Cultural Influences of Environmental Appraisals Among First-Time Mothers

A Dissertation

Submitted on the second day of July 2015

To the Department of Global Environmental Health Sciences

In partial fulfillment of the requirements

Of the School of Public Health and Tropical Medicine

Of Tulane University

For the Degree Of

Doctor of Philosophy

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Acknowledgements

I offer my sincere gratitude to the community health workers of GROWH: Patricia Davis, Christine Dennis, Onita Harris, Starleen Maharaj-Lewis, Kimisha Sawyers, and Courtney Shultheis. Their willingness to embrace the study, add more work to their already busy schedule, and to offer invaluable insight to the interpretation of results, and the creation of study materials was critical to this dissertation. I am forever grateful.

I am thankful to the members of my dissertation committee for their encouragement and support. I would like to express my appreciation to my dissertation committee advisor, Maureen Lichtveld for the opportunity to pursue this degree at Tulane. She was instrumental at every stage of this research, from developing the initial research topic, Community Advisory Board guidance, securing of grant funding, to the most picayune issues that occurred through the long dissertation process. Dr. Wickliffe was also instrumental in my PhD process. His door was always open to me. I learned a lot from him through the years, and am grateful for his friendship. Dr. Shankar was vital to the study process. I am thankful for her patience with the incorporation of the consensus methodology into public health. She was an outstanding teacher, and pushed me to develop my understanding of biostatistics to better answer the dissertation research questions. Dr. Harville was extremely helpful in solving several issues in the development of my study design and analysis. She was always available to answer questions, and I am thankful for her mentorship. Within my department, I was privileged to work with Dr. McCaskill and Dr. Wilson. I am thankful for their flexibility in joining my committee so late in the process. Their advice was instrumental in bettering framing my research to fit Environmental Health Sciences, and their timely advice always helped me work through problems. I am also appreciative of Dr. Parker. She has been a tremendous mentor during my time at Tulane,

and her input into the development of this study and at the prospectus stage helped this study immensely. This research would have been impossible without the guidance of Dr. Dressler. I couldn't have asked for a better resource. He was always available to talk, and helped make the concepts in Cognitive Anthropology approachable for a public health student. I am honored to have learned from him.

Many colleagues and friends have helped me through all phases of this process. I am indebted to the guidance of Dr. Covert and Anna Hassan, who always helpful in solving any issues I had, and whose guidance along the way is impossible to quantify. Thank you, as well, to the other students in my doctoral cohort.

I am thankful for the funding agency at National Institutes of Environmental Health, and the Substance Abuse and Mental Health Services Administration (grant number 5U19ES020677). The content is solely my responsibility and does not necessarily represent the official views of either agency.

Finally words cannot express my gratitude for the blessing of my family, specifically to my father and aunt for paying their way down to New Orleans to provide some timely, free daycare. Most importantly I would like to share my thanks for the unconditional love and support from my wife, Adrienne, and my daughter, Elin.

A. Abstract

Gulf Coast communities face many environmental threats that disproportionately impact the health of pregnant women. While the perception of risk strategies often differ across cultural groups, little is known about the detail of these differences. The purpose of this study was to explore the cultural knowledge of environmental threats within an at-risk group (low-income, first-time mothers in Southeast Louisiana). This proposal was a part of a SAMHSA-supplemental-funded study, which was an extension of a National Institutes of Health (NIH) funded U19 consortium called the *Transdisciplinary Research Consortium for Gulf Resilience on Women's Health (GROWH)*. In the first of a two-phase ethnographic approach, interviews with mothers helped identify risk in the environment, important steps to manage these threats, and trustworthy sources to turn to for help. Next, a larger sample (n=112) of mothers indicated their level of agreement to these items. These ratings were analyzed through cultural consensus analysis which gave a quantitative estimate of cultural sharing and beliefs. Results revealed that mothers shared a common pattern of risk perception and behavior regarding the assessment of different environmental threats. Further analyses detailed these cultural models, and identified if cultural knowledge was associated with key socio-demographic factors. Additionally, subtle areas of intra-cultural variation within the general consensus showed that some mothers emphasized health behaviors that may increase household risk. The results of this study contribute to an understanding of how low-income households manage environmental health threats, how cultural knowledge is distributed, and what factors influence knowledge. Study results can help to identify greater awareness of cultural differences within an at-risk population, which can be used to create culturally-tailored risk messaging. Implications for environmental health research, and public health policy are also discussed.

List of Tables

List of Figures

Table of Contents

B. Background

B.1 Environmental Health Disparities as a Public Health Issue

Public health is the study of health differences in a population, where gaps are not only seen in outcomes like morbidity and mortality, but further upstream in aspects like health access, and health behavior (*3*). Unequal exposure to environmental hazards, in particular, is thought to be the source of many health disparities (*4*).

Despite quality-of-life advancements and public policy awareness, health disparities still exist between many sub-populations of Americans. To address the persistent gap, new concepts have been introduced in the hopes of spurring progress (*5, 6*). First, disparities research has become more transdisciplinary, through the incorporation of an ecological, multi-level perspective (*4*). As a result, disparities research has seen an influx of new disciplines, from architecture to social work to exposure science (*5*).

Secondly, health disparities research has begun to incorporate culture. While anthropology provides a means to understand local norms, many have been frustrated with the difficulty in combining qualitative data with the traditional quantitative data (*7*). In the past, studies that worked to create comprehensive exposure indices excluded culture, because of the lack of "structural characteristics" available for measurement (*8*). Recently, momentum has grown for an improved partnership with anthropology, and a more systematic incorporation of its methods (*9, 10*).

B.2 Stress, Appraisal, and its role in Environmental Health Disparities

Early work from the Agency for Toxic Substances and Disease Registry (*11*) theorized that health outcomes following environmental exposure were partly driven by underlying psychosocial factors. Gee and Payne-Sturges (*4*) advanced this concept by

illustrating a complex stress-exposure interaction. Later, this theory was expanded to show that stress was a major predictor in differential health outcomes (*5*).

This line of research characterizes health disparities as the sum of three upstream factors: environmental exposures, health behaviors, and stress outcomes. Overall, the factors build upon the stress process (*12, 13*), which visualizes the individual in an ongoing interaction with the surrounding environment, and stress being an outcome of imbalance (*14*). The stress process was fundamental to the development of the influential cognitive appraisal theory (*15*). According to the theory (Figure 1), stressors are evaluated according to their personal threat. Steps are then followed by the individual to appraise the threat, and determine the appropriate responses (*15*).

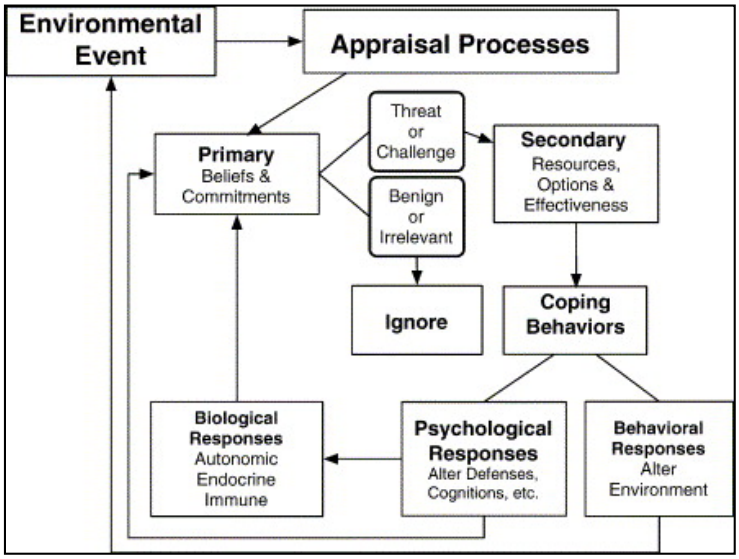


Figure 1 .The Lazarus and Folkman model of psychological stress. Adapted from Lovallo (*1*)

The initial assessment (primary appraisal) is a triage process which categorizes the threat based on its severity, the risk it presents, and possible consequences it may lead to. If the stressor is considered a threat, the individual will continue to the next step (secondary appraisal), where the person assesses "what might and can be done" regarding their response (coping behavior), how useful these options are (outcome expectancy) and their own perceived effectiveness (efficacy expectancy) (*16*).

The cognitive or behavioral effort used by the individual is called a coping strategy (*15*). Coping strategies can vary wildly depending on the person and the situation, but are often organized into two categories:

1) **Problem-focused coping** (also referred to as behavioral responses), which are actions aimed to directly respond to the effects of the stress. This mechanism "acts on the stress in an attempt to change the person, the environment, or the relationship between the two" (*17*).
2) **Emotion-focused coping** (also referred to as psychological responses), which regulates emotional responses to the problem. This can involve actions like denial or avoidance, distraction or minimization, wishful thinking, seeking meaning, or self-blame: all of which address the problem through "psychological soothing" (*17*).

During appraisals, personal and situational factors influence how stressors are assessed, and which coping strategies are chosen (*15*). Personal factors include commitments (the aspects, people, or places important to the person), and beliefs, which affect appraisals through personally or culturally shared notions (*18*). Situational factors also affect appraisal, such as the novelty of an event, or its predictability (*15*).

Eventually the appraisal process repeats (referred to as a reappraisal), as the individual collects feedback and determines (a) if the stressor is still present, and (b) should the current strategy be continued. This cycle of reappraisal and coping continues until the stressor is no longer considered a threat during the primary appraisal (*19*). Chronic stress, is theorized to develop when the process fails to stop, either due to a chronic stressor or an ineffective coping response. As a result, this theory is frequently used to illustrate the

chronic stress process, in particular, how these negative health outcomes occur through poor coping strategies or lack of resources (*20*).

B.3 Appraisal Theory: Applications in Environmental Health Sciences

Applications of the appraisal theory in Environmental Health Sciences often conceptualize stressors as what Baum and colleagues (*21*) term as environmental stress, where “events threaten, harm or challenge an organisms' existence or well-being and by which the organism responds to this threat”. Most often, these environmental studies focus on differential health outcomes during a disaster, for example, analyzing the psychosocial outcome following groups of coping behavior post-hurricane (*22, 23*). Technological disasters, such as oil spills, also are a frequent target of the appraisal theory to explain recovery (*24-26*). For example, Palinkas (*27*) found evidence that coping style was a strong mediator of impact of environmental stressors during the Exxon Valdez oil spill.

Appraisal theory has also been used to study smaller, chronic environmental stressors. The initial appraisal of community members living near landfills, for example, has been shown to help develop long-term risk perceptions (*28*). Finally, formal scales like the Environmental Appraisal Inventory (*29*) incorporated aspects from the appraisal theory, and have been used to predict the emotional response of a chronic environmental threat (*30, 31*).

Principles from the appraisal theory have also informed risk perception and risk communication research. Modern risk perception theorizes the need to incorporate various personal and situational factors into the development of communication, and supports the notion that risks are appraised based on how they relate to the individual (*31*). Research from Slovic (*32*) and Fischhoff (*33*), helped to develop the concept of the psychometric

paradigm, to explain the underlying factors that moderate a person's appraisal of the threat (e.g. whether they are exotic, familiar, self-imposed, etc.). Subsequent research in the past three decades has deepened this field by applying the psychometric paradigm to a variety of risks (*34*) and assessing differences in perception according to personality and values (*35*). Risk communication research and appraisal theory have become further intertwined through the Protective Action Decision Model (*36*), which modeled the social appraisals surrounding an emergency response. Applications have also shown appraisals can differ across gender (*37*), residence (*38*), and race (*39*).

Overall, the appraisal process has been incorporated into several studies regarding health disparities and has been hypothesized as a vital underlying mechanism behind differential health outcomes (*40*). However, many have criticized the theory for providing little information about potential cultural influences (*41*). Lazarus and Folkman (*15*) originally noted that culture was a major factor in their proposed appraisal process, both in dictating the appropriateness of coping behavior, and as a source of stress. Dressler (*14*) later cautioned that stress research must recognize the "social-patterned" quality of stress, as stressors can only be threatening because they carry a meaning, which is a function of culture.

B.4. Culture's Role in Environmental Health Appraisals

Independently, funding agencies and researchers within the field of Environmental Health Sciences have noted that environmental risk can be perceived differently across cultural groups(*42*). Relatedly, cultural groups can behave differently in response to environmental threats, and as a result, are at risk for developing different health outcomes (*43*).

To help organize this theme of research, the Agency for Toxic Substances and Disease Registry (ATSDR) co-sponsored a workshop in 1995 with Emory University and the Connecticut Department of Health to explore what was known about how communities respond psychosocially to environmental exposures. According to agency researchers, while ATSDR was equipped and credentialed to examine the physical effects of environmental exposures, they saw gaps in their ability to assess and incorporate the social and psychological effects (*11*). Much of the workshop ended up focusing on both the suspected role of culture in environmental health disparities, and the large research gap. Overall, the agency advanced the idea that cultural factors affect nearly every component of the exposure pathway (*11*). To better incorporate these possible effects, the workshop identified several research gaps for future Environmental Health research:

- More understanding of how subcultures respond to environmental exposure
- Understanding of different coping styles across cultures
- Explore and compare responses to environmental exposures between mainstream cultures and more marginalized communities
- Greater understanding of how culture shapes responses to the threat of environmental contamination (*11*)

Subsequent research has tried to better incorporate culture into health disparities (*44*), and risk assessment (*45, 46*). Additionally, recent research from the FrameWorks Institute, in partnership with the American Public Health Association (APHA), offered a detailed examination of the conceptual challenges in the cultural understanding of environmental health (*2*). Echoing the previous work by ATSDR, these researchers concluded that public's cultural conception of environmental health was limited, and environmental literacy gaps likely lead to greater risk of health issues. Overall their research found cultural

understanding of the environment defaulted into a series of unproductive models of thinking. These traps were structured into specific patterns that were represented in their "swamp" of cultural model (Figure 2).

Generally, they found the country's culture to be over-focused on environmental

Figure 2. The "Swamp" of Cultural Models, Adapted from Bales & Lindland (*2*)

contaminants, with limited understanding of the process behind the contaminants, or the environmental health work that can address those contaminants (*2*). Finally, echoing the call from ATSDR, they emphasized how critical is was for Environmental Health Science to become better familiar with culture. Both in order to appreciate the problems of the community, and to inform more effective health risk communications (*2*).

B.5. Cultural Theory and Measurement

To incorporate culture into Environmental Health Sciences is to incorporate the concept of culture as understood and measured in the field of Cognitive Anthropology.

Research in the field often uses Ward Goodenough's classic definition of culture: "that knowledge that one must know to function adequately in society" (*47*). Humans are constantly assigning meaning and generating scripts (or models) on how to act and think in certain situations. Inevitably, individuals will turn to peers to inform their models, which are formally called cultural domains (*48*). Domains cover all aspects of life, whether mundane activities (e.g., how to ride a bus), or central community values (e.g., what constitutes a successful life). Domains are "embedded in words, in stories, and artifacts" and are shared through social networks in formal or informal settings (*49*).

To document these domains, anthropologists use a range ethnographic methods to interview members of a culture. A common issue that arises in this field work, however, is inter-group variability. For example, when asking community members about cultural beliefs or practices, it is likely to experience differing levels of agreement. According to Dressler (*50*) variability can develop for several reasons. First, members of a community may incompletely share cultural models. Secondly, there may be competing models within the community. Anthropologists are faced with two critical questions related to this variability: "To what extent can the diversity of answers among respondents be understood as random deviations from a generally shared culture [and] is there a single "answer key" underlying the pattern of responses?" (*51*).

Romney, Weller, and Batchelder (*52*) developed an approach to help answer these questions by analyzing when agreement within a group of individuals equals cultural agreement. Their theory, Cultural Consensus Theory (consensus analysis), is based on the assumption that correspondence between two individuals is a function of their correspondence to the cultural truth, and by using a series of parametric statistical models

and aggregating the responses to a series of survey items, researchers can uncover cultural knowledge.

Consensus analysis determines the extent to which individual attitudes and beliefs are shared, and can be used to create a detailed model of cultural (shared) beliefs regarding a topic. Survey results are organized into an informant-by-informant response matrix, which can then be analyzed using minimum residual (primary axis) factor analysis. If all statistical assumptions are met, the method can offer three deliverables:

1) Determine if a single cultural model exists among the population.

2) Determine how well that individual matches the model's answers to the battery of questions asked.

3) Estimate with high accuracy the cultural answer key for the survey (i.e. the set of answer viewed by the group as "correct" according to that culture). (*52*)

Consensus analysis offers several advantages in the study of culture, primarily by making cultural knowledge a measurable concept that can be quantified and analyzed. Moreover, it is an easily discernable methodology that allows for inter-disciplinary application(*53*).

B.6. Parents and Culture

Few life events in a community are as culturally influenced as raising a child. Tremendous social pressure is placed on parents to raise children in a manner that reflects the values of a particular community (*54, 55*). Models of parenting are called "parental ethnotheories" and are culturally shared (*56*). As a result of this social context, tremendous variation can exist between parents in different cultures (*57, 58*).

New first-time parents face the burden of being unaware of these models, as they face a stream of novel issues (e.g., pregnancy-specific health concerns, delivery, lifestyle changes, infant health concerns), and are relatively uninformed about how to assess and respond to these stressors in an appropriate way. As a result, new parents rely heavily on their child-centered social network (*55*). The example and advice provided by peers carries tremendous weight during this time, and has been shown to be widely shared in the context of parent's social network (*59*). Therefore, while parents everywhere are faced with similar stresses, how they interpret those situations varies partly due to the ethnotheories shared by their culture (*56*).

Many studies have applied the cognitive appraisal theory to the stresses involving parenting, most often with the fears surrounding pregnancy (*60-62*). The Moneyham Threat Index (*63*) was developed by utilizing cognitive appraisal principles to create a formal index assessing pregnancy fears, and Cote-Arsenault (*64*) used the index to find that the initial threat appraisal of pregnant women was associated with the resulting psychosocial state.

Studies have also applied appraisal principles to parental decisions. Keller and colleagues(*65*) studied appraisal in three different cultures. Despite each culture's advocating three distinct parenting strategies, parents were found to utilize a similar appraisal process. Appraisals among mothers were shown in another study to be affected by a perception of personal responsibility, and that "perception of centrality in her child's life" was a major factor in overall coping strategy (*66*). Recently, Raghavan and colleagues(*67*) applied the cultural consensus method as a way to assess the ethnic differences in cultural perception regarding child rearing, and found cultural differences between social groups.

B.7. Environmental Hazards: Research with First-time Mothers

A particular source of fear that is salient for most parents is in providing a safe environment for their children. In many cultures, mothers make most of the health choices for the family, and as a result, the burden of protecting the child from the environment falls on them (*68*). The tasks facing a mother can be wide-ranging, as McGuigan (*69*) writes that, "mothers are advised to immunize, use sun screen, give children nutritious food, boost their immune systems, make sure they get enough exercise, and continually monitor them for any signs of potentially serious ill health." These health behaviors not only have immediate effect on the health of the child, but studies have found maternal decisions can influence the child for years, specifically in areas like food provision (*70*), and immunization (*71*).

Due to these culturally-constructed tasks, research shows that mothers face tremendous social pressure to manage environmental challenges in an appropriate manner (*69*). Social networks provide constant feedback on culturally-correct parenting choice, yet criticisms and peer pressure may often fall exclusively on the mother (*72*). Anxiety developed from environmental risk decisions may relate to the uncertainty over risks, and doubt over what is the recommended action (*73*). Uncertainty, in particular, may affect the appraisal process, and ultimately, the choice of appropriate health behaviors. David Levy (*74, 75*) showed that "vulnerability and fearfulness" can lead to overprotection of children against inappropriate risks. Cabana and colleagues(*76*) found in a survey of parental behavior, that mothers and fathers spend a great deal of time on actions that are neither recommended nor effective. Finally, Roy and Wisnivesky (*77*) found health behavior differed drastically along racial lines, as asthma disparities were somewhat attributable to differential environmental control practices (i.e. use of mattress and pillow covers, smoke avoidance, and carpet removal) among parents.

B.8. Community Resiliency and Research Gaps with Culture and Appraisals

A popular research topic that combines many of these issues relating environmental threats, culture, and appraisals is the concept of community resiliency. According to Norris and colleagues(*78*), community resiliency is a process where a disaster-exposed community (facing a litany of stressors) is led back to recovery (or wellness) through a set of robustly-supplied adaptive capacities. These capacities cover a variety of categories (e.g. economic development, community competency, information, and social capital), but all incorporate similar appraisal topics of values, commitments, and resources.

Norris and colleagues(*78*) hypothesized that these adaptive capacities are developed and disseminated through social networks and, as a result, may vary depending on culture. From information access to social support and engagement, Ross (*79*) later argued that adaptive capacities demonstrate that a resilient community may be better able to relay information that is (a) correct, and (b) well-disseminated.

Successfully preparing a community for a disaster requires spreading complex risk messages across an entire population (*80*). Cultural norms provide meaning to a disaster and influence a person's disaster appraisals and behavior (*81*). Therefore, successful adaptation to a hazard on a community level may require robust cultural networks. Despite this theoretical link between culture and community resiliency, no studies have elaborated, or have provided data to support this link.

B.9. Cultural influences on Resilience, and Environmental Health Disparities in Southeast Louisiana

Few states in this country face more environmental stress than Louisiana, and Southeast Louisiana, in particular is home to an infamous region known either as "Cancer Alley" or "Chemical Corridor", an 85-mile stretch of the Mississippi River which is one of the

most highly polluted areas in the country (*82, 83*). One-sixteenth of the total volume of toxins in this country are released each year come from this small region (*84*). As many of the chemicals processed, released, or dumped in the region are suspected to cause human health risks, studies have found widespread community fears of poor environmental quality, neglect, and perceived forms of environmental racism (*85*). Decades of several high-profile cases of environmental concern have arisen in this region in areas like Agriculture Street Landfill, Mossville, Grand Bois, and Norco. Each case included long fights of conflicting information between citizens and the federal government about the environmental contamination of the Southeast Louisiana communities, and disagreement about the appraisal of the threat (*86*). While final official reports found mixed results of health effects attributable to environmental exposure (*87, 88*), communities were nevertheless convinced that their health was in danger due to their surrounding environment (*86*).

In addition to these concerns regarding environmental exposures, Southeast Louisiana suffers from a frayed safety net regarding healthcare and family care access, as insurance coverage and proximity to key services varies dramatically by race, ethnicity, and socioeconomic status (*89*). Relatedly, residents suffer from key health disparities, as many sub-populations rank at the bottom of several health indicators - physical exercise, smoking, obesity and hypertension (*89*). Overall, the health environment of Southeast Louisiana makes it a prime target for concern due to the underlying disease burdens as it is filled with a "history of health disparities, environmental-justice concerns, recurrent impacts of natural disasters, and poor health metrics." (*90*).

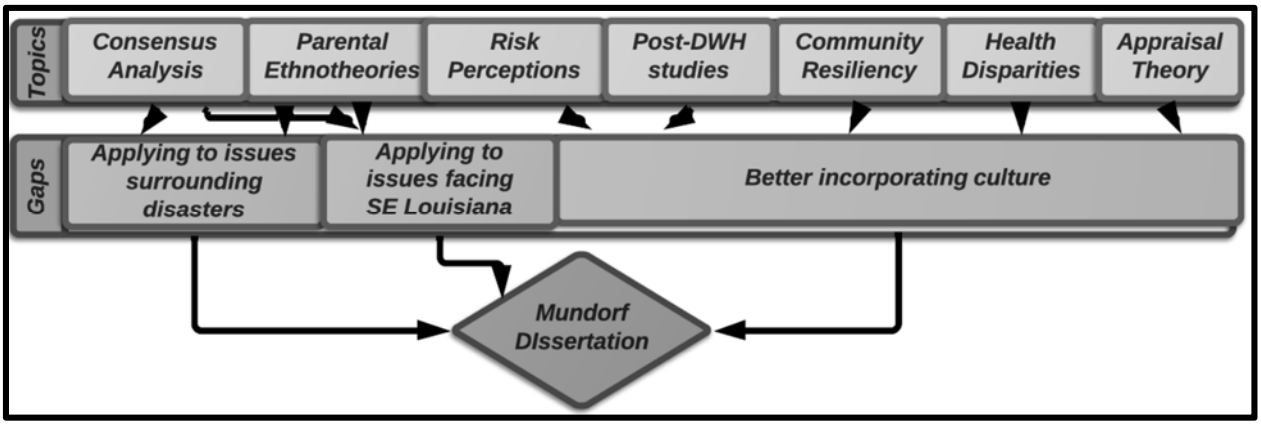
Recently, Southeast Louisiana has received additional attention due to the string of high-profile disasters, including Hurricane Katrina and the 2010 Gulf oil spill. Disparities exist in both the damage and recovery across the area affected by the spill (*91*). Strong

social networks have been documented in many of the resilient communities (*92*), yet other studies have suggested certain cultural attachments may influence negative coping behavior (*93*). Studies during previous oil spills like the Exxon Valdez showed that beliefs about the damage caused by the spill segmented according to cultural groups, and in particular, found that residents closer to the damage had less agreement over threats (*94*); however, no research has offered this amount of detail on how culture is associated with recovery in the spill-affected region.

Overall, the region exists in what environmental activists refer to as a “sacrificial landscape”, where land has been damaged by natural and man-made disasters, and is now crippled with coastal loss and invisible hazards (*95*). The population is currently faced with difficult environmental decisions in order to survive the risks of “industrial pollution, coastal restoration, economic diversification, environmental sustainability, social equity, and learning to live with risk” (*96*). Erikson (*97*) originally noted how the cumulative environmental danger can create a burden on the population that creates “numbing uncertainty” which can affect the appraisal of risk and behavior. He notes that in these situations , many of these hazards "are without substance and cannot be apprehended by the use of the unaided senses, and for that reason they seem especially terrifying” (*97*).

Due to these environmental threats, women of reproductive ages in the region –in particular pregnant women and new mothers- have received significant research attention since the oil spill (*98*). In general, pregnancy and motherhood offers a unique period of acculturation. New hazards that may have never been acknowledged are now a threat. Additionally, these women are often tasked with making the coping decisions for their families. In a region with such cultural diversity, yet facing so much environmental risk, it is vital to understand how the sub-population appraises and copes.

While the topics introduced in this background cover a diverse range of academic disciplines, they converge on a few key research gaps (Figure 3). This dissertation will offer an attempt at addressing these research gaps by examining cultural perceptions of the environment among new first-time mothers in a region recovering from years of disasters in Southeast Louisiana. Specifically, in this study, new first-time mothers in the region will be asked to offer their assessments of region-specific hazards. Anthropologic methods will then be used to assess the cultural influences of these perceptions, and behavior. A study of the appraisal process among new mothers may not only detail reasons for their own



health disparities, but may also provide new information on how they influence the health outcomes among their own children.

Figure 3 – Research Gaps for Dissertation

C. Research Goal and Hypotheses

C.1. Research Goals

- Use consensus analysis to answer how new first-time mothers in Southeast Louisiana think about threats in the environment.
- Examine the distribution of cultural knowledge and demonstrate the uses of mixed methods research to inform environmental health disparities research.

C.2. Research Questions

1) Is there a shared understanding among new first-time mothers regarding what are threats in the environment, and how to appropriately respond to these threats?
2) How are these beliefs shared among mothers of similar races, ages, or socioeconomic backgrounds?
3) How do parish-level indicators of community resiliency correlate with individual measures of cultural learning related to disaster behavior?

C.3. Hypothesis 1

There will be a single set of shared perceptions about hazards, risk behaviors, and sources of support among first-time mothers.

- Aim 1.1 – Elicit maternal perceptions related to the environment through a free-list ethnographic method.
- Aim 1.2. Operate a pile sort ethnographic method on a group of first-time mothers.
- Aim 1.3 – Use cultural consensus analysis to calculate the degree to which there is a shared set of perceptions.

C.4. Hypothesis 2

Socio-demographic attributes of first-time mothers will be associated with cultural knowledge.

- Aim 2.1 – Analyze consensus data to determine if any sub-cultures exist.
- Aim 2.2 – Examine differences in residual agreement and cultural competencies between demographic groups.

C.5. Hypothesis 3

Parish-level indicators of community resiliency will be associated with levels of cultural knowledge related to hurricanes

- Aim 3.1 – Categorize parishes in the study area according to level of community resiliency.
- Aim 3.2 – Examine differences in cultural knowledge between parishes with different resilience scores.
- Aim 3.3 – Assess differences in cultural hurricane perceptions in high and low resilient parishes.

D. Approach and Methods

D.1. Study Design

This proposal was the third section of a SAMHSA-supplemental-funded study, *Gulf Coast Cultural Influences on Maternal and Child Health: Influences of Prenatal Stress, Culture, and Epigenetic Factors*. The goal of this overall study was to more precisely define the biological and psychosocial pathways linking maternal, prenatal, and postnatal health. The SAMSHA-funded study was an extension of a National Institutes of Health (NIH) funded U19 consortium called the *Transdisciplinary Research Consortium for Gulf Resilience on Women's Health (GROWH)*. The goal of GROWH was to examine the effects of the Gulf oil spill on reproductive-aged women through three separate research projects. This dissertation analyzed participants through the third research project (Project 3) of GROWH, which sought to strengthen the community resilience of vulnerable pregnant women by integrating community health workers as disaster interventionists.

