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Disaster Vulnerability and Social Capitals in the Gulf Coast and Flint, Michigan

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DISASTER VULNERABILITY AND SOCIAL CAPITALS
IN THE GULF COAST AND FLINT, MICHIGAN

A Dissertation

Submitted to the Graduate Faculty of the
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Agricultural and Mechanical College
in partial fulfillment of the
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in

The Department of Sociology

by
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B.A., University of Tennessee, Chattanooga, 2012
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Abstract

In this dissertation, I explore the migration intentions, self-rated physical and mental health, and alcohol use of people living in regions facing environmental stressors. In my first chapter, I examine factors that predict willingness to move away from southeast Louisiana, a region threatened by land loss, hurricanes, and environmental pollution. Specifically, I assess the relationships risk perceptions, place attachment, and fishing employment have with willingness to move. I find that risk perceptions are positively related to willingness to move and that place attachment and fishing employment are negatively related to willingness to move. In my second chapter, I show the predictors of self-rated physical and mental health in Flint, Michigan, both before the Water Crisis and after. I pay special attention to the relationships race, perceived marginalization, and social capital have with self-rated health. The important takeaways from this paper are that perceived marginalization is a predictor of poorer physical and mental health before and after the Water Crisis, whereas social support predicts better health before the Water Crisis but loses much of its relationship with health after the announcement of the Flint Water Crisis. In my third chapter, I explore the relationships between resource networks, religious ecology, and alcohol misuse in the Gulf Coast. Here, I found that people in increasingly Catholic and Mainline Protestant counties tend to be at higher risk for potential alcohol misuse, and those with more local ties are at a greater risk for alcohol misuse than those with more extra-local ties. Together, these papers demonstrate how critical a person's social life is. One consistent finding in these papers is that social capital, be it social support or community sentiments, does not always operate in the same way for different social groups. In a disaster context, social capital can be taxing on a person, especially if their close ties are also under stress.

Introduction

This dissertation considers the relationships social capital has with migration intentions and health outcomes in three different disaster contexts. It contributes to existing research on social capital, health, migration, and disasters. As a sociologist, I approach disasters with attention to issues related to social vulnerability and inequality. This dissertation includes three substantive chapters focused on land loss in southeast Louisiana, health change before and after the Flint Water Crisis, and alcohol misuse in different religious contexts in the Gulf Coast.

In my first chapter, I examine factors that predict willingness to move away from southeast Louisiana, a region threatened by land loss, hurricanes, and environmental pollution. Specifically, I assess the relationships risk perceptions, place attachment, and fishing employment have with willingness to move. I find that risk perceptions are positively related to willingness to move and that place attachment and fishing employment are negatively related to willingness to move. I use concepts from disaster research (sociology, psychology, geography, among others) to help understand these relationships. I argue that disaster research has much to offer the growing body of literature on migration because disaster sociology asks us to understand what factors make people vulnerable to social disruption and what capacities individuals and communities have that foster more resilient outcomes. As climate change-induced migration continues to occur, we should not just be paying attention to where people go, but also, why they want to leave and why they might risk staying.

In my second chapter, I show the predictors of self-rated physical and mental health in Flint, Michigan, both before the Water Crisis and after. I pay special attention to the relationships race, perceived marginalization, and social capital have with self-rated health. The key findings from this paper are that perceived marginalization is a predictor of poorer physical and mental

health before and after the Water Crisis, whereas social support predicts better health before the Water Crisis but loses much of its relationship with health after the announcement of the Flint Water Crisis. Having data from before and after a disaster is unusual; the repeated cross-sectional design of the survey from Flint I used provides the opportunity to examine what predicts self-rated health in different situational contexts. This is an under-developed line of inquiry. Very little social science research has been published about the Flint Water Crisis, and though journalists often referred to it as a disaster, the disaster research community has not engaged with it as such. Therefore, findings from this paper are both substantively and theoretically novel.

In my third chapter, I explore the relationships between resource networks, religious ecology, and alcohol misuse in the Gulf Coast. Here, I found that people in increasingly Catholic and Mainline Protestant counties tend to be at higher risk for potential alcohol misuse, and those with more local ties are at a greater risk for alcohol misuse than those with more extra-local ties. These findings speak directly to two different research areas: the first on the differences between local and extra-local support and the second on religious ecology and alcohol. Understanding the dynamics of alcohol misuse, a costly and dangerous issue prevalent in much of the Gulf Coast, is critical for disaster planning.

I had the opportunity to use three different survey datasets for this dissertation. In the first chapter, I use a multi-mode survey of households in three southeast Louisiana parishes facing a range of environmental issues. This was an effort led by LSU researchers, and I had the good fortune of using it as part of my assistantship. In the second paper, I used repeated cross-sectional survey data from Genesee County, Michigan. I used two waves of this effort, which was commissioned to provide information about health and well-being in the struggling

community of Flint. In the third paper, I used a large telephone survey of households in Gulf Coast counties and Parishes, from Cameron County, Texas, to Monroe County, Florida.

Together, these papers demonstrate how critical a person's social life is. One consistent finding in these papers, and in my other research conducted here at LSU, is that social capital, be it social support or community sentiments, does not always operate in the same way for different social groups. In a disaster context, social capital can be taxing on a person, especially if their close ties are also under stress. This finding alone shows how important sociology is to disaster research; social life absolutely should be taken into account when studying something as seemingly straight-forward as health or migration.

Chapter 1. Risk Perceptions, Place Attachment, and Natural Resource Employment: Predicting Willingness to Move from a Threatened Coastline

Introduction

Environmental hazards, exacerbated by climate change, threaten both the physical and cultural landscape of the Louisiana Gulf Coast. This region has experienced acute threats such as the Deepwater Horizon oil spill and Hurricanes Katrina, Gustav, and Isaac, but the region is also experiencing slower-moving, more insidious unnamed threats such as saltwater intrusion and land loss. The colloquialism used to illustrate this is, "Louisiana loses a football field of land an hour." The severity of this crisis is perhaps obfuscated by discussions of the causes of climate change and sea level rise, and though discussions of the causes of climate change and sea level rise are critical to their mitigation, we must also engage with discussions about the consequences of climate change, one of which is migration.

