & Planning (PAP)	41.8
1. Prepared emergency plan	47.9
2. Practiced emergency procedures at home	18.8
3. Took first aid training	66.4
4. Have fire escape plan	56.2
5. Know disaster types likely in your community	82.6
6. Have family documents in a safe place	55.9
7. Have a disaster kit	45.1
8. Check disaster items for expiration dates	27.7
9. Planned for how to contact family during disaster	35.4
10. Know safe/unsafe evacuation areas in community	44.8
11. Know if home is in evacuation zone	37.3
12. Know where to go if have to evacuate	44.4
13. Have planned an evacuation route	35.4
14. If separated, have a family meeting place	23.1
15. Everyone at home aware of evacuation plan	41.3
16. Know location of local emergency shelter	29.9
17. Have plan for what to take if have to evacuate quickly	49.3
18. Prepared a small kit if have to evacuate quickly	23.9
19. Have one week of 1-gallon water supply/person	31.9
Disaster Supplies/Resources (DSR)	83.1
20. Have working smoke detectors	98.6
21. Have source of transportation if have to evacuate	96.5
22. Have a way to receive information if power lost	56.9
23. Have 1-week supply of ready-to-eat food	68.7
24. Have personal hygiene supplies	93.8
25. Have flashlight or other non-electric lighting	95.1
26. Have first aid kit	86.8
27. Have warm blankets or sleeping bag/person	94.4
28. Have cash	68.8
29. Have extra batteries	88.2
30. Have matches	75.0
31. Have fire extinguisher	74.3
Overall General Preparedness Scale (GP)	57.8

Note. HEPI = Household Emergency Preparedness Instrument; PAP = Preparedness Actions/Planning subscale, and DSR = Disaster Supplies/Resources subscale. Positive response to the PAP items is a "yes" response and a positive response to the DSR items is "I have this item in my home".

For our study, we used two indicators as proxy measures for being prepared for disasters. These included PAP item 1: "prepared emergency plan" and PAP item 7: "have a disaster kit." The purpose of forming the kit/plan subgroups was to give us some information on the internal validity to build evidence for the HEPI as a new research instrument. Our 144 respondents were grouped into four subgroups based on the joint occurrence/non-occurrence of the two proxy measures: had a plan and had a kit (+plan, +kit n = 47; 32.6%), had a plan and no kit (+plan, -kit; n = 22; 15.2%), no plan and had a kit (-plan, +kit); n = 18; 12.5%), and no plan and no kit (-plan, -kit; n = 57; 39.6%).

Table 4 presents participant percentage of positive responses to the PAP and DSR items in the four subgroups. The percentage agreement refers to the proportion of respondents who answered positively (yes) that they have implemented the preparedness plan/ action item (PAP) and that they have a DSR item either in their home or disaster supply kit. We see the mean percentage of positive responses for the PAP items is highest in the group with both a plan and emergency kit (66.7%) and lowest in the group with neither plan nor kit (19.0%). For PAP item 5: "know disaster types in your community", the average agreement was over 80% in the first three subgroups, and 68% in the no plan/no kit group. For PAP item 3: "took first aid training", there was relatively high agreement in all group, ranging from 86% in the plan/no kit group to 50% in the no plan/kit group. There were large differences in agreement between groups on PAP item 11: "know if home is in evacuation zone", where the average agreement ranged from 62%

in the plan/kit group, to 50% in the plan/no kit group, to less than 34% in the other two

subgroups.

Interestingly, in Table 4 we see that the mean percentage of positive responses for the

DSR items is highest in the group with a plan and no emergency kit (+plan/-kit) (90.2%) and

lowest in the group with neither plan nor kit (-plan/-kit) (75.6%). The DSR does not align with

the plan/kit categories. For example, the subgroup that reported having *prepared an emergency*

plan but did not have a *disaster kit* (+plan/-kit), had the highest percentage of positive responses

for 5 out of the 12 DSR items and two items matching 100% scores with the -plan/+kit subgroup,

such as (a) having working smoke detectors and (b) have warm blankets or sleeping bag/person.

Table 4

Percentage of Positive Responses to PAP and DSR Subscale Items in Respondents With or

Without Emergency Plan or Disaster Kit (N=144)

HEPI Subscale/Item	py, ky + plan/+ kit %	py, kn + plan/ - kit %	pn, ky - plan/ + kit %	pn, kn - plan/ + kit %
Preparedness Actions & Planning (PAP)	66.7	51.7	36.8	19.0
1. Prepared emergency plan	100	100	0	0
2. Practiced emergency procedures at home	45	18	6	2
3. Took first aid training	67	86	50	63
4. Have fire escape plan	77	77	44	35
5. Know disaster types likely in your community	91	100	83	68
6. Have family documents in a safe place	83	54	33	42
7. Have a disaster kit	100	0	100	0
8. Check disaster items for expiration dates	64	5	29	5
9. Planned for how to contact family during disaster	60	68	22	7
10. Know safe/unsafe evacuation areas in community	68	68	44	17
11. Know if home is in evacuation zone	62	50	33	13
12. Know where to go if have to evacuate	62	59	50	23
13. Have planned an evacuation route	53	50	39	14
14. If separated, have a family meeting place	38	50	11	4
15. Everyone at home aware of evacuation plan	68	68	33	11
16. Know location of local emergency shelter	51	27	22	16
17. Have plan for what to take if have to evacuate	77	73	39	21

quickly

18. Prepared a small kit if have to evacuate quickly	54	9	28	4
19. Have one week of 1-gallon water supply/person	53	23	33	17
Disaster Supplies/Resources (DSR)	87.8	90.2	86.1	75.6
20. Have working smoke detectors	98	100	100	98
21. Have source of transportation if have to evacuate	98	100	94	95
22. Have a way to receive information if power lost	66	73	56	44
23. Have 1-week supply of ready-to-eat food	81	73	89	51
24. Have personal hygiene supplies	96	95	100	89
25. Have flashlight or other non-electric lighting	98	95	100	91
26. Have first aid kit	96	95	83	77
27. Have warm blankets or sleeping bag/person	94	100	100	91
28. Have cash	79	86	67	54
29. Have extra batteries	87	91	100	84
30. Have matches	79	86	67	70
31. Have fire extinguisher	83	86	78	61

Note. PAP = Household Emergency Preparedness Instrument Preparedness Actions/Planning subscale;

DSR = Disaster Supplies/Resources subscale; +plan, +kit (n = 47) = yes has a disaster plan and yes has

an emergency kit; +plan, -kit (n = 22) = yes has a plan and no kit; -plan, +kit (n = 18) = no plan and yes

has a kit; -plan, -kit (n = 57) = no plan and no kit.

As noted previously, investigation of the HEPI included using two items from the scale,

(item 1) prepared and discussed a family emergency plan and (item 7) having supplies set aside

in your home in a kit, to form four subgroups based on yes/no answers to the two items. A one-

way analysis of variance was used to compare mean HEPI PAP, DSR, and GP scores in the four

groups followed by the Tukey multiple comparison test to examine pairwise mean differences

among groups. There was a statistically significant difference at the p < .001 level in HEPI PAP,

DSR, and GP mean scores for all four subgroups. The eta squared effect size indicated overall

large effect sizes related to the PAP and GP scores, and a medium effect size for the DSR scores.

Table 5 shows the mean HEPI PAP and DSR subscale and GP scale scores in the four

plan/kit subgroups. The multiple comparison test indicated mean PAP (12.68) and mean GP

(24.09) scores in the plan yes and kit yes group were significantly higher than the means in the

other three groups. The mean DSR score (11.40) was in the plan yes and kit yes (+plan/+kit)

group was significantly higher than the mean (9.38) in the no plan and no kit group (-plan/-kit).

Overall General Preparedness (GP) means were lowest for the -plan/-kit subgroup (*M*=12.82,

SD=4.62) and highest for the +plan/+kit subgroup (*M*=24.09, *SD*=5.67).

Table 5

Comparison of PAP, DSR, and GP Scores for Having or Not Having a Disaster Plan or

Emergency Kit

HEPI	+plan, +kit		+plan, -kit		-plan, +kit		-plan, -kit			
	M	SD	M	SD	M	SD	M	SD	F	η2
PAP	12.68	4.38	9.82	3.55	7.00	2.63	3.61	2.83	60.24***	.56
DSR	11.40	2.58	10.86	1.75	10.94	1.83	9.38	2.45	7.05***	.13
GP	24.09	5.67	20.68	4.67	17.94	3.57	12.82	4.62	47.46***	.50

Note. PAP = Household Emergency Preparedness Instrument Preparedness Actions/Planning subscale;

DSR = Disaster Supplies/Resources subscale; GP = General Preparedness Scale; +plan, +kit (n = 47 =

have disaster plan and emergency kit; +plan, -kit (n=22) = have plan and no kit; -plan, +kit (n = 18) = no

plan and have kit; -plan, -kit (n = 57) = no plan and no kit.

*** p < .001.

Access and Functional Needs (AFN) and Special Actions (SA) HEPI Items

The AFN and SA items are not part of the GP scale and not every item is applicable to all

respondents. According to the HEPI instructions, the AFN items should only be answered by

those with any of the following: have a disability, 65 years of age or older, take at least one

prescription medication, is pregnant. According to the HEPI instructions, only five of the six SA

Part 1 items would be applicable to those who wore prescription glasses, have a baby, or have a

pet, while item 1 could be answered by all respondents. Four of the five SA Part 2 items could be

answered by all the respondents, while item 5 would only be answered by those with a pet.

Table 6 presents the percentage of positive responses for those who responded to the

AFN and SA items. Percentage of positive responses refers to the mean percent of respondents

who answered positively, that either answered *yes* (AFN and Special Actions 2 subscales) or *I*

have this item in my home or *I have this item in my disaster supply kit* (Special Actions 1

subscale). The first five AFN items had the largest number of respondents. Of those items, the

lowest agreement was for items 1 (33%): "have medical history written or stored on flash drive

or cloud" and item 2 (32.4%): "list of doctors on paper or stored on flash drive or cloud." The

four items in SA Part 1 with the largest number of responses all had over 80 percent agreement.

In SA Part 2, only item 4: "have someone you could stay with during an emergency" has a high

percent of agreement (96.5%). The lowest agreement was with item 3 (47.9%): "have written

contact information of family and friends."