This dissertation (Table 1) measured the potential cultural influences of environmental beliefs through a two-stage, mixed-methods research design. The first stage

was a cultural domain analysis, where qualitative interviews defined a shared model among new first-time mothers. This stage was divided into two steps. First, a free-listing exercise was implemented (n=20) as a pilot study of the dissertation. Then, using information from the free-lists, pile sorting exercises were done with a slightly larger sample (n=31) to further understand the cultural organization of these domains.

In the second stage of the dissertation, a rating survey using data collected from the freelisting to a larger sample of women in Project 3 (n=112). Data were collected from May 2014 to April 2015, and oversight for this study was provided by the Tulane University Institutional Review Board.

Table 1
Overview of Survey Steps

Study section	Description	Items	Sample Size	Analysis
Stage 1a- Preliminary Study	Free-listing	Environmental Hazards	20	Frequency
		Behaviors		
		Sources of Support		
Stage 1b- Cultural Domain Analysis	Pile sorting	Environmental Hazards	31	Multi-Dimensional Scaling
		Behavior		
		Sources of Support		
Stage 2- Consensus Analysis	Rating	Environmental Hazards	112	Consensus Analysis
		Behavior		
		Source of Support		

D.2. **Subject Population**

Inclusion/exclusion

This dissertation worked exclusively with the cohort of study participants in the Project 3 of the GROWH study. These women were recruited at 18-45 years old, and were

required to have been living in one of the parishes in Southeast Louisiana that were affected by the Gulf oil spill of 2010. Women were also required to be in the first or second trimester of pregnancy of what would be their first child. They were also required to consent to adhering to appointments set by their assigned community health worker (CHW) and completing a battery of psychosocial surveys administered at set times during and after pregnancy. There was a requirement to own a personal cell phone and to consent to be trained on the key components of a mobile message platform that transferred text and voice messages to their personal cell phones. The messages covered some of the following topics:

- Health tips on topics surrounding prenatal care, nutrition, smoking cessation, substance abuse, emotional well-being, exercise and fitness, labor and delivery, breastfeeding, developmental milestones, safe sleep, immunization
- Disaster alerts

Finally, women were originally recruited by the Project 3 Program Manager and CHWs at 14 Women, Infant, Children (WIC) clinics across Southeastern Louisiana during peak prenatal visit times, and were required to be WIC eligible. WIC provides income assistance for foods and health care referrals for children and women. Women were eligible for this program if they fall under strict income and nutrition-related guidelines.(*99*).

Recruitment strategies

All interviews in this dissertation were conducted as a part of the regularly-scheduled interviews for Project 3. Each interview was administered by the CHW, who was assigned to a set of participants, and had developed an ongoing relationship. CHWs were chosen as administrators for this dissertation data collection to minimize any duplication of

interviews between this dissertation and GROWH. It was also believed that by using CHWs the participants would feel more comfortable answering questions, and hopefully provide more accurate cultural data for the ethnographic methods (*100*).

CHWs were trained on the process of cultural domain analysis. They were given a background of the study purpose, and the cultural concepts being used. Each survey was then introduced, and CHWs practiced administering to become comfortable with the questions, and to ensure there was consistency between CHWs.

A non-random sampling strategy was used to recruit for the freelisting and pile sorting. Handwerker and Wozniak (*101*) showed that the collection of cultural data, unlike individual level data, does not require randomly drawn samples. Instead the goal of cultural survey recruitment is to draw samples that purposively maximize cultural knowledge, and as a result, using convenience sampling is acceptable.

Table 2
Nested Sampling Frame – Freelisting

Category	Sample (n=20)							
Age	≥24 years old 8				<24 years old 12			
Income	≥$30k 4		<$30k 4		≥$30k 3		<$30k 9	
Region	Rural 1	Urban 3	Rural 2	Urban 2	Rural 2	Urban 1	Rural 4	Urban 5
Race	1 White	1 White 2 Black	1 White 1 Black	1 White 1 Not-White (Asian)	1 White 1 Black	1 White	2 White 2 Black	3 Black 2 White

Especially in a region as diverse as Southeast Louisiana, sampling potential cultural diversity was critical. Therefore, previously-completed demographic data were consulted and women were chosen in order to maximize diversity. While the sample was

not systematically stratified, it was drawn conveniently from a series of categories to maximize cultural heterogeneity. For example, the free-listing (n=20) and pile sorting (n=31) exercises attempted to follow a nested sampling frame (Table 2) by seeking diversity along the following four categories:

- Region – Rural areas (St. Bernard, Plaquemines, Lafourche, and Terrebonne parishes) and urban areas (Orleans and Jefferson parishes)
- Race/Ethnicity – White and Minority (African-American, Asian-American, Latina, and Native American)
- Income –Those with $30,000 or higher household income, those with lower
- Age – Those over 24, and those younger

For the wider consensus analysis using ratings surveys, 112 women completed a survey. This surpassed the recommendations (*53*) of having at least 29 women per sub-group. This helped produce a sufficiently-powered sample, which was estimated to answer >0.95 proportion of the questions at 0.999 confidence, assuming 0.50 cultural competency (Table 3).

Table 3
Sample Size and Validity Estimates for Different Levels of Agreement

Cultural Competency	Proportion of Items Classified Correctly at .999 Confidence Level .80 .85 .90 .95 .99				
0.50	19	21	23	29	>30
0.60	11	13	13	17	23
0.70	7	8	10	10	16
0.80	6	6	8	8	12

0.90	6	4	5	5	7
Adapted from Weller (*53*)					

D.3. Study Procedure

Aim 1.1.

Elicit maternal perceptions related to the environment through a free-list ethnographic method

This dissertation sought to understand the cultural influences through the appraisal process: (a) risk perception, (b) risk behavior perception, and (c) perception of sources of information and support. This goal was informed by the cognitive appraisal theory, as well as, a broader reading of the literature introduced in the background. It was hypothesized that these topics were a salient concern for new mothers in Southeast Louisiana, and would be a relevant source of cultural study. As a result, it was also hypothesized that relevant cultural domains could be found in relation to these topics.

To populate items in the cultural domains studied for this dissertation, a cognitive free-listing exercise was used. This task has participants catalog behaviors and beliefs regarding the chosen domain. According to Weller and Romney (*100*), this step is extremely important in ensuring that the cultural model is defined by participants in the language of their community. This task is also helpful in validating the saliency of the domain to the population. For example, If few items about the topic can be elicited from the population, the topic may lack the necessary relevance to continue with subsequent analysis (*100*).

Participants (n=20) were selected from the larger cohort in a way to ensure diversity across various demographic variables (Table 2). Protocol questions of free-lists were broad

enough to allow lists to be generated naturally. The script included an open-ended free-listing task with several probing questions that emphasized having the participant describe as many items as possible (Appendix A). To test the domains, the following three questions were asked in stages with probes using as a follow-up *(*e.g. "*Are there any other items you may have missed?")*:

- Hypothesized Domain 1 (Hazards)
    1) "What are the things in the environment that can threaten children and pregnant women in your community?"
- Hypothesized Domain 2 (Behaviors)
    1) "What do other mothers in your community do in response to these threats?"
- Hypothesized Domain 3 (Sources of support)
    1) "Where do people turn to for support and information in response to these threats?"

Responses were pooled, standardized, and coded using the help of the CHWs to judge which statements referred to the same concept. CHWs also helped in settling which exact phrasing should be used for each concept. Additional criteria were used at the recommendation of Weller and Romney (*100*) such as correcting for grammar, and using clear and autonomous statements. All data were analyzed in Anthropac and Ucinet (*102, 103*), to discern the most salient terms. Anthropac helps by generating three items: 1) frequency (the number of participants that listed each item), 2) rank (the average rank of each item), and 3) salience, which combines both the frequency and rank to estimate a gross mean percentile rank of each item across all lists.

Aim 1.2.

Operate a pile sort ethnographic method on a group of first-time mothers

In a pile sort, participants were asked to organize items generated from the freelisting more formally, putting similar terms in the same piles. This task can help in explaining how a group understands how terms are related to each other (*104*).

A sub-sample of mothers (n=31) sampled to ensure diversity (metro residence, race, age, education) were approached. The most salient terms developed from the free-listing exercise had previously been typed on white, numbered (4" x 6") index cards in large font with an identifying number on the back of the card. Participants were handed the shuffled cards and read the following (*100*):

1) *"Please read through the stack of cards and then sort them into piles, so that items in the same pile are more similar to each other than items in other piles".*

As recommended by Weller and Romney (*100*), after sorting was completed, the participants were directed to each pile and asked, "In what way are these alike?" or "Why are they together in the pile?" Throughout the interviews, the comments of the participants were recorded.

Using the data from pile sorting, answers were used to develop categories of how the domain was organized in the culture. An item-by-item similarity matrix offered analysis of items that are sorted together. This matrix was then used with hierarchical clustering and multidimensional scaling to analyze relationship between phrases. In particular, multidimensional scaling (MDS) can transform the similarities into coordinates in a multidimensional space, as the more similar they are according to sorting, the closer they

will be located in the MDS space (*105*). Data were analyzed in both Anthropac and Ucinet (*102, 103*).

Aim 1.3.

Use consensus analysis to calculate the degree to which there is a shared set of perceptions through a rating survey.

Finally, a series of rating surveys were created using items generated from the free-listing exercise (Appendix B). These surveys asked women to rate items on a series of conceptual scales representing attributes relevant to the domain. Weller and Romney (*100*) proposed that rating questions should be derived from the concept of the study. Therefore, since the first hypothesized domain (environmental hazards) was attempting to examine risk perceptions, research with the psychometric paradigm (*106*) informed the creation of questions to assess traditional measures of risk perception. Ratings for the second domain (behaviors) used similar questions from Copeland (*107*) to assess relative importance of various managing behaviors. Finally, for sources of support, questions used in research from Dressler (*50*) were used to create a question assessing the likelihood of using a source.

Completed surveys were analyzed using consensus analysis. Consensus analysis was developed by Romney, Weller, and Batchelder (*52*) as a statistical approach to analyzing when agreement means consensus, and how to quantify cultural belief. If there is sharing, the researcher can use consensus analysis to estimate the cultural competence of (a) the group as a whole and (b) for individual members of the group. Moreover, the method allows the researcher to use the competency scores to deduce the “culturally correct” answer key to whatever question was given to the group (*52*).

Three assumptions must be met for this analysis to work (*52*). The first assumption is that there is only one cultural answer key that the test takers are answering from. Secondly, people must answer each question individually, rather than in a group. Finally, each person must demonstrate a fixed competence at the time of the exam, meaning that the questions on the test must be concerning the same domain, and of equal difficulty.

There are two versions of consensus analysis – the formal and informal models. The formal model was the method detailed by Romney and colleagues(*52, 108*) and only handles a limited number of question types. The informal model, which will be used for this dissertation (*108*), can incorporate rating-type questions, and is run with a factor analysis procedure (principal components analysis). The factor analysis uses a form of factor analysis, where the data matrix is transformed so questionnaire items become rows, and participants become columns in the data matrix (*53*).

Rating responses were coded in such a way to limit bias and acquire necessary statistical inter-informant variability (*53*). Results were calculated in ANTROPAC software using the INTERVAL procedure (*102*). Output answered the following questions:

- Is there sufficient agreement to assume the population is sharing a single cultural domain?
- What are the “culturally best answers” to the survey questions?
- How closely does each participant’s answer match to the “cultural best answers”? –answered as a competence score (Romney, et al. 1986).

Aim 2.1.

Analyze consensus data to determine if any sub-cultures exist.

When participants were enrolled into GROWH Project 3 they completed a demographic survey concerning questions of race, age, residence, income, education, work, housing status, and marital status. Also, in conjunction with the rating survey in Aim 1.3., participants (n=103) answered a series of questions related to their personal attitudes and experiences of a range of environmental threats. For this dissertation, three questions were considered. First, women rated their level of experience with each hazard, the responsibility in their household for making decisions about that hazard, and how frequently they talked about that hazard with other mothers in the community. For this aim, all relevant categories of socio-demographic status, as well as personal attitudes and experiences with environmental threats were collected. Outputs of the consensus analysis generated in Aim 1.3. were then compared across the categories.

Aim 2.2.

Examine differences in residual agreement and cultural competence between demographic groups.

Findings from Aim 1.3. were used to provide insight into the intra-cultural variability of this group of mothers. The higher the loadings on the first factor for an individual woman indicated how well she matched the model. Typically, this loading is interpreted as a measure of cultural competence (*52, 108*). A loading on the second factor is also generated during the consensus analysis and represents the next largest source of inter-individual variation (*109*), and is described by Ross (*48*) as “residual agreement” since it represents the agreement left unexplained by the first factor. For some researchers, it is interpreted as the largest source of cultural belief among test-takers after removing the agreement of the main model, and as a result is extremely helpful in analyzing possible sub-cultural disagreements in a population (*110*).

This aim assessed the relationship between these measures of cultural competence and residual agreement with the variables collected in Aim 2.1. Relevant variables were measured for correlation, and significant variables were regressed against both the measure of competence and residual agreement. These were combined with several demographic factors that were force-adjusted *a priori* (race, age, and region) due to their relevance in the literature.

In addition to the multiple regression analysis, each participant's score was plotted on a table comparing cultural competence and residual agreement. This has been shown to be an effective way to visualize differences between certain groups (*110*). In this analysis, Dressler (*110*) proposed assessing deviations from the group consensus by taking the consensus rating of an item (factor score) and subtracting it from each participant's rating. A mean deviation score can then be calculated across the answer key, and the individual items can be plotted by the deviation scores by group. Potentially relevant groups can then be visualized on a plot by the deviation score to further explain how sub-cultures differ. All of this was done to better analyze how culture and a range of socio-demographic factors interact with each on the tested cultural topics.

Aim 3.1.

Categorize parishes in the study area according to level of community resilience.

In this aim, community resiliency scores developed by Ashley Ross (*79*) were analyzed to be assigned to specific parishes in the study area. Scores were developed from several parish-level secondary sources (Appendix C) (*79*) to measure adaptive capacities across six components: social resilience, community capital, economic resilience,

institutional resilience, infrastructure resilience, and ecological resilience. Scores from each of the six components were standardized by Ross and then each component was summed to generate an overall disaster resilience score. The disaster resilience index Ross creates ranges from 0 to 6 with higher values indicating greater overall adaptive capacity for resilience. The range of scores were from 2.54 to 3.76 (average 3.26; standard deviation 0.25). This index was then transformed by a z-score, and separated into five categories. For this aim, the raw scores were re-standardized for this specific study area. I focused my analysis on the overall disaster resilience scores, as well as the adaptive capacity of community capital, as that theoretically appeared to be the most related to culture (*79*).

Aim 3.2.

Examine differences in cultural knowledge between parishes with different resilience scores.

For this aim, cultural competencies related to key hurricane-related perceptions and behavior was analyzed between first-time mothers living in high-resiliency communities, and lower-resiliency communities. Rating surveys from Aim 1.3. were reviewed and items related to hurricanes will be segmented, and re-analyzed using consensus analysis. Competency scores averaged across each parish were calculated and then analyzed to determine the statistical difference between groups.

Aim 3.3.

Assess differences in cultural hurricane perception in high and low resilient parishes.

High agreement on cultural beliefs does not necessarily lead to good health decisions or behavior. Parental behavior is often misinformed, as social networks can

spread information that is neither recommended nor effected (*76*). In the final aim of the dissertation, a qualitative analysis was run on how women living in higher resilient parishes differed culturally from women living in lower resilient parishes.

D.4. Limitations in Study Design

While consensus analysis has been utilized in a variety of studies, many have concerns about its validity in quantifying cultural beliefs. Specifically, it has been criticized for the potentially over-limiting assumption of a single unified culture (*111*). According to these arguments, cultural knowledge is fluid and informed by many domains at a time. As a result, setting a threshold for a culture to exist dismisses potentially illuminating information about the distribution of cultural knowledge. As a result, this dissertation may be setting an artificial boundary on sufficient cultural sharing, and a risk exists that I am ignoring sub-cultural diversity.

Other possible validity issues were inherent to this study. The cohort of women that will be studied have an ongoing relationship with a CHW, and have been receiving a variety of risk information regarding pregnancy and new motherhood. This may alter the women's knowledge about health risks and behaviors. Moreover, since all of the women received similar texts, the entire cohort may have different perceptions and behaviors from the surrounding population. While few risk behaviors may overlap with risk information provided through text message, it still is likely that the intervention provided by Project 3 gave these women greater knowledge about appropriate prenatal and postpartum behavior. Therefore, any assumptions of external validity of this study should be cautioned.

Finally, a limitation of the study is that resource limitations dictated a smaller sample than would be desirable. A larger sample would increase this study's ability to explore

specific cultural variability within parishes, and test for group differences with a much smaller effect size. Southeast Louisiana is a region of tremendous diversity, and this study was only able to investigate a limited number of contender covariates.

E. Results - Manuscript 1: Uncovering upstream social determinants of health among Louisiana first-time mothers through community-based participatory ethnographic research

Background

The unprecedented 2010 Gulf of Mexico oil spill disaster threatened an entire region's ecosystem, economy, and public health [90]. The Institute of Medicine (IOM) highlighted women of reproductive ages and pregnant women as a population of specific concern for developing adverse health effects after this event [98]. Driven by this focus, a partnership between researchers and community members in Southeast Louisiana formed to develop a study to answer two health concerns of the affected community:

1. "Are mothers and children safe?"
2. "Is their environment (e.g. food/air/water) safe?"

The Transdisciplinary Research Consortium for Gulf Resilience on Women's Health (GROWH) - supported through a grant awarded by the National Institutes of Health (NIH) - was created to examine these questions while utilizing a community-based participatory research (CBPR) model to inform research goals, disseminate results, and strengthen community resilience. The consortium utilized the community advisory board (CAB) study model; community partners were equally involved in the design process to better incorporate the local perspective [112].

In addition to providing feedback on the primary research aims of GROWH, the CAB identified additional supplementary study pursuits. Two relevant research questions were raised by the CAB:

- Were some communities of mothers more resilient to recent disasters than others?

- What role does culture in the Gulf region play post-oil spill, and how did it differ between communities?

Discussions with community advisors led to a hypothesis that central to the mental health stress of pregnant women and mothers was both the awareness of threats in the environment, and the burden of navigating these threats successfully. The aim of this paper is to document how community-driven research questions were investigated through the use of Transdiscplinary ethnographic methods. This approach will be discussed for its possible benefits for future community collaboration. As a secondary aim, the pilot study results of this study will be presented and discussed.

Methods

Research into Culture and Ethnographic Methods

Culture is defined in Cognitive Anthropology as the knowledge needed to function adequately in society [47]. People assign meaning and generate scripts on how to act and think in certain situations, and many individuals will turn to peers to inform these cultural models [48]. Ethnographic methods are a set of common tools used by anthropologists in the study of a cultural model – defined as a cultural domain [49]. A cultural domain analysis is used to elicit the terms a population uses to describe a topic, and the meaning that is used to distinguish how terms are considered similar.

To address the cultural questions proposed by community members, a cultural domain analysis was used to analyze how first-time mothers think about different aspects of environmental hazards in similar ways. First, a freelisting exercise was used, where participants were asked to name items matching a description related to a chosen domain. Freelisting helped to populate items for researchers in a cultural topic, and also provide

insight into the relative importance of terms within the domain [113]. Next, an unconstrained pile sort exercise was used, where participants indicated how terms generated in the freelisting are groups together on the basis of similarity.

Study Population

The domain analysis was administered on a sample of women participating in the GROWH research project titled, *Building Community Resilience through Disaster Mobile Health*. 20 mothers were selected from the GROWH cohort to complete the freelisting exercise All 20 of the mothers who participated in the freelisting also participated in the pile sort, with an additional 11 mothers selected to increase the sample size, while also maximizing diversity across race, region, and age.

Women were originally recruited for the GROWH project during either their first or second trimester of pregnancy of what would be their first child. At the time of their inclusion for this supplemental study, many of the women were in their third trimester. Additionally, women were eligible participants of the Women, Infants, and Children (WIC) program, and were also required to be residents of a six-parish region Southeast Louisiana parish that was determined to be most affected by the Gulf oil spill.

Using Community Health Workers to Inform Research

Central to GROWH's intervention study was the use of community health workers (CHWs) as a source of messaging, health collection, and personal support. CHWs were assigned to two separate cohorts of women (n=237) Women, Infant, and Children (WIC)-eligible women across two study cohorts, and were tasked with providing informal counseling and social support remotely and face-to-face [112].

By sampling from women in the GROWH study, this study was able to partner with these CHWs and strengthen the study methodology. Due to their ongoing relationship with the GROWH cohort, it was believed using CHWs as ethnographers would improve study recruitment, and create a comfortable atmosphere for women to given honest responses to question. Also, it was believed that a partnership with the CHWs would aid in study interpretation, as they came from the same study area as participants.

Data Collection

The freelisting exercise proceeded by prompting participants to identify (a) threats in the environment, (b) ways to respond to those threats, and (c) sources to turn to manage those threats. Responses were pooled, standardized, and coded using the help of the CHWs to judge which statements referred to the same concept. CHWs also helped in settling which exact phrasing should be used for each concept. While efforts were made to keep original phrasing, a number of specific terms were collapsed to generate categories when it was deemed appropriate by the CHWs.

After compiling results from several participants, responses were ranked by the order they were elicited by each participant. The cultural importance of each item can then be measured by either the average rank on each participant's list, or the frequency mentioned across all participants' lists [114]. Relative importance is also measured by a combination of both rank and frequency through the Smith's index rank salience [115]. Smith's salience is based on the assumption that participants will list items of greater salience first, and is calculated by accounting for the number of participants who mention an item, the average position each item was given, and the length of the participant's list[116]. This score is calculated through ANTHROPAC 4 [102] as a scale (0-1) variable.

The most salient terms developed from the free-listing exercise were then used in the pile sorting activity. Items were typed on index cards. Using the same nested sampling frame of the freelisting, a slightly larger sample of mothers (n=31) were approached (some of the mothers had also completed the previous task), and handed the shuffled cards and asked to sort them into similar piles. CHWs recorded any comments the participants made, and during the analysis stage, helped in interpreting the meaning of clusters.

Pile sorting data were analyzed through nonmetric multidimensional scaling (MDS) calculated through ANTHROPAC 4 [*102*] and UCINET(*103*), which converts similarity of items (whether the items are placed in the same pile) into a measure of distance. MDS helps identify underlying dimensions of meaning that are being used to understand terms (*117*). The measure of the goodness of fit in MDS is referred to as "stress", which assesses how well the mapped solution represents the original similarity matrix of responses. Generally, the lower a stress value, the better the fit (*114*). The item-by-item similarity matrix was also run through a hierarchical analysis to analyze relationship between phrases and to confirm which phrases were included in which cluster.

Results

Table 4 shows the top 5 responses for each domain. For the first domain, a total of 67 threats were listed, with 7 being mentioned by at least 30% of the mothers. Hurricanes and violence in the community were two of the top responses. The threat of hurricane had a higher salience score (0.453 compared with 0.442), while violence had a higher average rank (2.91 compared with 3.18). For the second domain, 83 risk behaviors were listed, with 9 of those being mentioned by at least 20% of the women. Salience scores were much lower compared with the first domain, as the most popular response (“Buy supplies (hurricane)”) garnered a salience score of 0.265. Finally, for the third domain, 31 sources of

support and information were given by the 20 women, with 9 sources being mentioned by at least 20% of the group. Family was the most common response, 70% of the women listed it, giving it a salience score of 0.441.

Table 4 – Top 5 free listing responses for threat in the environment for all mothers

Item	**Frequency (%)**	**Average Rank**	**Smith's Salience**
Domain 1 – Hazards *"What are the threats in the environment facing mothers in the community?*			
Hurricane	55	3.18	0.453
Violence in the community	55	2.91	0.442
Outdoor air pollution	45	5.22	0.277
Drug activity in the community	40	5.88	0.211
Cigarette smoke	35	6.29	0.228
Domain 2 –Risk Behaviors *For each of these things in the environment, what are ways that mothers prepare or respond?*			
Ask authorities to fix - Violence	30	3.5	0.189
Buy supplies (water, food) for sheltering - Hurricane	30	2.83	0.265
Work with others to help community - Violence	30	4	0.204
Avoid – Cigarette smoke	25	4.2	0.189
Avoid bad influences – Personal drug use	25	11	0.103
Domain 3 – Sources of Support and Information – For each of the things in the environment, who do people typically turn to for information and support?			
Family	70	2.93	0.441
TV news	40	2.25	0.299
Police	40	3.13	0.245
Internet	30	3	0.207
Friends	25	4	0.144

Data for each question was re-run by stratifying across three demographic categories (race, residence, and age). The salience levels of each list were compared with each other. Table 5 shows stratification results for mothers by region.

Table 5– Cultural Salience Scores by Region				
	Metro Mothers (n=11)		Rural Mothers (n=9)	
Item	Smith's Salience	Salience Rank	Smith's Salience	Salience Rank
Domain 1: Threats				
Hurricanes	0.343	3	0.588	1
Violence in community	0.579	1	0.274	3
Outdoor air pollution	0.344	2	0.196	9
Indoor air pollution	0.24	5	0.217	6
Cigarette smoke	0.133	11	0.343	2
Drug activity in community	0.318	4	0.08	28
Bad/reckless drivers in community	0.168	8	0.178	10
Lack of activities for children	0.081	14	0.222	5
Floods	0.184	6	0.093	22
Problems with other mothers in the community	0.041	31	0.227	4
Domain 2: Risk Behaviors				
Buy supplies (water, food) for sheltering - Hurricane	0.245	3	0.291	2
Work with others to help community - Violence	0.258	2	0.138	11
Buy supplies (generator, batteries) in case power goes out - Hurricane	0.13	5	0.276	4
Avoid – Cigarette smoke	0.121	6	0.272	5
Ask authorities to fix - Violence	0.343	1	Not listed	
Plan evacuation route - Hurricane	0.061	20	0.277	3
Be extra cautious with family - Violence	0.013	35	0.307	1
Move to safer community - Violence	0.091	9	0.171	8
Evacuate when told - Hurricane	0.061	18	0.192	6
Stay off roads – Bad drivers	0.076	15	0.17	9
Domain 3- Supports				
Family	0.347	2	0.555	1
TV News	0.288	4	0.313	3
Police	0.421	1	0.03	19
Internet	0.114	8	0.321	2
People at Church	0.297	3	Not listed	
Government Services (WIC)	0.121	7	0.212	5
Local Government Leaders	0.173	5	0.111	10
Friends	0.018	18	0.298	4
Newspaper	Not listed		0.204	6
Community NGO Organizations	0.164	6	Not listed	

11 hazards given were selected to be further analyzed using the pile sort, and Figure 4 shows the MDS output. The figure displays participant-generated threats in the

environment from the first phase of the research. Terms that appear close together indicate that participants saw these terms as similar. The low stress level (0.045) indicates that this image is a good fit for the data. Pile sorting results showed that across a diverse sample, the 11 threats were organized into three separate topics. The mostly tightly compacted appeared to be physical hazards, such as bad drivers, drugs in the community, and community violence. On the other side of the MDS chart were more of the natural threats, which appeared to separate into two groups. One dealt with storm-related issues, such as mosquitos, hurricanes, and flooding. Finally, the last cluster dealt with air and water contamination issues: outdoor air pollution, indoor air pollution, radiation, cigarette smoke, and water pollution. A hierarchical cluster analysis confirmed these three groups, and the boundaries are superimposed over the pile sort results on Figure 1.

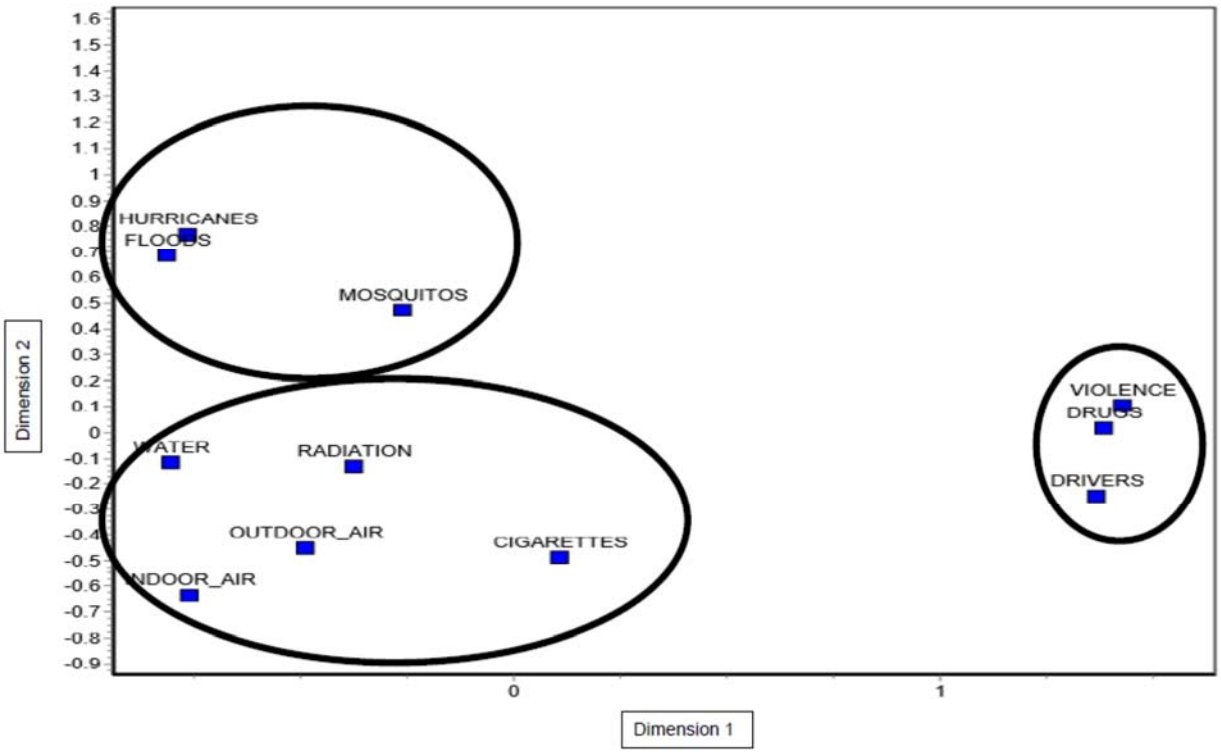


Figure 4. Multidimensional Scale and Clusters: Environmental Hazards

For risk behaviors, top responses were chosen for three of the most salient hazards (hurricanes, violence, and air quality). Pile sort and hierarchical cluster analysis produced four groups of terms (Figure 5). Clusters mostly separated by the hazard (hurricanes, air quality). However, violence coping behaviors, and certain behaviors from the other hazards seemed to be separated into two groups. The cluster on the bottom right all deal with community actions. Comments given by the mothers about the cluster on the bottom left generally assessed these behaviors to be about providing safety to the mother and the family. The low stress level (0.125) indicates that this image is a good fit for the data.