In this paper, I examine the willingness of southeast Louisiana residents to permanently leave their homes if environmental threats continue or worsen. I consider the role of overall environmental risk perceptions, place attachment, and natural resource-based employment. Using data collected in a region threatened by a number of acute and slow environmental hazards, I am able to explore what environmental issues residents find to be most threatening, as well as what factors make them more or less likely to move. Doing so contributes to the nascent body of research on elective climate change-induced migration in the United States. I frame these processes using social vulnerability and resilience paradigms often used in disaster and hazards research. Bringing these two literatures together provides insight into the social elements of environmental migration.

Background

Migration

As place-based boundaries become more porous, migration has become a concern of researchers across disciplines. This growing body of work seeks to understand the causes and consequences of migration. Because migration is a widespread phenomenon stemming from a number of causes, it is critical to be intentional with the language employed to discuss these processes. In this paper, I will be discussing environmental migration, and I will be making distinctions between elective and forced migration (Hunter 2015).

I employ the International Organization for Migration's (IOM) definition for environmental migrants (EMs), "Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their homes or choose to do so, either temporarily or permanently, and who move either within their country or abroad" (IOM 2011). I opt not to use the term environmental or climate "refugee" for several reasons. First, the UN defines a refugee as "someone who has been forced to flee his or her country because of persecution, war, or violence" (UNHCR 2018). This excludes two key descriptors: those who never cross international borders and those who leave their homes for environmental reasons and/or resource scarcity. Individuals who meet these criteria are referred to as "internally displaced persons" or IDPs. IDPs are not protected under international law and are instead the responsibility of their own countries. Experts assert that most migration takes place within national borders and that, while many people are displaced by natural hazards, more migration occurs because of other environmental factors (McLeman and Gemenne 2018).

The broad definition for EM purposefully encapsulates a wide range of migration and displacement experiences, including both forced and elective migration stemming from any environmental catalyst. As pointed out by researchers in this area, the differences between forced and voluntary migration are still being explored (Piguet 2018), and this is even less clear in the context of environmental migration (Black et al. 2011), where there could be both direct and indirect drivers of migration[1]. Direct drivers of migration increase the "hazardousness of place," whereas indirect drivers of migration might include economic or political stressors brought about by environmental change (Black et al. 2011). The effect of these "macro" factors on the decision to migrate are then mediated by both "meso" (i.e. social) and "micro" (i.e. individual) factors (Black et al. 2011).

Migration, even temporary migration, is expected in the face of an acute, catastrophic weather event when homes are destroyed. Perhaps one of the most salient examples of a catastrophic weather event that provoked both temporary and permanent migration is Hurricane Katrina. A number of studies have examined the precursors of migration/evacuation related to Hurricane Katrina (e.g. Barnshaw and Trainor 2007; Burnside, Miller, and Rivera 2007; Myers,

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[1] As this becomes more of a reality, we will need consistent, agreed upon terminology with which to discuss these processes. So when the New York Times refers to coastal Louisiana residents being forced to leave their homes in the face of sea level rise as "climate change refugees" (Davenport and Robertson 2016), that language does two things: 1) it "others" the residents of these threatened communities by likening them to foreigners in need of assistance, and 2) it removes the onus of responsibility from the United States, making these EMs seem troublesome and helpless. This underscores the need to understand people's motivations (and hesitations) for relocating; it humanizes and normalizes their experiences (rather than painting them as helpless and foreign), and this may, in turn, make decision makers more sympathetic to residents' needs.

Slack, Singelmann 2008; Sastry and Gregory 2014), as well as the consequences of such upheaval (e.g. Fothergill and Peek 2015; Rendall 2011).

Less attention is paid to migration that occurs due to the gradual degradation of quality of life, opportunity, and safety, especially in the United States. In the United States, there are coastal communities in Alaska (Goode 2016) and Louisiana (Davenport and Robertson 2016) facing the decision to move due to gradual sea level rise that has threatened the safety and livelihoods of residents. Such decisions are coming to national attention.

As mentioned above, I am also making distinctions between those who elect to migrate from their homes and those who are forced to leave their homes. In other words, migration does not always come about as a result of natural hazards, but rather, may be a calculated decision made by people who are experiencing, or expect to experience, the effects of climate change. As stated by McLeman and Gemenne, environmental migration appears "a lot less like a simple push-pull phenomenon that affects only poor people in poor countries, and a lot more like a continually changing, complex interplay of processes that generate context-specific, heterogeneous outcomes in countries rich and poor" (2018:11).

Key differences between those engaging in forced and elective migration can be understood using terminology employed in disaster resilience research. For example, Adger and colleagues (2018) discuss forced migration as a function of *vulnerability*, whereas migration is conceptualized as an *adaptive* response to environmental threats; "mobility is multi-faceted. Migration and displacement are in effect two elements of vulnerability and adaptation to climate change" (Adger et al. 2018:29). In other words, social vulnerability (see Cutter et al. 2008) may be a predictor of forced migration and/or displacement, and elective migration/mobility may be the result of a person's adaptive capacities (i.e. resilience). Resilience is sometimes defined as a

person or community's ability to "bounce back" from an extreme event, but in the era of climate change-induced environmental change, which may result in interrelated stressors such as coastal land loss, declining productivity of renewable resource industries, and economic pressures (Adger et al. 2018; Harrison 2017), "bouncing back" in the same location may not be the safest or most adaptive course of action. In some contexts, resilience may involve a voluntary and proactive move to a new place.

Turning to southeast Louisiana, the wholesale move of the community on Isle de Jean Charles illuminates the issues facing those in a geologically and socially vulnerable region. A Housing and Urban Development grant of $1 billion, across 13 states, was allocated to improve infrastructure resilience in the face of climate change; $48 million of this grant was specifically earmarked to assist residents of Isle de Jean Charles as they relocate (Davenport and Robertson 2016). The federal government has invested in resilience, but even these programs acknowledge when resilience means relocating because the changes to the landscape are so inevitable.