Table 6

Percentage of Positive Responses to HEPI Access and Functional Needs Special Action and

Items

Items	n	%
Access and Functional Needs		
1. Have medical history written or stored on flash drive or cloud	112	33.0
2. List of doctors on paper or stored on flash drive or cloud	111	32.4
3. Asked family or friends if able to help in case of disaster	110	42.7
4. Have written list of prescription medications and dosages	107	58.9
5. Have two-week supply of prescription medications	108	71.3
6. Have 2-week supply of special diet food and specialized medical equipment	30	56.7
7. Have alternate power source for medical equipment or refrigerated medicine	39	38.5
8. Have small cooler and cold packs for refrigerated medicines	59	88.1

9. Have paper copy of advanced directive stored on drive or cloud	99	29.3
Special Actions Part 1		
1. Have wrench or other tool to turn off utilities	139	96.4
2. Have extra prescription glasses or contacts	116	88.8
3. Have one-week supply of formula, bottles, baby food	4	50.0
4. Have one-week supply of diapers/nappies	7	71.4
5. Have one-week supply of pet food and water for each pet	97	91.8
6. Have one-week supply of pet medications	53	83.0
Special Actions Part II		
1. Signed up for a community emergency alert system	140	57.9
2. Know how to turn off utilities at home	141	60.3
3. Have written contact information of family and friends	142	47.9
4. Have someone you could stay with during an emergency	143	96.5
5. Have evacuation plan for pet(s)	99	61.6

Note. HEPI = Household Emergency Preparedness Instrument. n = number of respondents for which each item is applicable to. Percentage agreement refers to the mean percent of respondents who answered positively, that either answered yes (AFN and Special Actions 2 subscales) or I have this item in my home or I have this item in my disaster supply kit (Special Actions 1 subscale).

Research Question 1.2

What is the relationship among HEPI subscale and total scores, personal experience of a disaster, level of concern for disasters/crises that could affect the community, having a personal disaster plan, gender, and age?

Disaster Experience (CART F26), Level of Concern (CART F29), Having a Personal Disaster Plan (CART D6), Age, and Gender

The relationships between HEPI PAP and DSR subscales and total GP scores with (a) personal experience of a disaster (CART Item F26); (b) level of concern for disasters/crises (CART Item F29) that could affect the community; (c) having a disaster plan (CART Item D6); (d) gender; and (e) age were investigated using Pearson correlations. The positive response items

for the CART F26 disaster experience item was reflected by participants who answered *yes* to experiencing a natural disaster, and/or a technological disaster, and/or a human-caused disaster. The response items for the CART F29 level of community concern item was reflected by participants who responded that they were *somewhat concerned* or *very concerned* about health threats, intentional-human caused disasters, natural disasters, socioeconomic issues, or unintentional disasters. The Likert type items for the CART D6 disaster plan item was reflected by participants who *agreed* or *strongly agreed* that "My family and I have a disaster plan." The age category was designated as a continuous variable. The gender category was designated a 0 = female and 1 = male.

 Table 7 presents means, standard deviations, and percent agreement with CART disaster related items. Over half of the respondents reported having experienced a disaster (64.6%) and of having a disaster or crisis plan (56.3%). Of the five community concerns, respondents were most concerned about health threats, natural disasters, and socioeconomic issues and least concerned about unintentional disasters such chemical leaks or fires.

Table 7

Means, Standard Deviations, and Percentage of Positive Responses to Likert Measures of Having a Personal Disaster Experience (CART F26), Having a Disaster Plan (CART D6), and Level of Community Concerns (CART F29)

Variables	*M*	*SD*	*n*	%
1. Have you ever personally experienced a disaster? [a]			93	64.6
2. My family and I have a disaster or crisis plan.	3.40	0.98	81	56.2
3. Concern about health threats	3.74	1.01	106	73.6
4. Concern about natural disasters	3.63	1.08	98	68.1

5. Concern about socio-economic issues	3.61	1.14	94	65.7
6. Concern about intentional, human caused, disasters	3.18	1.17	73	50.7
7. Concern about unintentional disasters	2.48	1.15	29	20.1

Note. [a] Categorical question with yes/no choices. Response choices for CART F26: yes, natural disaster; yes, technological disaster; yes, human-caused disaster; no. CART D6: Strongly disagree, disagree, neither disagree nor agree, agree, strongly agree; CART F29: not at all concerned; not very concerned; neither concerned or unconcerned; somewhat concerned; very concerned.

Table 8 presents the correlations of disaster experience (CART F26), have a disaster plan (CART D6), and age with PAP and DSR subscales and GP total scale scores. For the total group we have a large correlation between having a disaster plan and the PAP subscale ($r = .51$, $p < .001$) and a medium correlation between having a plan and the GP scale ($r = .46$, $p < .001$). In the subgroup of males, we have a medium correlation between disaster experience and the DSR subscale ($r = .33$, $p < .05$), and large correlations between having a plan and the PAP subscale ($r = .64$, $p < .001$) and GP scale ($r = .57$, $p < .001$). There were no statistically significant correlations in the male subgroup between age and HEPI PAP, DSR subscales nor HEPI GP total scale scores.

In the female subgroup, we have medium correlations between having a plan and the PAP subscale ($r = .43$, $p < .001$) and GP total scale scores ($r = .39$, $p < .001$). All of the statistically significant correlations describe positive relationships. There was a small correlation in the female subgroup, between age and the HEPI DSR subscale ($r = .24$, $p < .05$) subscale.

Table 8

Correlations of Disaster Experience (CART F26), Disaster Plan (CART D6), Age, and Gender
with HEPI PAP and DSR Subscales and Overall GP Scale

Variables	PAP	DSR	GP
Total group (N = 144)			
1. Disaster experience	.11	.21*	.16
2. Have a disaster plan	.51***	.20*	.46***
3. Age	.05	.20*	.11
4. Gender	-.06	-.08	-.06
Males (n = 45)			
1. Disaster experience	.20	.33*	.27
2. Have a disaster plan	.64***	.24	.57***
3. Age	.00	.05	.03
Females (n = 96)			
1. Disaster experience	.10	.19	.15
2. Have a disaster plan	.43***	.13	.39***
3. Age	.03	.24*	.12

Note. Disaster experience coded 0 = no, 1 =yes; Have a disaster plan coded 0 = no, 1 = yes; Gender coded 0 = female, 1 = male; Age is a continuous variable. * $p < .05$. ** $p < .01$. *** $p < .001$.

Concerns About Disasters and Socio-Economic Issues

All the correlations between HEPI PAP, DSR subscales, and overall GP scale scores with CART F29 items asking about respondent's level of concern about health threats, intentional disasters, unintentional disasters, natural disasters, and socio-economic issues yielded only non-

significant small correlations ranging from .00 to .18. Gender and age did not moderate the correlations of HEPI scores with F29 community threats. For the males, non-significant correlations ranged from .01 to .27, and from .00 to .17 for females.   Participant less than 65 years of age had non-significant correlations ranging from .00 to .18, while those 65 or older had non-significant correlations ranging from .04 to .30.

Research Question 2.1

What is the level of community resilience (CR) as measured by the five domains of the Communities Advancing Resilience Toolkit (CART), percentage of positive responses to the CR items comprising the five CR domains, and relationships among the five domains?

Five Domains of CR from CART

The results for this research question focused on the CART 27 core resiliency items and the five interrelated CR domains formed from the 27 core items. Table 9 presents means, standard deviations, and Cronbach Alpha coefficients estimating internal consistency reliability for the five CR domains and total CR score for the study sample. Domain mean scores ranged from 3.36 (Transformative Potential) to 3.65 (Disaster Management), with overall perceived CR mean score of 3.48. All Cronbach Alpha estimates ranged from .85 to .96 indicating adequate internal consistency reliability for all scores.

There were large, statistically significant correlations between all five CR domains, with the highest correlations between Resources and Transformative Potential ($r = .85$) and the lowest between Connection and Caring and Disaster Management ($r = .51$). All the domain scores were highly correlated with the total CR score; refer to Table 10.

Table 9

Descriptive Statistics for CART Domains and Overall Perceived CR (N = 144)

Community Resilience Domains/ Items	*M*	*SD*	Cronbach's Alpha
1. Connection & Caring	3.55	.63	.85
2. Resources	3.40	.71	.86
3. Transformative Potential	3.36	.62	.89
4. Disaster Management	3.65	.62	.89
5. Information & Communication	3.47	.67	.90
Overall CR	3.48	.57	.96

Note. CART = Communities Advancing Resilience Toolkit; CR = Community Resilience

Table 10

Intercorrelations for the Five CART Domains and Overall Community Resilience

Measure	1	2	3	4	5	6
1. Connection & Caring	—					
2. Resources	.74	—				
3. Transformative Potential	.81	.85	—			
4. Disaster Management	.51	.55	.59	—		
5. Information and Communication	.69	.77	.84	.63	—	
6. Overall CR	.86	.90	.95	.74	.90	—

Note. All coefficients are significant at p < .01. CART = Communities Advancing Resilience Toolkit; CR = Community Resilience.

Percentage of Positive Responses and Relationships

Survey items associated with each of the five Core CR CART Domains, along with percentage of positive responses, reflected by participants who responded that they *agreed* or *strongly agreed,* for each item, are presented in Table 11. The two items with the highest percentage of positive responses were item 25 (77.1%): "My community can provide emergency services during a disaster or community crisis" and item 4 (74.8%) "People in my community help each other." The two items with the lowest percentage of positive responses included item 22 (24.3%): "People in my community trust local officials" and item 19 (35.4%): "My community looks at its successes and failures so it can learn from the past."

Table 11

Percentage of Positive Responses to Perceived Community Resilience Items

CART Section B: Core Resiliency Domain/Items	%
Connection & Caring	
1. People in my community feel like they belong to the community.	63.2
2. People in my community are committed to the well-being of the community	56.3
3. People in my community have hope about the future.	61.1
4. People in my community help each other.	74.8
5. My community treats people fairly no matter what their background is.	39.9
Resources	
6. My community supports programs for children and families.	64.6
9. My community has the resources it needs to take care of community problems.	54.2
10. People in my community are able to get the services they need.	51.0
11. People in my community know where to go to get things done.	44.4
17. My community has effective leaders.	36.1
Transformative Potential	
7. People in my community work together to improve the community.	55.9
8. People in my community can be trusted.	49.0
12. My community works with organizations and agencies outside the community to get things done.	56.6
19. My community looks at its successes and failures so it can learn from the past.	35.4
20. My community develops skills and finds resources to solve its problems and reach its goals.	46.5
21. My community has priorities and sets goals for the future.	53.8
22. People in my community trust local officials	24.3
Disaster Management	
23. My community tries to prevent disasters and community crises.	60.8
24. My community actively prepares for future disasters and community community crises.	56.2
25. My community can provide emergency services during a disaster or community crises.	77.1
26. My community has services and programs to help people after a disaster or community crises.	56.2
27. If a disaster or community crisis occurs, my community provides Information about what to do.	68.1
Information and Communication	
13. My community keeps people informed about issues that are important.	56.2

CART Section B: Core Resiliency Domain/Items	%
14. Local information about issues in my community is generally accurate and fair.	61.1
15. Communication sources used by my community are effective in reaching residents.	51.7
16. Communication and information in my community focus on positive as well as negative issues.	60.4
18. People in my community communicate with leaders.	44.4
Unassigned to a Domain	
28. My community is at risk for disasters and community crises (for example tornadoes, terrorism, economic downturns).	68.1

Note. CART = Communities Advancing Resilience Toolkit

Research Question 2.2

What is the relationship between the perceived CR domains and (1) study participant demographic characteristics to include gender, age, and home ownership; (2) CART Secondary Sections (C, D, E, and F) items assessing participant descriptions of their community (CART Section C), participant self-descriptions and relationships to their community (CART Section D), and participation in social/community activities (CART Section E); and (3) CART items assessing sources of connection to their community (Section F22, F23) and reasons (Section F24, F25) for living in their community?