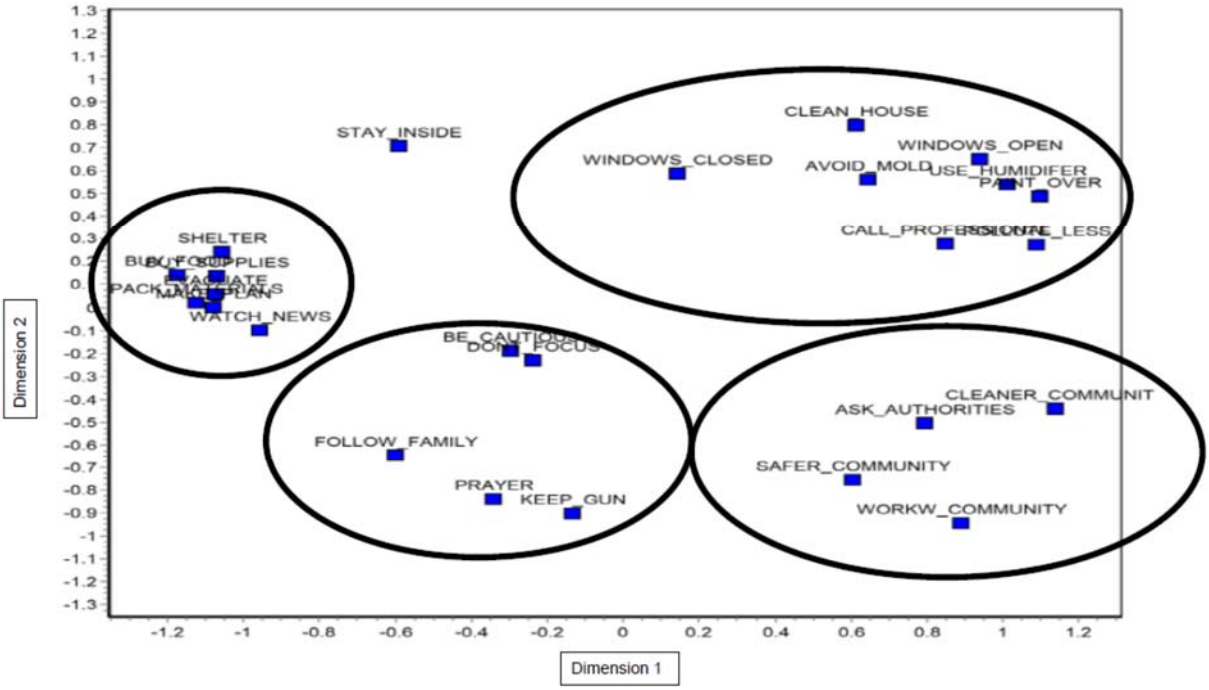


Figure 5. Multidimensional Scale and Clusters: Environmental Risk Behaviors

Finally, for the last domain of supports, top items were again chosen, and the MDS output (Figure 6) shows three clear clusters of items. Family, friends, people from church, and to a lesser extent, doctors all were clustered together. Internet and TV news were grouped together. And police, government services and local leaders were grouped together. The low stress level (0.005) indicates that this image is a good fit for the data.

Discussion

Results indicated a different interpretation of “the environment” for women in the Gulf Coast. Most of the items listed for the first domain related to physical hazards (drugs, drivers, violence). Also, the absence of several traditional environmental health threats (e.g.

Figure 6. Multidimensional Scale and Clusters: Sources of Support

lead, pollen, food contaminants), as well as nothing directly related to the 2010 Gulf oil spill is interesting, and deserves further study.

Segmenting by population group showed differences, despite the small sample sizes. Rural moms were more likely to report cigarette smoke as an environmental threat than metro moms. The most salient risk behavior for metro moms was to ask authorities to address community violence; however, no rural moms gave that response in their free list. Instead, rural moms saw “being extra careful” to response to community violence as the most salient behavior, while it was almost never mentioned by metro moms. Finally, metro moms saw people at church and the police as two of the most salient sources of support. Church members were never mentioned by rural moms, and the police had much lower salience than metro moms (Table 4).

Pile sorting helped further clarify the possible dimensions of meaning within these three domains. The clusters of Domain 1 may explain the broad inclusion of more physical hazards, as those were very distinctly grouped together. Domain 2 showed that participants generally understood behaviors according to the hazard they were addressing. However, certain types of behaviors were organized separately, and they appeared to be split between community-focused and internally-focused. Finally, Domain 3 shows sources of support being organized by closeness, as family and friends were seen distinctive from government leaders.

Due to the study design, several factors may potentially limit the external validity of this research. Study participants had been receiving text-based healthcare and hurricane messages as a part of GROWH intervention. While few of the text messages matched the information provided by the free list, it is possible that the GROWH project intervention provided these women with increased awareness of certain hazards, behaviors, and sources of support. Another limitation of this paper is the small sample size. While 20 informants is adequate for free listing [*114*], a larger sample would have allowed for greater stratification across demographic groups, and examine, and further examine domains where there is less agreement.

Despite these limitations, this research offers several possible insights. Contrary to the anticipated results, a large proportion of freelisting responses were related to non-chemical environmental stressors, such as like violence, traffic, and money issues. This study was originally created with the expectation that women's responses would detail their interaction with the natural environment. However, roughly two-thirds of the responses to the first question dealt with non-chemical issues. Additionally, pile sort results indicate a potential theme in how mothers understand risk behaviors.

Next Steps

Free listing and pile sorts only offer a sketch outline of a cultural domain [114, 118]. As a result, it is often only the first of several ethnographic methods used to complete a cultural domain analysis. To give a fuller examination of how new mothers interact with the environment, a two-stage research design will build on this domain analysis. In the next stage of the expanded cultural research, data collected from freelisting will be used to create a rating survey. This survey will be given to all of the women in the GROWH project (n=112). Women will be asked to rate the various hazards based on various criteria (e.g. risk, dread, personal control, locus of control). Questions will also have the women rate various risk behaviors based on their level of importance according to the community. Finally, the top answers generated as sources of support will be rated based on the likelihood they will be used by other mothers in response to four main hazards (hurricanes, community violence, indoor air pollution, and outdoor air pollution).

Completed surveys will be analyzed using the Cultural Consensus Analysis, which analyzes cultural agreement to quantify cultural belief [52]. The method uses a form of factor analysis to assess the sharing within a group of test-takers, and analyzes whether they are drawing from a similar domain. It can then estimate the cultural competence of (a) the group as a whole and (b) for individual members of the group. Moreover, the method allows the researcher to use the competency scores to deduce the “culturally correct answer” [52].

Finally, using the cultural consonance methodology from Dressler and colleagues [119], results from the consensus analysis will be used to construct a measure for collecting data on beliefs and behavior according to the individuals. The measurement of cultural consonance calculates the degree to which individuals match the shared model in beliefs and behaviors. This cultural consonance measurement is then compared with psychosocial

measurement previously collected in the GROWH study. It is assumed that the higher an individual's cultural consonance, the better their health status [120].

Conclusions

Taken as a whole, this extended cultural investigation will help to better answer the original questions proposed by the CAB. By utilizing domain analysis results, we can document how women in this region understand environmental management. Differences in cultural beliefs across socio-demographic characteristics can then be determined. Finally, directly related to the CAB-driven question, we can assess how health is influenced by cultural decision-making.

Despite the limited scope of the domain analysis process, results can help inform a more culturally-tailored study in the area of the cultural differences in environmental behaviors, and the importance of addressing all hazards, whether physical, chemical, meteorological to better address community concerns. Participants of all background agreed on the threat of hurricanes, on the usefulness of certain hurricane behaviors, as well as, the importance of relying on family. However, issues of community violence, drug activity, and church all showed differences organized by demographic group. This may just be an artifact of the small sample size; however, it may indicate different threats across the region. Regardless, additional research is needed to examine the source of these cultural differences.

This study underscores the benefits of a community-academic partnership throughout the study process. Specifically, this study was strengthened by community collaboration across several facets in the research process:

- **Research development**- The research into cultural differences was driven exclusively by community feedback. The GROWH CAB model encouraged researchers to engage in transdisciplinary methods in order to answer locally-relevant research questions.
- **Study design**- Locally-trained community health workers were instrumental in the development and interpretation of surveys.
- **Data collection-** Through their ongoing role as health navigators, CHWs had a strong relationship with mothers, which allowed for meaningful discussion.
- **Interpretation of results** –Partnering with CHWs allowed for a more sound coding of freelisting responses, as they helped to determine when different responses were actually referencing a similar term.

The incorporation of community collaboration throughout the research process, provides a possible model for future studies to implement community-based participatory research in a transdisciplinary fashion.

F. Results - Manuscript 2: A Mixed Methods Approach to Studying Cultural Models of Risk Perception among Low-Income Mothers

Background

Risk perceptions and the belief systems that influence the appraisal of stressors (*15*) may be particularly relevant for mothers of young children. Mothers are often tasked with the protecting the health of the family by assuming the care of children, and the management of the home environment (*121, 122*). Additionally, over the course of their pregnancy, new mothers struggle with familiarizing themselves with a stream of novel threats and new risks to older threats (*68*). Low-income mothers can face greater stress as a result of this responsibility, as they often must manage an environment that is frequently more contaminated, all with diminished resources and inadequate services (*68*).

While the appraisal process and risk perception principles have been incorporated into the challenge mothers face, more research is needed to incorporate the role of culture (*41*). Tremendous pressure exists to raise children in a manner that reflects the values of the local culture (*54, 55*). Practices and norms are frequently passed through social interaction, and new mothers in particular rely on child-centered networks to inform risk perception and decision-making from more experienced mothers (*49, 123*). This process of sharing creates a form of peer pressure for mothers to conform their actions to idealized version of motherhood, where oftentimes a "good" mother maintains the health of the family by enacting a series of “moral, responsible, and safe health choices”(*69, 124*).

Sophisticated techniques exist to quantify the role of culture through cultural consensus analysis (*52, 108*). Using this technique, detailed overviews of cultural beliefs have been provided in the practice of breastfeeding (*125*), child health management (*126*),

pregnancy decision-making (*127*), and infant care (*128*), all using this information to create a more culturally-tailored intervention (*125*). However, this methodology has yet to be applied to a broader evaluation of risk perception in a community.

Offering greater insight into the cultural influences of risk perception could be especially helpful in the complex environment of Southeast Louisiana. The area has a long history of environmental contamination, as it is home to an infamous region of "Cancer Alley", an 85-mile stretch of the Mississippi River which is one of the most highly polluted areas in the country (*82, 83*). Additionally, the region is home to New Orleans which suffers from continuing high rates of community violence (*129-131*). The area also is a frequent setting of diverse disasters, such as Hurricane Katrina and the 2010 Gulf oil spill. Federal authorities through the National Institute of Health helped to respond to this concern by prioritizing scientific research towards at-risk populations living in the region, most notably women of reproductive ages, and pregnant women, and how they respond to a multi-hazard environment (*98*).

This manuscript will describe results that used cultural consensus analysis to uncover cultural influences of risk perceptions among low-income first-time mothers in Southeast Louisiana. Detailed results will be listed, and analysis will attempt to uncover the key demographic factors driving cultural knowledge of risks.

Methods

Participants

This study was conducted in a cohort of women participating in an ongoing intervention study related to the Gulf oil spill. The inclusion criteria for the cohort required the women to be residents of a Southeast Louisiana parish affected by the Gulf oil spill

(Orleans, Jefferson, St. Bernard, Terrebonne, Lafourche, and Plaquemines). Women were recruited from Women, Infants, and Children (WIC) clinics and were required to meet the WIC eligibility criteria (*99*).

Data collection

Following frequently-used cultural ethnographic methods, survey materials were developed from freelisting (*100*), where participants (n=20) were selected from the GROWH intervention, and asked to name the threats in the environment. 11 of the most salient hazards listed were chosen for further analysis. A follow-up pile sort analysis using some of the same women revealed three distinct clusters that distinguished the hazards according to type (Table 6).

Table 6 – Select hazards for study and pile sort cluster

1. Bad/Reckless drivers in the community ***(Physical)***
2. Cigarette smoke ***(Air&Water)***
3. Drugs in the community ***(Physical)***
4. Floods ***(Meteorological)***
5. Hurricanes ***(Meteorological)***
6. Indoor air pollution ***(Air&Water)***
7. Mosquitos ***(Meteorological)***
8. Outdoor air pollution ***(Air&Water)***
9. *Radiation* ***(Air&Water)***
10. Violence in the community ***(Physical)***
11. Water pollution ***(Air&Water)***

In the final stage of the study discussed in this paper, the same 11 hazards were used for a ratings surveys, which aimed to assess the cultural perception of each hazard following traditional principles from the psychometric paradigm (*32, 33*). Six criteria were created to assess the eleven hazards: the risk, the stress caused, the choice of exposure, the dread, the knowledge of the hazards, and then finally, the level of responsibility in terms of protecting the family (i.e., does it fall on the government, the family, or somewhere in between).

To supplement these cultural ratings, socio-demographic information previously collected by the larger intervention study were included for analysis. Also, participants were asked to answer several questions concerning their personal attitudes and experiences related to the 11 threats. This included their experience with each hazard, the level of responsibility they had in their household when making decisions about each hazard, and how frequently they talked to other mothers in the community about each hazard. Responses were coded categorically. Categories were analyzed separately, and were also summed to create an index of experience, family responsibility, and communication, both across all hazards, and by three clustered produced in pile sort.

Data analysis

Ratings were analyzed using cultural consensus analysis (*108*). Consensus analysis uses a form of factor analysis on the respondent matrix to determine if there is sufficient agreement in the responses to conclude that a single response pattern is present (*52*). The ratio between the first and second eigenvalue produced by the factor analysis is used as a guide for the fit of the solution (*52*). If a single factor structure is present (a ratio ≥3:1), the factor scores (a weighted average of response) are then used to represent the culturally-correct responses of that model. Additionally, the output of the consensus analysis produces two factor loadings for each participant. The first factor loading indicates how well the individual answers match the model (cultural competence). The second factor loading represents the participant's correspondence to the next largest source of inter-individual variation (residual agreement), which is often used to assess sub-cultural variation (*53, 108*).

The output of the analysis offers different ways to further analyze the dynamics within the population, and were used in this study to determine if certain sub-groups were

more or less likely to share in the cultural information(*132*). Variables found to be relevant were regressed against both factor loadings to better capture which variables were most predictive of cultural knowledge. Further analysis of the residual agreement was then used to better understand how the model was distributed between sub-groups(*133, 134*). Using a residual agreement analysis detailed by Dressler (*135*), patterns of deviation from the culture were calculated. The method calls for subtracting the rating of the cultural answer key from each individual's rating of the same item. A positive value indicates that item was rated higher by the respondent than by the answer key. Each item's overall deviation can be calculated by averaging the deviation scores across all individuals. This method removes the known variation accounted for by the first factor, leaving only the residual agreement.

112 women were interviewed and completed a survey, which surpassed recommended minimum for the analysis, which allowed for more accurate estimates of sub-group differences (*100*).

Results

Results of the consensus analysis revealed a moderate cultural agreement of a model of risk perceptions. The model fit the data (eigenvalue ratios exceeded the recommended 3:1) with a ratio of 4.232. While there were 5 women with a negative 1st factor loading, the overall average competence was sufficient at 0.537 (which is roughly equivalent to a Spearman correlation of 0.288).

Since the model was sufficient, the factor loadings were used to estimate the "culturally correct" answer to the survey (Table 7). Drugs, hurricanes, and violence were seen as threats with the most risk, stress, knowledge, and dread-causing. Indoor air pollution and cigarette smoke were seen as the items where mothers had the greatest

amount of choice over exposure, and personal responsibility. Results were averaged across pile sort category (Figure 7) to show that the physical hazards (drivers, drugs, and violence) were most distinctly rated as the most stressful, and dread-inducing, and more well-known. Significant mean differences were specifically found between physical and air/water threats concerning stress and dread.

Table 7 – Cultural Consensus Answer Key – Risk Perception						
	Risk (low 1 – high 4)	Stress (low 1- high 5)	Choice (low 1- high 5)	Dread (low 1- high 6)	Knowledge (low 1- high 5)	Responsibility (low 1- high 5)
Bad Drivers	2.93	3.55	2.02	4.32	4.13	2.29
Cigarette Smoke	2.97	3.36	2.99	3.79	4.34	3.02
Drugs in the community	3.17	3.9	2.64	4.84	4.35	2.5
Floods	2.94	3.47	1.88	4.35	4.17	2.24
Hurricanes	3.14	3.91	1.73	4.71	4.35	2.41
Indoor Air Pollution	2.45	2.86	3.15	3.45	3.73	3.39
Mosquitos	2.66	3.12	1.87	3.48	3.71	2.03
Outdoor Air Pollution	2.76	3.24	1.75	3.79	3.55	1.97
Radiation	2.22	2.62	1.67	3.61	2.92	1.65
Violence	3.19	4	2.49	5.16	4.38	2.32
Water Pollution	2.37	2.94	1.72	3.67	3.30	1.74

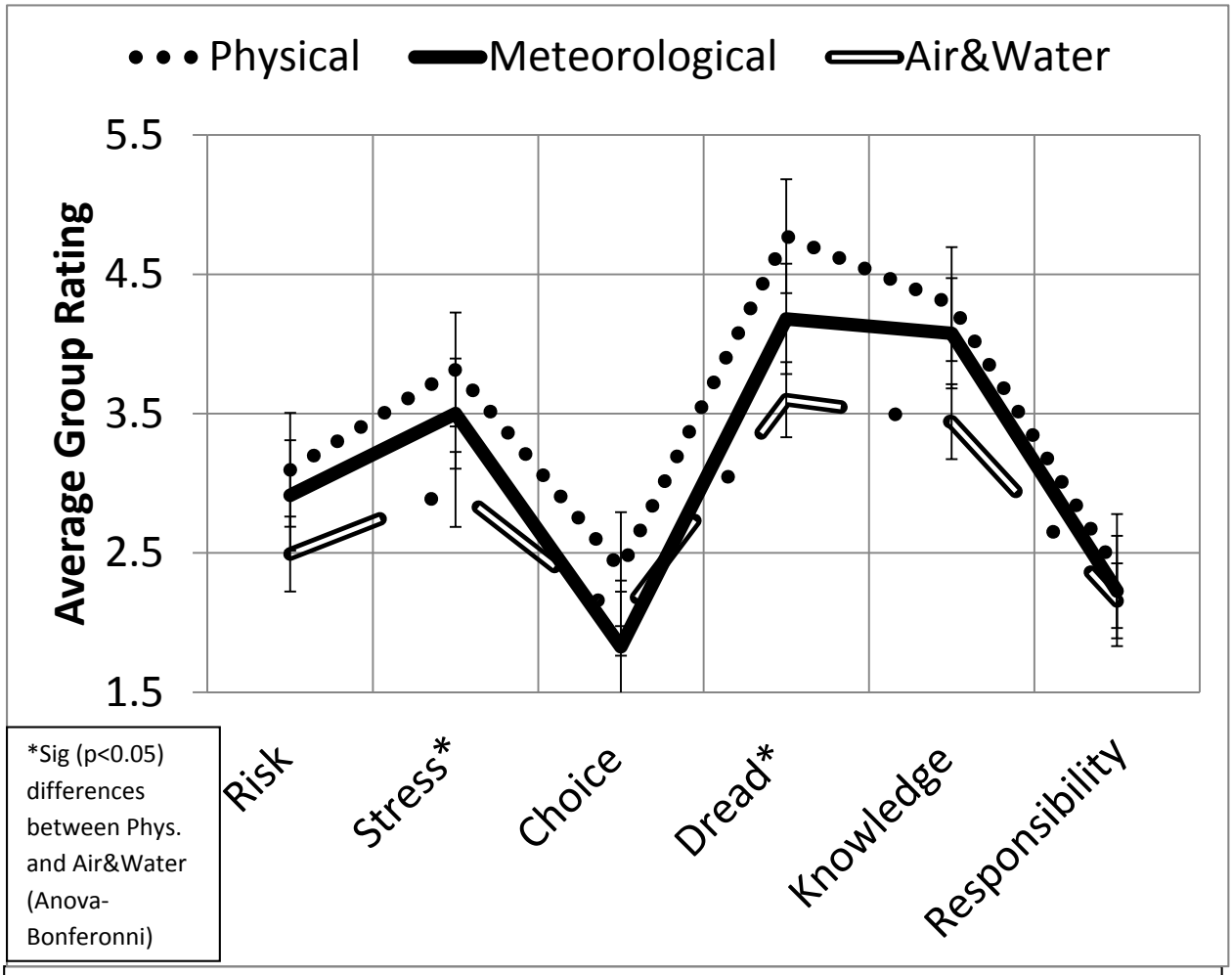


Figure 7 – Risk Perception Ratings by Pile Sort Cluster

Loadings on the first and second factor were compared across different population groups. Table 8 shows the agreement to the model by selected demographic groups. Even when comparing subgroups, agreement was still consistently high. The highest cultural competence was with women who had a college degree (0.62), and those with the lowest competency were those under 22 years (0.42). Based on these tests, significant differences were found across region, and near significance were found across age. For the second factor loading, statistically significant differences were found between race (p=.031).

For the first loading, a strong, significant correlation was found with personal experience index (r=0.273, p=0. 005), and for the second loading, a moderate significant

correlation was found with the index of family responsibility (r=0.193, p=0.051). Interestingly, stratification by region indicated these results held only for mothers in the metro region

Table 8 – Average Competency Score across population group – Risk Perception		
Category (n)	Average competency (SD)	Kruskal-Wallis p-value
Age		
Under 22 (22)	.42 (.31)	.079
22-23 (28)	.52 (.26)	
24-27 (32)	.56 (.19)	
28 and over (30)	.62 (.16)	
Region Density (households per square mile)		
Urban (2213 and above) (12)	.52 (.21)	.014
Upper Third Suburban (2212-1581) (28)	.60 (.22)	
Middle Third Suburban (1580-846) (40)	.59 (.22)	
Lower Third Suburban (845-118) (12)	.39 (.30)	
Rural (Under 102) (20)	.45 (.23)	
Region		
Metro (81)	.58 (.22)	.003
Non-Metro (31)	.43 (.26)	
Race		
Black (70)	.55 (.23)	.490
White (32)	.51 (.24)	
Other (10)	.56 (.32)	
Education		
Dropout (19)	.58 (.22)	.130
High school graduate (67)	.50 (.26)	
College (26)	.62 (.15)	
Housing situation		
Own (16)	.58 (.17)	.067
Rent (61)	.57 (.24)	
Shelter (8)	.59 (.25)	
Live with older friend/family (6)	.31 (.33)	
Other (20)	.50 (.19)	
Income		
Under $10k (58)	.55 (.23)	.749
$10k -20k (18)	.50 (.29)	
$20-$30k (12)	.53 (.24)	
Over $30k (16)	.53 (.13)	

To analyze cultural knowledge further, variables found to be significant correlation were regressed against the cultural competency and residual agreement scores. For competency, a model (adjusted R-squared 0.184) produced significant predictors of age (Standardized Beta 0.211, p=0.027), region (Standardized Beta -0.260, p=.006), the type of house (Standardized Beta 0.157, p=0.090), the sum of personal experience (Standardized Beta 0.186, p=.049), and race (Standardized Beta -0.019, p=0.835). For residual agreement, the model (adjusted R-squared of 0.120) produced two significant variables: whether the mothers were in the 25th percentile of having household responsibility (according to the index of household responsibility) (Standardized Beta -0.334, p=0.001) and the race of the mother (Standardized Beta -.205, p=.042).

Table 9 – Correlation between groups – Residual Agreement – Risk Perception

	Total	Risk	Stress	Choice	Dread	Know	Resp.
Region (Rural/Metro)	.391*	-.488	-.076	-.112	-.244	-.608*	.054
Experience	.084	.287	.204	.113	.630	.103	-.310
Family Responsibility	.692*	.803*	.785*	.699*	.655*	.589	.910

(* Significant correlation where p<0.05 – Spearman Correlation)

Using the residual agreement analysis, mean deviations were calculated for each of the groups found to be significant in the regression models. Associations were measured through two ways. First, association was measured for the whole survey, then by each separate question (Table 9). A strong inverse association was found between deviations scores related to knowledge between different regions (r=-.608). This means that many of the items rated as more known by respondents in the rural region, or with less experience, were rated as less known by respondent in the metro region, or with more experience. However, this distinction was only found among women with greater experience dealing with the threats. These regional deviations were not stable, however, as women with higher experience had a similarly negative correlation (r=-.600, p.050), while women with less

experience had no correlation (r=.024, p=.945). . Visualizing the mean deviation differences for region of knowledge (Figure 8) shows a distinctive difference in the pattern of answers as it relates to outdoor air and water pollution.

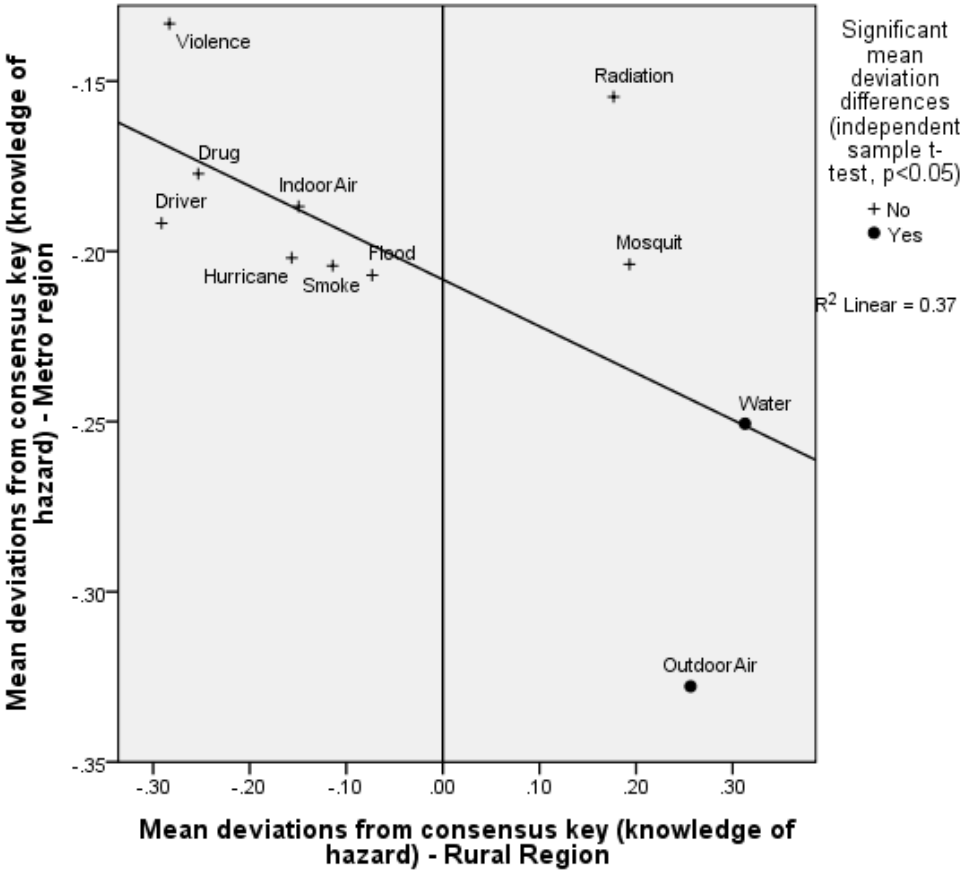


Figure 8. Residual agreement comparisons of perceptions of hazard knowledge between regions

Discussion

Participants had unique understandings and relationships with the hazards surveyed, as issues like hurricanes and community violence were frequently talked about. On the other hand, issues of radiation and water pollution rarely came up in the lives of the participants. Despite these differences between threats, an overall model of risk perception

was shared across a diverse sample of low-income mothers. Overall, the main model shows a mix of different types of hazards (physical, air and water, meteorological), with hurricanes and community violence being the hazards consistently rated as the riskiest, most stress-inducing, and dread-causing. Sorting by pile sort cluster showed that generally the physical hazards were considered the more concerning hazards for these women, with air and water issues being the least concerning.