Using terminology from disaster research, we can conceptualize these changes as environmental hazards. Environmental hazards have been broadly defined as threats to people that stem from, or interact with, environmental factors (Cutter 2001; Hunter 2015). Cutter and colleagues (2008) argue that adaptive capacities can be built upon during environmental hazards because individuals and communities have time to make changes based on the needs of their communities. With this in mind, it is critical to understand the adaptive capacities and vulnerable attributes of those facing environmental hazards. Migration/displacement of people within their own country due to environmental conditions is no longer an extreme event.

Risk Perceptions

Emergency managers and risk communication scholars have drawn the attention of disaster researchers toward another factor influencing migration: risk perceptions. Risk perception "occurs in a social context where individual notions of risk are filtered by community influences such as shared experiences and existing power relationships" (Flint and Luloff 2005:406). Research suggests that heightened risk perceptions can contribute to adaptive responsive behavior (Burnside et al. 2007; Dash and Gladwin 2007), which could include the calculated decision to leave one's home.

However, risk is not perceived equally across groups. Perceptions of risk differ across racial and ethnic groups (Finucane et al. 2000; Fothergill, Maestras, and Darlington 1999), socioeconomic status (Fothergill and Peek 2014), sex (Finucane et al. 2000; Marshall 2014), and other sociodemographic characteristics. Furthermore, responses to risk may also depend on a person's resources and adaptive capacities (Flint and Luloff 2005; Fothergill and Peek 2014), as well as a person's trust in the source of information about the risk (Dash and Gladwin 2007). Furthermore, research after the Deepwater Horizon oil spill has demonstrated that Gulf Coast residents with disaster experience may experience environmental attitudinal change and new environmental behaviors (Bergstrand and Mayer 2017). In southeast Louisiana, where residents have lengthy residential tenure, and natural hazards are routine, it is critical to understand who is perceiving risk to their homes and how those perceptions are linked to actions.

Place Attachment

Another factor that may contribute to migration patterns is place attachment. Place attachment "involves an interplay of affect and emotions, knowledge and beliefs, and behaviors and actions in reference to a place" (Low and Altman 1992:5; see also Proshansky, Fabian, and Kaminoff

1983). The term "place attachment" is used to encapsulate a variety of ways people bond with "places." In this context, "place" refers to "space that has been given meaning through personal, group, or cultural processes…place can vary in several ways – scale or size and scope, tangible versus symbolic, known and experienced versus unknown or not experienced" (Low and Altman 1992:5). Among the precursors of place attachment are genealogical linkage, experience of land loss or loss of community, and economic ties (Low 1992), qualities that might be particularly salient among long-time residents of disappearing coastlines.

If the place a person knows begins to fundamentally change, this may contribute to additional place attachment (LeMenager 2014; Low 1992), where residents cling to their social and cultural meanings of a place. In the context of southeast Louisiana, a study of residents found that 60% of respondents had lived in their community their entire lives, and more than 81% had lived in their present community for more than 20 years (Lee and Blanchard 2010). Such tenure could make a person feel more strongly about the Louisiana coastline, and possibly, make them less willing to move away. With this in mind, research on environmental migration and land loss should consider the relationships between place attachment and migration intentions to identify vulnerable populations who may be resistant or unable to move.

Industry of Employment

Researchers using the ecological-symbolic approach argue that a person's economic relationship with the environment may influence their response to environmental change (Kroll-Smith and Couch 1993, 1991). Reliance upon natural resource-based livelihoods presents another form of potential social vulnerability in the face of environmental hazards (Cutter, Boruff, and Shirley 2003). Many residents of southeast Louisiana have ties to the fishing and seafood industries, the oil and gas industries, and to a lesser extent, the tourism industry.

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Louisianans take great pride in these industries. In 2016, Louisiana's commercial fishing industry produced 1.2 billion pounds in landings, making it the top producing state in the contiguous U.S. (National Oceanic and Atmospheric Administration 2017). Furthermore, the Louisiana coast supplies 90% of the country's outer continental shelf oil and gas (Coastal Protection and Restoration Authority 2013). The extraction of oil and gas in Louisiana is largely an offshore enterprise, and its movement into the deep waters of the Gulf has been a fundamental force in shaping the social, economic, and even geographic structure of the state's coastal region (Austin et al. 2014).

The fishing and oil industries have played a pivotal role in shaping the definition of the Cajun ethnic identity unique to this part of the Gulf South (Henry and Bankston 2002), though there may be differences in how people with ties to these different industries relate to their natural environment and thus, perceive environmental risk. For example, Milnes and Haney (2017) documented that men living in a community dependent upon oil production exhibited "environmental complacency" after a disaster. They argue that the masculinity maintained through the oil and gas industry resists change and protects the economic interests of the oil and gas business. Participation in such an economy may preclude environmental concerns.

Fishers, on the other hand, may be part of what are referred to as renewable resource communities (RRCs), "whose primary cultural, social, and economic existences are based on the harvest and use of renewable natural resources" (Picou and Gill 1996:881). In this way, fishers may be uniquely vulnerable to mental health issues and other social and economic disruptions as the environment is adversely affected (Arata et al. 2000; Cope et al. 2013; Flint and Luloff 2005; Gill, Ritchie, and Picou 2016; Oberg et al. 2016; Parks et al. 2018; Picou and Gill 1996; Urquhart and Acott 2004).

Fishing, across contexts, has been described as a way of life, often shared inter-generationally, and fishers may be "affected by their work in such a way that their work relationships, interests, and values permeate their nonworking lives" (Marshall, Fenton, and Marshall 2007:364). Fishing "communities" range in size and scope (Clay and Olson 2008); they may exist as physical, geographic communities where the majority of residents have ties to the fishing industry. Alternatively, fishing communities may be represented by subcultural occupational enclaves within larger communities, or when cultural identity joins people in "community" that extends across place-based localities. For example, fishers could be joined together by shared fishing grounds, docks, and/or cooperatives, rather than residence in a shared neighborhood or town. While fishing is not the leading source of employment in southeast Louisiana, the cultural identity of the region is very much intertwined with fishing (Henry and Bankston 2002; Urquhart and Acott 2004).

The Louisiana Coast

As coastal erosion continues to claim more and more of Louisiana's coastline, residents will be faced with the decision to leave their homes. Currently, there are no state or federal policies that take into account 1) that not all members of a community may be equally willing to relocate, and 2) the different factors that make people more or less likely to relocate. Often, relocation is discussed in terms of economics, and these certainly are new, wicked problems that will be complicated and costly. But less attention is paid to residents, what they want, and what makes them want to stay.