Perceived CR Domains and Demographic Characteristics

For the first part of this research question, the relationship of the five perceived CR Domains (as measures by CART Assessment Survey Section B) with participant demographic characteristics, including gender, age, and home ownership, was investigated using Pearson Correlation Coefficient. All correlations of gender, age, and home ownership with CR domains were small or near zero, with the variables (a) Age and the Disaster Management Domain; and (b) Gender and Resources Domain being statistically significant. See Table 12.

Table 12

Correlations of Age, Gender, and Homeownership with CR Domains and CR Total

| | CR Domains and Total CR | | | | | |
Variables	1	2	3	4	5	Total
Age	.10	.06	.05	.17*	.09	.10
Gender	.12	.20*	.12	.07	.08	.14
Home Ownership	-.04	-.11	-.07	.13	-.01	-.03

Note. Gender: 0 = female, 1 = male; Home ownership: 0 = no, 1 = yes; D1 = connection and caring; D2 = resources; D3 = transformative potential; D4 = disaster management; D5 = information and communication. *p < .05

CART Secondary Sections: C, D, E, and F

The results for this research question focuses on the secondary items of the CART, including eight items addressing reasons for feeling connected to their community (Section C), ten items addressing possible descriptions of the respondent and their relationship to their community (Section D), nine items describing possible activities the respondent may have participated in over the past month (Section E), two Section F items related to sources of the respondent's *connection* to their community (F22 and F23), and two Section F items related to *reasons* why the respondent lives in their community (F24 and F25). In addition, the results address possible relationships of these secondary CART Section items to the five core CR domains.

Section C and D. Survey items associated with CART Section C and D along with the percent agreement for each item are presented in Table 13. The percent agreement among the eight community description statements (Section C) are all over 60%. The two items with the highest percentage of positive responses included item C2 (79.6%): "My community is a safe

place to live and work" and item C5 (79.0%) "Good educational opportunities are available to people who live in my community." The two items with the lowest percentage of positive responses included item C8 (60.8%): "Leadership opportunities are available to people who live in my community" and item C3 (61.3%): "Good housing is available for people who live in my community."

Section D items have percentage of positive response values ranging from 28.5% to 95.1%. The two items with the highest percentage of positive responses included item D7 (95.1%): "I have friends in my community" and item D3 (94.4%) "I live in good housing." The two items with the lowest percentage of positive responses included item D9 (28.5%): "I would like to become a leader in my community" and item D10 (30.8%): "I trust local officials."

Table 13

Percent of Positive Responses to CART Section C and Section D Items

Item	%
Section C	
C1. People in my community care about each other.	67.1
C2. My community is a safe place to live and work.	79.6
C3. Good housing is available for people who live in my community.	61.3
C4. People in my community can access necessary health care services.	66.7
C5. Good educational opportunities are available in my community	79.0
C6. Good work opportunities are available in my community.	75.5
C7. People in my community have friendships with their neighbors.	67.4
C8. Leadership opportunities are available in my community.	60.8
Section D	
D1. I feel like I belong to my community.	69.7
D2. I have hope about the future.	85.4
D3. I live in good housing.	94.4
D4. I can get the services I need.	93.0
D5. I work with people in my community to solve our problems.	51.7
Item	%

D6. My family and I have a disaster or crisis plan.			56.2
D7. I have friends in my community.			95.1
D8. I would like to be involved in trying to improve my community.			69.4
D9. I would like to become a leader in my community.			28.5
D10. I trust local officials.			30.8

Section E. Table 14 presents the frequency of participation in nine community related activities as asked in Section E of the CART. Participation frequencies ranged from no participation to more than 10 times over the past month. The two activities that had the highest frequency of participation included activity E9: "Checked the news" and activity E1: "Spoken to your neighbor." The two activities with the lowest frequency of participation included activity E6: "Attended a public meeting in which there was a discussion of local community affairs" and E8: "Worked on community projects."

Table 14

Frequency of CART Section E Activities Participated in Over the Past Month

Activity	Times Participated			
	0	1-5	6-10	11+
	%	%	%	%
E1. Spoken to your neighbor	7.7	45.5	24.7	32.2
E2. Helped a neighbor or received help from a neighbor	33.3	54.1	8.3	4.2
E3. Had neighbors in your home or been in their home	61.8	27.1	6.9	4.2
E4. Attended community events	54.9	31.6	3.5	2.1
E5. Attended any club or organization meeting	57.6	34.0	2.8	5.6
E6. Attended a public meeting involving local affairs	84.0	12.5	0.7	2.8
E7. Volunteered in the community	66.7	25.7	2.1	5.6
E8. Worked on community projects	78.3	16.8	1.4	3.5
E9. Checked the news	4.9	21.5	12.5	61.1

Section F. Two Section F items which focused on the sources of connection that individuals could have with their community included one item that asked the respondent to

select all sources of their connection to their community and one item to select only the single most important connection. Table 15 presents the percent of respondents who selected each source and the percent of respondents who selected their one primary source. The sources selected most frequently included friends (88.2%), work (66.7%), family (54.9%), neighborhood (52.8%), and church (40.3%). The primary sources with the highest percentages included work (30.6%), friends (27.8%) and family (13.9%).

Table 15

CART Section F22,23: Source of Connection to Community (N = 144)

Source (F22)			Primary Source (F23)	
	n	%	*n*	%
Friends	127	88.2	40	27.8
Work	96	66.7	44	30.6
Family	79	54.9	20	13.9
Neighborhood	76	52.8	6	4.2
Church	58	40.3	12	8.3
School	38	26.4	10	6.9
My Tribe	23	16	7	4.9
Other	12	8.3	5	3.5
Military	5	0.0	0	0.0

Table 16 presents the two Section F items related to the percent of respondents who selected all their reasons for living in their community and percent of respondents who selected their most important reason why they live in their community. The five most popular reasons included own my home (61.1%), convenient location (55.6%), appearance and feel (47.2%), work (44.4%) and affordable housing (40.3%). The top reasons identified as most important included own my home (23.6%), work (18.8%), convenient location (11.1%) and family (10.4%).

Table 16

CART Section F24, 25: Reason for Living in Their Community (N = 144)

Reason (F24)			Primary Reason (F25)	
	n	%	*n*	%
Own Home	88	61.1	34	23.6
Convenient Location	80	55.6	16	11.1
Appearance and Feel	68	47.2	14	9.7
Work	64	44.4	27	18.8
Affordable Housing	58	40.3	7	4.9
Safety	48	33.3	7	4.9
Family	37	25.7	15	10.4
Neighbors	31	21.5	2	1.4
School	18	12.5	6	4.2
Have always lived here	16	11.1	6	4.2
Cannot afford to move	15	10.4	2	1.4
Church	13	9.0	0	0.0
Other	7	4.9	7	4.9
My Tribe	6	4.2	1	0.7
Military	0	0.0	0	0.0

Associations Between CART Secondary Sections and CART Core CR Domains

The remaining results for this research question present findings related to associations of

the secondary sections (C, D, E, F) of the CART Assessment Survey with the Core CART CR

domain items (Section B) and total score. All Section C items have large significant positive

correlations with all Section B Core CR domains and total score. Table 17 presents the

correlations of Section C and D items with the five Core CR domains and total score. Items D1,

D5 and D10 have medium or large positive correlations with all the Core CR domains scores and

total score. Item D6: "My family and I have a disaster or crisis plan" has a medium correlation

with disaster management domain ($r = .37$) and small correlations with all the other domains and

total CR score. All Section E activity items have negligible or small correlations with Core CR

domains and total CR scores. All the correlations between E1, E2, E3, E6, E7, and E9 with CR

95

scores were non-significant with correlations ranging from .01 to .16. There were some small

(<.30), statistically significant, CR domain correlations with item E4 (attended community

events), E5 (attended any club or organization meeting), and E8 (worked on community

projects). E4 was correlated with resources domain ($r = .20$, p = .02), E5 was correlated with

resources domain ($r = .23$, p = .004), transformative potential domain ($r = .20$, $p = .017$), and CR

total score ($r = .19$, $p = .022$), and E8 was correlated with connection and caring domain ($r = .20$,

$p = .017$), resources ($r = .22$, $p = .007$), transformative potential ($r = .22$, $p = .008$), disaster

management ($r = .17$, $p = .046$), and total score ($r = .21$, $p = .012$).

Table 17

Correlations for the CART Sections C & D Items and the Five Core CART Domains and

Overall Community Resilience

Section C	Domain	1	2	3	4	5	6
C1. People in my community care about each other.		.68***	.59***	.70***	.45***	.63***	.70***
C2. My community is a safe place to live and work.		.53***	.46***	.55***	.35***	.49***	.55***
C3. Good housing is available for people who live in my community.		.44***	.55***	.46***	.36***	.44***	.51***
C4. People in my community can access necessary health care services.		.47***	.60***	.49***	.36***	.49***	.55***
C5. Good educational opportunities are available to people who live in my community.		.48***	.54***	.55***	.43***	.53***	.58***
C6. Good work opportunities are available to people who live in my community.		.46***	.51***	.51***	.47***	.47***	.56***
C7. People in my community have friendships with their neighbors.		.50***	.51***	.51***	.40***	.59***	.57***
C8. Leadership opportunities are available to people who live in my community.		.62***	.59***	.70***	.48***	.64***	.70***
Section D							

D1. I feel like I belong to my community.	.66***	.59***	.63***	.52***	.66***	.70***
D2. I have hope about the future.	.45***	.33***	.36***	.28**	.37***	.41***
D3. I live in good housing.	.27**	.20*	.18*	.29***	.21*	.26**
D4. I can get the services I need.	.23**	.20**	.19*	.25**	.21*	.25**
D5. I work with people in my community to solve problems.	.52***	.42***	.54***	.39***	.49***	.54***
D6. My family and I have a disaster or crisis plan.	.12	.15	.15	.37***	.14	.21*
D7. I have friends in my community.	.34***	.23**	.26**	.32***	.30***	.33***
D8. I would like to be involved in trying to improve my community.	.29***	.21*	.31***	.24**	.25**	.30***
D9. I would like to become a leader in my community.	.31***	.25**	.31***	.20*	.19*	.29***
D10. I trust local officials.	.44***	.54***	.62***	.36***	.53***	.58***

Note. CART = Communities Advancing Resilience Toolkit; Domain1 = connection and caring; 2 = resources; 3 = transformative potential; 4 = disaster management; 5 = information and communication; 6 = overall community resilience. * $p < .04$. ** $p < .01$. *** $p < .001$.