Despite this the initial consensus of the model, the high number of negatives on the first factor loading, and number of women with extremely high (>0.50) residual agreement indicated potential sub-cultural divisions. Further analysis uncovered potentials rifts within the shared cultural model regarding the relative risk seen in types of threats. Patterned differences were found in women across region and across age groups. Using residual agreement analysis, distinctive patterns were found by certain question topics, as air and water threats (outdoor air and water pollution) were seen as a much more known threat in the rural region than in the metro region. This may be associated with the related finding of personal experience being a predictor of cultural knowledge. Outdoor air pollution and water pollution may be seen as more present in the rural region, therefore driving a cultural understanding of their knowledge.

Despite these findings, several limitations should be noted. Due to the participant's ongoing involvement in the wider intervention study, participants had been receiving a text-based messaging service regarding maternal child health issues and –more importantly for this study – disaster risk messaging. For example a text message would prompt them to remember to make a disaster plan, while another would remind them to go to a certain website to learn more. Additionally, half of the women were chosen at random to receive additional disaster information, which included various brochures on detailed disaster tips.

Some of the behaviors on the survey were mentioned in either the text-messaging service, or in the disaster brochures, and as a result may affect the external validity of this study.

Some misclassification in the demographic response may also be possible. Demographic data were collected at baseline enrollment for the participants. At the time of their inclusion in this study, several months sometimes passed, and it is likely that some of the moms may have moved to a new address, which would weaken any conclusions about region in this study.

Conclusion

Low-income, first-time mothers in this study shared a model on how environmental threats are perceived. Generally, the model was better shared among mothers living in the metro region, were older, or had greater general experience with the hazards. The model cut across an appropriate idea of each threat's risk, stress, and dread, as well as, the expectation of family responsibility. Results showed a general pattern of responses according to the type of hazard, as physical environmental threats were accepted as a set of greater concern than more traditional environmental issues. The main source of cultural disagreement was between the youngest and oldest mothers, and the mothers between the rural and metro region of the study area. Women from different regions tended to be divided on their perception of air and water threats, as rural mothers shared a perception that outdoor air and water pollution was a much more well-known threat than mothers in the metro region.

Despite these differences, results showed broad consensus across a diverse sample of low-income mothers. Understanding how different threats are culturally perceived can help to shape more culturally-tailored services. More importantly, this research

demonstrates that cognitive anthropological methods can be effective in investigating public health question. In particular, this study showed how beliefs are shared – and not – among at-risk mothers in a region facing a wide range of environmental hazards. Overall, findings are useful in demonstrating the efficacy of this methodology for future public health questions. Specifically for this New Orleans area, more culturally-informed interventions can be made to emphasize potential risks in the clusters of lower concern, such as air and water pollution. In particular finding ways to increase the perception of knowledge for these relatively less-understood threats.

G. Results - Manuscript 3: Exploring Cultural Models of Air Quality Management Among Low-Income Mothers

Background

Exposure to air pollutants is linked to a string of chronic diseases, and recent research has raised concern of the unique vulnerability for fetuses and young children to these hazards (*136*). Childhood exposure to outdoor air pollution has been linked with the development and aggravation of disease such as asthma (*137*), Similarly, exposure to indoor air pollution, through a range of chemical and biological contaminants may lead to several adverse health effects(*138, 139*).

Families are exposed to air pollutants at varying levels, and as a result, stark disparities have been found in related health outcomes(*140*). Contrary to popular thought, asthma morbidity may be higher in rural families than urban families (*141*). Families of certain ethnic and racial minorities, as well as families of low socioeconomic status (SES), may be more likely to be exposed to worse air environments, and suffer from diseases related to the exposure of these environment (*142*). Some research found that even when controlling for income differences, asthma was greater among African-American families than White families (*143*).

To mitigate the risk of air pollution, a variety of home environmental control methods have been shown to decrease the frequency and severity of air quality-related diseases (*144, 145*). However, interventions seeking to implement these methods have been mixed in both disseminating information (*146, 147*), and changing behavior (*148, 149*). In particular, folk remedies and misconceptions are still prevalent and resistant to change (*76*). Overall, many families opt for alternative health management techniques to protect their

family(*150*). To improve outcomes, and address idiosyncratic folk remedies, recent interventions have emphasized culture in addressing exposure to air pollution (*151-153*), Additionally, some have specifically emphasized culturally-tailored outreach to improve health literacy outreach (*154*),

Culture is best understood as information shared through social networks, which through personal interaction can influence personal models of perception and behavior (*49*), Culture may be particularly relevant for new mothers. Beginning with their pregnancy, new mothers must familiarize themselves with a stream of novel threats (e.g. pregnancy health concerns, delivery decisions, lifestyle changes, infant health concerns), and new risks to older threats (e.g., air hazards) (*68*). Subsequently, mothers are often tasked with protecting the health of the family by assuming the care of children, and the management of the home environment (*121, 122*), yet many have little knowledge air hazards, and about the appropriate strategy to manage their risk (*155*).

Uncovering the cultural messages received by mothers would be illuminating for researchers to better examine susceptible sub-populations, and key behaviors to focus for intervention. Methods exist to answer many of these cultural questions present in the literature, specifically through cultural consensus analysis (*52, 108*). Lee Pachter and colleagues used cultural consensus analysis to assess asthma beliefs and behaviors across Latino populations (*156*). Results were able to locate specific folk beliefs within the population, and measure systematic differences between Latino populations in different geographic areas, while also discerning specific ethno-cultural beliefs that could be used for more culturally-tailored health interventions. While this methodology offers many advantages in detailing cultural differences, it has never been applied to a population of new mothers concerning air quality management.

This paper will describe results from a study that used these anthropological methods to uncover cultural perceptions of appropriate strategies to manage air quality. Study participants were drawn from a population of low-income first-time mothers in Southeastern Louisiana parishes. The region has suffered several large-scale events that have related to air quality. Indoor air quality was a major concern in metro areas following Hurricane Katrina (*157, 158*), and researchers were worried about the cultural barriers to remediation (*159*). More recently, the 2010 Gulf oil spill raised concerns about air quality in the bayou rural parishes(*90, 160*). Due to saliency of air quality threats in the region, and the deep distinctions in cultural groups, some have been concerned about different population's ability to cope (*161, 162*)

Methods

Study Participants

This cross-sectional study was conducted through in-person interviews from a cohort of women participating in an ongoing intervention study in Southeast Louisiana parishes affected by the Gulf oil spill. As a part of the wider study, women were required to be in their first or second trimester of pregnancy of what would be their first child. Women were recruited from Women, Infants, and Children (WIC) clinics and were required to meet the WIC eligibility criteria, which are satisfied through nutritional and income requirements (*99*).

Surveys were developed through semi-structured interview techniques, which identified possible strategies to manage air quality concerns, and sources to turn to help in the process. The rating survey had women rate the importance of a range of actions, and the likelihood of turning to the differences sources. All responses were rated on a 6-point scale.

To supplement these cultural ratings, socio-demographic information was collected, and participants were asked to answer several questions concerning their personal experiences with outdoor air and indoor air pollution. This included their experience with both hazards, the level of responsibility they had in their household when making decisions about each hazard, and how frequently they talked to other mothers in the community about each hazard.

Data Analysis

Cultural ratings were analyzed using the informal version of the cultural consensus analysis (*52, 108*). Consensus analysis uses factor analysis on the respondent-by-item matrix to assess whether agreement in the group responses were high enough to conclude that a single response pattern was present (*52*). Fit is determined by the factor analysis output (fit is achieved if eigenvalue ratio ≥ 3:1), and if sufficient, the factor scores of the output can be used to estimate the "cultural correct" answers to the survey questions (*52*). Finally, the output of the consensus analysis produces several factor loadings for each respondent, which can be used to analyze inter-cultural and intra-cultural variability. The first factor loading indicates the correspondence of the individual response to that of the model (often called a cultural competence score). Any agreement that is not represented on the first loading is then collected on the second loading, and is sometimes referred to as a residual agreement (*135*).

Cultural variation was further analyzed in this study using a method detailed by Dressler (*135*). Deviation scores can be calculated for each individual by subtracting the item value of the cultural answer key from the individual rating. A positive value indicates that item was rated higher by the respondent than by the answer key. Each item's overall deviation can be calculated by averaging the deviation scores across all individuals. This

method removes the known variation accounted for by the first factor, leaving only the residual agreement. This then visualized to inspect for patterns of deviation across population groups (*110*).

Finally, inter-cultural differences were inspected by plotting each individual's first and second factor loading on a scatterplot. A visual, subjective inspection can then determine how, if necessary, to separate the respondents into groups based on their relative agreement with each other. Other studies have used more rigorous application of hierarchical clustering to confirm how respondents on the boundary should be filed (*133*). These groups can then be run separately to compare answer keys, and statistical tests can be performed on demographic data to estimate associations of membership(*133*).

Results

The results of the consensus analysis produced an eigenvalue ratio (3.125) that just passed the minimum threshold ratio of 3:1. 10 individuals had negative factor loadings, and the group competency average was low (0.423, SD 0.296), all suggesting the model is not a good fit to the study population.

To investigate drivers of possible inter-cultural variation, competency scores of the main model were compared (Table 10). The highest agreement or competence were among those with a college degree (0.51), or with a great deal of outdoor air pollution experience (0.57). Those with the lowest competency were those living in rural density regions (0.30), and homeowners (0.29), and those that personally considered indoor air quality to be completely the government's responsibility (0.20).

Table 10 – Average Competency Score across population group – Air Quality		
Category (n)	Average competency (SD)	Kruskal-Wallis p-value

Age Under 22 (22) 22-23 (28) 24-27 (32) 28 and over (30)	 .33 (.35) .45 (.27) .45 (.25) .44 (.33)	 .550
Region (Households per square mile) Rural (102 and under) (20) Suburban (103-2212) (80) Urban (2213 and above) (12)	 .30 (.39) .46 (.26) .39 (.29)	 .173
Region Rural (31) Metro (81)	 .38 (.35) .44 (.27)	 .541
Race Black (non-Latina) (65) White (non-Latina) (27) Other (20)	 .42 (.30) .41 (.33) .45 (.26(	 .681
Education Dropout (19) High school graduate (67) College (26)	 .48 (.26) .37 (.31) .51 (.26)	 .098
Housing situation Own (16) Rent (61) Shelter (8) Live with older friend/family (6) Other (20)	 .29 (.42) .49 (.23) .34 (.29) .21 (.23) .45 (.32)	 .022
Income Under $10k (58) $10k -20k (18) $20-$30k (12) Over $30k (16)	 .38 (.30) .51 (.26) .56 (.19) .35 (.38)	 .129
Experience with indoor air pollution None (33) Some (40) Moderate (20) Great deal (10)	 .40 (.28) .46 (.26) .37 (.35) .50 (.25)	 .638
Experience with outdoor air pollution None (24) Some (45) Moderate (28) Great deal (6)	 .40 (.32) .44 (.24) .38 (.32) .59 (.20)	 .385
Responsibility in family for decision- Indoor air pollution Completely (18) Mostly (9) Equal (34) Mostly (17) Completely (25)	 .37 (.28) .35 (.30) .40 (.31) .37 (.31) .56 (.19)	 .085

Responsibility in family for decision- Outdoor air pollution Completely (27) Mostly (19) Equal (32) Mostly (13) Completely (12)	 ,36 (.24) .53 (.23) .43 (.28) .26 (.40) .56 (.22)	.033
Talk to other mothers about indoor air pollution Never (44) Rarely (27) Occasionally (22) Great deal (10)	 .49 (.21) .33 (.34) .32 (.31) .60 (17)	.013
Talk to other mothers about outdoor air pollution Never (40) Rarely (32) Occasionally (23) Great deal (8)	 .43 (.25) .41 (.31) .39 (.31) .58 (.17)	.438

Multiple regression analyses were used to test for the significant predictors for the dependent variable of cultural knowledge (1st factor loading). Predictors that were significantly correlated to the competency score were regressed and the resulting model produced an adjusted R-squared of 0.134, and found two significant predictors of a mother's cultural knowledge of air management: whether the mother lived in a rental unit (Standardized Beta 0.223, p=0.023), whether she felt indoor air was completely her responsibility (Standardized Beta 0.257, p=.007), controlling for the effects of age, region and race. Using identical steps, factors were also regressed against residual agreement (2nd factor loading). The model (adjusted R-squared of 0.217) produced one significant predictors of whether the mother had at least moderate experience with outdoor air pollution (Standardized Beta .357, p=0.00), controlling for the effects of age, race, and region.

Due to the evidence of poor fit with the model, loadings were plotted to examine to partition the original sample into multiple subgroups (*163*). The first factor loadings were used to separate the respondents with low to negative first factor loadings (Group 3). Consensus analysis was performed on this group, which resulted in an extremely low ratio (1.125), indicating no pattern of agreement was shared among this group. Next, the respondents with a positive second factor loading were grouped together (Group 1), and the respondents with a negative second factor loading were group together (Group 2). Plotting

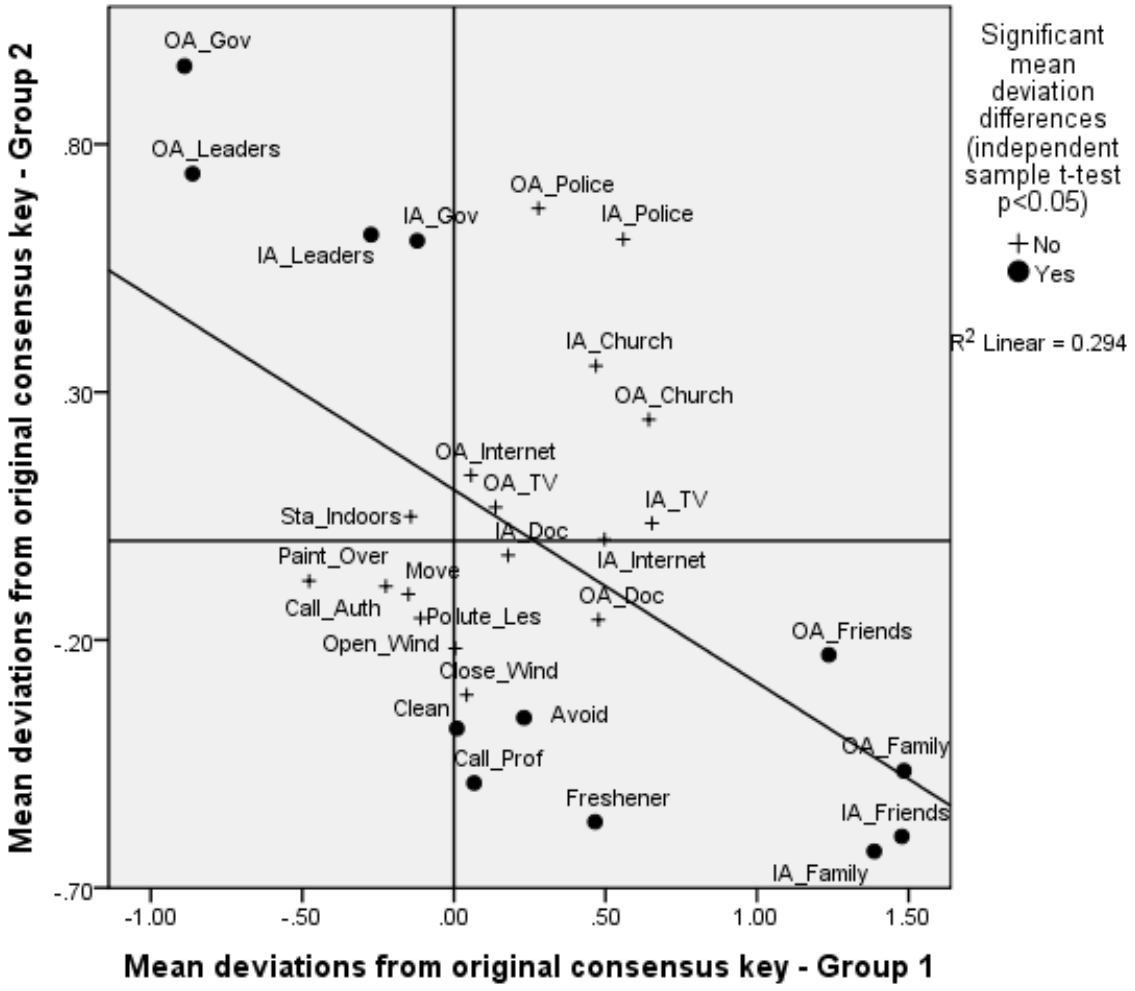


Figure 9. Relationship of mean deviations from the consensus answer key for respondents in group 1 and 2 - air quality domain

groups 1 and 2 against each other (Figure 9) using residual agreement analysis helped to visualize the distinctions between the two cultures, as group 1 tended to value relying on friends and family for support, while group 2 tended to rely on government services and leaders.

Consensus analysis was performed on these two groups separately, and both demonstrated much higher indicators of consensus (Group 1 ratio=4.436; Group 2 ratio=5.418), suggesting that two distinct cultures were present in the study sample. Using factor scores for the two groups, answer keys were created, which confirmed the difference between the cultures regarding the value of family and friends versus government support to manage air quality (Table 11).

Table 11. Segmented Air Quality Answer Keys – Group 1 and 2		
Choice	**Group 1 Collapsed Answer (Rating)**	**Group 2 Collapsed Answer (Rating)**
Risk Behaviors		
Avoid parts of the house where there is a problem (e.g., mold, smell)	**EI (5.59)**	**VI (4.99) ***
Call a professional to clean (e.g., mold, smell)	**VI (5.42)**	**VI (4.84) ***
Keep house extra clean (e.g. vacuum, wash sheets)	**EI (5.61)**	**VI (5.32) ***
Keep windows open as much as possible	**VI (4.71)**	**VI (4.51)**
Paint over mold spots	**MI (3.84)**	**MI (4.07)**
Use air fresheners	**VI (5.07)**	**MI (3.9) ***
Ask authorities to do something	**VI (5.27)**	**VI (5.3)**
Pollute less	**VI (5.34)**	**VI (5.17)**
Keep windows closed as much as possible	**VI (4.8)**	**MI (4.33)**
Move to area with cleaner air	**MI (4.44)**	**MI (4.5)**
Sources of Support		
Indoor Air - Doctor	**SL (3.7)**	**SU (3.43)**
Indoor Air – Family	**L (4.58)**	**SU (2.55) ***
Indoor Air – Friends	**SL (3.82)**	**U (1.8) ***
Indoor Air – Government services (e.g., WIC, Health Department)	**SU (2.73)**	**SU (3.48) ***
Indoor Air – Internet	**SL (3.51)**	**SU (3.1)**
Indoor Air – Local government leaders	**SU (2.56)**	**SU (3.44) ***

Indoor Air – People at church	**U (2.11)**	**U (1.97)**
Indoor Air – Police	**U (2.2)**	**U (2.23)**
Indoor Air – TV News	**SL (3.67)**	**SU (2.91)**
Outdoor Air - Doctor	**SL (3.99)**	**SU (3.05)**
Outdoor Air – Family	**SL (3.87)**	**U (1.94) ***
Outdoor Air – Friends	**SU (3.3)**	**U (1.81) ***
Outdoor Air – Government services (e.g., WIC, Health Department)	**SU (2.53)**	**L (4.55) ***
Outdoor Air – Internet	**SL (3.74)**	**SL (4.01)**
Outdoor Air – Local government leaders	**SU (3.19)**	**L (5.05) ***
Outdoor Air – People at church	**U (2.29)**	**U (1.94)**
Outdoor Air – Police	**SU (2.81)**	**SU (3.22)**
Outdoor Air – TV News	**SL (4.34)**	**SL (4.28)**
Significant differences, Kruskal-Wallis, p<0.05** ***Collapsed Answer Symbols: **Part 1: EI=Extremely important; VI=Very important; MI=Moderately important;** **Part 2: L=Likely; SL=Somewhat likely; SU=Somewhat unlikely; U=Unlikely**		

Finally, to analyze any potential socio-demographic associations with group members, significant variables were regressed using a binary logistic regression. Controlling for the effects of region, age, and race, a moderately predictive model (Nagelkerke R Square=0.383) found two significant predictors of being in group 2: Women who never personally talked to other moms about outdoor air (Exp (B) 5.347, p=0.004) and women who had little experience with outdoor air (Exp (B) 5.349, p=.004).

Discussion

Despite the initially positive indicators of cultural consensus (>3:1 eigenvalue ratio) of the whole population, further analysis revealed air quality management to be divided between two distinct models of management. There was strong agreement across most behaviors for participants; however, fundamental differences were seen on a few specific behaviors between the two main groups of women.

Women in the two cultural groups differed most markedly around the value of turning to friends and family, versus turning to government services and leaders in helping manage air quality. The two groups also differed in several indoor air management strategies. Group

2 consistently valued these behaviors less. While some of these differences concern strategies that supported by public health professionals (keeping the house clean, calling a professional to fix), others may be discouraged (using air fresheners). Further research should investigate the relationship between the values in sources of support and values of risk behaviors, as the difference in sources of support may be related to the difference in attitudes concerning household management.

Logistic regression was used to find two indicators of membership between the groups. Women with limited outdoor air pollution experience had an almost 5 times greater likelihood of being in group 2, and women who never talk about outdoor air pollution had an almost 4 times likelihood, controlling for region, age, and race. The fact that women with experience tended to value relying on friends and family could be a sign of concern with the existing public health infrastructure in the study area, as women who have had to deal with the problem in the past shared a low opinion of the available resources from the government.

In both cultural groups 1 and 2, it was surprising how all of the potential risk behaviors were rated above average importance on the scale. We had specifically chosen several actions (e.g., painting over mold spots, avoiding trouble areas, using air fresheners) that we thought would be considered unimportant, in order to balance the answer key. While some of these behaviors were still rated relatively unimportant, when compared to the other actions, it was surprising how little gap there was between these actions.

Despite these findings, several limitations should be noted. Due to intervention of GROWH study, participants had been receiving two interventions that could have differentiated them from the general population. First, they have been in constant communication with an assigned community health worker. We used these community

health workers to the advantage of this study by having them act as ethnographers, and we believe make the participants feel more comfortable in giving honest responses.

Secondly, participants had been receiving a text-based messaging service throughout the service that normally applied to maternal child health issues. However, none of these messages covered air quality issues. It is possible that the text-messaging service may have altered their perception of sources of support.

Some misclassification in the demographic response may also be possible. Demographic data were collected at baseline enrollment for the participants. At the time of their inclusion in this study, several months sometimes passed, and are likely that some of the moms may have moved to a new address, which would weaken any conclusions about region in this study.

Finally, several limitations exist in the study design. The number of questions used in the survey fell short of the recommended minimum (*53*), and as a result, the reliability of the findings may have been weakened. Also, even though efforts were made to balance the survey with positive and negative items, we were surprised with the overwhelmingly high ratings of behaviors and sources for the survey. To prevent the low inter-informant variability from creating bias in the results, we recorded several questions to provide the recommended variability. Additionally research into this topic should use more sophisticated efforts to ensure that the full range of the air quality management is surveyed by evaluating equal positive and negative behaviors and sources.

Conclusion

The aims of this article were (1) better detail cultural influences of a vulnerable subpopulation in the at-risk region of Southeast Louisiana (2) test the benefits of cultural

consensus analysis on disaster public health. Overall, this research demonstrates that a diverse range of low-income first-time mothers in Southeast Louisiana generally agree about the ways to manage air quality for their families. However, our findings of inter-cultural disagreement are notable, and uncover seams between the groups of women. Women in the study mostly were grouped by two subtly different models of priorities that most differed in their value of relying on friends and family versus their value of relying on government leaders and services.

More importantly, this research demonstrates that cognitive anthropological methods can be effective in investigating public health questions. In particular, in this study, we showed how beliefs are shared – and are not shared – among at-risk mothers in an at-risk region. A main finding is that no subculture fully is in-line with recommendations. However, subcultures seemed to differ in association by either (a) how often they talked about air quality with other moms, and (b) their experience with the threat.

Overall, findings are useful in demonstrating the efficacy of this methodology for addressing future public health questions. Specifically for the New Orleans area, more culturally-informed interventions can be designed to emphasize the lower-rated behaviors among the specific sub-populations noted. Taking findings from this research, interventions could aim to find reasons for dissatisfaction with government sources among mothers with air quality pollutant experience.

H. **Results - Manuscript 4: Cultural Influences on Hurricane Preparedness Among Low-Income Mothers in Southeast Louisiana**

Background

Disasters often increase the risk of a wide range of possible direct and indirect health effects, with women being generally more at-risk than men (*164, 165*). Pregnant and postpartum women may be particularly susceptible to these effects, through both added risk of adverse pregnancy outcomes (*166, 167*), and negative mental health problems (*168*). This may partly stem from a lack of access to health care services, as well as the direct physical threats (whether injury or sexual violence) following a disaster (*168*). Another factor may relate to the added burden mothers face in navigating the disaster-related threats for themselves and their child.

First-time mothers, in particular, are given the daunting task of evaluating and managing a host of novel threats, while also re-assessing previously-evaluated hazards with due to the vulnerability of a fetus or infant (*68*). To inform appropriate behaviors, new mothers often heavily rely on peers in their child-centered social network (*59*). Cultural practices and norms are passed through these types of interactions, and the examples and advice provided by fellow mothers carries tremendous weight, and information passed through these relations has been shown to be highly influential in health behaviors (*59, 123*).

Central to the process of how values influence behavior, which in turn, may influence the development of poor health outcome, is the concept of the appraisal theory(*167*).

Disaster health studies often incorporate the appraisal process, seen often in post-hurricane health studies of the general population (*169*), those displaced from the storm (*170*), and

among nurses working during the disaster (*171*). A more recent study applied this concept to mothers exposed to Hurricane Katrina and found that certain coping strategies provided a protective benefit (*167*).

Hurricane Behavior and Culture

Despite its importance in ensuring positive psychosocial adaptation before, during, and after a hurricane, recommended preparedness steps are rarely known or followed (*172, 173*). Systematic differences exist in hurricane behavior, and are often found across race and socioeconomic status. Disparities have been found according to a person's education and income levels (*174*). Racial and ethnic gaps also exist, particularly with how sources of support are accessed (*175*).

The President's official assessment following Hurricane Katrina cited improving citizen education concerning preparedness as a top priority, and recommended partly achieving this through the creation of a culture of preparedness (*176*). As a result, disaster research has subsequently incorporated this nomenclature of "culture" to help shape recommendations of improved preparedness interventions (*172, 177-179*). Culture can influence behavior through shared values (*180*), as cultural differences can dictate whether responsibility for a hurricane is seen as lying primarily with the family, or with an outside group (*181, 182*). Culture can even drive households to value certain behaviors over others, even when they are directly harmful to health (*181*). Finally, due to the social nature of disaster preparedness, acculturation has been cited as a possible explanation of differing disaster behavior (*174*). Fitzpatrick (*183*) examined this after finding that new residents who have not lived through storms were less likely to take necessary precautionary steps.

Despite these findings, research is still limited in offering detailed examples of the cultural differences in hurricane preparedness. Sophisticated techniques exist to help answer these exact questions through cultural consensus analysis (*52, 108*). While this methodology has been used in several studies focused on maternal culture in the practice of breastfeeding (*125*), child health management (*126*), pregnancy decision-making (*127*), and infant care (*128*), it has never been used for hurricane behavior, especially among the at-risk population of new mothers.

This basis of this study is an analysis of cultural influences associated with hurricane actions and coping strategies across a diverse sample of low-income first-time mothers in Southeast Louisiana. The region continually faces hurricane threats. Despite the ubiquity of hurricane preparedness in the area, research has found deep disparities in disaster response and behavior in the region, as some have attributed these differences to culture (*184*). In particular, a post-Katrina study attributed differential PTSD development on cultural influences (*185*), while other studies found unique post-hurricane adaptation of certain cultures (*186-188*). However, no study has offered more detail into how these cultures differ regarding hurricane behavior, and where the boundaries lie within an at-risk population of new mothers. In particular, researchers have criticized the lack of disaster analysis in the region focused on women (*189*). Using the consensus analysis, detailed results will be listed, and analysis will attempt to uncover the key demographic factors driving membership between cultures, and how those cultures precisely differ. Finally, results will be discussed for any relevance for informing more culturally-appropriate health interventions.

Methods

Participants

This cross-sectional study was conducted on a cohort of women participating in an ongoing intervention study, which focuses on women living in the Southeast Louisiana region affected by the 2010 Gulf oil spill. Through this larger intervention study, women were recruited in either in their first or second trimester of pregnancy of what would be their first child. Women were recruited from Women, Infants, and Children (WIC) clinics and were required to meet the WIC eligibility criteria, which is satisfied through a nutritional and income criteria (*99*).

Data collection

Survey materials were constructed through a sample (n=20) of study women participating in an ethnographic freelisting technique. Women were asked to identify typical strategies to prepare and respond to a hurricane, as well as, people and things that are potential sources to turn to. The most salient responses were carried over to the rating survey to be completed in two sections. In the first section, participants were asked to rate the importance of several possible coping behavioral strategies related to hurricanes. Importance was rated on a 6-point scale ranging from extremely important to not at all important. In the second section of the survey, women were asked to indicate how likely those mothers in this community rely on various sources of support for help in managing the hazard: Respondents were given nine sources and asked to rate on a scale ranging from extremely likely to extremely unlikely.