In this paper, I examine one potential motivator for moving, risk perceptions, and two potential hindrances of moving, place attachment and involvement in the fishing industry.

Research Questions

1. What environmental issues do residents of southeast Louisiana perceive as threats to their homes?

2. Do particular environmental threats affect residents' willingness to move away?

3. Do risk perceptions impact residents' willingness to move if conditions continue or worsen?

4. Does place attachment affect residents' willingness to move if conditions continue or worsen?

5. If environmental threats continue/worsen, are residents with ties to the fishing industry more or less likely to move than those without ties to the fishing industry?

6. Does the relationship between risk perceptions and willingness to move differ between those with and without ties to the fishing industry?

Methods

Data

Data for these analyses come from the Threatened Louisiana Coastal Communities Survey, a multi-mode (mail, web, and phone) household survey sampling residents of Plaquemines and Lafourche parishes. Residents of these southeastern Louisiana parishes have experienced several major hurricanes (Katrina and Rita in 2005, Gustav in 2008, Isaac in 2012, and Nate in 2017), as well as the largest marine oil spill in history (the Deepwater Horizon oil spill in 2010). The survey, developed in partnership between the Louisiana State University Coastal Sustainability Studio and the Department of Sociology, is intended to capture residents' capacities for resilience in the face of environmental threats to their homes (Cope et al. 2018).

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Sampling

The data were collected by the Louisiana State University Public Policy Research Lab between October 2013 and January 2014. Ten thousand household addresses in Plaquemines and Lafourche parishes were randomly selected from the U.S. Postal Service's computerized Delivery Sequence File. Of those, 5,300 addresses were mailed a survey. Inside the survey materials was a link to an online version of the survey if respondents preferred that mode over the paper survey. Approximately a month after delivering the survey, follow-up telephone interviews were conducted for those who had not completed a mail or online survey. Then, the phone records were expanded to include households from the remaining initial records (n=4,700) so that the intended sample size could be reached (n=1,209).

The overall response rate was 9.5%, which is comparable to the response rates currently achieved by major survey research organizations (Curtin et al. 2005). Due to differential probabilities of response across the population, data are weighted by age and sex based on the distributions of these groups in our sample versus the sample from corresponding areas in the 2008-2012 American Community Survey. After deletion of cases with values missing at random, 943 cases were available for analysis.

Measures

Dependent Variable

The outcome of interest is whether a respondent might elect to migrate in the face of environmental threats. From a list of potential environmental threats (sea level rise, coastal erosion, salt water intrusion, seasonal flooding, declines in fishing harvests, wind damage from hurricanes, storm surges from hurricanes, and environmental pollution), respondents were asked to identify which they perceive to be *the most serious threat* facing their home. They were then

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asked if they would move away if the threat continued or worsened (yes or don't know=1). I

included those who responded that they did not know if they would move away or not because,

in this case, those who are unsure about whether they would move may be more similar to those

who would move than those who would not move in that they might consider moving in the

future. The "no" respondents are voicing opposition to moving even if environmental conditions

become more dangerous or expensive. This is a firm position that requires rootedness in place.

The "yes" and "don't know" respondents are voicing willingness, not necessarily a firm plan, to

move. As such, the "yes" and "don't know" respondents seem more similar than the "no" and

"don't know" respondents, an approach taken with other recent studies on environmental

positions (Milnes and Haney 2017).

Twenty-four percent of respondents indicated that they did not know if they would move

away if their most serious threat continued or worsened. Of these, 83% completed mail surveys,

indicating that the survey mode may have influenced respondents' answers. To account for this, I

control for survey mode (discussed below), and I ran sensitivity analyses to determine 1) if

respondents who used the mail surveys differed significantly from those who did not, and 2) if

respondents who "didn't know" if they would move away differed significantly from those who

did not. While there were some statistically significant differences between these groups, the

major substantive difference for the purpose of these analyses is that mail respondents were more

likely to say that they did not know if they would move away. Furthermore, I also ran the

analyses with the "don't know" respondents grouped with the "no" respondents, and the results

were very similar. Thus, I have opted to present the results with the "don't know" respondents

grouped with the "yes" respondents while controlling for survey mode.

In some cases, residents of coastal Louisiana are being "forced" to leave due to land loss; these data reflect the choice that residents would make due to threats to their homes. Thus, I conceptualize this as voluntary migration. It is critical to understand the motivations of those willing to migrate because, in years to come, communities may be forced to move either by natural forces (if towns are leveled by storm surge, water engulfs the community, etc.) or political forces (through eminent domain and forced relocation).

Independent Variables

Risk perceptions. Using the list of environmental threats above, respondents indicated *all* the threats they perceived as potential threats to their homes. Respondents could choose all threats that apply (yes=1). I summed these responses to form a risk perception index, ranging from 0 to 8 (KR-20=0.79).

Place attachment. Through a series of questions about the wetlands and coast, respondents indicated how strongly they identify with the surrounding natural environment. Respondents were asked to indicate their level of agreement with 11 statements (α=0.94). Responses range from strongly disagree=0, disagree=1, don't know=2, agree=3, and strongly agree=4, which were then summed to create a place attachment score. The statements are as follows:

1. I am very attached to the wetlands and coast.
2. I feel the wetlands and coast are a part of me.
3. I identify strongly with the wetlands and coast.
4. I have pride in my heritage because of the wetlands and coast.
5. The wetlands and coast are a special place for my family.
6. Important family memories are tied to the wetlands and coast.
7. The wetlands and coast contribute to my community's character.
8. My community's history is defined by the wetlands and coast.
9. The wetlands and coast have helped put my community on the map.
10. My community's economy depends on the wetlands and coast.
11. Louisiana's economy depends on the wetlands and coast.

Natural resource employment. I also focus on three types of natural resource-based

employment: employment in the oil and gas industries, employment in the tourism industries,

and employment in the fishing and seafood industries. All three are measured as dichotomous

variables. Respondents were asked if they, or any member of their immediate families, currently

work in the aforementioned industries (yes=1).