Table 18 presents the primary reasons that respondents selected for living in their community and their percentage agreement with the Core CR domain items and total CR items. Respondents who selected "own my home", "work", "convenient location", "family", or "appearance and feel" as their primary reason for living in their community all had the highest percent agreement with the items comprising domain 4 (Disaster Management) compared to all the other domains and total CR. Respondents selecting "own home", "convenient location", or "appearance and feel" had the lowest percent agreement with the items comprising domain 3 (Transformative Potential), and those selecting "work" or "family" had the lowest percent agreement with domain 2 (Resources).

Table 18

Primary Reason for Living in Their Community Related to Percent Agreement with Five Core

CR CART Domains and CR Score

Community Domain Variable	1 %	2 %	3 %	4 %	5 %	6 %
Most important reason you live in your community:						
1. Own my home	62.3	54.7	45.0	67.6	60.0	57.0
2. Work	54.8	36.3	40.7	54.8	45.2	45.9
3. Convenient location	56.2	61.2	52.7	73.7	57.5	59.7
4. Family	69.3	44.0	47.6	74.7	54.7	57.3
5. Appearance & feel	54.1	51.4	42.9	64.3	54.3	52.2

Note. CR = community resilience; Domain1 = connection and caring; 2 = resources; 3 = transformative

potential; 4 = disaster management; 5 = information and communication; 6 = overall community

resilience.

Research Question 3.1

What is the relationship between the perceived Core CR domains, disaster-related characteristics,

and emergency preparedness among study participants?

Disaster-Related Characteristics and Emergency Preparedness

This research question looks at relationships between community resilience and disaster-

related questions from the CART survey and emergency preparedness from the HEPI. Disaster-

related characteristic questions included: (a) CART Item B28: "my community is at risk for

disasters and community crises;" (b) CART Item F26: "have you personally experienced a

disaster;" and (c) CART Item F29, which includes five items about the respondent's level of

concern about each of the following: health threats (e.g., flue epidemics), intentional human-

caused disasters (e.g., mass-shootings), natural disasters (e.g., server weather events),

unintentional disasters (e.g., chemical leaks), and socio-economic issues (e.g., crime). The

Emergency Preparedness variables included: (a) HEPI Preparedness Actions/Planning (PAP) subscale and (b) HEPI Disaster Supplies/Resources (DSR) subscale.

Table 19 presents the correlations of the CART items and HEPI variables with the five Core CR dimensions and CR total score. Item B28 is not related to CR. Disaster experience has only one small negative correlation (-.22) with the resource domain. Two of the disaster concerns, intentional and unintentional, have only small or negligible correlations with CR. Health and natural disaster threats only have one negative medium correlation with the resource dimension, and all the other correlations are small. Socio-economic concerns have medium negative correlations with CART Domains (a) Connection and Caring (-.32), (b) Resources (-.41), Transformative Potential (-.33), and the Total CR score (-.35). The negative correlations indicate that increased levels of concerns are related with lower CR domain scores or higher levels of CR are associated with lower levels of concern. There appears to be no relationship between HEPI PAP (r = -.02) and DSR (r = .00) behaviors and perceived Total CR to disasters.

Table 19

Correlations of CART Disaster Related Items and HEPI Disaster Related Items with CR CART Domains and CR Total Score

	CR Domains and Total CR					
Variables	1	2	3	4	5	Total
CART						
B28: Risk for Disasters	.00	-.06	.02	.17	-.05	.01
F26: Disaster Experience	-.13	-.22**	-.16	.02	-.09	-.15
F29: Health Threat	.20*	-.31***	-.25**	-.15	-.24**	-.27**
F29: Intentional Disaster	-.18*	-.12	-.15	-.13	-.11	-.16
F29: Natural Disaster	-.20*	-.32***	-.25**	-.20*	-.18*	-.27**

F29: Unintentional Disaster	-.14	-.08	-.09	-.11	-.07	-.11
F29: Socio-Economic issue	-.32***	-.41***	-.33***	-.20*	-.26**	-.35***
HEPI						
PAP	-.02	-.06	-.05	.11	-.06	-.02
DSR	-.06	-.06	-.04	.15	.02	.00

Note. CART = Communities Advancing Resilience Toolkit; HEPI = Household Emergency Preparation Instrument; CR = community resilience; B28 = "My community at risk for disasters and crises"; Domain1 = connection and caring; 2 = resources; 3 = transformative potential; 4 = disaster management; 5 = information; 6 = CR total score; PAP = preparedness actions/planning subscale; DSR = disaster supplies/resources subscale. $^*p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

Research Question 3.2

What is the relationship between perceived CART Core CR domain scores, HEPI subscale scores, and personal disaster experience (CART Section F26) in predicting whether a study participant has a disaster/crisis plan?

Table 20 presents the correlations of the CART Core CR domain scores; the HEPI PAP and DSR subscales; and the CART Section F26 personal disaster experience item, with CART item D6: "My family and I have a disaster or crisis plan" and HEPI item PAP1: "Have you prepared and discussed a family emergency plan?" Correlations with both CART D6 and HEPI PAP1 items, coded as 0 = no and 1 = yes, are presented because there was only a 76.5% agreement between the two items. Although both survey instruments included *preparedness planning* questions (CART D6 and HEPI PAP 1), the items appear to measure different dimensions or facets of the construct *preparedness planning*. For example, the HEPI PAP1 item uses the words "emergency plan" and the CART D6 uses the words "disaster or crisis plan." Furthermore, the HEPI PAP1 is more prescriptive and asks if the plan has been prepared and discussed with family members; whereas the CART D6 item is more general in asking if the

100

family has a plan. Participant interpretation of these two preparedness planning items may have influenced response selection resulting in a lower than expected agreement between the two survey items.

There were two significant items with the CART disaster plan item, a medium positive correlation with disaster management and a small CR total correlation. None of the CART variables were related to the HEPI disaster plan item. All two of the HEPI measures had positive significant correlations with both disaster plan items, with the strongest relationships occurring between the HEPI subscales and total GP scale with the HEPI disaster item. A direct binary logistic regression was originally planned for research question 3.2; however, preliminary data analysis indicated that logistic regression was not appropriate, especially given that the two dependent measures of having a plan (HEPI PAP item 1 and CART Section D, item 6) gave contradictory responses, as previously discussed in the paragraph above.

Table 20

Correlation of CR Domain Scores, HEPI Subscale Scores, and Disaster Experience with

CART D6 and HEPI PAP1 Items Denoting Occurrence or Non-occurrence of Having a

Disaster Plan

Variables	CART D6 Plan	HEPI PAP1 Plan
CART CR Domains		
1. Connection and Caring	.12	-.06
2. Resources	.14	-.10
3. Transformative Potential	.14	-.12
4. Disaster Management	.33***	.04
5. Information and Communication	.12	-.14
HEPI		
PAP Subscale	.51***	.70***
DSR Subscale	.20*	.31***
CART F26 Have Disaster Experience	.02	.07

Note. * p < .05. *** p < .001.

102

CHAPTER 5: DISCUSSION

The relationships between Household Emergency Preparedness (HEP) and Community Disaster Resilience (CDR) are not well understood. The primary objective of this descriptive study, using secondary analysis of data collected with the Household Emergency Preparedness Instrument survey (HEPI) (Heagele et al., 2020) and the Communities Advancing Resilience Toolkit (CART) Assessment Survey (Pfefferbaum et al., 2020), was to understand the complex relationships of variables within an All Hazards, All Agencies, and All People framework, in a local context, by assessing emergency preparedness behaviors, such as HEP and perceived CDR, during the disaster response phase of the COVID-19 Pandemic, among residents living in Pitt County, NC, a geographical vulnerable inner coastal plain community. The results of this study are viewed with the All Hazards, All Agencies, All People Conceptual Framework in order to better understand the shared responsibility of all individuals, households, and agencies in emergency preparedness for all hazards. This chapter also addresses the limitations of the study, recommendations for future research, and implications for disaster-based nursing practices.

All People

This study described the *All People* Domain, as consisting of all people residing in a community, in this case Pitt County, NC, as valuable partners in building CDR, regardless of perceived social or health vulnerability (Fitzpatrick, 2016). The All People variables in this study included (a) HEP, and (b) individual characteristics, such as demographic, socioeconomic, and prior disaster exposure. HEP is essential for individual, family, and CDR, especially among subpopulations that bear a higher burden of risk and vulnerability, such as people with chronic health issues and functional impairments, pregnant women and children (Hendriks et al., 2018).

All People: Individual Characteristics of Residents of Pitt County, NC

The predominant participant demographics in this study were similar to the subgroups reported in the integrative review, such as White, educated, females that are > 40 years of age. However, this sample was different than the samples from previous studies that assessed HEP and perceived CDR. The current study sample included a large percentage of participants (61.8%) who reported full-time (30 or more hours/week) employment status; with 44.5% working in education or healthcare. Given the inclusion criteria for the parent study, these data reflect not only the perspectives of residents who live in Pitt County, but also a large portion of residents (44.5%) working for key education and healthcare agencies and organizations within this community.

Paton and McClure (2013) assert that work-family interface is an example of how organizational preparedness can influence family decision making and overall level of HEP in a community. These blended personal and professional perspectives may enhance the shared objective and responsibility of improving individual and community health within Pitt County, NC. For example, the authors of the All Hazards, All Agencies and All People Framework, urge the involvement of all governmental, non-governmental, private sector, and volunteer emergency management agencies during all phases of disaster mitigation, disaster preparedness, disaster response, and disaster recovery (Fitzpatrick, 2016). Healthcare and academic institutions are recognized as key community-based agencies with knowledge of local community risks, needs, and capacities (Coppola, 2021d). The findings of this study stress the importance of making sure all agency personnel are personally prepared for disasters so they are able to fulfill their professional obligations during the disaster life cycle as well.

All People and HEP Behaviors (Research Question 1.1)

Study participants were queried about their household emergency preparedness

behaviors, including action-based HEP activities, as measured by the HEPI PAP subscale, and

resource-based activities, such as those measured by the HEPI DSR subscale. Individual

endorsement of action-based or resource-based behaviors reflects respondent approval or support

for personal engagement in specific preparedness activities. There was a greater number of

participants who endorsed the DSR items (83.1%) as compared to a smaller number of

participants who endorsed the PAP items (41.8%). It is interesting to note that the DSR items

with the highest percentages of agreement, as reflected by participants who answered *yes* to

having a disaster supply/resource either in their house or their emergency disaster supply kit,

were the items such as working smoke detectors, transportation, personal hygiene supplies, a

non-electric light source, and warm blankets. This finding is similar to other emergency

preparedness studies that have questioned actual versus perceived levels of HEP (Der-

Martirosian et al., 2014; Donahue et al., 2014; McNeill et al., 2018). For example, most of the

HEP studies reviewed for this current study, utilized perception-based self-report survey

instruments, which supply an abundance of subjective data, with limited or lacking objective

data to confirm these reported HEP behaviors. More specifically, individuals may perceive HEPI

DSR items in their homes as emergency supplies, thus selecting a "yes" survey response, when

the supplies and resources are actually used for everyday utility.