To supplement these cultural ratings, socio-demographic information previously collected at the baseline of the GROWH study were included for analysis. Also, participants were asked to answer several questions concerning their personal attitudes and experiences related to hurricanes. This included their experience with hurricanes, who

made decisions in their household about hurricanes, and how frequently they talked to other mothers about hurricanes and hurricane behavior.

Data analysis

Cultural ratings were analyzed using cultural consensus analysis (*52*). 112 women in the GROWH study were interviewed and completed a survey, which far surpassed the minimum required, and allowed for accurate estimates of sub-group differences (*100*). Consensus analysis uses factor analysis on the respondent matrix to determine if there was sufficient agreement in the responses to conclude that a single response pattern was present; e.g., that there was a single, shared set of beliefs concerning the rating of hurricane risk behaviors and sources of support (*52*). The ratio between the first and second eigenvalue is used as a guide for the dimensionality of the solution and a ratio greater than 3:1 generally indicates a single factor structure (*52*). If sufficient, the factors scores (another output of the factor analysis) are used to represent the responses of the group, and is a highly accurate estimate of the "culturally correct" answer to each of the survey questions. This is estimated by weighting the responses of each individuals by their first factor score and aggregating responses across the population (*53, 108*). Finally, the output of the consensus analysis produces two factor loadings for each respondent. The first factor loading indicates how well the responses of each individual correspond to that of the model (often called a cultural competence score). Any agreement that is not represented on the first loading is then collected on the second loading, and is sometimes referred to as a residual agreement (*135*).

Socio-demographic variables were analyzed in this study against both factor loadings to determine if any predictors exist of a participant's cultural knowledge. Additionally, sub-cultural variation was further analyzed using a method by Dressler (*135*),

where the factor score of each item is subtracted from each respondent's own rating. A positive value will then indicate that that item was rated higher by the respondent than by the answer key. Each item's overall deviation can be calculated by averaging the deviation scores across all individuals. Average deviations can then be calculated across groups, which can then be visually plotted to examine patterns of deviation and intra-cultural variability (*110*).

Results

Overall, the study population was overwhelmingly young, poor, and African-American. Personal experiences and familiarity with hurricanes varied across the study sample. Many (69.6%) had at least moderate amounts of hurricane experience. Similarly, 41.2% said that someone else in the household made most of the hurricane decisions. Finally, many (58.8%) talked to other mothers about hurricane decisions occasionally or a great deal.

Despite the diversity of the study sample, the results of the consensus analysis reveal a strong cultural agreement of the appropriate behaviors, and appropriate sources to turn in the event of a hurricane. The model fit the data with an eigenvalue ratio of 6.262. While there was 3 woman with a negative factor loading, the average cultural competence was 0.691 (standard deviation 0.259), which is roughly equivalent to a Spearman correlation of 0.477.

Since the model was sufficient, the factor scores were used to estimate the "culturally correct" answer to the survey (Table 12). All risk behaviors surveyed were considered at least moderately important. Beyond that, the behaviors separated into three

tiers. The four actions seen as extremely important were watching the news during the hurricanes seasons, making a plan, and keeping supplies in the house.

Table 12 – Cultural Consensus Answer Key - Hurricane		
Risk behavior evaluation	Interval Rating (6-1)	Collapsed Answer Equivalent
Buy extra supplies (food, water) to have in the house	5.77	Extremely important
Buy materials in case power goes out (e.g. radio, batteries, flashlight generator)	5.68	Extremely important
Watch news	5.58	Extremely important
Make a plan of how/where to evacuate	5.53	Extremely important
Plan to evacuate at least 24 hours before the storm	5.33	Very important
Plan to shelter at home	4.99	Very important
Collect materials (family records, contacts) during season	4.95	Very important
Don't let thoughts overwhelm you/ Don't focus on threat	4.48	Moderately important
Do what other family members do	4.11	Moderately important
Source of Support Evaluation	Interval	Collapsed
Family	5.53	Extremely likely
TV News	5.51	Extremely likely
Friends	4.77	Likely
Local government leaders	4.75	Likely
Police	4.72	Likely
Internet	4.54	Likely
Government services (e.g. WIC, health department)	4.51	Likely
People at church	4.16	Somewhat likely
Doctor	2.35	Unlikely
Estimated answers were collapsed from interval key 1(1.00 to 1.5), 2 (1.51 to 2.5); 3 (2.51 to 3.5); 4 (3.51 to 4.5); 5 (4.51 to 5.5); 6 (5.51 to 6.0)		

Loadings on the first and second factor were compared across different population groups. Table 13 shows the agreement to the model by selected demographic groups. The highest agreement or competence was with women living in the rural region (0.79), and making more than $30,000 in income (0.81). Those with the lowest competency were those without a high school education (0.48), and those few who were living in a shelter at study baseline (0.46).

Table 13 – Average Competency Score across population group – Hurricane		
Category (n)	Average Competency score (SD)	Kruskal-Wallis p-value
Age		
Under 22 (22)	.73 (.28)	.482
22-23 (28)	.68 (.24)	
24-27 (32)	.73 (.23)	
28 and over (30)	.63 (.28)	
Region Density –(Households per square mile)		
Urban (2213 and above) (12)	.60 (.29)	.057
Suburban (103-2212) (80)	.68 (.27)	
Rural (102 and under) (20)	.79 (.18)	
Region		
Metro (81)	.66 (.25)	.008
Rural (31)	.76 (.27)	
Education		
Dropout (19)	.48 (.33)	.001
High school graduate (67)	.73 (.22)	
College (26)	.74 (.24)	
Race		
Black (non-Latina) (65)	.72 (.23)	.249
White (non-Latina) (27)	.65 (.32)	
Other (Latina, Asian, Native American) (20)	.64 (.26)	
Income		
Under $10k (58)	.67 (.24)	.056
$10k -20k (18)	.71 (.29)	
$20-$30k (12)	.69 (.26)	
Over $30k (16)	.81 (.18)	
Experience with hurricanes		
No experience (10)	.72 (.30)	.789
Some experience (22)	.69 (.27)	
A moderate amount of experience (32)	.69 (.28)	
A great deal of experience (39)	.66 (.26)	
Responsibility in family for hurricane decision		
Completely someone else' (27)	.74 (.24)	.238
Mostly someone else' (15)	.63 (.24)	
Equally the participant's and someone else' (35)	.67 (.25)	
Mostly the participant's (13)	.57 (.36)	
Completely the participant's (13)	.73 (.28)	

How often hurricanes are talked about with other mothers Never (8) Rarely (34) Occasionally (53) A great deal (8)	 .55 (.36) .68 (.28) .67 (.26) .85 (.07)	 .195

To analyze cultural knowledge further, 1st and 2nd factor loadings were used as separate dependent variables in a multiple regression. Multiple regression analyses were used to test for the significant predictors for the dependent variable of cultural knowledge (1st factor loading). Significant correlates were regressed to create a model of an adjusted R-squared of 0.150 that produced two significant predictors: whether the mother had a high school degree (Standardized Beta 0.372, p=0.000), and whether she lived in a rural neighborhood versus a metro neighborhood (Standardized Beta 0.167, p=.080). Using similar steps, variables were regressed against the 2nd factor loading to create a moderately predictive model (adjusted R-squared of 0.275) that produced four significant predictors: whether the mother had at least moderate hurricane experience (Standardized Beta -0.369, p=0.084), whether she graduated high school (Standardized Beta .-.160, p=.069), her race (Standardized Beta 0.220, p=0.012), and the type of house she lived in (Standardized Beta .208, p=.018).

A residual agreement analysis was conducted on significant predictors. Mean deviations were calculated for each significant predictors. Correlations between the average deviations were calculated for the whole survey, as well as, each individual section. Many of the variables produced significant negative correlations (Table 14), indicating that the same behaviors that were valued as more important/likely were valued as less important/likely by the other group. One of the strongest negative correlations was between women who did and did not have high levels of hurricane experience (r=-.787) were plotted showed

distinctions between the groups regarding the value of relying on the police, versus the importance of collecting information, and evacuating (Figure 10). Deviations were also plotted for women with and without a high school degree (Figure 11).

Table 14. Correlation between groups – Residual Agreement - Hurricane			
	Full survey	Part 1: Hurricane risk behaviors	Part 2: Hurricane sources of support
Education	-.562*	-.228	-.576
Experience	-.7872*	-.965*	-.326
Talk	-.797*	-.894*	-.421
(*significant correlation at p<0.05 – Spearman Correlation)			

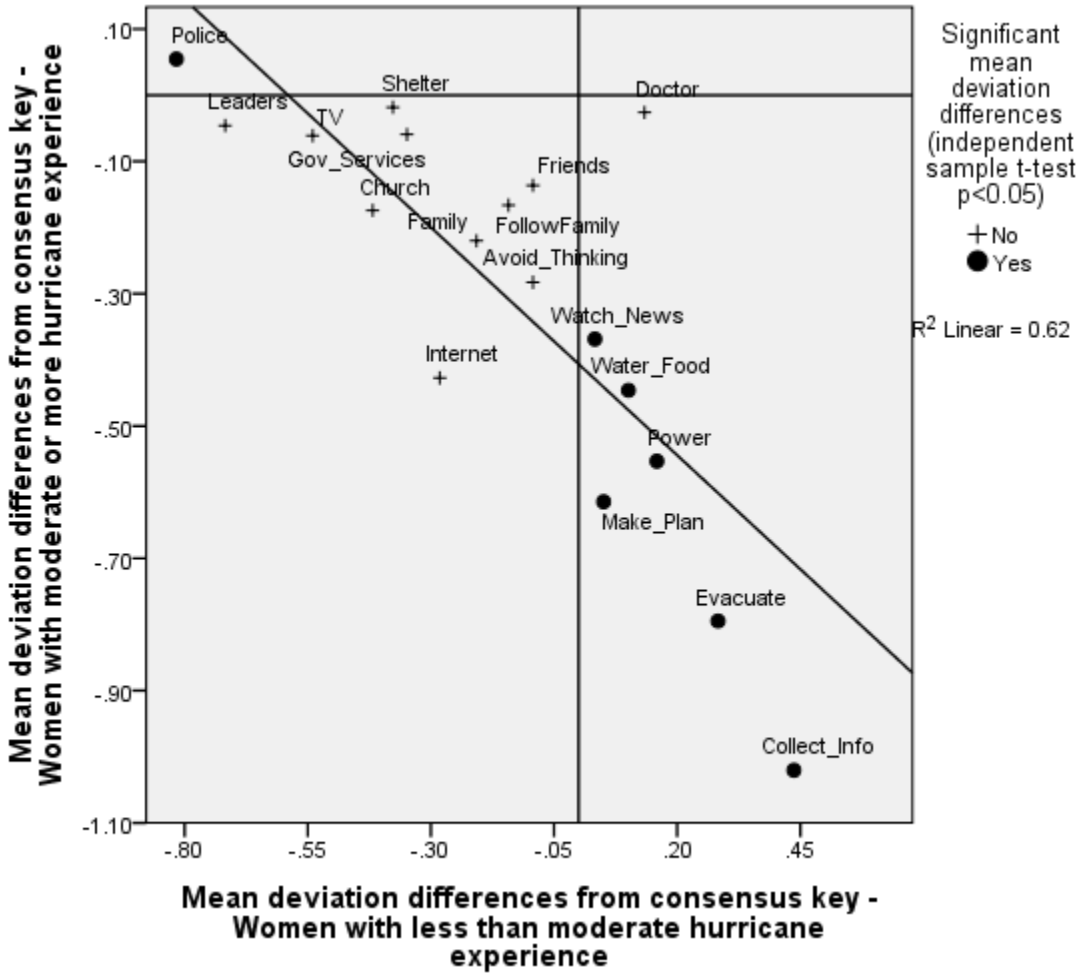


Figure 10. Relationship of mean deviations from the consensus answer key for respondents in with high and low hurricane experience - hurricane domain

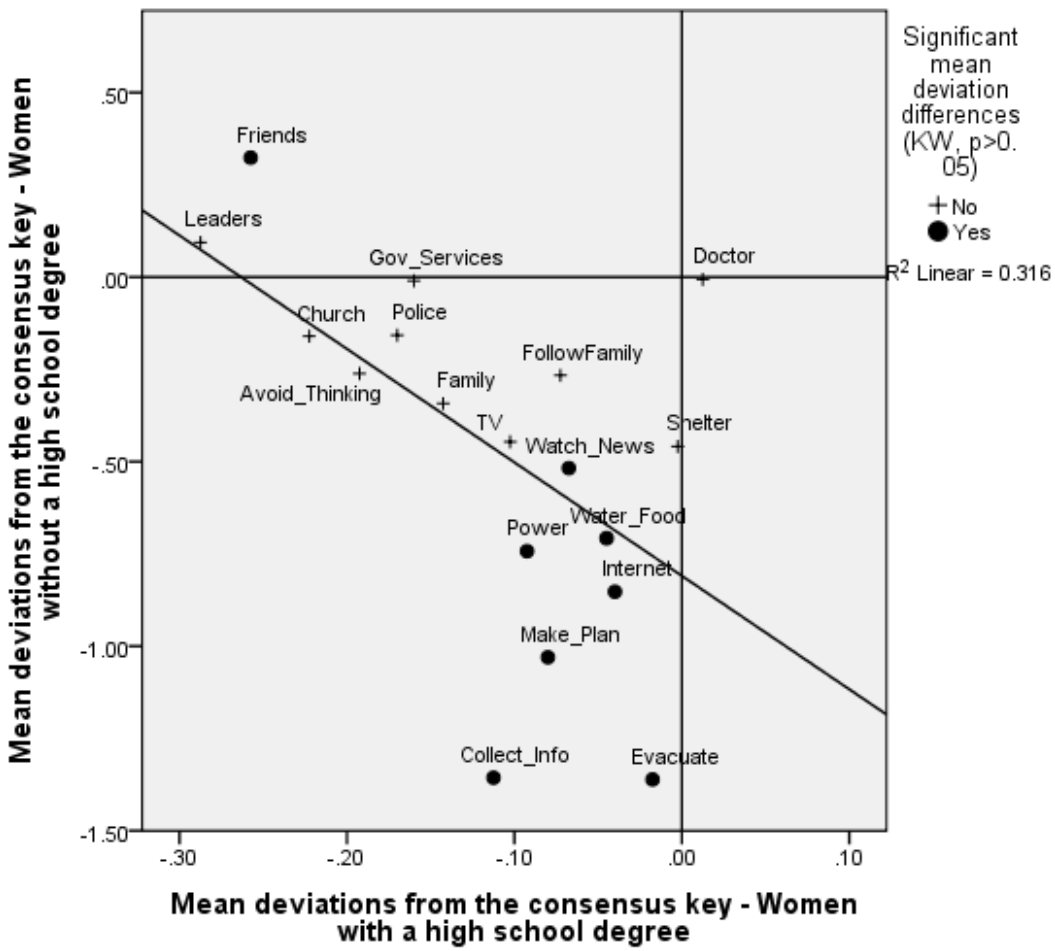


Figure 11. Relationship of mean deviations from the consensus answer key for respondents in with and without high school degree - hurricane domain

Discussion

Hurricane preparedness was a salient topic among mothers in this study. It was frequently talked among mothers in the sample, and not surprisingly, despite the diversity of the sample, participants agreed on a general model of appropriate steps for a mother to take to prepare for a hurricane. However, further analysis uncovered patterned deviations within the population regarding the priority of several actions, best seen between women who did and did not have hurricane experience. The significance of hurricane experience in

association with hurricane culture was surprising. Seen best in the residual agreement plot (Figure 10), women with greater than moderate hurricane experience on average under-rated the importance of most survey items. In particular, the action with the greatest disagreement between women of differing levels of experience was the importance of collecting family documents.

The patterned deviation may indicate the effect of hurricane experience in population's observation of other behaviors. Due to the generally young age of the sample, many of the mothers were likely children adolescents in 2005 for the catastrophic Hurricane Katrina. Hurricanes in subsequent years (which are likely the storms these women with experience are referencing) were much milder, and may have led to a less vigilant model being spread, which seems to favor sheltering-in-place and keeping a generator over evacuating, making a plan, and collecting family information. This relationship between experience and a less-vigilant model runs slightly contrary to some of the disaster literature, as disaster experience was most often considered a predictor of greater preparedness(*177*).

Despite these findings, several limitations should be noted. Due to intervention of the wider intervention study, participants had been receiving two interventions that could have differentiated them from the general population. First, they have been in constant communication with an assigned community health worker. The potential bias of the community health worker intervention was anticipated by treating them as ethnographers in our study. They administered all ethnographic interviews, and it is likely the relationship with the participants may have made the mothers feel more comfortable in giving honest responses.

Secondly, participants had been receiving a text-based messaging service throughout the study, which normally sent maternal child health tips. However, during data collection of this study, the messaging covered specific topics related to hurricane preparedness. For example a text message would prompt them to remember to make a disaster plan, while another would remind them to go to a certain website to learn more. Additionally, half of the women were chosen at random to receive additional disaster information, which included various brochures on detailed disaster tips. Some of the behaviors on the survey were mentioned in either the text-messaging service, or in the disaster brochures, and as a result may affect the external validity of this study. The bias was anticipated by emphasizing the participants answer not based on their personal attitudes but through their impression of other mothers in the community. However, it is still possible that the risk messaging falsely creating a sense of culture for these women, and may raise doubts about the external validity of this paper.

Conclusion

Despite the limitations, the external validity of the findings to the population of low-income, first-time mothers in Southeast Louisiana is likely strong. Since all participants had received relatively equal disaster information from the GROWH study, our findings of inter-cultural disagreement is likely strong. Consistently across race, socioeconomic status, and hurricane experience, participants disagreed about the cultural importance of several preparedness strategies. The degree of disagreement found in the residual analysis is very interesting and likely shows actual cultural distinctions in this population.

More importantly, this research demonstrates that cognitive anthropological methods can be effective in investigating public health disasters. In particular, in this study, the data showed how beliefs are shared – and are not shared – among at-risk mothers in a hurricane

vulnerable region. A main finding is that there is a set of shared beliefs about hurricane preparedness that is in-line with recommendations. Despite women reporting limited discussion of hurricane preparedness, hurricanes are ubiquitous in Southeast Louisiana, and as a result, the generally agreed-upon model of hurricane preparedness lacked any surprises.

Most useful to future disaster public health research is the detailing of shared culture among women. The data suggested cultural tension between women with hurricane experience. Additional research should evaluate the reasons why these behaviors may be losing value for women through experiencing hurricanes. It may be that living through previous hurricanes may change the women's perceptions of how others prepare and make their personal model more idiosyncratic.

Overall, findings are useful in demonstrating the efficacy of this methodology for future disaster public health questions. Specifically for the New Orleans area, more culturally-informed interventions can be made to emphasize the lower-rated behaviors among the specific sub-populations noted. Combining knowledge of which sources are trusted (e.g., TV news) can be used to disseminate tailored risk information (e.g. on the ease and benefits of collecting family documents and storing during hurricane season) that would address some of the findings from this study. Further analysis of a more representative sample of women can also provide greater detail on the differences between cultural models.

I. Results - Manuscript 5: Cultural Knowledge Among Low-Income Mother Regarding Strategies to Cope with Community Violence

Background

Even with national crime rates continuing a decade-long drop(*190*), subpopulations still face an environment where community violence is a common threat to health and safety. In particular, exposure to community violence is still present at an epidemic level for many young children (*191*), with high rates of violence exposure particularly common among families of certain races and families of low socioeconomic status (*192*). Beyond the direct risk of community violence, chronic exposure for children to this type of environment is associated with a range of psychosocial effects (*193, 194*), as well as more chronic physical health effects(*195*).

Community violence can be particularly taxing on mothers of young children, as those exposed may be at greater risk for experiencing psychosocial distress at a later point (*196*). The stress on the mother may further influence the child's health either directly, as indicated by changes to telomere length (*197-199*), or indirectly, through change in the child's adjustment and emotional safety (*200*).

Mothers are often tasked with protecting the health of the family by assuming the care of children, and the management of the home environment (*121, 122*). Low-income mothers can face greater stress as a result of this responsibility, as they often must manage an environment that is often more exposed to community violence with diminished resources and inadequate services (*68*). First-time mothers, in particular, face an even greater burden of both evaluating a stream of novel hazards (e.g., pregnancy-specific health

concerns, delivery, lifestyle changes, infant health concerns), while also re-assessing familiar hazards with a suddenly greater risk, such as the threat of community violence (*68*).

Coping Behavior and Culture

Disparities exist in how different populations are exposed to violence (*201, 202*), how populations respond to the threat (*203*), and related health outcomes (*204, 205*). Race is a major factor in these disparities, as women of color face greater susceptibility to experiencing psychosocial effects in a community violence environment, and authors have used concepts in the appraisal theory to explain differential behavior (*196, 206*). Additionally, the risk of community violence may be more pronounced among lower-income mothers, as limited resources limits the social supports available to help these new mothers cope with these stresses (*207, 208*). Gaps exist in the literature, however, as calls for research have requested more geographical diversity, as most studies focus on violence in inner-cities, rather than suburban or rural areas (*192, 209*). Finally, researchers have called for a greater understanding of the cultural factors that may make certain populations of mothers better able to cope to community violence (*206*).

The appraisal theory offers a model to understand how external threats such as community violence can lead to different behaviors, and possibly lead to poor mental health outcomes (*15*). In response to a threat, the individual will assess “what might and can be done” regarding their response (coping behavior), how useful these options are (outcome expectancy) and their own perceived effectiveness (efficacy expectancy) (*16*). Coping strategies can vary wildly depending on the person and the situation, but are generally organized as either a (a) problem-focused coping, which acts on the stress in an attempt to change the person, the environment, or the relationship between the two” (*17*), or (b) emotion-focused coping, which regulate emotional responses to the problem(*17*). Overall,

the appraisal process has been incorporated into several studies regarding health disparities and has been hypothesized as a vital underlying mechanism behind differential health outcomes (*40*). This theory is frequently used to understand differences in coping strategies among parents (*65, 210, 211*). In particular, concepts of coping have been used a model to explain the psychosocial outcomes of women exposed to community violence (*196, 212*).

Using principles of the appraisal theory, and the public health literature on violence it could be assumed that a diverse range of first-time mothers would demonstrate equally diverse range of cultural coping strategies when faced with the threat of community violence. By better understanding cultural influences of behavior, in particular, what those influences actually are, and who is mostly likely to receive those influences, more effective interventions and policies can be created to anticipating the role of culture. Previous studies deployed cultural consensus analysis to analyze cultural interactions; however, none have ever been applied to the issue of community violence (*52, 108*).

This paper will describe results from a study that uses this methodology to uncover cultural perspectives on the appropriate management of community violence among low-income first-time mothers in Southeastern Louisiana parishes. Community violence is likely a salient topic in the region, as the metro New Orleans area suffers from high rates of community violence, which have been connected with a range of public health concern. (*129-131*). Detailed results will be listed, and beliefs will be analyzed in a discussion of potential targets for culturally-appropriate health interventions.

Methods

Participants

Study participants were recruited from a cohort of women participating in an ongoing intervention study focused on first-time mothers in Southeast Louisiana recovering from the 2010 Gulf oil spill. The women were originally recruited in their first or second trimester of pregnancy of what would be their first child, and at the time of data collection for this study were near the end of their pregnancy. Additionally, women were originally recruited from the Women, Infants, and Children (WIC) program, which required them to meet certain nutritional and income criteria (*99*).

Data collection

Rating survey materials were constructed through a freelisting technique, which had a sample of women (n=20) identify possible ways mothers cope with community violence concerns and the possible sources in the community they turn to. The most salient responses were carried over to a rating survey to be completed in two sections. In the first section, participants were asked to rate the importance of each of the behavior strategies on a 6-point scale. In the second section of the survey, women were asked to indicate how likely mothers in their community would rely on various sources of support for help in managing the threat of community violence. Respondents were given nine sources and asked to rate on a 6-point scale ranging from extremely likely to extremely unlikely.

To supplement these cultural ratings, socio-demographic information previously collected at the baseline of the wider intervention study was included for analysis. Additionally, participants completed a follow-up survey regarding their personal attitudes and experiences related to community violence, such as their experience with violence, who made decisions in their household about protecting the family from violence, and how frequently they talked to other mothers about violence in the community.

Data analysis

112 women in the intervention study were recruited and completed the survey. Responses were coded in such a way to limit bias and acquire necessary statistical inter-informant variability(*53*). Results were analyzed using consensus analysis (*52*) by using ANTROPAC software (*102*). Consensus analysis uses a form of factor analysis on the respondent matrix to determine if there was sufficient agreement in the responses to conclude that a single response pattern is present (*52*). The fit of the model is determined by the ratio of the first and second eigenvalue (fit is appropriate when the ratio ≥3:1) (*52*). If the model fits the data, factors scores can be used to estimate the "culturally correct" answer to each of the survey questions.

Finally, the output of the consensus analysis produces two relevant factor loadings for each respondent, which can be compared against socio-demographic variables to assess cultural variability in the population. The first factor loading (cultural competence) indicates how well the responses of each individual correspond to that of the model. Any agreement that is not represented on the first loading is then collected on the second loading (residual agreement) (*135*). Inter-cultural variability can be further explored through a residual agreement analysis. In this methodology, the deviations between the culturally-correct answer key and each individual's personal response can show how person specifically differs from the model. The deviations across a group can then be averaged to assess patterns of deviations. Additionally, these deviations can be plotted to visualize sub-cultural variability (*135*).

Results

The results of the consensus analysis revealed a strong cultural agreement of the appropriate behaviors, and appropriate sources to turn to cope with community violence. The model fit the data with an eigenvalue ratio of 6.783. While there was 6 woman with a negative 1st factor loading, the average cultural competence was 0.647, which is roughly equivalent to a Spearman correlation of 0.419.

Factor loadings were used to estimate the "culturally correct" answer to the survey (Table 15). All risk behaviors surveyed were considered at least moderately important. Two actions were evaluated as being extremely important in managing the threat of violence. For sources of support, only police was seen as an extremely likely source.

Table 15 – Cultural Consensus Answer Key - Violence

Risk behavior evaluation	Interval Rating (6-1)	Collapsed Equivalent Answer
Be extra cautious with family	5.59	Extremely important
Ask authorities to help	5.55	Extremely important
Work with others to help in the community	5.14	Very important
Move to safer community	5.07	Very important
Watch the news every night	4.98	Very important
Rely on the church/prayer	4.78	Very important
Keep a gun in the house to protect family	4.13	Moderately important
Stay inside as much as possible	4.08	Moderately important
Source of Support Evaluation	**Interval Rating (6-1)**	**Collapsed**
Police	5.69	Extremely likely
TV News	5.4	Likely
Local government leaders	5.19	Likely
Family	5.12	Likely
Friends	4.86	Likely
People at church	4.47	Somewhat likely
Internet	4.04	Somewhat likely
Government services	3.96	Somewhat likely
Doctor	2.1	Unlikely

Estimated answers were collapsed from interval key 1(1.00 to 1.5), 2 (1.51 to 2.5); 3 (2.51 to 3.5); 4 (3.51 to 4.5); 5 (4.51 to 5.5); 6 (5.51 to 6.0)

Table 16 shows the agreement to the model by selected demographic groups. Even when comparing subgroups, agreement was still consistently high. The highest agreement with model was seen with young women (21 and under), those with an income greater than $20k, and those who had complete decision-making responsibility in their household. Meanwhile, those who were not working at baseline, and those who never talked with other mothers about community violence had the lowest agreement with the model.

Table 16 – Average Competency Score across population group – Violence		
Category (n)	Average competence (SD)	Kruskal-Wallis p-value
Age		
21 and under (22)	.70 (.12)	.482
22-23 (28)	.64 (.33)	
24-27 (32)	.61 (.27)	
28 and over (30)	.65 (.36)	
Region		
Rural (20)	.65 (.29)	.401
Lower Third Suburb (12)	.54 (.42)	
Middle Third Suburb (40)	.68 (.27)	
Upper Third Suburb (28)	.70 (.20)	
Urban (12)	.52 (.37)	
Race		
Black (non-Latina) (65)	.65 (.29)	.173
White (non-Latina) (27)	.59 (.34)	
Other (20)	.73 (.22)	
Education		
Dropout (19)	.54 (.39)	.173
High school graduate (67)	.66 (.24)	
College (26)	.68 (.33)	
Working at baseline		
No (71)	.60 (.32)	.005
Yes (40)	.73 (.23)	
Housing situation		
Own (16)	.67 (.30)	.824
Rent (61)	.64 (.33)	
Shelter (8)	.75 (.12)	
Live with older friend/family (6)	.74 (.19)	
Other (20)	.67 (.18)	

Income Under $10k (58) $10k -20k (18) $20-$30k (12) Over $30k (16)	 .62 (.28) .68 (.31) .77 (.16) .70 (.26)	.054
Experience with violence No experience (20) Some experience (29) A moderate amount of experience (30) A great deal of experience (24)	 .67 (.17) .69 (.31) .57 (.33) .63 (.33)	.265
Responsibility in family for decision Completely someone else' (18) Mostly someone else' (17) Equally the participant's and someone else' (36) Mostly the participant's (18) Completely the participant's (14)	 .65 (.15) .50 (.44) .65 (.29) .67 (.33) .70 (.20)	.459
Talk to other mothers about violence Never (14) Rarely (21) Occasionally (30) A great deal (38)	 .60 (.32) .63 (.26) .65 (.35) .64 (.29)	.738

To analyze cultural knowledge further, 1st and 2nd factor loadings were used as separate dependent variables in a multiple regression. Significant correlates to the 1st loading were regressed to create a significant, but poorly predictive model (adjusted R-squared of 0.061), which produced only one significant predictors of whether the mother was working at baseline of the study (Standardized Beta 0.205, p=0.045). Similar steps were run with the residual agreement, which produced a model with an adjusted R-squared of 0.124 and produced significant predictors of whether she lived in an owned home vs. rented (Standardized Beta -.275, p=.020), and whether she had little to no experience with violence (Standardized Beta -.268, p=0.024). Both models were run while controlling for the effects of race, region, and age.