Control Variables

A series of controls are also included in these analyses, including a dummy variable for whether

or not respondents are *homeowners* versus renters (homeowner=1), a continuous variable for

number of children under 18 living at home, a continuous variable for *years of education*, a

dummy variable for *sex* (female=1),[2] a dummy variable for whether or not a respondent is

married (yes=1), a categorical variable for *employment status* (reference=full time employment),

a dummy variable for *race* (white=1), a dummy variable for *Cajun ethnicity* (Cajun=1), a

continuous variable for *age*, respondents' *income*,[3] and a three point categorical variable for

survey mode (mail=reference).

I expect that being a homeowner, having more children, being married, being white,

being Cajun, and being older will be associated with being less willing to move, as these are all

factors that could potentially root a person more firmly into their communities and networks.

Conversely, I anticipate that having more education, being female, not having full-time

employment, being younger, and having higher household income will be associated with being

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[2] Sex was not captured in mail surveys. In these cases, investigators coded sex using the respondents' name. A panel of three project team members coded each respondent as male or female. Responses from each panel member were cross checked for consistency and compared to a logistic regression model predicting respondents' sex. This equation can be denoted as: $Sex = age(\bar{x}) + race(\bar{x})$.

[3] Due to a large number of missing values on the annual household income variable, we developed an OLS regression equation to generate predicted values for annual household income. This equation can be denoted as: $Income = b_0 + male(\bar{x}) + age(\bar{x}) + educational\ attainment(\bar{x}) + race(\bar{x}) + household\ size(\bar{x})$. See Cope et al. 2018 for more details about these imputations.

more willing to move, as these factors could be related to a person's mobility and environmental awareness.

Analytic Strategy

I first present descriptive statistics for the sample used in these analyses. Then, I provide the percentages of respondents who identified each of the eight possible environmental issues as a threat to their homes. As noted above, respondents were asked to identify the most pressing threat to their homes and were then asked if they would move away if that particular threat worsened or continued. As such, I also present the percentages of respondents who identified each particular environmental issue as the most threatening, as well as the percentages among those who would be willing to move if that particular threat continued or worsened. Finally, I present the results of two logistic regression models. The first illustrates how overall risk perceptions, place attachment, natural resource-based employment, and a series of control variables are associated with willingness to move away if the most serious environmental threat a respondent specifies either continues or worsens. The second includes an interaction term for fishing and risk perceptions to assess whether the relationship between risk perceptions and willingness to move differs between those with and without ties to the fishing industry. These analyses speak to the factors associated with elective migration in the face of mounting environmental stressors, which is a pressing issue affecting coastal Louisiana communities.

Results

Descriptive statistics for the variables used in these analyses are presented in Table 1. Nearly 65% of respondents said that they would be willing to move in response to continued or increasing environmental change.

Table 1.1. Descriptive statistics

	Percentage/Mean	Standard Deviation
Willingness to move		
Yes	42.2	-
Don't Know	22.7	-
No	35.1	-
Risk perception	4.1	0.2
Place attachment	36.2	0.6
Oil employment	55.1	-
Fishing employment	25.3	-
Tourism employment	18.7	-
Home ownership	95.8	-
Number of children	0.6	0.1
Years of education	13.7	0.1
Married	65.4	-
Female	49.5	-
Employment status		
Full time	54.4	-
Part time	11.4	-
Retired	18.4	-
Unemployed	11.2	-
On disability	4.6	-
White race	89.1	-
Cajun ethnicity	77.4	-
Age	45.9	1.6
Income	$66,050	$2,134
Survey type	-	-
Mail survey	53.9	-
Phone survey	41.9	-
Web survey	4.3	-

N = 943

Data: Threatened Louisiana Coastal Communities Survey, 2013-2014

The mean risk perception score is 4.1, meaning that each respondent felt that about four of the eight environmental issues listed were of concern to their home. Figure 1 shows the percentages of respondents who identified each threat as one of the threats facing their homes. The most endorsed threat was hurricane wind damage (91% of respondents), and the least endorsed threat was declines in fishing harvests (38% of respondents). The percentages of respondents endorsing the remaining threats range from 42% to 54%.
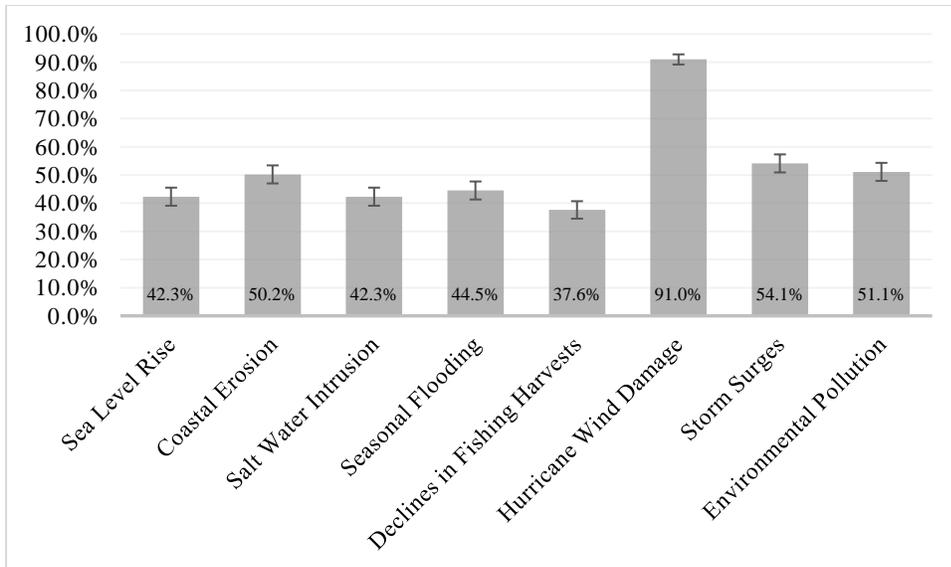
Figure 1.1. Percentage of respondents endorsing each threat
Data: Threatened Louisiana Coastal Communities Survey, 2013-2014