Labrague et al. (2017) observed that the use of largely perception-based (subjective)

instruments leads to a gap in disaster preparedness science because stakeholders aren't clear

"what factors predict low preparedness for actual disasters response" (p. 50). Paton and McClure

(2013) recommend caution in interpreting self-reported household preparedness behaviors

because similar to the most endorsed DSR items in this study, most of those supplies and resources also have everyday utility or are regulated by government agencies. For instance, personal hygiene supplies are often purchased for everyday utility and NC building code for fire prevention, requires the installation of smoke detectors in every dwelling unit (NC State Construction Office, 2011). Further exploration is needed to confirm whether these DSR items were purchased for emergency preparedness use. More specifically, "actual" HEP measures refer to preparedness actions and resources that can be objectively measured and evaluated, such as a face to face evaluation or photo validation of an individual's emergency supply kit that contains hard copies of emergency preparedness action and planning documents, as well as verifiable amounts of water, non-perishable food, batteries, etc. "Perceived" HEP measures are subjective self-report surveys of HEP measures. Paton and McClure (2013) assert that "the key goal of preparedness research is to explain differences in observed levels of people's hazard preparedness" (p. 59). Public health emergency preparedness leaders cannot expect to improve HEP readiness until there is more objective data confirming perception-based self-reported HEP measures (Der-Martirosian et al., 2014; Donahue et al., 2014; McNeill et al., 2018); which will require more mixed-methods and observational studies to confirm self-reported action-based and resource-based HEP behaviors. Equally important is the need to engage all agencies and all people at the community level to bridge the gap between HEP knowledge and HEP planning actions. The lack of objective HEP data and a HEP knowledge – practice gap, may help to explain the disparity that exists between national preparedness efforts to increase emergency preparedness at the household level and reported low states of readiness at the individual/family subsystem levels.

The findings from this study add to the variability of HEP behaviors noted in the literature. For instance, Zamboni and Martin (2020) conducted a cross-sectional study using a national-level data set, the 2017 American Housing Survey, to identify disaster preparedness disparities among household in the U.S. They observed that 68.9% of households in their study reported fulfilling more resource-based items than action-based items; suggesting that people may perceive the risk of not having key resources greater than certain action planning activities. By comparison, Uscher-Pines and colleagues (2009), concluded that people with special needs requiring transportation assistance were more likely to engage in action planning activities than to spend time on buying resource-based supplies. There is speculation that reasons for people's preference for certain emergency preparedness behaviors over others, may be due to reliance on family members or outside agencies to meet basic disaster survival needs (Uscher-Pines et al., 2009) and an overconfidence of perceived risk judgments and in mitigation measures (Paton & McClure, 2013). The variability in HEP behaviors places an emphasis on more local-level mixed-methods research engaging all agencies and all people to determine the unique needs, knowledge, and skills of both community members and local agencies.

In relation to HEPI PAP transportation and evacuation items, the current study's findings are congruent with other studies examining these covariates (Uscher-Pines et al., 2009; Paton & McClure, 2013) as 83.1% of participants reported having all 12 DSR items and 96.5% of participants agreed that they have necessary transportation if they needed to leave their neighborhood quickly, in the event of a mandatory evacuation. These findings are interesting when compared with other lower participant endorsed PAP items such as: (a) knowing where to go if they need to evacuate (44.4%); (b) having a planned evacuation route (35.4%); (c) if separated, having a meeting place (23.1%); (d) knowing the location of local emergency shelter

(29.9%); and (d) practicing emergency procedures at home (18.8%). These findings raise further questions related to participants' perception of risk and vulnerability in relation to an over confidence in their means of transportation to evacuate their community quickly versus a need to engage in PAP activities, as well as resource-based activities. Only 5 participants (3.5%) had HEPI General Preparedness (GP) scores greater than 30, implying that the majority of study participants were categorically unprepared for hazards in their community. This finding is interesting and potentially concerning given the geographic disaster vulnerability of Pitt County being an inner coastal plains community near the Atlantic coastline and requires further investigation. However, looking beyond a categorical description of being prepared or not prepared, HEP most likely exists across a continuum, reflecting different variations of emergency preparedness that are dependent on a multitude of socioecological factors, such as the social determinants of health.

All People: Variation within HEPI PAP Subscale (Research Questions 1.1). An interesting finding of this study was the variability within the HEPI PAP subscale among study participants using two proxy measures of preparedness: (a) having prepared and discussed a family emergency plan (PAP item 1), and (b) having supplies set aside in an emergency kit to be used in case of a disaster (PAP item 7). As noted in the Results Section, Table 5 contains the percentage of participant agreement for HEPI PAP and DSR subscale items, using these two proxy measures, among the following four subgroups: (a) +plan/+kit: have a plan and have a kit; (b) +plan/-kit: have a plan but no kit; (c) -plan/+kit: does not have a plan but has a kit; and (d) -plan/-kit: does not have a plan or a kit. It was not surprising that the subgroup (+plan, +kit), who prepared and discussed a family emergency plan and had prepared an emergency kit, had: (a) overall higher percentage of positive responses for PAP items; (b) greater awareness of the

types of disasters in Pitt County; and (c) knowing if their home was in an evacuation zone, as compared to those who reported not having a plan or a kit (subgroup -plan/-kit). These new PAP subgroup findings are important for decreasing disaster risk among existing residents and new residents who relocate to Pitt County, as majority of homeowning participants in this study (62.3%) reported that the-primary reason for living in Pitt County is work-related (54.8%). For example, it is possible that as individuals move to Pitt County for employment reasons and purchase homes, they may need disaster preparedness information if they are not familiar with the area. This is an area that community-based agencies, such as land use planning, fire departments, law enforcement, emergency medical services, local public health departments, hospitals, academia, and local volunteer agencies, such as the American Red Cross, can share local experiences and resources to increase residential familiarity with local community risks to collectively enhance community disaster resilience for all people, whether they are new or existing residents in Pitt County.

Sharing the responsibility of PAP processes between people and community-based agencies is imperative to meeting basic health and survival needs for All People throughout the disaster life cycle (Couig et al., 2019). Further exploration is needed to determine which agency or agencies would be responsible for sharing information related to HEP DSR and PAP activities with all people living in or relocating to all parts of Pitt County. These findings support that actual levels of HEP knowledge should not be assumed to be adequate based on socio-demographics characteristics, such as socioeconomic status and participant professional education levels, as 56.2% of study participants report income levels > $75, 000 and 56.9% of participants in this study have graduate-level education and the sample still had low HEP GP scores. For example, despite having higher levels of income and higher levels of education in

this study sample, only 5 participant (3.5%) had General Preparedness scores greater than 30, implying that the majority of study participants were categorically unprepared for hazards in their community. However, a difference between the current study and these previous studies, is the application of the all hazards, valid and reliable, HEPI Survey. The HEPI Survey allows for a more in-depth examination of "resource-based and action-based preparedness" (Zamboni & Martin, 2020) behaviors.

All People: Individuals with Access and Functional Needs (AFN) and Special Actions (SA) (Research Question 1.1). The HEPI AFN subscale assesses a subgroup of participants who self-report that they have a disability, 65 years of age or older, take at least one prescription medication, or that they are pregnant. The HEPI SA subscale is intended for people who wear prescription glasses, have a baby, or have a pet. In the SA section, item 1 could be answered by all respondents, four of the five SA Part 2 items could be answered by all the respondents, while item SA5 would only be answered by those with a pet.

The literature review for this study identified high risk populations as: (a) people living with disability or functional limitations (Kurkjian et al., 2016; Strine et al., 2013; Uscher-Pines et al., 2009); (b) chronic physical or psychological conditions (Bethel et al., 2011; Eisenman et al., 2009; Strine et al., 2013); and (d) being a pet owner (Baker et al., 2018). Based on the response criteria for the AFN and SA subscales, it was surprising that 33% of respondents (n = 112) reported having important medical information, such as next of kin, medical history stored on a portable flash drive or cloud-based system and 32.4% of respondents (n = 111) had a list of "doctors" on a paper or stored on a flash drive or cloud-based system. Similarly, 29.3% of respondents (n = 99) had a paper copy of advance directive stored on a flash drive or cloud. This unexpected low report of respondent-healthcare provider emergency preparedness is similar to

other study findings that reported "only 4.9% of respondents actually reported having a discussion with their healthcare professional about preparedness" (Killian et al., p. 87) and that respondents who reported fair/poor perceived health, a disability, and three or more chronic diseases were less prepared for disasters than respondents without these health concerns (Bethel et al., 2011).

HEPI survey item construction and language choice, such as *doctors* versus *healthcare professionals* may have restricted response outcomes. The low endorsement of emergency preparedness conversations between study respondents and healthcare professionals is an important finding and stresses the critical role that healthcare providers play in assisting patients with chronic health conditions in preparing for all hazards. This shared emergency preparedness responsibility extends beyond the patient and healthcare provider relationship by providing a means of accurate communication of healthcare information with other community-based agencies such as, first responders, emergency shelters, and local hospitals during response and recovery phases when individuals may be experiencing emotional distress.

Baker et al. (2018) highlighted a unique perspective of the vulnerability of households with pets. They point out that pet owners are considered a high-risk population because they are less likely to evacuate during a disaster. However, in the current study, households with pets endorsed having SA subscale items, such as 91.8% ($n = 97$) of participants reported having a one-week supply of pet food and water, 83% ($N = 53$) had pet medications, and 61.6% ($N = 99$) had an evacuation plan for their pet. A limitation of these quantitative statistical perspectives is: (a) the inability to confirm whether the first three pet-based items, pet food, water for pet, and pet-medications, are in the household for everyday necessity or if the participants obtained the items for household emergency preparedness purposes, creating an above and beyond supply of

food and water; and (b) whether or not the pet evacuation plan has been written and discussed with other household members. Unlike the Baker (2018) study, the current study does not have sufficient data to understand the relationship between HEPI SA items and participant intent to evacuate or not evacuate with or without their pet(s).

All People: Personal Disaster-Related Characteristics (Research Question 1.2)

For the first time, this study examined the relationships between HEPI PAP and DSR subscales, the combined HEPI GP scale, with CART Survey items assessing participant reports of personal disaster experience and level of participant concern for disasters that could affect their community (health threats intentional human caused disasters, natural disasters, socio-economic issues, and unintentional disasters), age, and gender. Over half of the respondents in this study reported having a personal disaster experience (64.6%) and a having a disaster/crisis plan (56.3%).