Residual agreement analysis was then examined for all variables found to be significant predictors. There was a significant negative correlation between deviations among mothers who owned a home versus mothers who rented (0.581, p=.011), which was

even stronger when just considering the risk behavior section (Table 17). When plotted, the negative correlation can be seen, with marked disagreement concerning the importance of staying inside as much as possible, watching the news every night, and relying on the police (Figure 12).

Table 17. Correlation between groups – Residual Agreement – Violence			
	Full survey	Part 1: Risk Behaviors	Part 2: Sources of Support
Home (own v. rent)	-.525*	-.808*	-.091
Talk	.196	-.571*	.300
Experience	.100	-.699*	.254
(*significant correlations p<0.05)			

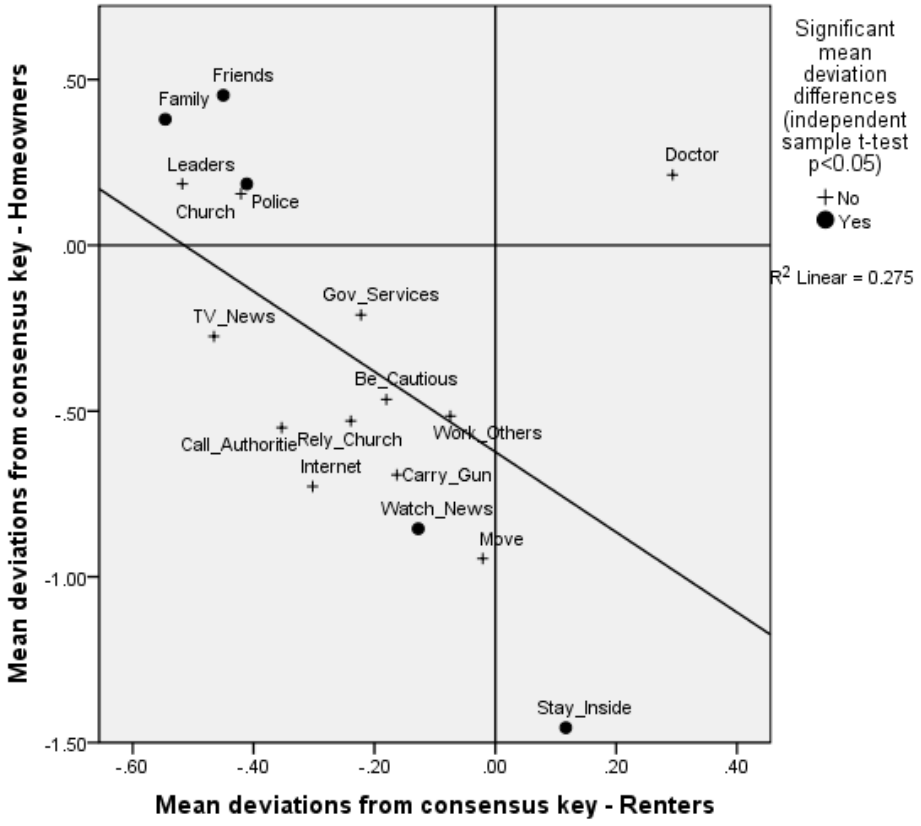


Figure 12. Relationship of mean deviations from the consensus answer key for respondents between housing statuses – violence domain

Discussion

The model for community violence coping was widely-held across the study population of low-income, first-time mothers, indicating the topic's relevance in lives of these women. This was also seen in the high numbers of the women who noted their experience and how frequently they talked to other mothers about it. Overall the model offered a mix of problem-focused strategies (e.g. reaching out to authorities, organizing with community members), and emotional-focused coping (e.g., rely on church and prayer). The support model overwhelming valued relying on the police as a source. Interestingly, government leaders were a much more valued source than government services.

Further analyses uncovered seams in the cultural model regarding the importance of more drastic actions, like staying indoors. Women who lived in an owned home and those who lived in rented units tended to differ in their cultural perceptions regarding these behaviors. Measuring correlation and plotting residual differences revealed a significant negative correlation in how these groups of mothers rated items. Many of the same items rated as more important than the cultural consensus by the homeowners were rated as less important by those who did not own homes. The small number of women who owned homes (n=16) in the study population limited any additional ability to investigate the difference. However, these results suggest that these women tended to deviate from the general model of community violence in a patterned way. While it may be possible that another variable is confounding this relationship, it may be that women living in a home that is owned have a different understanding of their place in the neighborhood.

Despite the relative differences between subgroups, overall, it was surprising how almost all items on the survey were rated relatively important on the scale. Specific items (e.g., "keep a gun in the house", "staying inside") were added to the survey with the expectation that they would be considered unimportant, and help to improve inter-item

variance. Instead, while these behaviors were still rated relatively unimportant, there was very little distance in ratings between the behaviors. The overall high ratings of most choices in the model could be a product of general fear concerning violence, as these women share an “all of the above” approach to coping with community violence.

Specific violence coping strategies can have long-term psychosocial health and physical- effects (*213*). In particular, gun ownership in the home of a small child is concerning, as it has been shown to be associated with an increase in violence within the household(*214*). Additional research should investigate this relationship, and evaluate interventions to communicate more effective coping strategies.

Despite these findings, several limitations should be noted. Some misclassification in the demographic response may be possible. Demographic data were collected at baseline enrollment for the participants. At the time of their inclusion in this study, several months sometimes passed, and it is possible that some of the women in the study moved to a new zip code, and changed houses. While it is less likely they moved between housing categories (e.g., they became homeowners, or moved out of their house and into a rental unit), it is still a possibility and could weaken conclusions about region in this study.

Finally, several limitations exist in the study construction. The number of questions fell short of the recommended minimum (*53*), and as a result, the reliability may be weakened. Also, even though efforts were made to balance the survey with positive and negative items, there were overwhelmingly high ratings of behaviors and sources for the survey. To prevent the low inter-informant variability from creating bias in the results, several questions were coded in a way to provide the recommended variability. Additional research into this topic should use more sophisticated efforts to ensure that the full range of

the community violence coping behavior is surveyed by evaluating equal positive and negative behaviors and sources.

Conclusion

Results found that a complex model of community violence coping was highly shared across a sample of low-income, first-time mothers in Southeast Louisiana. Consistently, these women valued a mix of strategies to protect their families and rely on personal and governmental sources. Further analyses, however, revealed patterned differences based on the housing status of the mother. Residual agreement analysis showed a strong, negative correlation between the type of actions and sources valued among women living in rental units, and women living in owned units.

This study showed how beliefs are shared among at-risk mothers in a high-crime region. It is likely that the salience of the threat of violence in the region lead to the high sharing of an agreed-upon model of violence coping strategy. While certain troubling behaviors were endorsed in the model (e.g., keeping a gun), generally the set of shared beliefs about dealing with the threat of community violence falls mostly in-line with recommendations. Further analysis could detail the values driving the endorsement of gun ownership among this population, and possibly explore the factors driving this cultural belief.

J. Main Results Summary

With this section, the main findings of the dissertation research are summarized. Results from the previous sections and unpublished results are presented according to the hypotheses and aims framework

Hypothesis 1 - There will be a single set of shared perceptions about hazards, risk behaviors, and sources of support among first-time mothers.

Aim 1.1 - Perform a free-list ethnographic method (n=20) on first-time mothers to elicit information concerning perceptions related to the environment.

For the first domain of environmental threats (Table 18), 68 items were generated, with 7 being given by at least 30% of the study women. To choose what items to include in subsequent aims, an approach seen in Dressler (*50*) was used, where less salient items (e.g. radiation, floods, etc.) were combined with the top responses to be included for additional research. This would help balance the items and help to better capture the variability in the domain.

Table 18 – Free-listing results for Domain 1

Item	Frequency (%)	Average Rank	Salience
Violence in the Community	55	2.91	0.442
Hurricanes	55	3.18	0.453
Outdoor air pollution	45	5.22	0.277
Drugs in the community	40	5.88	0.211
Cigarette smoke	35	6.29	0.228
Indoor air pollution	35	4.43	0.23
Bad drivers in the community	30	6.67	0.173
Terms added for additional analysis			
Floods	25	6.6	0.143
Water pollution	15	3.67	0.098
Radiation	15	5.67	0.082
Mosquitos	15	6.33	0.078

The second free list (Table 19) regarding risk behaviors was less focused than the other domains, as participants were divided by the hazard they were listing behaviors. 85 different behaviors were listed, with only 9 being on at least 20% of the lists. Analyzing the results with CHWs, it became clear that some of the hazards associated with physical hazard that had high relative saliency (Bad drivers, cigarette smoke and personal drug use) also had a very clear appropriate response. For example, for the 7 women cited cigarette smoke as a threat, the possible actions to address that threat appears to be direct, as "avoid smokers" was a offered by 5 of those women.

Table 19- Free listing results for Domain 2

Item	Frequency (%)	Average Rank	Salience
(Violence) Ask authorities to fix	30	3.5	0.189
(Hurricane) Buy extra supplies (food, water) to have in the house	30	2.83	0.265
(Violence) Work with others to help in community	30	4	0.204
(Violence) Be extra cautious with family	25	7	0.146
(Hurricane) Buy materials in case power goes out (radio, batteries, flashlight, generator)	25	4.2	0.196
(Hurricane) Have a plan of how to evacuate	20	4.25	0.158
Terms excluded			
(Cigarette smoke) Avoid	25	4.2	0.189
(Personal drug use) Avoid	25	11	0.103
(Bad drivers) Avoid the road	20	7	0.118

On the other hand, air and water threats that were highly salient in the first domain (i.e., indoor and outdoor air pollution) lacked any salient connected responses. Instead, each woman that participated in the free list had a different idea for an appropriate response concerning that hazard. For example, each of the 9 women who gave "outdoor air pollution" as a threat in the environment offered a unique idea of how mothers typically manage the threat. This either shows that participants didn't know the best way to manage outdoor air

pollution, or there is subtle sub-cultural variation among different types of mothers that was not detected by this study's small sample size.

Due to the variability in risk behaviors in the second domain, it appeared that some hazards elicited a more robust set of connected risk behaviors than others. Since the purpose of investigating this domain was to identify the relative importance of risk behaviors, it seemed best to focus on the threats that offered the most potential behaviors for the mothers. Therefore, for the second potential domain, only the risk behaviors for hurricanes, community violence, and air pollution (indoor and outdoor) were chosen.

Similar to the first domain, items were chosen to balance salience. Additionally, five items were included in subsequent steps that were not elicited in the freelisting stage. The first two were related to hurricanes ("Plan to shelter in place" "Don't let thoughts about hurricanes overwhelm you"), and the other three were related to air pollution ("paint over mold" "keep windows open" and "keep windows closed"). No women mentioned these activities, but using an approach from Copeland (*107*), discussions with CHWs revealed these behaviors to be a likely option for many of the mothers. Because some of these activities are not recommended by authorities, it seemed possible that the women didn't feel comfortable bringing them up to the CHWs. Therefore, to assess their importance, they were included for additional analysis.

The final free list related to sources of support (Table 20). This list was more focused and smaller (only 32 total items) than the other domains. Almost 1/3 of the list (9) was mentioned by at least 20% of the sample. As mentioned earlier, several specific terms in the original free list were collapsed in order to generate certain categories. For example, lists mentioning specific family members were just categorized as "family", and lists mentioning "parish president", "city council", or "mayor" were just categorized as "local government

leaders". This decision likely eliminated some detail in future analysis that would have offered insight these categories. However, there was a concern about the size of the survey, and the CHWs expressed an interest in simplifying the survey to avoid any potential dropouts in the study.

Table 20 – Free listing results for domain 3			
Item	**Frequency (%)**	**Average Rank**	**Salience**
Family	70	2.93	0.441
Police	40	3.13	0.245
TV News	40	2.25	0.299
Internet	30	3	0.207
People at church	25	2.8	0.163
Friends	25	4	0.144
Doctor	20	7	0.075
Government services	20	2.25	0.162
Local government leaders	20	2.5	0.145

Differences in freelisting results were identified by key demographic groups. In addition to the differences between regions described in the first manuscript, findings were stratified by race and age. Non-white mothers were much more likely to list "working with others" in addressing community violence, while white mothers were more likely to list the risk behaviors of avoiding cigarette smoke. Finally, non-white mothers were more likely to regard people at church to be a salient source of support (Table 21).

Table 21 – Cultural Salience Scores by Race				
	White Mothers (n=10)		Non-White Mothers (n=10)	
Item	Smith's Salience	Salience Rank	Smith's Salience	Salience Rank
Domain 1: Threats				
Hurricanes	0.644	1	0.262	3
Violence in community	0.279	4	0.605	1
Outdoor air pollution	0.252	6	0.302	2
Indoor air pollution	0.31	2	0.15	6
Cigarette smoke	0.307	3	0.148	7
Drug activity in community	0.215	7	0.207	4
Bad/reckless drivers in community	0.267	5	0.078	25
Lack of activities for children	0.2	8	0.089	17
Floods	0.157	11	0.129	8

Problems with other mothers in the community	0.139	14	0.111	10
Domain 2: Risk Behaviors				
Buy supplies (water, food) for sheltering - Hurricane	0.36	1	0.17	4
Work with others to help community - Violence	0.067	21	0.341	1
Buy supplies (generator, batteries) in case power goes out - Hurricane	0.239	3	0.152	9
Avoid – Cigarette smoke	0.278	2	0.1	13
Ask authorities to fix - Violence	0.185	5	0.193	3
Plan evacuation route - Hurricane	0.177	6	0.14	11
Be extra cautious with family - Violence	0.126	11	0.165	5
Move to safer community - Violence	0.1	12	0.154	8
Evacuate when told - Hurricane	0.162	9	0.077	17
Stay off roads – Bad drivers	0.186	4	0.05	24
Domain 3- Supports				
Family	0.475	1	0.406	1
TV News	0.365	2	0.233	5
Police	0.194	4	0.297	2
Internet	0.133	6	0.28	3
People at Church	0.05	16	0.277	4
Government Services (WIC)	0.224	3	0.1	9
Local Government Leaders	0.083	12	0.207	6
Friends	0.105	7	0.184	7
Newspaper	0.064	15	0.12	8
Community NGO Organizations	0.1	10	0.08	11

Older moms (24 years old and older) saw air pollution as a major threat, while younger moms (under 24 years old) were more likely to reference cigarette smoke and reckless drivers. Younger moms frequently cited “moving to a better community” as a response to violence, and evacuating a hurricane, while older moms never mentioned those behaviors. Finally, like with the other groups, women split by age had different responses to church. Young mothers saw people at church as a salient source (Table 22).

Table 22 – Cultural Salience Scores by Age				
	Young Mothers (<24 yrs.) (n=12)		Older Mothers ≥24 (n=8)	
Item	Smith’s Salience	Salience Rank	Smith’s Salience	Salience Rank
Domain 1: Threats				
Hurricanes	0.46	2	0.444	2

Violence in community	0.524	1	0.318	3
Outdoor air pollution	0.124	12	0.508	1
Indoor air pollution	0.207	6	0.264	4
Cigarette smoke	0.296	3	0.125	13
Drug activity in community	0.227	4	0.187	6
Bad/reckless drivers in community	0.227	5	0.091	19
Lack of activities for children	0.146	11	0.143	9
Floods	0.149	10	0.135	10
Problems with other mothers in the community	0.087	18	0.182	7
Domain 2: Risk Behaviors				
Buy supplies (water, food) for sheltering - Hurricane	0.288	1	0.232	1
Work with others to help community - Violence	0.242	2	0.146	6
Buy supplies (generator, batteries) in case power goes out - Hurricane	0.207	6	0.179	4
Avoid – Cigarette smoke	0.231	3	0.125	8
Ask authorities to fix - Violence	0.194	8	0.18	3
Plan evacuation route - Hurricane	0.208	5	0.083	15
Be extra cautious with family - Violence	0.097	13	0.219	2
Move to safer community - Violence	0.212	4	Not listed	
Evacuate when told - Hurricane	0.199	7	Not listed	
Stay off roads – Bad drivers	0.085	16	0.167	5
Domain 3- Supports				
Family	0.458	1	0.383	2
TV News	0.068	13	0.521	1
Police	0.162	6	0.371	3
Internet	0.289	2	0.177	5
People at Church	0.217	5	0.021	17
Government Services (WIC)	0.242	3	0.167	6
Local Government Leaders	0.117	8	0.188	4
Friends	0.224	4	0.025	16
Newspaper	0.153	7	Not listed	
Community NGO Organizations	0.067	14	0.125	7

Aim 1.2. Operate a pile sort ethnographic method on a group of first-time mothers (n=31) to further define the domains related to threats in the environment.

Pile sort responses were collected and analyzed to create a multidimensional scale (MDS) analysis. The MDS output of risk perception shown in the first manuscript displays participant-generated threats in the environment from the first phase of the research. Terms that appeared close together indicate that participants saw these terms as similar and

belonging together during pile stress. Pile sorting results showed that across a diverse sample, the 11 threats were organized into three separate topics: a physical hazard cluster, a meteorological cluster, and an air and water cluster. A hierarchical cluster analysis confirmed these three groups, and the boundaries are superimposed over the pile sort results on Figure 1. These clusters were used to better categorize threats in Aim 1.3, and in the risk perception manuscript to demonstrate the differences in opinions across cluster.

Aim 1.3 – Administer a ratings survey on first-time mothers (n=112) and use consensus analysis to calculate the degree to which there is a shared set of perceptions.

This dissertation sought to understand the cultural influences through the appraisal process: (a) risk perception, (b) risk behavior perception, and (c) perception of sources of information and support. It was hypothesized that these topics were a salient concern for new mothers in Southeast Louisiana. As a result, it was also hypothesized that relevant cultural domains could be found in relation to these topics.

Analyzing the three survey sections (Table 23) separately showed a sufficiently high eigenvalue ratio (> 3:1) for each survey. Risk behavior had the strongest indicators, with a 5.179 ratio, and a 0.653 average competency. Risk perception had similarly high indicators of a 4.232 ratio and 0.537 competency. Sources of support, on the other hand, just passed the ratio criteria (3.017), and had an average competency below 0.50 (0.459). Similarly, all models produced negative first factor loadings on participants, indicating potential poor fit with that population.

Table 23. Consensus Analysis Results – Main Surveys

Domain	Eigenvalue ratio	Average first factor score (standard deviation)	Negative first factor loadings

Hazard risk perception	4.232	0.537 (0.236)	5
Hazard risk behavior	5.179	0.653 (0.312)	6
Hazard sources of support	3.017	0.459 (0.249)	9

These three models were further analyzed in Hypothesis 2, but it became increasingly clear that the chosen domains may have been an ill-fit for what was actually being surveyed in this dissertation. A reanalysis of the second and third survey (behavior and sources of support) together was conducted according to the threat being analyzed: hurricanes, community violence, and air quality (Table 24).

Table 24. Consensus Analysis Results – Behavior and Support - Subdomains

Domain	Eigenvalue ratio	Average first factor score (standard deviation)	Negative first factor loadings
Hurricane behaviors and sources of support	6.262	0.691 (0.259)	3
Community violence behaviors and sources of support	6.783	0.647 (0.291)	6
Air quality behaviors and sources of support	3.125	0.423 (0.296)	10

This combination produced much higher indicators of consensus for some hazards (hurricane and community violence) and lower indicators for air quality.

Hypothesis 2 - Socio-demographic attributes of first-time mothers will be associated with cultural knowledge.

Aim 2.1 - Segment the consensus data according to demographic variables and analyze consensus data to determine if any sub-cultures exist.

Socio-demographic data were collected from the GROWH study. Based on the literature, the main variables considered were, (1) region, (2) age, (3) race/ethnicity, (4) education, (5) income, (6) housing type, (7) marital status, and (8) work status. Marital status, work status, income, and housing type were treated as categorical data, as it was

collected. Age was treated as a scale variable, and as a categorical variable by creating quartiles of the population. Education was collected categorically, and it was considered in two collapsed versions. A 3-category version (College, High School Degree but no college, and No High School Degree) was a created, and a dichotomized variable of whether the participant had a high school degree or not was also used.

Race was originally collected categorically, along with an ethnicity question that had participants identify as Hispanic/Latina. Based on the literature, minority status was frequently seen as a predictor, therefore, the race/ethnicity information was collapsed into a categorical variable into 3 categories: (1) White, Non-Latina, (2) Black, Non-Latina, and (3) Other (which includes Latina/Hispanics, Native Americans, and Asians).

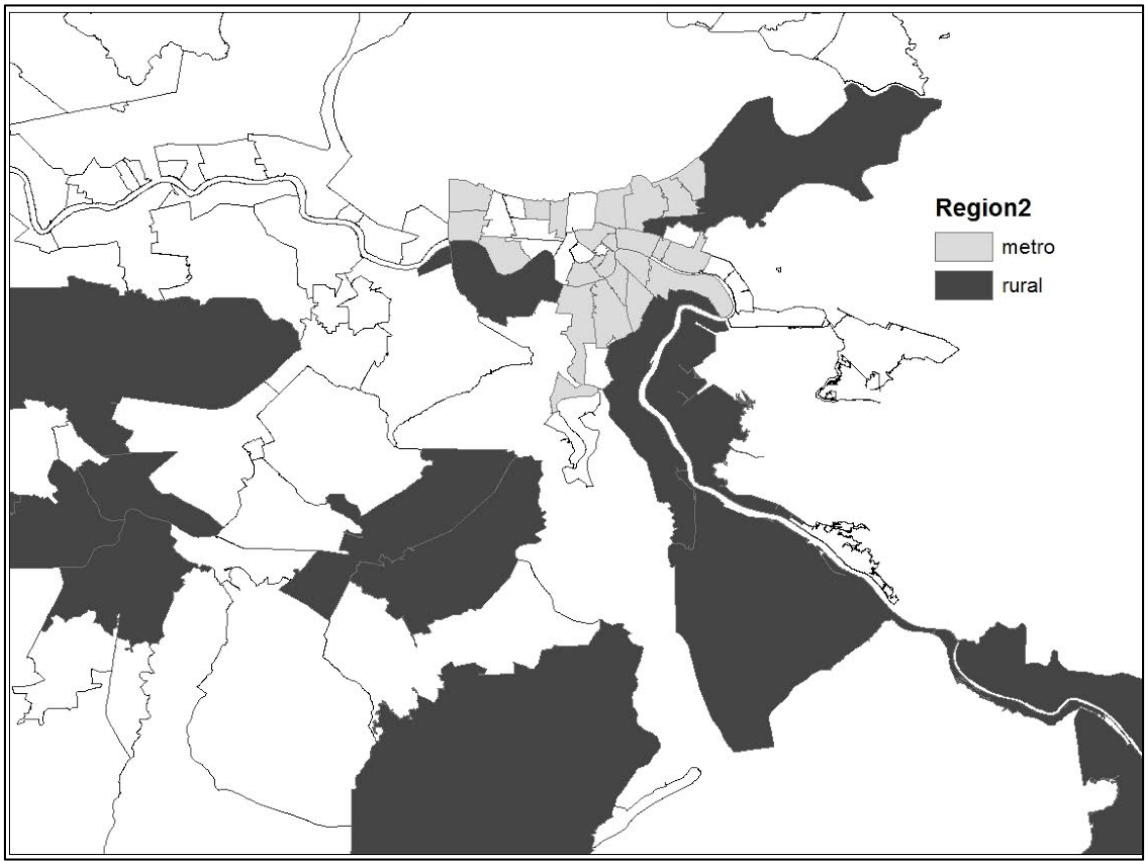


Figure 13. Rural-Metro Partition - Southeast Louisiana

Residence was collected through zip codes, and I classified region in two ways. I created a dichotomous Rural/Metro category that classified women living in the extremely sparse regions of Orleans parish, and those living in Terrebonne, Lafourche, and Plaquemines Parish as rural (Figure 13).

However, because there was a concern about areas on the edges of Orleans, Jefferson, and St. Bernard that were more similar with rural regions than New Orleans, zip codes were also based on household density. A study by Jed Kolko with Trulia.com and FiveThirtyEight.com (*215*) found that participant-perceived neighborhood status was best predicted by household density. This classification system in his research found residents that live in cities rarely identify their neighborhood as metro. This was useful for a city like New Orleans, which has many neighborhoods that have more suburban characteristics. Density was calculated by households per square mile (land area only, not water area) according to the 2010 decennial Census. Zip code classification was assigned as follows (Figure 14):

- Urban: Households per square mile >=2213.2
- Suburban: Households per square mile >=101.6 and <2213.2
- Rural: Households per square mile <101.6

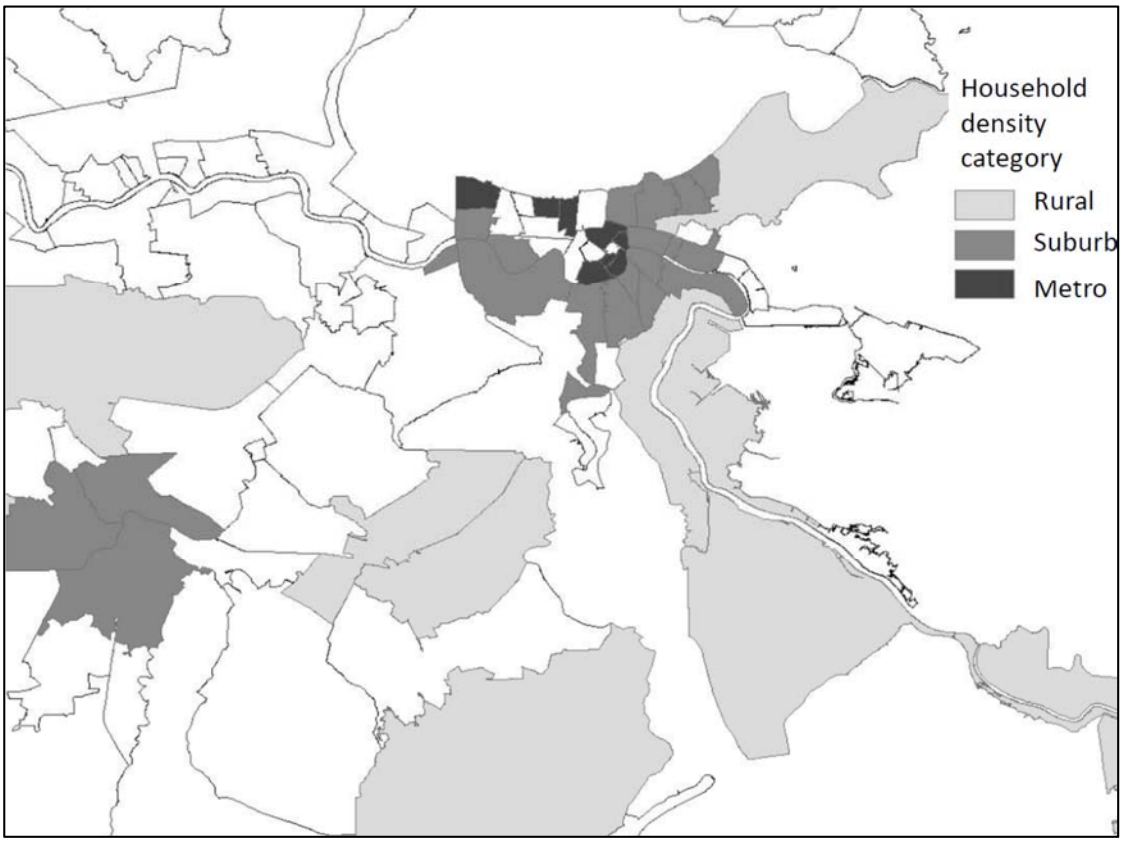


Figure 14. Household density category partition – Southeast Louisiana

A follow-up group of participants (n=102) answered several questions concerning their personal attitudes and experiences related to the 11 threats. These questions focused on their experience with each threat, who's decision it is in the family to manage those threats, and how frequently they talk about those threats with other mothers. Each of these variables were treated categorically, and also collapsed into a dichotomous set.

In the analysis of each model, any variable found to be a significant predictor was tested through segmented analysis. In every instance, one of the groups (e.g., High school graduates) would produce a much higher consensus indicator, while the other group (e.g., High school dropout) would produce a much lower consensus indicator, suggesting that one group was more knowledgeable of the culture (and generally more organized) than the

other. In most of these situation residual agreement analysis was used in place of segmented analysis. As Dressler (*135*) noted, segmenting analysis possibly ignores the amount of cultural information that is already shared by a population. Since each of the models explored were at least moderately cohesive, I didn't want to discount the great deal of sharing that was already taking place in the population.

Aim 2.2 - Examine differences in residual agreement and cultural competencies between demographic groups.