Respondents were also asked to identify what environmental issue presented the greatest threat to their homes, and then they were asked to indicate whether they would consider moving if that particular threat continued or worsened. Willingness to move varies across the different threats. Figure 2 shows the distribution of endorsement of each of the most serious threats and, within those who endorsed each threat, how many are willing to move and how many are not. About 32% (n=305) of the total respondents identified wind damage from hurricanes as being the most serious threat to their homes. Of those, 56% said that if hurricane wind damage continued or worsened, they would consider moving. The threats with the highest proportion of respondents who would move if the threat continued or worsened are sea level rise (80.8% would move), seasonal flooding (80.7% would move), and coastal erosion (76.8% would move). The only threat where the majority of respondents said they would not move away if the threat continued or worsened was declines in fishing harvests; only about 27% respondents who identified this threat as the most serious would consider moving away if it continued or worsened. Declines in fishing harvests was both the least endorsed threat, as well as the threat

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with the lowest proportion of respondents who indicated they would move away in response. This could be due to the relatively small proportion of the sample with ties to the fishing industry; over half of respondents who endorsed this threat reported that they have ties to the fishing industry.
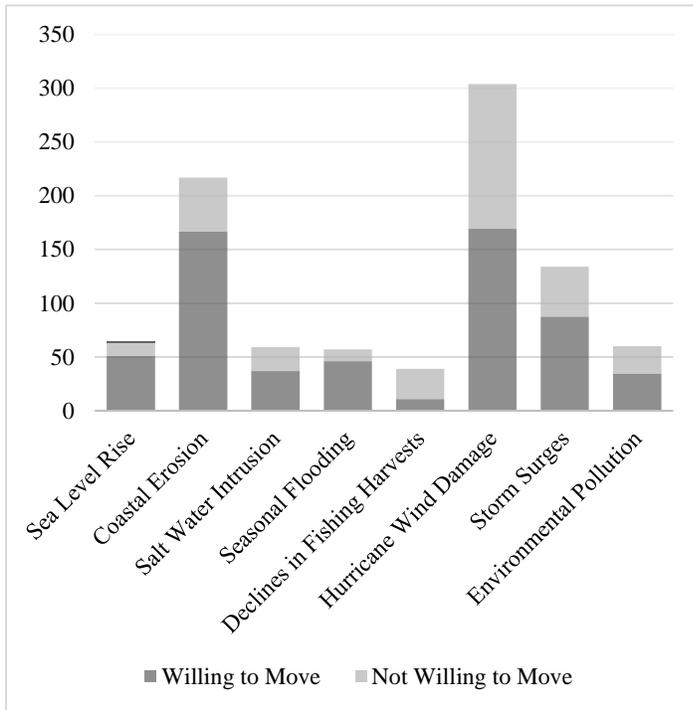
Figure 1.2. Number of respondents reporting each threat as the most serious and the number of respondents willing versus unwilling to move
Data: Threatened Louisiana Coastal Communities Survey, 2013-2014

The mean place attachment score is 36.2 (ranges from 0 to 44), indicating relatively high place attachment. Fifty-five percent of respondents have ties to the oil industry, 25% have ties to the fishing industry, and 19% have ties to the tourism industry. It is worth noting that there is overlap between these industries. In fact, about 6% (n=57) of respondents have ties to all three industries. Related to place attachment, there are two descriptive statistics that speak to respondents' connection to the region. Nearly 96% of respondents are homeowners, much higher than the national homeownership rate of 63.9% (United States Census Bureau 2017). Seventy-

seven percent of respondents identify as Cajun. Additional analyses (not presented) indicate that

Cajuns exhibited significantly more place attachment (mean=37.1) compared to non-Cajuns

(mean=31.3); similarly, homeowners reported significantly higher place attachment (mean=36.0)

than renters (mean=31.9).

Moving to the multivariate analysis, Table 2 presents odds ratios for logistic regression

models predicting willingness to move (yes=1). In Model 1, risk perception is associated with

significantly more willingness to move away (OR=1.23; $p<0.001$). That is, for each additional

threat identified as a threat to a person's home, the odds of them being willing to move increases

by 23%. Place attachment is associated with significantly lower odds of willingness to move

(OR=0.94; $p<0.001$). Oil and tourism employment do not have a significant relationship with

willingness to move, but ties to the fishing industry is associated with significantly lower odds of

willingness to move (OR=0.58; $p<0.05$). In other words, those with ties to the fishing industry

are 42% lower odds than those without ties to the fishing industry of being willing to move away

if environmental conditions continue or worsen. Of the controls, only homeownership, being

white, and income have a significant relationship with willingness to move. Homeownership and

being white are both have a significant negative relationship with willingness to move, whereas

income has a significant, positive relationship with willingness to move.

Table 1.2. Logistic regression models predicting willingness to move

	Model 1		Model 2	
	OR	SE	OR	SE
Risk perception	1.23***	0.06	1.32***	0.07
Place attachment	0.94***	0.02	0.94***	0.01
Fishing employment	0.58*	0.14	1.34	0.71
Oil employment	0.67	0.17	0.67	0.17
Tourism employment	0.61	0.20	0.66	0.20
Homeowners	0.22*	0.14	0.23*	0.14
Number of children	1.22	0.18	1.19	0.17
Years of education	0.98	0.04	0.98	0.05
Table continued				

	Model 1		Model 2	
	OR	SE	OR	SE
Sex	1.07	0.25	1.09	0.25
Married	1.04	0.25	1.09	0.27
Employment				
Full time (ref)	-	-	-	-
Part time	1.21	0.74	1.33	0.78
Retired	1.43	0.39	1.40	0.39
Unemployed	0.77	0.28	0.75	0.27
On disability	1.42	0.62	1.34	0.58
White	0.27***	0.10	0.26***	0.10
Cajun	1.05	0.27	1.01	0.26
Age	0.99	0.01	0.99	0.01
Income	1.00*	0.00	1.00	0.00
Survey mode				
Mail (ref)	-	-	-	-
Phone	0.71	0.17	0.69	0.16
Web	0.91	0.48	0.95	0.50
Risk perception * Fishing			0.82	0.09

N = 943
Data: Threatened Louisiana Coastal Communities Survey, 2013-2014
Notes: OR = odds ratio. SE = robust standard error. *p<0.05; **p<0.01; ***p<0.001.