Of the five community concerns, most participants were concerned about (a) health threats, (b) natural disasters, and (c) socio-economic issues, and less concerned about unintentional disasters, such as chemical leaks and fires. There were no gender or age differences noted between HEPI PAP, DSR, or GP total scores and these five community concerns; see Tables 10 and 11. These current study findings are inconsistent with other studies that reported conflicting evidence linking level of HEP with certain sociodemographic characteristics. For example, some researchers reported age and gender to be a barrier to having adequate emergency preparedness supplies (Enkenga & Ziyu, 2019; Killian et al., 2017) and others reported older age as a protective factor when securing resources for HEP (Gargano et al., 2015; Thomas et al., 2015).

The report of having a disaster/crisis plan, as measured by the CART Assessment Survey Item D6 (56.2%), was incongruent with previous HEPI PAP Item 1 (47.9%) study findings of participants who prepared an emergency plan. It is not surprising then that there was a large correlation between having a disaster plan (CART Item D6) and the HEPI PAP subscale and a medium correlation between having a plan and combined HEPI GP scale. However, in this study there was a positive medium correlation with males who reported having a personal disaster experience and their DSR subscale scores. In contrast, there was a positive medium correlation between females who reported having a disaster plan, PAP subscales, and overall GP scale scores. These findings are interesting when considering the results of the Hung (2017) study that reported on intra-household dynamics and differences in levels of HEP due to households with predominant husband decision making, households with predominant wife decision making, and households with joint decision making. Households with joint decision making are reported to have higher levels of preparedness as compared to households with sole wife decision making.

The findings from the Hung (2017) study are similar to the findings from the Ekenga and Ziyu (2019) study that reported women had lower levels of HEP as compared to men. Hung (2017) recommended that emergency management and disaster preparedness agencies encourage household decision makers and their spouses to attend hazard awareness events to increase the likelihood of joint decision making, and empower all people to share the responsibility of enhancing overall HEP levels. In this study, we consider household diversity to include any combination of household decision makers, regardless of race, ethnicity, gender, sexual orientation, socioeconomic status, cultural, or religion. Agency recognition of household diversity, may also help to close the gap between national preparedness efforts to increase

emergency preparedness at the household level and reported low states of readiness at the individual/family subsystem levels.

One way community-based agencies, such as fire departments, law enforcement, emergency medical services, local public health departments, hospitals, academia, and local volunteer agencies, can respect household diversity and advance social and health equity in disaster risk reduction and disaster preparedness for all people, is the adoption of cultural and linguistic practices, such as defined by the National Standards for Culturally and Linguistically Appropriate Services in Health and Health Care (CLAS Standards). The U.S. Department of Health and Human Service's (DHHS) Office of the Assistant Secretary for Preparedness and Response (ASPR) (2020) has adopted the National Technical Assistance and Evaluation Center's definition of cultural competence as:

> The ability of individuals and systems to respond respectfully and effectively to people of all cultures, classes, races, ethnic backgrounds, sexual orientations, and faiths or religions in a manner that recognizes, and affirms, and values the worth of individuals, families, tribes, and communities, and protects and preserves the dignity of each. (para. 2).

Self-reflection is also valuable in identifying personal prejudices or assumptions (ASPR, 2020) when considering the diversity of households and household characteristics, such as household decision making in relation to HEP behaviors.

All People: CART Section B-Core Community Resilience Domains (Research Question 2.1)

Residents of Pitt County, NC were asked about their perceptions of community resilience in their community, as measured by the five interrelated core domains of the CART Assessment Survey, Section B. The Disaster Management Domain had the highest mean score ($M = 3.65$, SD

= .62) and the Transformative Potential Domain had the lowest (M = 3.36, SD = .62). The overall

perceived CR mean score was M = 3.48, SD = .57). This is an interesting and important finding

because the CART Disaster Management Domain assesses a participants' perception of their

community's disaster prevention, mitigation, preparedness, response, and recovery capacity

(Pfefferbaum et al., 2013c). All phases of the disaster life cycle play a critical role in disaster risk

reduction. The disaster life cycle is a continuous process that requires critical reflection as

individuals, households, agencies, and communities collectively engage to problem solve with

the information they gather throughout this process (Pfefferbaum et al., 2011). In this study, the

Transformative Domain had the lowest mean domain score and reflects a perceived challenge for

Pitt County, NC. Only 24.3% of participants agreed that "people in my community trust local

officials" and only 35.4% agreed that "my community looks at its successes and failures so it can

learn from the past." However, the event characteristics of the COVID-19 pandemic, the

transition of Presidential Administrations, and civil unrest during the time of data collection may

have influenced participant responses. In the All Hazards, All Agencies, All People Model,

effective preparedness strategies will be reflected by the quality of engagement between all

people and all response and recovery agencies (Paton & McClure, 2013b). These findings are

important because the majority of residents (68.1%) in this study recognize that their community

is at risk for future disasters and crises, including natural and intentional disasters, as well as

economic downturns. This first-time application of the CART Integrated System in Pitt County,

NC, provides all people and all agencies in this community an opportunity to further assess these

perceived challenges in order to build community resilience to all hazards. These perceived

community resilience challenges may impede future emergency preparedness efforts.

There were significant positive intercorrelations for the Five CART Domains and Overall Community Resilience. Similar to another study conducted by Pfefferbaum and colleagues (2015) the highest correlation among the five core domains was between the Resources and Transformative Potential Domains ($r = .85$, $p < .01$) and the lowest correlation was between the Disaster Management and Connection and Caring Domains ($r = .51$, $p < .01$). Pfefferbaum et al. (2015) supported that resources are key in helping a community to develop skills and fulfill their goals (Transformative Potential). It is important to note that resources include: (a) land; (b) raw materials; (c) physical capital and infrastructure; (d) human workforce, expertise, and leadership; as well as (e) social resources, such as support systems (Pfefferbaum et al., 2008).

All People: CART Section B-Core CR Domains, Study Participant Demographic Characteristics, and Secondary Sections (C, D, E, F) (Research Question 2.2)

In this part of the study, other covariates were examined in order to better understand how participants describe their community, their relationship and their connection to Pitt County. Covariates included gender, age, and homeownership. CART secondary sections (C, D, E, and F) were also used in addition to the five Core CR Domains from section B.

There is insufficient evidence in both this study and these prior studies noted in the literature to support why sociodemographic factors, such as age, gender, and socioeconomic status result in varying levels of HEP adoption rates and how HEP determinants influence CDR.

It is possible that demographic characteristics are not as equally weighted in influencing HEP behaviors and perceptions of CDR, as community-based factors are, such as reflected and measured by the CART Core CR Domains. Based on the articles reviewed for this study, All Agency or community factors have received less attention than the All People factors previously discussed. Approximately 23% of the studies addressed community factors when determining

levels of HEP (Glik et al., 2014; Kurkjian et al., 2016; McNeill et al., 2018; McNeill et al., 2020a; Thomas et al., 2015; Zidek et al., 2014). Social, economic, and political dimensions were identified as protective community factors and were described as community-based training programs, state-level disaster preparedness programs, school-based disaster preparedness programs, public health decision makers use of social media and technology platforms to disseminate preparedness and warning messages, and engagement of healthcare providers in disaster preparedness management for people managing chronic health conditions. Furthermore, in this study, participants, regardless of age, gender, and homeownership describe Pitt County as a community that offers good educational opportunities, access to necessary healthcare services, and is a safe, friendly place to live and work. However, there is less participant agreement that Pitt County offers leadership opportunities and good housing for all people in their community. There also appears to be less interest in becoming a community leader (28.5%) and low levels of trust of local officials (30.8%). This is an important finding considering only 39.9% of study participants agreed or strongly agreed that "my community treats people fairly no matter what their background is" and only 36.1% perceived that "my community has effective leaders." The lack of trust in community leaders and perceived effect of leaders may in part reflect the partisan discord around agency responses to COVID-19, such as misinformation and disinformation related to social mask mandates, isolation and quarantine recommendations, availability of treatment options, and vaccines. Paton and McClure (2013f) assert that everyday trust in local agencies becomes a determinant of the trust needed in the context of infrequent hazards. Studies show that particular attention needs to be paid to vulnerable communities that disproportionately experience chronic daily stressors, such as health disparities and inequities related to the social

determinants of health, as well as the addition of disaster-related stress (Lichtveld, 2018; Morton & Lurie, 2013; Couig et al., 2021).

The All Hazards, All Agencies, All People Approach to build CDR identifies *community engagement* as critical in the co-creation of programs and policies that empower all people in communities to share the responsibility of disaster preparedness (Fitzpatrick, 2016). According to Herbert (2014) "the weakest link in many risk management strategies has been the lack of involvement from the local people" (p. 10). In the context of the COVID-19 pandemic, it is unclear if the low frequency of resident participation in local public meetings (2.8%), and community projects (3.5%) is due to personal preference or socially mandated restrictions. However, these participants, willingly participated in the ComPACT study, a community-academic research project, where this data was collected. Further exploration of the relationships between all people and all community-based agencies, is needed to build CDR and close the gap between preparedness efforts and low states of readiness, as identified in Pitt County, NC.

All People and All Hazards: CART Section B-Core CR Domains, Disaster-Related Characteristics, and HEP (Research Questions 3.1 and 3.2)

This part of the study looked at five different hazard types: (a) health threats, (b) intentional human caused disasters, (c) natural disasters, (d) unintentional disasters, and (e) socio-economic issues; participants' perceived CR to disasters and their level of concern for these hazards; participant experiences with these hazards; and their emergency preparedness behaviors, such as having a disaster/crisis plan and an emergency supply kit for disasters. The primary findings of this research question show that participant concerns about health threats and natural disasters have a negative medium correlation with the CART Resources domain. As a participant's level of concern for health threats and natural disasters increases, Resource domain

scores would go down. For example, there would be less agreement that the community has the resources to take care of community problems (B9); people are unable to get the services they need (B10); people might not know where to go to get things done (B11); and that community has effective leaders (B17). Likewise, the opposite could be true, such as during non-pandemic times, when resources are plentiful, participants may perceive less concern about potential hazards and disasters, have more confidence in local community leaders, and have overall higher perceptions of CR. Pfefferbaum et al. (2013a) describes the CART Resources domain as including natural, physical, information, human, social, and financial resources, which in "an all-hazards environment, structural elements must permit flexibility in addressing unforeseen vulnerabilities and threats" (p. 252). These results could possibly be explained because the data collection occurred during a pandemic, when supply chain issues and services were limited or non-existent in some cases.

Another area of concern for study participants was socio-economic issues, which had also had medium negative correlations with the following CART Core CR Domains: (a) Connection and Caring (-.32), (b) Resources (-.41), (c) Transformative Potential (-.33), and the Total CR score (-.35). It is not surprising that as participant concerns related to socio-economic issues in their community increase, that perceived CR mean scores would decrease in relation to tangible items such as available resources. It is interesting to note that increased socio-economic issues in the community are also perceived to negatively correlate with intangible items such as Transformative Potential (togetherness, goal setting, outside agency assistance), Connection and Caring (shared values, equity, and a sense of belonging), and overall perceived CR. Likewise, it is plausible that as intangible resilience factors, such as positive community change, shared values, equity, and a sense of belonging increases, that there would be less concern about

119

socioeconomic issues because these factors positively impact socioeconomic issues (Coppola, 2021f).