Segmented socio-demographic and personal behavior data were analyzed for each domain according to the same approach (Table 25). The average 1st and 2nd factor loading score for each relevant variable was collected and measured using ANOVA or Kruskal-Wallis test for differences. Correlation was then measured between the variables and the loadings, and noted any variables found to be significant. These variables were combined those variables that were selected *a priori* to be a possible predictor of culture (race, age, and region) based on the review of the literature. All of these variables were then entered into a multiple linear regression to determine what variables were significant predictors of the loadings on the 1st or 2nd factor.

Table 25. Aim 2.2. Analysis Approach

Step	Statistical Test
Measure the strength of association between variables and loadings	• **Pearson's** correlation for normal • **Spearman's** correlation for nonparametric
Regress correlates (with force-added *a priori* variables (race, region, age)) against factor loadings	• **Multiple Linear Regression**
Compare patterns of deviation in cultural model (Residual Agreement Analysis)	• Subtract factor rating from individual rating • Group and average deviations

	• Plot averaged deviations by group
Defined groups through individual factor loading plots	• Subjective interpretation • **Hierarchical cluster analysis**
Assess the effects of correlates on segmented clustered group	• **Logistic regression**

Domain 1: Risk Perception

The risk perception cultural domain produced a sufficient indicator of cultural consensus, and as a result, factor scores were exported to create answer key. Analyzing differences in the risk perception domain, detailed in manuscript 2, showed that demographic differences differed by question type. For example, between age groups, differences could be seen in what hazards produce dread, and their perception of the choice of each hazard. Additional analysis showed across multiple risk perception categories there was a notable difference in rating according by hazard type (physical, meteorological, and air/water - as categorized through aim 1.2.).

Domain 2: Risk Behavior

For the behavior cultural model (Table 26), women making over $30k, and those living in low density suburbs had the highest agreement with the model. Women without a high school diploma had the lowest agreement. There was a very large, significant difference in competency scores across education (p=0.017)

Table 26. Average Competency Score across population group –Risk Behavior

Category (n)	Average competence (SD)	Kruskal-Wallis p-value
Age Under 22 (22) 22-23 (28)	 .69 (.30) .71(.24)	 .719

Figure 15. Relationship of mean deviations from the consensus answer key (choice) for respondents by age- risk perception domain

24-27 (32) 28 and over (30)	.62 (.32) .61 (.38)	
Region Rural (20) Lower Third Suburb (12) Middle Third Suburb (40) Upper Third Suburb (28) Urban (12)	 .69 (.39) .73 (.23) .66 (.25) .56 (.41) .66 (.41)	 .138
Race Black (non-Latina) (65) White (non-Latina) (27) Other (20)	 .70 (.31) .60 (.33) .59 (.31)	 .102
Education Dropout (19) High school graduate (67) College (26)	 .47 (.33) .68 (.29) .72 (.31)	 .017
Working at baseline No (71) Yes (40)	 .63 (.31) .69 (.32)	 .064
Housing situation Own (16) Rent (61) Shelter (8) Live with older friend/family (6) Other (20)	 .54 (.28) .66 (.31) .35 (.46) .73 (.34) .79 (.20)	 .014
Income Under $10k (58) $10k -20k (18) $20-$30k (12) Over $30k (16)	 .64 (.30) .70 (.37) .57 (.38) .73 (.26)	 .248

On the first factor loading, household density, region, race, education, home category, hurricane experience, talking a great deal about hurricanes, and talking a great deal about indoor air were all significant correlates. Running a regression produced a model with a very small predictive power (adjusted R-squared, 0.064), yet significant predictors with hurricane experience (Standardized Beta= -.198) and frequency of talking about indoor air (Standardize Beta=.113)

On the second factor loading, age was significant correlate, as well as race, education, experience with hurricanes, indoor air, outdoor air, or violence. These variables

were regressed, and it produced a moderately predictive model (adjusted R-squared 0.259) with significant predictors with race, and hurricane experience.

Using the factor loadings, an answer key was created for the risk behavior cultural model (Table 27). Three distinct tiers of answers can be seen with hurricane behaviors taking up most of the extremely important behaviors. Similar to the models presented in the manuscript, the overall risk behavior model contains a mix of positive actions and actions that are not recommended.

Table 27. Cultural Consensus Answer Key –Risk Behavior

Question	Rating	Collapsed Answer
Hur_Extra Food Water	5.81	Extremely Important
Hur_Power Supplies	5.74	Extremely Important
Hur_Watch TV	5.63	Extremely Important
Hur_Make Plan	5.59	Extremely Important
Vio_Be Cautious	5.53	Extremely Important
IA_Clean	5.51	Extremely Important
Hur_Evacuate	5.47	Very Important
IA_Avoid Smell	5.47	Very Important
Vio_Call Authorities	5.42	Very Important
OA_Call Authorities	5.37	Very Important
IA_Call Professional	5.27	Very Important
OA_Pollute Less	5.26	Very Important
Vio_Move to Safer Community	5.26	Very Important
Vio_Work with others	5.26	Very Important
Vio_Watch News	5.17	Very Important
Hur_Shelter-in-Place	5.06	Very Important
Hur_Collect Documents	5.04	Very Important
Vio_Go to Church	4.83	Very Important
IA_Use Fresheners	4.82	Very Important
OA_Move to Cleaner Community	4.8	Very Important
IA_Close Windows	4.78	Very Important
OA_Open Windows	4.65	Very Important
Hur_Don't_think about it	4.5	Moderately Important
Vio_Stay Inside	4.35	Moderately Important
Hur_Follow Family	4.11	Moderately Important
Vio_Keep a Gun	4.11	Moderately Important

OA_Stay Indoors	4.05	Moderately Important
IA_Paint over Spots	3.94	Moderately Important

Domain 3: Sources of Support

For sources of support (Table 28), women under 22, and those living in an urban community had the least in common with the model. Mothers with a college degree and making higher income ($20k-$30k) had the highest agreement.

Table 28 – Average Competency Score across population group –Support		
Category (n)	Average competence (SD)	Kruskal-Wallis p-value
Age		
Under 22 (22)	.44 (.18)	.264
22-23 (28)	.38 (.31)	
24-27 (32)	.51 (.23)	
28 and over (30)	.49 (.24)	
Region		
Rural (20)	.42 (.25)	.237
Lower Third Suburb (12)	.45 (.32)	
Middle Third Suburb (40)	.47 (.25)	
Upper Third Suburb (28)	.53 (.21)	
Urban (12)	.35 (.27)	
Race		
Black (non-Latina) (65)	.43 (.26)	.143
White (non-Latina) (27)	.46 (.26)	
Other (20)	.56 (.18)	
Education		
Dropout (19)	.45 (.27)	.015
High school graduate (67)	.42 (.24)	
College (26)	.55 (.25)	
Working at baseline		
No (71)	.42 (.27)	.047
Yes (40)	.53 (.20)	
Housing situation		
Own (16)	.51 (.22)	.277
Rent (61)	.48 (.21)	
Shelter (8)	.53 (.22)	
Live with older friend/family (6)	.28 (.29)	
Other (20)	.42 (.31)	
Income		
Under $10k (58)	.41 (.24)	.001
$10k -20k (18)	.50 (.26)	
$20-$30k (12)	.67 (.11)	

Over $30k (16)	.50 (.25)	

The first factor of source of support was measured for correlation. Housing status, the level of responsibility the mother had in making indoor air decisions, and whether she talked indoor air with other mothers were a great deal all were significant correlated. All of these variables were included in a multivariate analysis, along with age and region, and a significant model was created, (adjusted R-squared, 0.113). Three significant predictors were found in this model: housing status (standardize beta=.218), indoor air responsibility (standardized beta=.194), and talking about indoor air a great deal (standardized beta=.195).

For the second factor loading, region, outdoor air experience, and frequency of talking about outdoor air were all significant correlates. These variables were included in a regression model, along with age, and produced a model with moderate predictive power (adjusted R-squared 0.200) with only outdoor air experience as a significant predictor (standardized beta=.372).

Using the factor scores, an answer key was created for the sources of support cultural model (Table 29). Four tiers of behaviors are seen, with the police (for violence) and TV news (for hurricanes) being the most valued sources to turn to.

Table 29. Cultural Consensus Answer Key –Support

Question	Rating	Collapsed Answer
Vio_Police	5.76	Extremely Likely
Hur_TV	5.63	Extremely Likely
Hur_Family	5.47	Likely
Vio_TV News	5.35	Likely
Vio_Leaders	5.23	Likely
Hur_Leaders	4.99	Likely
Vio_Family	4.97	Likely

Vio_Friends	4.81	Likely
Hur_Police	4.78	Likely
Hur_Friends	4.76	Likely
OA_TV News	4.53	Likely
OA Gov_Leaders	4.48	Somewhat Likely
Hur_Gov Services	4.39	Somewhat Likely
Vio_Church	4.35	Somewhat Likely
Hur_Internet	4.25	Somewhat Likely
Gov_Internet	3.95	Somewhat Likely
Hur_Church	3.9	Somewhat Likely
Vio_Gov Service	3.88	Somewhat Likely
Vio_Internet	3.84	Somewhat Likely
OA_Gov Services	3.79	Somewhat Likely
IA_Family	3.63	Somewhat Likely
OA_Police	3.4	Somewhat Unlikely
IA_TV News	3.35	Somewhat Unlikely
IA_Doctor	3.34	Somewhat Unlikely
IA_Internet	3.27	Somewhat Unlikely
IA_Gov Services	3.26	Somewhat Unlikely
OA_Doctor	3.23	Somewhat Unlikely
IA_Leaders	3.06	Somewhat Unlikely
IA_Friends	2.83	Somewhat Unlikely
OA_Family	2.76	Somewhat Unlikely
OA_Friends	2.47	Unlikely
IA_Police	2.37	Unlikely
OA_Church	2.12	Unlikely
Hur_Doctor	2.05	Unlikely
IA_Church	2.03	Unlikely
Vio_Doctor	1.94	Unlikely
Estimated answers were collapsed from interval key 1(1.00 to 1.5), 2 (1.51 to 2.5); 3 (2.51 to 3.5); 4 (3.51 to 4.5); 5 (4.51 to 5.5); 6 (5.51 to 6.0)		

As discussed in the manuscripts, the evaluation of hurricane and community violence as separate domains produced similar results compared to each other, as highly-shared cultural model was generated through the rating responses. For both domains, the residual agreement analysis showed one or two variables to demonstrate negative correlation between each on the deviation of the answer key.

On the other hand, the domain of air management required several extra steps. Due to the low average competency and high negative factor loadings, the variables were analyzed to further determine how the culture was shared. As discussed in the manuscript, the sample of women were partitioned (Figure 15) according to their 2nd factor loading score, and the resulting segment analysis produced much higher indicators for the two main groups (Ratio=4.436 for group 1; Ratio=5.418 for group 2).

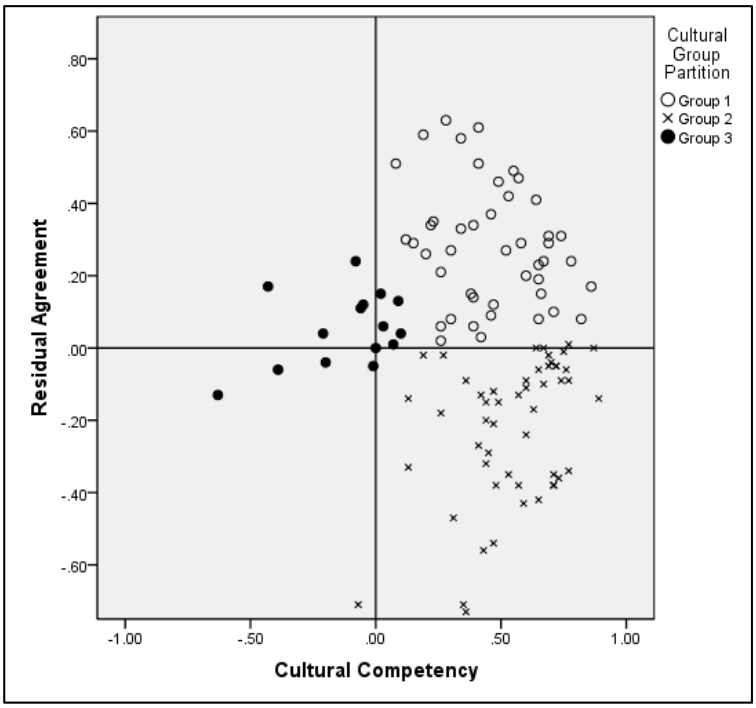


Figure 15. Partitioned Air Quality Sample

Hypothesis 3- Parish-level indicators of community resiliency will be associated with levels of cultural knowledge related to hurricanes

Aim 3.1 – Categorize parishes in the study area according to level of community resiliency.

To explore for any possible relationship with community resilience, the ratings developed by Ross (*79*) to quantify community resilience, and it's subcomponents possibly relevant to culture - community capacity – were used. This required standardizing the data to the study region, as the original rankings were calculated in comparison to the entire Gulf region. Methods were followed recommended by Ross (*79*), to create rankings of community resiliency across the 6-parish region, as well as subcomponent rankings of social resilience and community capital. Due to the small sample size of parishes, I decided

to collapse the data and assess community resilience and community capital based on whether the parish was above average, or below average.

Aim 3.2 - Segment rating responses based on hurricanes and examine difference in culture knowledge between parishes with different resilience scores

Similar to the methods laid out in Aim 2.2, I analyzed the mean competency score for women living in. Table 30 shows that there was near significant (0.057) differences in cultural competency between women living in parishes of high community capital and low community capital; however, when I included community capital as a possible predictor into the same regression model discussed in Aim 2.2., it was not found to be a significant predictor.

Table 30. Average Competency Score Across Resiliency Category - Hurricane		
Indicator	Average competency (SD)	P-value
Community Resiliency of Parish Low (14) High (97)	 .75 (.19) .68 (.27)	 .726
Community Capital of Parish Low (95) High (16)	 .68 (.25) .75 (.31)	 .057

Aim 3.3 – Qualitatively assess differences in cultural hurricane perceptions in high and low resilient parishes

Even though community resilience and community capital didn't seem to be significant predictors in how culture was being distributed in the study sample, there answer keys were still compared. Community capital was exclusively used to its significance in comparing the competency scores. The two answer keys (Table 31) are mostly similar with each other.

Most notably, women in the parishes of lower community capital placed slightly less value on making a plan, and evacuating. However, as discussed earlier, the variable of community capital is highly correlated with other more predictive variables. However, it does support incorporation of this concept in future, larger studies in hurricane culture.

Table 31. Description of overall hurricane cultural model by community capital

Risk behavior evaluation	High Capital Interval Rating (6-1)	High Capital Collapsed Answer Equivalent	Low Capital Interval Rating (6-1)	Low Capital Collapsed Answer
Extra Water	5.92	Extremely important	5.75	Extremely important
Make a plan	5.86	Extremely important	5.47	Very Important
Keep power supplies	5.82	Extremely important	5.66	Extremely important
Evacuate	5.7	Extremely important	5.27	Very important
Watch the news	5.68	Extremely important	5.57	Extremely important
Collect	5.31	Very important	4.91	Very important
Shelter in place	5.01	Very important	5.00	Very important
Avoid thinking	4.95	Very important	4.4	Moderately important
Follow Family	4.18	Moderately important	4.10	Moderately important

Different collapsed answer responses are highlighted in yellow
Estimated answers were collapsed from interval key 1(1.00 to 1.5), 2 (1.51 to 2.5); 3 (2.51 to 3.5); 4 (3.51 to 4.5); 5 (4.51 to 5.5); 6 (5.51 to 6.0)

K. Discussion

The aim of this dissertation was to evaluate how low-income, first-time mothers thought about the household management of environmental health threats. The research focused on revealing the content, and patterns of sharing across several cultural domains. This section will provide an overview of the research findings by hypothesis, limitations of

those findings, and a discussion of the implications to policy and to the field of environmental health sciences.

Hypothesis 1: There will be a single set of shared perceptions about hazards, risk behaviors, and sources of support among first-time mothers.

Key to understanding the cultural model for these mothers required first identifying the ideas shared within this population. Freelisting results offered a surprising twist regarding the course of this dissertation. Giving the sample of women the prompt to name "threats in the environment" offered a mix of items not typically considered environmental in the field of Environmental Health Sciences. Issues with money, other mothers, crime, and drugs were some of the more salient responses. On the other hand, items that were expected to be relevant, such as lead, mold, and food safety, were rarely mentioned, if at all.

Additionally, the prompt to name "ways a mother prepares and responds" showed marked differences in the number of responses for each hazard. While the sample offered almost a dozen possible behaviors to manage hurricanes, highly salient threats like air quality, only elicited a couple of responses. As discussed, many of the physical hazards listed (e.g. cigarette smoke) had an almost perfect connection to a single behavior (e.g. avoiding smokers). On the other hand, while outdoor air pollution was mentioned by many as a threat, none of the mothers agreed on a single action they could take to deal with that threat. This dynamic would reappear in the rating survey, as air quality had much lower indicators of consensus that community violence, as there appeared to be less understanding of how to handle air quality in the household.

Examining the themes revealed in the first pile sort (threats in the environment) showed participants shared a way of thinking about threats in the environment by their source. This organization became useful for the rest of the dissertation, as the perceptions among this study sample tended to show markedly different attitudes according to the pile. Rural mothers seemed to have a patterned deviations in understanding of the pile associated with air and water pollution, while younger moms had a patterned deviation in understanding regarding the pile associated with physical hazards (e.g., violence in the community, bad drivers, and drugs in the community). This may be related to exposure. In studying the risk perception model, personal experience to hazards was predictive of knowledge. For these types of hazards, it may be that rural mothers have greater interaction with air and water quality issues. Meanwhile, the youngest mother (<22 years) may have had a disproportionate experience with hazards in the physical environment, when compared to older mothers (>28 years).

The second pile showed that mothers in the sample organized possible risk behaviors by the type of hazard they were responding to. Additionally, the second pile sort showed that across hazards, there were a handful of behaviors that mothers tended to cluster which dealt with more emotional coping behaviors - not focusing on the threat, being cautious, relying on prayer. Curiously, the idea of keeping a gun in the house was frequently clustered with these behaviors, rather than with other behaviors aimed at coping with community violence. This perhaps begins to explain the inclusion of this specific behavior as a moderately important behavior in the model. Research in this field is limited, but studies have showed that predictors of gun ownership may be associated with an emotional need to feel safe, rather than a feeling that the gun solves the issue (*213*). However, other research shows that gun ownership is associated with subsequent exposure to community

violence (*216*). Further research should be used to untangle these cultural understandings of gun ownership.

The last section of this hypothesis used the previous findings to evaluate cultural sharing using consensus analysis. Initial findings of the three survey sections (risk perception, risk behavior, sources of support) produced sufficient eigenvalue ratios. However, further analysis of the latter two uncovered some issues. First, both surveys had a high number of negative first factor loadings, and the source of support had a low average competency score (0.459). Subsequent analysis of the risk behavior and source of support domains found that deviations were strongest in relation to air quality. This, in combination with the findings of the pile sort, led to the conclusion that the organization of questions into a risk behavior/ source of support domain may not be a good fit to what is actually being shared. Instead, using the three clusters created in the first pile sort, three new topics were tested. The first was focused on the physical hazard threat (community violence), the second was related to the meteorological hazard threat (hurricanes), and third, the indoor air and outdoor air questions were combined to create a single air quality threat. Analyzing these three new domains produced much higher indicators of consensus for the hurricane and community violence domains, and a low consensus indicator for air quality.

This organization is likely to have better captured what was actually going on in the population. There was far less variation in beliefs about hurricane and violence behaviors than with air quality, as it likely reflected that the model of hurricane behavior or violence behavior was a much more salient topic than air quality behavior. This seemed to be supported by the pile sort results in Aim 1.2., as behaviors were mostly organized by the type of hazard they dealt with. Also, discussions with CHWs gave the impression that participants referred to survey sections as “hurricane questions”, or “violence questions”.

Overall, I settled on four justifications to organize my analysis of risk behaviors and sources of support by hazards:

1) Organizing by hazards produced higher consensus indicators
2) Organizing by hazards better captured the dynamic within the study population of violence and hurricane being a more salient cultural topic than air quality behavior
3) Organizing by hazards produced different socio-demographic predictors, than when analyzed together(discussed in Aim 2.2)
4) Organizing by hazards allowed for a much easier way of communicating results, and discussing potential public health threats to the public.

Ultimately, this issue revealed the precarious dilemma inherent in domain selection. In typical anthropological research, extensive field work before more structured interviews even begin helps the researcher get a sense of salient domains in the topic. As a result, it is the community that is driving the domain selection, and not the researcher. For this dissertation, however, the construct of the appraisal process was hypothesized to be salient without prior fieldwork, and as a result, was wrongly projected onto this population. As consensus analysis is increasingly used outside of anthropological research, It is tempting to see it as a way confirm researcher-chosen hypotheses of cultural concepts; however, it seems crucial to let the community drive the initial research topic selection. In short – consensus analysis doesn't allow for the bypass of community involvement, it actually makes it more important than ever.

Data produced by the factor loadings of each domain allowed for the examination of each threat to the population. For risk perception, drugs in the community, hurricanes and violence were consistently seen as the threats that cause the most risk, dread, and stress. On the other hand, indoor air pollution and outdoor air pollution were consistently seen as

the threat producing the least risk, dread or stress. Visualizing the ratings by pile sort cluster helped to show that generally the physical environmental hazards (drugs in the community, bad drivers, and violence) were perceived as a greater threat than more traditional environmental threats.

For the air quality domain, factor scores weren't extracted for the overall model due to the low average competency score and high negative loading. Instead, by partitioning two main groups, two distinct models were found that varied on select behaviors and sources. Overall, the two models shared a priority of personal responsibility, as keeping the house extra clean and avoiding adding pollution were the top responses. The two models also shared a value in relying on TV news to help manage outdoor air threats. The two models diverged regarding the value of using air fresheners, and the choice of relying on friends and family, versus government leaders and services.

The hurricane model heavily endorsed most of the behaviors and sources surveyed, indicating an "all of the above" attitude about values of hurricane preparedness. Four actions were considered extremely important: buying extra food and water supplies, buying extra power supplies, watching TV news every night, and making a disaster plan. Even the lowest rated behaviors were still seen as moderately important (don't focus on the threat, and following other family's advice and actions). It is interesting that these two behaviors are the only behavior choices that reflect more of an emotional coping to the hurricane threat, and that they are seen as much less important among the mothers. The role of emotional coping in this model is important, as studies have shown a reliance on unhealthy emotion-coping strategies is associated with higher post-disaster psychosocial health issues (*217*). Additional research that expands on this topic would better evaluate other

emotional-focused coping strategies and their relationship to more problem-focused behaviors.

The hurricane model of support had a similar strong endorsement of most of the choices. Other family and TV news were seen as the most valued sources during hurricane season, rated much higher than any other choice. The next tier reflected the similar "all of the above" seen in the risk behavior, as friends, government leaders, government services, police, and people at church were all rated similarly as a likely source of support during the season.

Overall, the high indicators of consensus for this model, and the overwhelmingly high endorsement of most behaviors and sources of support all reflect the saliency of this topic for these women. It was still surprised that the model lacked any variation in value. It is possible that the women are by habit endorsing all actions (checking extreme answers in the survey). If this model is reflective of how these women actually perceive, however, it is necessary to question the value of prioritizing so many resource-dependent actions (buying extra food, water, generators, radios) for a population with an average income of less than $10,000. It may indicate the need for an alternative communication strategy for lower-income households about how to prepare on a budget.

This active hurricane model may have additional implications for the health of these women. Income constraints may make it difficult for many of the women in the study to approximate these resource-heavy behaviors into their own household's hurricane plans. Dressler's concept of cultural consonance (*104*) has shown that gaps in the approximation of behavior and cultural models can be linked to a range of health issues, as women encounter cultural pressure to conform to the expected model of behavior. Future analysis

of data already collected from this cohort will be analyzed to investigate this possible relationship.

The community violence coping model produced a similarly shared and strongly endorsed set of actions. The risk behaviors contained a mix of emotional- and problem-focused coping. Similar to the hurricane model, even the lowest rated behaviors were still rated as “Moderately important”, indicating a similar “all of the above” approach to managing the threat of community violence. Even more curious, the actions that were seen as moderately important to manage violence (keep a gun, stay inside) were specifically added to the survey with the expectation that they would be considered unimportant. The model of gun ownership would seem to lead to increase in the individual’s decision to purchase a gun, as research shows that cultural socialization of a gun culture, as well as fear of crime (both of which appear to be present in this study population) increase the odds of household gun ownership (*213*). As discussed, specific violence coping strategies can have long-term health effects(*213*). More troubling, gun ownership in the home may be associated with an increase in violence within the household (*214*). Additional research should investigate this relationship, and evaluate interventions to communicate more effective coping strategies.

Hypothesis 2: Socio-demographic attributes of first-time mothers will be associated with cultural knowledge.

The next step of the dissertation study attempted to find if any attributes of the mothers could predict their knowledge of the cultural model. Additional investigation using residual agreement analysis then analyzed the specific areas that different sub-groups of women disagreed in their values. For risk perception, several factors independently contributed to the cultural knowledge of the mothers. Women with greater experience dealing with the hazards tended to have greater knowledge of the shared model.

Additionally, women living the metro region, and older moms all tended to have greater knowledge. The role of age and residence both were evaluated more thoroughly through residual agreement analysis. Differences in the model between younger and older women in study were most extreme in their evaluation of the choice in exposure, and the dread produced by the threat. Plotting the residual agreement showed that the deviations were almost exclusively seen in physical hazards such as violence, drugs, and bad drivers, as the younger moms had an understanding that other mothers had a greater level of control, than what older mothers thought. Also, plotting the deviations in dread, showed disagreement between cigarette smoke and hurricanes. Younger mothers tended to feel cigarette smoke was more of a dreaded threat than older moms. Meanwhile, older moms tended to feel hurricanes were more of a dreaded threat than what younger moms thought. For regional differences, the deviations were most clearly seen in the air and water threats of outdoor air, and water pollution.

For the air quality model, women who lived in rental units (versus owning their home), and women who felt indoor air management was their responsibility in the family, both were more likely to be knowledgeable of the main cultural model. However due to the low consensus indicators, the sample was partitioned based on the 2nd factor loading score. The two models differed most markedly in the flipped endorsements of family/friends in one model, and government sources in the other model. A regression model indicated that experience with outdoor air pollution was a powerful predictor group membership. Women with experience had an almost 5 times greater likelihood of being in the cultural subgroup that valued relying on family and friends. Independently, women who talked about outdoor air strategies with other mothers had an almost 5 times greater likelihood of being in that

subgroup. The size of difference between the two groups in the value of family/friends vs. services/leaders was striking.

Due to the study design, causality can't be evaluated, so it may be that women who had experienced outdoor air pollution were unsatisfied with services and leaders, and now see the value of family and friends. It is also possible that an unseen confounding factor is influencing whether these women prioritize family and friends as sources to turn to, while the less experienced women value services and leaders. For example, research has found a "corrosive" public environment developing in the region most exposed to the oil spill (*218*), which may have heavily influenced the perception of authorities. No questions about the oil spill were asked in this study, but it appears possible that experience with this specific disaster may be modifying the relationship in this cultural model.

For the hurricane model, high school education was a powerful predictor of cultural knowledge, as women without a degree had little agreement with each other. Further investigation found race, and experience to be a major driver of how mothers understood the cultural values. Residual agreement analysis showed much of the disagreement centered on stark differences in the value of collecting information and evacuating. These behaviors tend to be communicated frequently in regional risk messaging of hurricane preparedness, so it is curious why the women who cite their experience also differ most on those two actions. It could be that going through several hurricanes revealed to them that most others don't do those two activities. Similar to the issues found with air quality models, it is just as possible that a third hidden factor is at play in this relationship. For example, the region varies in specific hurricane risk, as certain areas are more likely to flood, while other areas have recently been unscathed (*219*). It is possible that the different sub-models may be indicative of the differing levels of vulnerability in the region. Additional research

sampling according to areas of high and low hurricane risk could investigate this possible relationship further.

Finally, for the community violence model almost none of the variables collected could explain the differences in cultural knowledge. Whether the mother was working at baseline was the only significant predictor found (when controlling for race, region, and age), but it only produced a very poor predictive model. Subcultural disagreement found on residual agreement was best predicted independently by the mother's housing status, and her experience with violence. Additional investigation of the residual agreement by housing status showed a stark disagreement concerning the value of staying inside as much as possible, and to a lesser extent, watching TV news every night. The small sample size of homeowners limits the ability to stratify this analysis to look for any potential confounders with race, age, or region. While these variables were controlled in the regression, and still showed homeownership to be a significant predictor of residual agreement, it is possible that the particular deviation concerning staying inside could still be explained by a third factor. If it is true, however, results indicate that women living in an owned home are associated with a subtly different understanding of community violence.

Hypothesis 3: Parish-level indicators of community resiliency will be associated with levels of cultural knowledge related to hurricanes

The last hypothesis of this dissertation sought to evaluate what role – if any exists – of community resiliency in how mothers organized their model of hurricane management. Cultural knowledge was significantly different by community capital rankings, which were hypothesized to be the strongest link to cultural sharing. However, when the variable was included in a wider regression model, that controlled for other factors, such as race, age, and education – most of the association went away. However, when stratifying parishes of

low community capital and high capital separately, significant differences were found in several behaviors. Women living in lower community capital placed less value in the importance of making a plan, and evacuating. Ultimately, this hypothesis was limited by the study design, as the 6-parish study region did not offer enough variability in other factors to control for the effect of race, rage, or education. The preliminary findings seen in the significantly different cultural knowledge average, and differences in answer key, however, give support to further study this relationship in a bigger study.