In Model 2, the multiplicative term between risk perceptions and fishing was added.

Rather than interpret the p-value of this interaction (Long and Mustillo 2018), I have opted to

present the predicted probabilities of willingness to move among those with ties to the fishing

industry and those without in Figure 3.
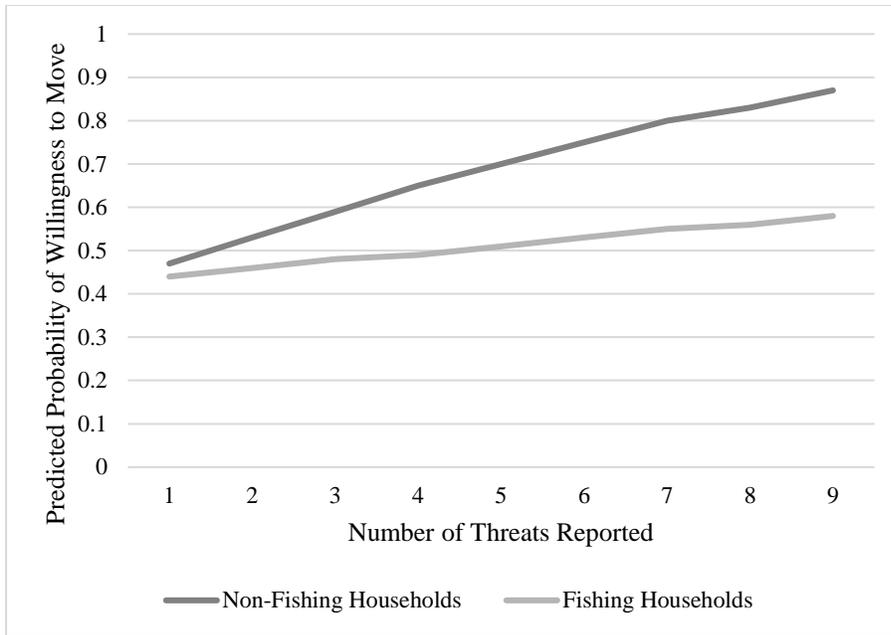
Figure 1.3. Predicted probabilities of willingness to move among non-fishing and fishing households
Data: Threatened Louisiana Coastal Communities Survey, 2013-2014

Figure 3 shows that the predicted probabilities for willingness to move for those with and without ties to the fishing industry increases as the number of perceived threats increases. However, the predicted probabilities for willingness to move among those without ties to the fishing industry increase more dramatically than the predicted probabilities for those with ties to the fishing industry. Furthermore, additional analyses (not shown) indicate that the predicted probabilities for willingness to move of fishers and non-fishers becomes significantly different once respondents reported at least four out of the eight potential threats as issues facing their homes. In other words, as risk perceptions increase, those without ties to the fishing industry are significantly more likely to be willing to move away if environmental conditions worsen compared to those with ties to the fishing industry.

Discussion

These analyses provide insight into the risk perceptions, place attachment, industrial ties, and willingness to migrate among residents of southeast Louisiana. In particular, I explored which environmental issues residents of southeast Louisiana perceive as threats to their homes and which threats they register as the most serious. In doing so, I was also able to assess how risk perception affects willingness to move. Furthermore, I examined what role place attachment and ties to the fishing industry play in predicting willingness to move.

More specifically, I found that close to thirds of respondents were open to moving if environmental conditions continued or worsened. On average, each respondent listed about four of the eight environmental issues as being a threat to their home. The most commonly endorsed threat was wind damage from hurricanes, but over half of respondents also listed coastal erosion, storm surge, and environmental pollution as threats to their homes. When it came to the *most pressing* threat to their homes, more respondents listed wind damage than any other threat. In response to these most pressing threats, there was variation in how they motivated respondents to potentially move. The threats with the highest proportion of respondents saying they would move are closely related to each other (sea level rise, coastal erosion, and seasonal flooding), indicating that the changing coastline of southeast Louisiana is motivating people to move. Furthermore, the perception of these threats was positively associated with willingness to move, and this is even more apparent among those without ties to the fishing industry.

Respondents with greater place attachment were significantly less likely to be willing to move if environmental conditions continued or worsened. Similarly, respondents with ties to the fishing industry were less likely to indicate willingness to move. These two factors may make

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residents more vulnerable to disaster impacts and the effects of climate change if they are unwilling to move.

These analyses bring together several bodies of literature: work on migration, risk perception, place attachment, and fishing employment. While there is a very wide body of literature on migration, research on voluntary migration (Piguet 2018) and environmental migration (Black et al. 2011) is in its nascent stages. This paper examines voluntary migration in an environmentally-motivated context, providing an unusual look into the motivations of people living along a threatened coastline. As Black and colleagues (2011) suggest, there are certainly "macro" level factors at play (political and economic pressures brought about by environmental conditions), but the "meso" (social) and "micro" (individual) factors do have a significant relationship with willingness to move in this context. These factors are often overlooked in popular discussions about migration.

This paper also draws on the social vulnerability and resilience/adaptive capacity paradigms within disaster research (Adger et al. 2018; Cutter et al. 2008; Norris et al. 2008) to frame environmental migration behavior. I argue that unwillingness to move represents a form of vulnerability in this context, whereas willingness to move represents an adaptive response, a potentially resilient attribute. From a practical standpoint, it is critical in regions, such as southeast Louisiana, to take into account who may be unwilling to move in the face of environmental threats and why.

These findings support existing research on the relationship between risk perceptions and adaptive behaviors (Bergstrand and Mayer 2017; Burnside et al. 2007; Dash and Gladwin 2007). I found that increases in perceptions of environmental threats were associated with increased odds of being willing to move if the threats continued or worsened. This indicates that if

residents are presented with information from a trusted source about the risks associated with living in a place facing coastal erosion and an increase in the severity of hurricanes, they may be more willing to move. Or, at the very least, presenting them with information about environmental issues gives them more information to make a thoughtful, calculated decision about moving.