These findings echo one of the public health-policy failures identified by Lichtveld (2018), such that previous disaster experiences have taught us that we have ignored the chronic stressors, such as socioeconomic concerns, that individuals and communities manage on a daily basis. For example, Lichtveld (2018) points out that Hurricane Katrina victims faced a "triple threat burden: historic health disparities, persistent environmental health risks, and living in a disaster-prone area" (p. 28). Paton and McClure (2013c) assert that the development of individual interpretations of disaster risk, preparedness, and partnership processes are influenced by social and community relationships. This study samples' concern for the socioeconomic issues in their community may be straining these social and community relationships. Disaster vulnerability researchers, who examine the intersection of social and environmental inequalities, argue that disasters "are shaped by the already existing social, political, environmental, and economic conditions" in a given context (Bolin & Kurtz, 2018, p. 183). A limitation of solely using a research design that represents a quantitative statistical perspective, is the inability to further explore these relationships and reflections with study participants. Future qualitative work in this area can strengthen our understanding of how the combination of sociopolitical, economic, cultural, and community-based agency factors influence individual interpretation of disaster risk, vulnerability, the need to engage in HEP behaviors, and overall perceived CR.

It may be that community contexts, societal relationships, community-based agencies, and participants' prior disaster experiences play an important role in emergency preparedness behaviors, such as preparedness action and planning, and whether or not they develop a disaster or crisis plan. Support for community factors, such as prior disaster experiences and social

support, was evident in several of the studies reviewed for the current study (Gargano et al., 2015; Heagele, 2021; Malmin, 2021; Murti et al., 2014). However, it is interesting to note, that the only study to examine levels of HEP in relation to geographic region (Zamboni & Martin, 2020), reported that households in the South were more likely to fulfill overall preparedness criteria, including both resource and planning activities as compared with households in the Northeast, West, and Midwest. Findings from the current study, which assessed a sample of participants in the South, identified that only 5 participant (3.5%) had General Preparedness scores greater than 30, implying that the majority of study participants were categorically unprepared for hazards in Pitt County, NC, a geographically vulnerable community near the Atlantic coastline. Simultaneous application of the CART Assessment Survey and the HEPI have allowed for a more detailed exploration of relationships between perceived CDR, disaster-related characteristics, and emergency preparedness among study participants. This empirical data will be paramount in assisting public health emergency preparedness leaders' efforts to improve HEP readiness and building CDR.

There were several major HEPI findings from this study: (a) the HEPI findings add to the variability of HEP behaviors noted in the literature; (b) there was an unexpected low report of respondent-healthcare provider emergency preparedness; and (d) most study participants were categorically unprepared for hazards in their community. The major CART findings reflect various dimensions of perceived CR in the context of the COVID-19 pandemic, with the Disaster Management Domain, which had the highest mean score, as being the perceived primary CR strength and the Transformative Potential Domain, which had the lowest mean score, as being the perceived primary CR challenge in Pitt County, NC. Only 24.3% of participants agreed that "people in my community trust local officials" and only 35.4% agreed that "my community

looks at its successes and failures so it can learn from the past." In addition to low trust of local officials, there are concerns related to the fair treatment of all people despite their background, and that community leaders may not be as effective as they could be. Overall, participants expressed the most concerned about (a) health threats, (b) natural disasters, and (c) socio-economic issues, and were less concerned about unintentional disasters, such as chemical leaks and fires.

The major findings from this study also adds to the ambiguity found in the HEP and perceived CDR disaster literature. Though the assumption that the more people engage in HEP activities, the less harm they will incur when a destabilizing event hits (Bodas, 2019; McNeill et al., 2018; Nukpezah & Soujaa, 2018) may be true, and that the shared relationship between preparedness and resilience is the cornerstone of disaster preparedness (Levac et al., 2012), this study demonstrated that by using the All Hazards, All Agencies, All People Conceptual Model, we see that individual preparedness is only one facet of CDR. The cross-sectional nature of the data used for this study did not examine other facets of CDR, such as (a) the shared responsibility of mitigation, preparation, and recovery training efforts between All Agencies and All People; (b) the shared responsibility of supported community self-reliance by All Agencies and All People; and (c) the shared responsibility of community resilience building between All Agencies and All People to All Hazards. It was originally hypothesized that by identifying and measuring All People and All Agencies factors that enhance HEP, the smallest unit of analysis in the disaster preparedness system, larger units will benefit due to the reciprocity of interdependent relationships; although, there appears not be a relationship between individual HEP and perceived CDR with this study sample. It is possible that the specific elements of CDR that may be related to HEP are not sufficiently captured with the CART domains. Further research is

needed to determine how these overlapping areas collectively contribute to both verifiable HEP measures and perceived CDR in Pitt County, NC.

Strengths

This study has successfully filled a scientific gap in the disaster risk reduction and public health emergency preparedness with the first ever application of the CART Assessment Survey and the HEPI at the local-level in eastern NC, to understand the complex relationships between the All Hazards, All Agencies and All People domains in a local context. Previous research supports that individual preparedness factors are determinants in promoting resilience to disasters (Enkenga & Ziyu, 2019; Glik et al., 2014; Killian et al., 2017; McNeill et al., 2020b). The current study has made the following contributions to disaster risk reduction and disaster preparedness science in Pitt County, NC:

1) Examining demographics with the application of CART Assessment Survey and the HEPI AFN and SA subscales, allowed for particular attention to the needs of potentially vulnerable populations, that may be disproportionately experiencing chronic daily stressors, such as health disparities and inequities related to the social determinants of health. The level of attention is a mandate of the All Hazards, All Agencies, All People approach and the 2019-2022 National Health Security Strategy, which calls for a need to (a) protect at-risk individuals; (b) empower citizens to participate in preparedness efforts to reduce their risk; and (c) build individual and community resilience (U.S. ASPR, 2019b). The findings from the current study can help to fill a gap identified by Lichtveld (2018), who attributed a disconnect between policy and health to a failure in recognizing how chronic stressors, such as socioeconomic and health disparities, impact disaster preparedness and recovery.

123

2) First time local-level assessment of HEP and perceived CDR to disasters in Pitt County, NC allowed for an All People approach to ensure the involvement of the local people in a specific area to create both shared understanding and responsibility for community disaster resilience (CDR) (Fitzpatrick, 2016). This was novel given that a review of the literature revealed that the majority of the studies published in the U.S. between 2003 and 2021, examining HEP and community disaster resilience (CDR) were quantitative secondary analyses (n=11) of national-level (9) and state-level (2) data sets.

3) This study presented an opportunity for interprofessional healthcare providers to collaborate in establishing preliminary local-level emergency preparedness and CDR data that can be used for future community-based participatory research studies. The generation and dissemination of local disaster preparedness knowledge will benefit all people and all agencies in Pitt County, and serve as an exemplar for local disaster preparedness assessment on the national level.

Limitations

A major limitation of this secondary analysis of CART and HEPI survey data is the cross-sectional nature of this data set, providing only a snap shot of study variables from one point of time, from an available population (Polit & Beck, 2021f; Wang & Cheng, 2020). There are other methodological weaknesses when using a cross-sectional design, such as (a) difficulty making causal inferences; (b) challenges in interpreting identified associations; and (c) the inability to assess the temporal relationships between study outcomes and risk factors, as we saw in this study with data being collected during the COVID-19 pandemic (Wang & Cheng, 2020). Another limitation of this study was we were unable to assess participants' interpretations of survey items. Conceptual ambiguity may also be a problem with some of the survey items. For

example, it is hard to know if participants answered yes to having certain HEP items in their house due to everyday utility or if they were purchased in addition to their everyday supply for emergency use, raising questions related to perceived or actual levels of HEP; an issue raised by other emergency preparedness researchers (Der-Martirosian et al., 2014; Donahue et al., 2014; McNeill et al., 2018). More specifically, "actual" HEP measures refer to preparedness actions and resources that can be objectively measured and evaluated, such as a face to face evaluation or photo of an individual's emergency supply kit that contains hard copies of emergency preparedness action and planning documents and verifiable amounts of water, non-perishable food, batteries, etc. "Perceived" HEP measures are subjective self-report surveys of HEP measures, which is currently the main source of HEP data in the literature and in this study.

Generalizability of these research findings is challenged by: (a) the study sample being only a small percentage of Pitt County residents and does not demographically represent the known diversity of this County, and (b) the event characteristics of the COVID-19 pandemic, the transition of Presidential Administrations, and civil unrest during the time of data collection.

Recommendations for Further Research

Application of the CART Assessment Survey in this study has initiated the generation of a community profile for Pitt County, NC. The next steps in the CART process include interviewing key community-based agencies and informants. This information is necessary to develop the All Agencies Domain, of the All Hazards, All Agencies, All People Conceptual Model. Community-based agencies are identified as fire departments, law enforcement, emergency medical services, local public health departments, hospitals, academia, and local volunteer agencies, such as the American Red Cross. Assessing the All Agencies Domain will provide a more in-depth understanding of the collaborative community disaster resilience

building efforts in Pitt County, NC. This overlapping All Agencies to All People and All People to All Agencies approach to build CDR, encourages communities to share the ownership of disaster preparedness and ensures that the diversity of the community is reflected in the disaster risk reduction programs and interventions designed. Community Disaster Resilience is considered as the "outcome of an integrated all hazards, all agencies, all people approach" (Fitzpatrick, 2016, p. 66).

Secondly, actual versus perceived HEP, or more specifically, objective-based and subjective-based measures of HEP, requires further exploration in order to adequately identify households that may not meet preparedness criteria; thus, increasing their risk and vulnerability to all hazards. More research is needed to determine if certain HEPI DSR items are being used for everyday utility versus being purchased specifically for emergency use. The determination between actual versus perceived HEP is needed to assess for possible overconfidence in emergency preparedness behaviors, which can threaten human and pet health and well-being for any type of hazard.

Lastly, additional HEP and perceived CDR research is needed with more diverse samples, including demographic subgroups outside of the predominant ones identified in the preceding literature review and this study. High-risk vulnerable populations, including households with pregnant women, children, elderly, people with chronic physical and mental health conditions, and rural households with limited access to healthcare providers and services. Additionally, the COVID-19 pandemic illuminated the importance of frontline essential workers as another important group warranting particular attention for the emergency preparedness, safety, and well-being.