Trends Across Models

One of the advantages of exploring several similar cultural models is it allowed for a comparison of the factors that influence cultural knowledge. Often in the environmental health literature, it's assumed that culture is synonymous with a single set of factors, such as ethnicity and region (*11*). Readings from Cognitive Anthropology have shown a variety of demographics factors to be influential in cultural knowledge, most often related to race, education, and region (*132*). Therefore, it was surprising to see the level of variability in predictive factors across the topics (Table 32). While many of the same factors were correlated with cultural scores, when controlling for the same set of factors, a diverse set of variables were found for each cultural topic. Not surprising, race and ethnicity was the most frequent socio-demographic predictor, seen most strongly in whether or not the mother a minority (not white or black). This is backed by previous findings showing minority status to often be associated with outlier behaviors in household management (*183, 220, 221*). Housing status was also predictive in each of the behavior models. This is somewhat unsurprising as the model dealt with household management, and that a mother's housing situation may change her perception of the appropriate behavior. Other literature has shown that housing quality and even homeownership impact neighborhood perceptions(*222, 223*).

Table 32. Significant Predictor Variables Across Cultural Domains – Combined						
	Perception	Behavior	Support	Air	Hurricane	Violence
Age						
Region						
Race/Ethnicity						
Marital Status						
Work Status						
Education						
Housing Status						
Income						
Experience						
Responsibility in household						
Communication						
Key= Square shaded gray indicates variable was a significant ($p<0.05$) correlate Square shaded black indicates variable was a significant ($p<0.05$) correlate and significant predictor in linear regression when controlling for other factors						

By far, however, the most consistent predictor of culture for a study participant appears to be her experience with the topic being asked. For every model, the role of experience was seen more on the residual agreement than on cultural competence. Experience then seems to consistently drive an alternative model of understanding, rather than just knowledge of culture. As discussed previously, this relationship has many interpretations. It is possible that experience was associated with another factor that was not surveyed. It is also possible that going through the experience of managing the threat changed the mother's perception of what other mothers do. What differs in each model was how experience was associated with culture. For air quality, experience was associated with a higher value of reaching out to friends and family and lower value of reaching out to government leaders and services. For hurricanes, experience was associated with a lower value of collecting family documents and evacuating. While research in community violence frequently cites past exposure to be a powerful predictor of coping strategies (*224*), a review of the literature could find no other studies in these areas that relate culture and experience.

Limitations

Results from this dissertation should be interpreted with some caution. First the sample size was not large enough to do extensive analysis based on additional variables. Variables discovered to be strong predictors in specific domains (experience, home ownership) had too small a sample size to be further segmented, or have sufficient power to run a segmented consensus analysis (*53*) . While regression models found these variables to be significant while controlling for suspected confounding factors, a larger sample size would have offered a chance to further investigate the relationships within the residual agreement analysis. This may have resulted in a more precise understanding of these variable's relationship to the model.

Secondly, the intervention of the GROWH study produces generalizability issues to the wider population of WIC-eligible first-time mothers in Southeast Louisiana. Participants also had been receiving a text-based messaging service throughout the service that normally applied to maternal child health issues. The biggest issue, however, is with hurricane behavior. Women had been receiving specific disaster-related information during data collection. Additionally, some of the women were given a disaster binder that included related information. While there was no association between those who received the disaster binder and cultural knowledge, there was no way to control for this effect, and these interventions possibly had some effect on differentiating this study population.

Some misclassification in the demographic response may also be possible. Demographic data were collected at baseline enrollment for the participants. At the time of their inclusion in this study, several months had passed, and it is likely that some of the variables may have changed The most likely to be weakened would be region, as the odds of a woman changing address during pregnancy are high, seen in findings in recent Nurses'

Health Studies (*225*). However it seemed less likely that the women would move between rural and metro regions, and more likely to have just moved within the region. Relatedly, housing status should probably be considered carefully. However, while the women had a high likelihood of changing address, it is seems less likely they changed status between living in a rental unit versus living in an owned property, which was the variable used in much of the analysis.

Finally, several limitations exist in the study construction. The number of questions used in hurricane and violence survey fell short of the recommended minimum (*53*), and as a result, the reliability of the findings may have been weakened. Also, even though efforts were made to balance the survey with positive and negative items, we were surprised with the overwhelmingly high ratings of behaviors and sources for the survey. To prevent the low inter-informant variability from creating bias in the results, we recorded several questions to provide the recommended variability. Additionally, research into this topic should use more sophisticated efforts to ensure that the full range of the air quality management is surveyed by evaluating equal positive and negative behaviors and sources.

Implications for policy and practice

Despite limitations, the results of this study provide insights into the perceptions and practices regarding threats in the environment across a diverse study sample of low-income, first-time mothers in Southeast Louisiana. Results suggest several considerations in designing future clinical and public health interventions, as well, as policy changes.

Answer keys for each domain found a mix of behavior that is recommended and not recommend by public health officials. Certain behaviors were chosen in the three main

behavior cultural models that were expected to receive low value. This included some of the following choices:

- Air Quality: Painting over molds spots – Using air fresheners – Avoiding trouble areas
- Hurricanes: Avoiding thinking about it – Just follow what the family does
- Violence: Stay inside as much as possible – Keep a gun

Interestingly, each of these behaviors received moderate support in the model. Most relevant for a potential intervention are several issues with air quality management. Educational interventions in this population that reinforce shared and recommended behaviors (e.g., keeping the house clean, calling a professional when necessary), while de-emphasizing less recommended behaviors, yet shared behaviors (e.g., use air fresheners, paint over mold) would help to address these findings.

To strengthen these outreaches, the sources of support model can help to identify the most trusted channel to communicate these risks. For outdoor air, TV news was strongly shared as a trusted source of information. However, no consensus existed for a trusted source for indoor air concerns. Women with limited concern and experience for air quality threats saw government services to be a valued source. Meanwhile, women with greater experience almost solely valued the help of family and friends.

This cultural divide in air quality sources of support transitions into a research and possible policy issue. In the areas where mothers have the greatest air quality experience, it is worth researching the role, access, and quality of the environmental health workforce. While facilities exist in the study area, their ability to implement household-level help is likely strained by limited budgets. Therefore, a question for public health officials is where this

population **should** be encouraged to turn to. It seems that currently, women with experience are seeing friends and family as their primary source of support. Potentially relatedly, these same women are more likely to endorse a model that emphasizes just avoiding parts of the house that have mold, and using an air freshener to manage their air quality concerns. Ultimately, it appears that changing indoor air quality behavior in this at-risk population must be incorporated into a wider evaluation of what support system should be made available to this women. If policy limits the ability of the government to be a quality source, more effort should be made to build community-level support that can better equip these women into making better decisions.

This is further supported by the findings in Hypothesis 1. During freelisting, almost synonymous with the naming of a physical hazard threat was the naming of the best practice to manage that threat. This was not the case for air quality. This was further supported in Hypothesis 2, as air quality behavior were more moderately rated than hurricane and violence behaviors. Even more starkly, while the hurricane and violence models had a highly valued source to turn to (TV news for hurricanes and police for violence), none of the sources in the air quality model were seen as a highly valued source to turn to. More research needs to be directed in creating more digestible risk communication for managing this hazard.

A second set of issues raised by the results relates to hurricane risk communication. Much of the region's outreach strategy seems to be educating an uniformed population (*226*). This makes sense practically and has support in the literature, as those newest in the community are often the least prepared, likely because they are unaware of the model of hurricane preparedness(*183*). Results seem to suggest these efforts have been successful in permeating this at-risk population in creating a culture of preparedness. Inexperienced

women in the study sample shared a clear model of behavior that matches much of the communication sent by authorities. However, among mothers with experience, marked deviations were found from this model. In particular, women who reported moderate or higher levels of experience vastly undervalued the importance of collecting documents/information and evacuation. More resources should be dedicated to reach this population and battle false complacency.

Additionally, as discussed previously, the value of communicating resource-dependent risk behaviors among an extremely low-income population could potentially lead to either disillusionment with the model, or worse health outcomes through cultural consonance. Currently, the city of New Orleans and larger organizations like Red Cross express a single risk messaging model for households regardless of income (*227*). However, it may make sense to develop a low-resource alternative model that emphasizes small activities to prepare that have minimal resource commitment. Additional analysis comparing these cultural norms with actual personal behavior and psychosocial health measurements (through the concept and methodology of cultural consonance (*119*)) could further analyze how these norms are approximated into the participants' lives.

Future Applications of Methodology in Environmental Health Sciences

This dissertation represents an application of the consensus analysis methodology into an Environmental Health Science issue. As discussed in the background, agencies dealing with environmental health have long called for a greater incorporation of culture. Cognitive Anthropology provides a framework to study environmental health through the verification, comparison, and evaluation of how individuals act in relation to the environment. By examining specific domains regarding environmental behavior, this dissertation was able to elicit common and salient terms that captured the essence of how

mothers prepare and respond to environmental threats. While there was variation in and around each of these environmental domains, mothers shared a common understanding.

Specifically, this type of research fits in well with the purpose of the funding agency of the National Institute of Environmental Health Sciences, which states its main mission as the discovery of how the environment affects people in order to promote healthier lives. This dissertation has aimed to show the main ways that culture influences how individual's act in relation to the environment, and as a result, influence their exposure. As discussed by the ATSDR, culture influences almost every component of the exposure pathway. This is also shown through this dissertation research, specifically with the more environmentally-focused air quality model. The cultural model influences the decision of what to put into the environment (Source), where people contact the media (Exposure point), and how they decide to consume (Exposure route). Finally, socio-demographic influences of culture ultimately decide the types of people that are exposed to the hazard (Receptor population).

The role of culture in Environmental Health Science is also well-established in the FrameWorks production, partnered through APHA and discussed more in the background(*2*). Many of their findings are supported through this dissertation. Overall their research found that there was little cultural understanding of environmental health, and as a result, cultural models defaulted into a series of unproductive models of thinking, many of which are demonstrated in this research: they had a narrow focus on contaminants and on the importance of individual behavior, and overlooked the resources available from the environmental health workforce.

It seems that many of the elements produced by FrameWorks would be well-supported through ethnographic methods demonstrated in the findings of this dissertation. Freelisting and pile sort are powerful tools that can elicit values in a population. Then

through using analysis in the consensus methodology, betters understandings of the gaps in knowledge can be identified, as well as the perception of potential messengers in the community to deliver the intervention. Taken together, cultural ethnographic methods would be a powerful addition to creating more tailored environmental health interventions.

Additionally, while the utility of this type of research is most certainly relevant to Environmental Health Sciences, different directions are available in how exactly this type of research fits into specific study. Most clearly, the utility of consensus analysis is in its small sample size requirement, which would be useful in a baseline ethnographic survey of a population to understand cultural values before an intervention is created. This has been used in other public health studies with breastfeeding practices, but would fit well into an environmental health intervention focused on individual behavior, as researchers could capture potential at-risk sub-groups, or troubling behaviors that could influence their study design. Relatedly, naturally tied to this is the ability to monitor and evaluate any intervention by running post-test and measuring changes in cultural belief (*228*).

L. Conclusion and Recommendations

This research explored how socio-demographic factors and life experiences contributed to the cultural values concerning a range of environmental management topics. The cultural domains of risk perception, hurricane behavior, air quality behavior, and community violence coping were explored using consensus analysis and residual agreement analysis. Data were collected through structured and semi-structured ethnographic research. The specific aims of the research helped to answer the following questions:

- What are the mother's knowledge and beliefs about risks in the environment and beliefs about appropriate ways to manage specific risks?
- Is there a cultural consensus in the community regarding these beliefs?
- What factors best predict knowledge of these beliefs in the community?
- Are there cultural beliefs within the model that serve as a source of disagreement?
- Are emerging parish-level concepts (community resiliency) a strong predictor of cultural beliefs?

Supporting the first hypothesis, there was a shared belief system for understanding risks and for the management of two major threats (hurricanes and violence). Air quality existed as a bimodal belief system that was divided concerning the value of relying on family and friends for support versus relying on government services and leaders. The answer keys produced for each model in many ways were concordant with the set of recommended behaviors disseminated through public health officials. However, intermixed with the sound behaviors were beliefs and practices that exemplified alternative models of managing household threats.

Supporting the second hypothesis, there were several variables that predicted the cultural knowledge of women in these models. Although there were shared models among the entire group of women (n=112), experience with the hazard was often related to patterns of sub-cultural disagreement with the rest of the population. Additionally, when controlling for common predictors (race, region, and age), education and housing status were frequently related to patterns of sub-cultural disagreement.

The third hypothesis – which aimed to evaluate the predictive power of community resiliency with hurricane culture – was not supported by findings. Near significant

differences were found across the population according to the community capital of their parish. However, the variables of community resiliency and community capital were heavily associated with other, more powerful predictors of cultural knowledge. Controlling for these predictors lowered any significance and predictive power of both resiliency and community capital.

Overall, several main findings were discovered in this research. First, predictors of culture (both as cultural competency and residual agreement) changed across similar models of environmental management. Across the domains, a mother's residence, race, ethnicity, income, and education all were shown to be associated with how she understood a culture. However, none of these variables remained significant for each domain. The most consistent predictor of culture was experience in the domain. However, how that experience was associated with culture changed depending on the topic covered. Experience with violence was associated with greater cultural knowledge of the appropriate ways to cope with community violence. Experience with hurricanes was associated with marked deviation in importance of key hurricane preparedness behaviors (collecting family documents, evacuating). Finally experience with air quality issues was associated with a distinct inter-cultural model that prioritized family and friends over community and governmental officials. More research is needed to explore why experience interacts differently to these topics, however these dissertation results provide support for a more nuanced understanding of what determines culture.

Secondly, the research found a range of problematic behaviors across the domains. Both models of air quality management endorsed questionable behaviors like painting over mold spots and using air fresheners. The model of violence coping endorsed the moderate importance of keeping a gun in the household. Evidence of shared endorsement of these

behaviors, combined with the information of the culturally-trusted sources of information, should inform more targeted public health interventions. TV news may be the source of information that is both trusted by the culture, and easily accessible for public health professionals. Targeted news stories that explain the benefits or dangers of certain behaviors could be a potentially helpful outreach strategy. Disseminating information through WIC clinics may be another more culturally-appropriate avenue for communicating risk, as it is already used as a clearinghouse of health information for mothers during pregnancy, and could easily be expanded to include environmental health information.

On the other hand, churches and people at church were consistently among the least trusted sources for this culture. This stands in contrast to the tendency of most governmental risk communication in Southeast Louisiana (especially related to hurricane preparedness) being disseminated through churches. A cultural literacy gap may exist among health and governmental officials, and these results may help to better dispel unfounded assumptions

Finally, results help to show the different understanding of “the environment” for these women. Across samples, the idea of environmental threats included a range issues in surrounding physical environment. The shared understand of risk perception for these women consistently rated these threats as a source of greater dread, risk, and stress, than more traditional threats. This should inform future research that traditional frameworks in environmental health may not match the understanding of the population. Future research should do more to incorporate this evidence of a broader conceptualization of risk by incorporating different kinds of stressors (chemical and non-chemical) into future environmental risk studies.

Overall, this research was guided by recommendations by ATSDR and sought to approach the study of environmental health from a cultural perspective. The results support the conclusion that a diverse group of low-income, first-time mothers in Southeast Louisiana share a similar model of perceiving risk in the environment, and managing hurricane threats, and coping with community violence. Ultimately, findings support previous research in showing cultural models of environmental threats have numerous blind spots. People generally have little idea of what environmental health means, they easily default to unproductive models of avoiding contaminants, and place too much responsibility at the individual level.

Additional research can build on these findings to produce a more generalizable study sample, and further examine in detail the cultural models of air quality. Based on the work of the appraisal theory and research from FrameWorks, studies should further examine how people understand the mechanisms of air quality pollutants and offer a more detailed range of items in the model. This would help to create a clearer picture of how air quality is perceived, and of the actions people think are appropriate to manage air concerns. Utilizing similar methods in this dissertation, comparing consensus outputs across socio-demographic information can better inform the focus on interventions and messaging to help influence behavior. All of this would help to further the science and practice of the emerging field of environmental health literacy.

Mothers face an ongoing challenge of effectively managing a range of environmental health threats. Low-income mothers have an especially difficult task as they must navigate these threats with diminished resources. Effective approaches to evaluate the risk of this population to direct environmental contact, or through indirect health effects require the need to identify and describe the influence of cultural perspectives within this community.

Cultural knowledge and beliefs have a direct influence on the ways communities chose to access services and resources in the community. As a result, culture should always influence how we practice and research public health.

M. Appendix

Appendix A:

Freelisting and Pile Sort prompts

Part 1 - Free-listing

For the following questions, please freely list in words what comes to mind when you read or hear the question. We encourage you to give as many answers as possible for each question, to the extent your knowledge or belief regarding the subject matter make possible. There are no predetermined numbers, lengths, or formats for answers.

1. What are the things in the environment that threaten mothers and children in your community?

   Probe:

   Can you think of anything/anyone else?
2. For each of these things in the environment, what are ways that mothers prepare or respond?

   Probe:

   Can you think of anything/anyone else?
3. For each of the things in the environment, who do people typically turn to for information and support?

Probe:

Can you think of anything/anyone else?

Part 2 - Pile sort

"Please read through the stack of cards and then sort them into piles, so that items in the same pile are more similar to each other than items in other piles"[hand the participant the deck of cards]

Probe:

How did you separate piles?

Appendix B:
Part 3 - Ratings

Part 3 - Ratings

Instructions: Please answer these questions as best you can about threats in your environment, how to respond, and people and things to trust. We want to know what, in general, mothers in this community think and do. There are no "right" or "wrong" answers. Please give your best guess for each question.

3.1 – Hazards

For these first questions, we want to know how mothers in this community think of various threats in the environment. I will read you through a list of hazards, and thinking of other mothers in your community, try to answer as best you can:

1) According to mothers in this community, what risk do the following items pose to families?

	1 – No risk at all	2 – Small risk	3 – Moderate risk	4- Extreme risk
Bad/Reckless drivers in the community				
Cigarette smoke				
Drugs in the community				
Floods				
Hurricanes				
Indoor air pollution				
Mosquitos				
Outdoor air pollution				
Radiation				
Violence in the community				
Water pollution				

2) How much stress do the following items create for mothers in this community?

	1 – Extreme levels of stress	2- Moderate amounts of stress	3- Some stress	4- Small amounts of stress	5- No stress at all
Bad/Reckless drivers in the community					
Cigarette smoke					
Drugs in the community					
Floods					
Hurricanes					
Indoor air pollution					
Mosquitos					
Outdoor air pollution					
Radiation					
Violence in the community					
Water pollution					

3) According to mothers in this community, to what extent is being exposed to the following item their choice?

	1 – No choice	2- Small choice	3- Some choice	4- Moderate amounts of choice	5- Complete choice
Bad/Reckless drivers in the community					
Cigarette smoke					
Drugs in the community					
Floods					
Hurricanes					
Indoor air pollution					
Mosquitos					
Outdoor air pollution					
Radiation					
Violence in the community					
Water pollution					

4) To what extent do mothers in this community feel dread or fear when thinking about the risks associated with these items?

	1 – Extremely calm	2- Calm	3- Somewhat Calm	4- Somewhat feared	5- Feared	6- Extremely feared
Bad/Reckless drivers in the community						
Cigarette smoke						
Drugs in the community						
Floods						
Hurricanes						
Indoor air pollution						
Mosquitos						
Outdoor air pollution						
Radiation						
Violence in the community						
Water pollution						

5) To what extent do mothers in this community know about the causes of and risks associated with the following items?

	1 – Completely known	2- Mostly known	3- Somewhat known	4- Little known	5- Not know at all
Bad/Reckless drivers in the community					
Cigarette smoke					
Drugs in the community					
Floods					
Hurricanes					
Indoor air pollution					
Mosquitos					
Outdoor air pollution					
Radiation					
Violence in the community					
Water pollution					

6) According to mothers in this community, to what extent does protecting the family from the risks associated with following items the responsibility of the family, or does the responsibility fall on someone outside the family (e.g., city, parish, state, or federal government)?

	1- Completely other's responsibility	2- Mostly other's responsibility	3- Equally the family and other's responsibility	4- Mostly the family's responsibility	5- Completely the family's responsibility
Bad/Reckless drivers in the community					
Cigarette smoke					
Drugs in the community					
Floods					
Hurricanes					
Indoor air pollution					
Mosquitos					
Outdoor air pollution					
Radiation					
Violence in the community					
Water pollution					

3.2 Risk Behaviors

For this next question, we want to know how mothers in this community manage four hazards in particular (Hurricanes, outdoor air pollution, community violence, and indoor air pollution). I will read to you a series of possible actions that could be used to manage each hazard. Again, please think of how other mothers in your act, and give your best answer

1) According to mothers in this community, how important is it to choose the following action to manage the related hazard?

	1 Extremely Important	2 Very Important	3 Moderately Important	4 Slight importance	5 Low importance	6 Not at all important
(Hurricane) Buy extra supplies (food, water) to have in the house						
(Hurricane) Buy materials in case power goes out (e.g. radio, batteries, flashlight generator)						
(Hurricane) Do what other family members do						
d(Hurricane) Don't let thoughts overwhelm you/ Don't focus on it						
(Hurricane) Make a plan of how/where to evacuate						
(Hurricane) Collect materials (family records, contacts) during the season						
(Hurricane) Plan to evacuate at least 24 hours before the storm						
(Hurricane) Plan to shelter at home						
(Hurricane) Watch news during hurricane season						
(Indoor air) Avoid parts of house where there is problem (e.g. mold, smell)						
(Indoor air) Call a professional to clean (e.g. mold, smell)						
(Indoor air) Keep house extra clean (e.g. vacuum, wash sheets)						
(Indoor air) Keep windows open as much as possible						
(Indoor air) Paint over spots with mold						
(Indoor air) Use air freshener						
(Outdoor air) Ask authorities to do something						
(Outdoor air) Don't add to the pollution – (pollute less)						
(Outdoor air) Keep windows closed as much as possible						
(Outdoor air) Move away to cleaner community						
(Outdoor air) Stay indoors as much as possible						
(Violence) Ask authorities to fix						
(Violence) Be extra cautious with family						
(Violence) Keep a gun in the house to protect yourself						
(Violence) Move to safer community						
(Violence) Rely on church						
(Violence) Stay inside as much as possible						
(Violence) Watch the news as much as possible						

	1 Extremely Important	2 Very Important	3 Moderately Important	4 Slight importance	5 Low importance	6 Not at all important
(Violence) Work with others to help in community						

Section 3: Sources of Support

For this final question, we want to know where mothers in this community rely upon for help when faced with the hazards we've been discussing. I will go through one hazard at a time, and then I will read through several possible sources of support. Think of how other mothers in this community act, and for each scenario, give your best answer by using one of the six following choices.

1- Extremely Likely
2- Likely
3- Somewhat Likely
4- Somewhat Unlikely
5- Unlikely
6- Extremely Unlikely

1) How likely are mothers in this community to rely on the following for help in managing the hazard? Prompt: Remember to think about how mothers in this community would generally act.

	Hurricanes	Indoor air pollution	Outdoor air pollution	Violence in the community
Doctor				
Family				
Friends				
Government services				
Internet				
Local government leaders				
People at church				
Police				
TV News				

Appendix C - **Sources Used for Adaptive Capacities for Resilience Codebook (Ross, 2014)**

Social Resilience	
Variable and Description	**Source**
Education	American Communities Survey 2010 5 Year
Percent of the population with a Bachelor or higher	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Nonelderly population	U.S. Census 2009 Population Estimates, USA Counties Database
Percent nonelderly population (elderly= 65 and over)	http://censtats.census.gov/usa/usa.shtml
Transportation access	American Communities Survey 2011 5 Year
Percent of households with a vehicle	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Communication capacity	American Communities Survey 2011 5 Year
Percent housing units with a telephone	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Language competency	Language spoken at home ACS 3 yr 2010
Percent of population over 5yrs old who speak English "very well"	http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_3YR_S1601&prodType=table
Nonspecial needs population	Census 2000 SF3
Percent population without a physical disability	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Health insured population	U.S. Census Small Area Health Insurance Estimates 2007, via USA Counties
Percent population with health insurance (under 65 years)	http://censtats.census.gov/cgi-bin/usac/usacomp.pl
Community Capital	
Variable and Description	**Source**
Place attachment	American Communities Survey 2009 3 Year
Net international migration per 1,000 population	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Place attachment	American Communities Survey 2010 5 Year estimates
Percent population born in state that still resides in that state	http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_B05002&prodType=table
Political engagement	Secretary of State/Department of State for Each State 2008

Percent voter turnout in 2008 presidential election	http://elections.sos.state.tx.us; http://www.sos.louisiana.gov; http://www.sos.ms.gov; http://www.sos.alabama.gov/elections; https://doe.dos.state.fl.us
Religious social capital	Association of Statisticians of American Religious Bodies (ASARB) 2010, TOTRATE
Religious adherents per 1,000	http://www.thearda.com/Archive/Files/Downloads/RCMSCY10_DL2.asp
Civic social capital	County Business Patterns 2009 Code 8134
Civic organizations per 10,000	http://www.census.gov/econ/cbp/index.html
Advocacy social capital *Social advocacy organizations per 10,000*	County Business Patterns 2009 Code 8133 http://www.census.gov/econ/cbp/index.html

Economic Resilience	
Variable and Description	**Source**
Housing capital	Census 2010 SF1
Percent owner occupied housing	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Employment	American Communities Survey 2010 5 Year
100 - Percent pop unemployed	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Income inequality	US Census, 2006-2010 American Community Survey
Gini Index by county (1=0.461 to 0.645; 2=0.439 to 0.460; 3=0.422 to 0.438; 4=0.402 to 0.421; 5=0.207 to 0.401)	http://www.census.gov/prod/2012pubs/acsbr10-18.pdf
Economic diversity	NAICS 2012
Percent of pop not employed in farming, fishing, forestry, or extraction	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Female labor force	American Community Survey 2010 5 Year
Percent of labor force (16 years old and over) that is female	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Business robustness	SUSB 2009 County totals
Ratio of large to small businesses employees	http://www.census.gov/econ/susb/
Health care access	American Medical Association, 2009 via USA Counties Database
Total physicians per 10,000	http://censtats.census.gov/cgi-bin/usac/usacomp.pl
Institutional Resilience	
Variable and Description	**Source**
Mitigation plan-covered population	FEMA Mitigation Plan Status (April 2012)
Percent population with multi-hazard mitigation plan	http://www.fema.gov/multi-hazard-mitigation-plan-status
Spending on first responder services	US Census 2002, USA Counties
Percent local government expenditures for health and hospitals, fire and police	http://censtats.census.gov/usa/usa.shtml
CRS-covered population	FEMA's CRS Eligible Communities (2012)
Percent population in Community Rating System Communities/Counties	http://www.fema.gov/library/viewRecord.do?id=3629
Political fragmentation	US Census, 2007 Governments Integrated Directory

Number of municipalities, school districts, and special districts	http://harvester.census.gov/gid/gid_07/options.html
Disaster experience	FEMA Historical Disaster Declarations
Number of Presidential disaster declarations, 2002-2011	http://gis.fema.gov/DataFeeds.html
Citizen Corps-covered population	Citizen Corps (November 2012)
Percent pop covered by county Citizen Corps council	https://www.citizencorps.gov/cc/CouncilMapIndex.do
Storm Ready-covered population	NOAA's Strom Ready Communities
Percent population in Storm Ready counties or communities	http://www.stormready.noaa.gov/communities.htm

Infrastructure Resilience	
Variable and Description	**Source**
Nonvulnerable housing	American Communities Survey 2010 5 Year
Percent of housing not mobile homes	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Rental shelter capacity	Census 2010 SF1
Percent vacant rental units	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Hospital capacity	County and City Data Book: 2007 (Actual data from 2004)
Number of hospital beds per 10,000	https://www.census.gov/statab/ccdb/ccdbstcounty.html
Evacuation/access capacity	Census 2010 Tiger/Line Shapefiles
Primary and secondary road miles per square mile	http://www.census.gov/cgi-bin/geo/shapefiles2010/main
Nonvulnerable housing	American Communities Survey 2010 5 Year
Percent housing units built 1970-94	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
Hotel shelter capacity	County Business Patterns 2009
Number of hotels/motels per square mile (excludes casino hotels)	http://www.census.gov/econ/cbp/index.html
School shelter capacity	HAZUS Data aggregated by county/ FEMA Hazus 2.0 2011
Number of public schools per square mile	http://www.fema.gov/hazus-software
Ecological Resilience	
Variable and Description	**Source**
Impervious surfaces	National Land Cover Database 2006 Percent Developed Imperviousness
Percent impervious surface in square miles of land area	http://www.mrlc.gov/nlcd06_data.php
Wetland preservation	NOAA CSC Coastal Change Analysis Program (C-CAP) Land Cover Atlas
Net change (1997 to 2006) in percent wetland area between 1996 to 2006	http://stateofthecoast.noaa.gov/wetlands/welcome.html
Floodplain housing development	Number of Severe Repetitive Loss Properties per County (FEMA 2007)
Number of severe repetitive loss properties (0=0; 1=1 to 20; 2=21 to 30;3=31 to 40; 4=41 and over)	http://www.fema.gov/library/viewRecord.do?id=2711

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