Implications for Nursing Practice and Education

This study provides support for nurses to advance disaster nursing science by providing a baseline assessment of HEP and perceived CDR at a local-level. In order for nurses to play a key role in developing the nation's capacity for disaster risk reduction, as called for by *The Future of Nursing 2020-2030*: *Charting a Path to Achieve Health Equity,* more nurses need to conduct more disaster risk reduction and disaster preparedness research studies, so they can advocate for realistic comprehensive disaster preparedness efforts and safer post-disaster self-recovery for all people exposed to all types of hazards but especially for high-risk vulnerable populations. Community leaders and agencies should not assume they know who these high-risk vulnerable populations are without the input of the people they are intending to protect. This study offers an example of how nurses can lead interprofessional disaster preparedness activities in their local communities, which will ultimately add to overall national preparedness efforts and national security.

Implications for the Local Context – Pitt County

The descriptive findings from this study have implications for All Agencies involved in Pitt County emergency preparedness, response, and recovery practices. The findings from this study offer insight into some of the factors that may be related to overall low levels of HEP and perceived CDR among residents of Pitt County, such as lack of trust in local officials, beliefs that not all people are treated fairly, concern about socioeconomic issues, and perceived lower transformative potential for community change. These are important implications for local agencies.

In order to enhance local public health emergency preparedness efforts to build disaster risk reduction capacity and CDR to decrease mortality and morbidity rates, and to reduce risk of

re-traumatization among vulnerable subpopulations, that are highly sensitive to climate injustices, we urgently need to understand the complex social characteristics and relationships between All Hazards, All Agencies, and All People at the local-level. An additional focus on community-based participatory disaster preparedness research, with stakeholders from both the All People and All Agencies domains, is needed to better understand resident concerns and issues identified in this study and address the knowledge-practice gap between vulnerable populations and disaster preparedness.

Summary

This study provides greater insight into the importance of local-level assessment of emergency preparedness behaviors and perceived CDR. The majority of households in this study were categorically unprepared for hazards in their community. However, out of the five CART CR domains, Pitt County residents perceived Disaster Management as the primary community resilience strength, while their community's Transformative Potential as the primary community resilience challenge within their community. Critical analysis of collective community experiences, including disasters, is what community leaders and agencies need in order to design community-based interventions that effectively build CR (Pfefferbaums et al., 2013c). Interestingly, the literature review for this study recognized a general consensus among the qualitative researchers (Diekman et al., 2007; Heagele, 2021; McNeill et al., 2020) that there is a need for local and state-level disaster preparedness education programs, preparedness interventions, and engagement of all people, and all agencies to improve disaster outcomes.

The findings from this study are consistent with Buergelt and Paton (2014) proposal that low preparedness rates may be related to the paucity of disaster research examining the interdependent systemic relationships between the All People and All Agencies domains (i.e.,

individual and community domains). In order to promote equitable community disaster resilience for all populations, more local-level community-based disaster preparedness research, including qualitative and mixed methodologies, is needed in order to better understand contextually and culturally relevant emergency preparedness behaviors that promote both the capacity of All People and All Agencies to adapt during all hazardous events.

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APPENDIX A: UMCIRB APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284 ·
rede.ecu.edu/umcirb/

Notification of Amendment Approval

From: Social/Behavioral IRB
To: Lisa Wilcox
CC: Courtney Caiola
Date: 6/7/2022
Re: Ame1_UMCIRB 21-002498
         UMCIRB 21-002498
         An All Hazards, All Agencies, All People Approach to Assess Local-Level Household Emergency
         Preparedness and Community Disaster Resilience

Your Amendment has been reviewed and approved using expedited review on 6/7/2022. It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must adhere to all reporting requirements for this study.

If applicable, approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
There are no items to display	

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

Household Emergency Preparedness and Community Disaster Resilience (n=26)

Research Design		Level of analysis		
		Local	**State**	**National**
Quantitative (n=22)	Experimental	Glik et al. (2014)		
	Quasi-experimental	Joffe et al. (2019) Baker et al. (2018)		
	Non-experimental, retrospective, cross-sectional		Clay et al. (2020)	
	Non-experimental descriptive, correlational	McNeill et al. (2018) Hung (2017) Gargano et al. (2015) Murti et al. (2014) Uscher-Pines et al. (2009)	Thomas et al. (2015)	
	Non-experimental univariate descriptive	Kurkjian et al. (2016)		
	Quantitative: secondary analysis	Ferguson et al. (2019) Eisenman et al. (2009)		Malmin (2021) Zamboni & Martin (2020) Ekenga & Ziyu (2019) Nukpezah & Soujaa (2018) Killian et al. (2017) DeBastiani et al. (2015) Der-Martirosian et al. (2014) Strine et al. (2013) Bethel (2011)
Mixed (1)			Zidek et al. (2014)	

Qualitative (n=3)	Descriptive	Heagele et al. (2020) McNeill et al. (2020a) Diekman et al. (2007)		

APPENDIX C: INSTRUMENT

Household Emergency Preparedness Instrument (HEPI) v.2

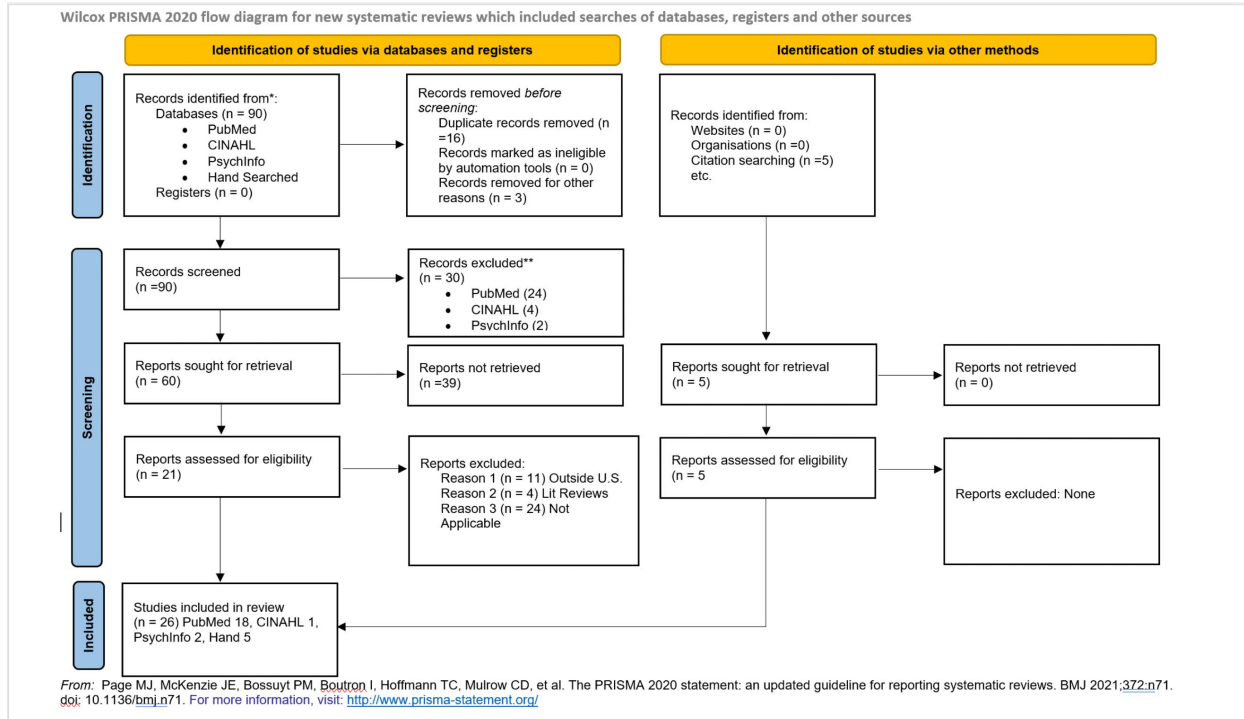| Subscales	Items	Response Options
A. Preparedness Action & Planning	1-19	0=*no* 1=*yes*
B. Disaster Supplies & Resources	20-31	0=*I don't have this item.* 1=*I have this item in my house.* 2=*I have this item in my disaster supply kit.*
C. Special Actions 1	32-37	0=*I don't have this item.* 1=*I have this item in my house.* 2=*I have this item in my disaster supply kit.*
D. Special Actions 2	38-42	0=*no* 1=*yes*
E. Access & Functional Needs	43-51	0=*no* 1=*yes*

(Heagele et al., 2020)

APPENDIX D: ASSESSMENT SURVEY

Summary of Communities Advancing Resilience Toolkit (CART)

CART Survey Sections	Items	Response Options
Section A: Eligibility	1-3	Binary yes/no and open-ended choices
Section B: CART Domains		
1. Connection and Caring	1,2,3,4,5	1=*strongly disagree* to 5=*strongly agree*
2. Resources	6,9,10,11,17	1=*strongly disagree* to 5=*strongly agree*
3. Transformative Potential	7,8,12,19,20,21, 22	1=*strongly disagree* to 5=*strongly agree*
4. Disaster Management	23,24,25,26,27,*	1=*strongly disagree* to 5=*strongly agree*
5. Information and Communication	13,14,15,16	1=*strongly disagree* to 5=*strongly agree*
Section C: **Descriptions of local community**	1-8	1=*strongly disagree* to 5=*strongly agree*
Section D: Relationship with community	1-10	1=*strongly disagree* to 5=*strongly agree*
Section E: Activities within the community	1-9	1=*strongly disagree* to 5=*strongly agree*
Section F: Individual Characteristics	1-29	Multiple response options and some yes, no, not sure options

Note. * CART Assessment Survey item B28 is not assigned to a CART Domain at this time

APPENDIX E: PRISMA 2020 FLOW DIAGRAM

Wilcox PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

Identification of studies via databases and registers		Identification of studies via other methods

Identification

Records identified from*:
Databases (n = 90)
- PubMed
- CINAHL
- PsychInfo
- Hand Searched
Registers (n = 0)

→

Records removed *before screening*:
- Duplicate records removed (n =16)
- Records marked as ineligible by automation tools (n = 0)
- Records removed for other reasons (n = 3)

Records identified from:
Websites (n = 0)
Organisations (n =0)
Citation searching (n =5)
etc.

Screening

Records screened
(n =90)

→

Records excluded**
(n = 30)
- PubMed (24)
- CINAHL (4)
- PsychInfo (2)

Reports sought for retrieval
(n = 60)

→

Reports not retrieved
(n =39)

Reports sought for retrieval
(n = 5)

→

Reports not retrieved
(n = 0)

Reports assessed for eligibility
(n = 21)

→

Reports excluded:
Reason 1 (n = 11) Outside U.S.
Reason 2 (n = 4) Lit Reviews
Reason 3 (n = 24) Not Applicable

Reports assessed for eligibility
(n = 5)

→

Reports excluded: None

Included

Studies included in review
(n = 26) PubMed 18, CINAHL 1, PsychInfo 2, Hand 5

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

APPENDIX F: PITT COUNTY COMPACT COVID-19 STUDY PHASE 1RECRUITMENT FLIER