One of the potential inhibitors of voluntary environmental migration is place attachment. While place attachment may evoke positive feelings, strong feelings about one's community and local environment have been shown to be associated with negative outcomes and additional disruptions after disasters (Cope et al. 2013; Lee and Blanchard 2012; Parks et al. 2018). Low (1992) argues that residents of areas experiencing land loss may actually exhibit *more* place attachment in response to environmental threats (see also LeMenager 2014), which may, in turn, make them even *less* likely to move, as evidenced by these results.

Ties to particular industries, and therefore their relationship to natural resources and the environment, affect the responses of those living in environmentally threatened regions (Kroll-Smith and Couch 1993, 1991). Many residents of southeast Louisiana have ties to the fishing, oil, and tourism industries. Residents with ties to the fishing industry face particular challenges because of their economic and sociocultural ties to the environment (Arata et al. 2000; Cope et al. 2013; Flint and Luloff 2005; Gill et al. 2016; Oberg et al. 2016; Parks et al. 2018; Picou and Gill 1996; Urquhart and Acott 2004). Economically, those with ties to the fishing industry rely on a healthy natural resource base (i.e. one free from pollution and oiling). Industrial pollution, oil spills, and hurricanes, which can dredge up oil from past spills, can affect the health of fish and seafood, thus impacting the livelihoods of fishers. In a less material sense, changes to the environment may affect the sociocultural wellbeing of fishers. Fishing, for many in southeast

Louisiana, permeates all aspects of fishers' lives (Marshall et al. 2007), so any damage to the resource base is therefore damage to their identity and way of life (Henry and Bankston 2002; Oberg et al. 2017; Picou and Gill 1996). As such, moving may be out of the question for many fishers. So, fishers are both vulnerable to changes to the environment and are less likely to engage in adaptive behavior (in this case, voluntary migration) in the face of environmental threats.

While I present new information about voluntary migration in southeast Louisiana, my study is not without limitations. There are two particular limitations I would be remiss in not addressing: the measurement of the dependent variable and the sampling strategy. As mentioned previously, the dependent variable is measured as a dichotomous indicator of whether or not a respondent would be willing to move if a particular environmental threat continued or worsened. There were a large number of respondents who indicated that they "don't know." These cases were included with the "yes" respondents since they did not voice strong opposition to moving, what I conceptualize as a potential form of vulnerability. An affirmative or tentative response could be a precursor to adaptive behavior.

Also, the multi-mode strategy, though employed to increase respondent participation, presented a number of challenges. For example, the mail survey erroneously did not include a question for sex. However, a team of researchers worked to code each respondents' sex, which was then checked against a model-based imputation for sex (Cope et al. 2018). Also, the format of different modes may have encouraged or discouraged respondents from saying "don't know" or "refuse," similar to the dependent variables. That said, I attempt to account for this by controlling for survey mode.

As a future direction, I recommend qualitative inquiry into these questions. While I present novel information about voluntary migration, survey responses provide limited information about the lived experiences of those living in areas affected by climate change. Qualitative research will be critical to understanding why residents may want to stay in their homes and what their specific hesitations are about leaving.

Conclusion

In this paper, I show that voluntary migration may be dependent upon factors such as risk perceptions, place attachment, and ties to the fishing industry. More specifically, I find that risk perceptions are positively associated with willingness to move and that place attachment and ties to the fishing industry are negatively associated with willingness to move. Furthermore, I show that, as risk perceptions increase, those with ties to the fishing industry are significantly less likely to be willing to move away than those without ties to the fishing industry. Drawing on research on disasters, I conceptualize willingness to move as an adaptive capacity and unwillingness to move as a form of vulnerability. Therefore, Louisiana residents with ties to the fishing industry are uniquely vulnerable to potential environmental hazards.

As the coast of southeast Louisiana continues to be threatened by changing environmental conditions, it will be critical to understand the motivations of those who are both willing and unwilling to move. Analyses such as these are the first step to equitable mitigation planning and eventual relocation.

Chapter 2. Predicting Self-Rated Physical and Mental Health Before and After the Announcement of the Flint Water Crisis

Introduction

Sociological research on disasters has its roots in understanding social order (Kreps 1984). Researchers working in this area often conceptualize disasters as disruptive events that exacerbate existing stress and social inequality (Fritz 1996). Similarly, the environmental justice movement focuses on social inequalities as they relate to environmental hazards (Brown 1995; Bullard 1983; Bullard and Wright 1987; Lerner 2010; Taylor 2014). These areas of research intersect when the focus of the research examines the outcomes facing vulnerable populations after disasters or other traumatic events (Adeola and Picou 2016; Bolin and Kurtz 2018). In this paper, I bring these perspectives together in the context of Flint, Michigan, both before and after the onset of the Flint Water Crisis (FWC).

Using unique data from Genesee County, Michigan, I explore the ways race, perceived marginalization, and sense of community relate to self-rated physical and mental health before and after the announcement of the FWC. Given the findings of previous research on disasters and health over time (Lee and Blanchard 2011; Cope et al. 2013), these analyses will be conducted using data from two time points, thereby examining whether the relationships of race, perceived marginalization, and sense of community on physical and mental health differ after the announcement of the FWC. This provides an opportunity to explore whether the predictors of health change in a disaster or mass-trauma situation. As a result, these findings contribute to the research on health and disasters by assessing the extent to which factors predicting physical and mental health differ across disaster contexts.

Background

In an attempt to save the city about $200 million over the course of 25 years (Kennedy 2016),

Flint's water system was switched from Detroit's water system to water from the Flint River in

April 2014. The improperly treated acidic water from the Flint River leached lead and other

harmful chemicals from the city's water pipes so that by the time water reached residents' taps, it

was highly contaminated. About six months after the switch, GM informed the city that the water

used in their factories in Flint was corroding their cars. GM subsequently received water from an

alternative source (Colias 2016). Residents, however, were not so lucky. Despite residents'

complaints, Michigan's Department of Environmental Quality insisted the water was safe (Felton

2014).

As time went on, it became clear that the water, or rather, what the water was doing to the

city's pipes, was not safe. Flint was found to be in violation of the Safe Drinking Water Act

because of carcinogenic particles in the water (Kennedy 2016). Over time, evidence validated

residents' fears. A water-testing team from Virginia Tech reported that water from the Flint

River had eight times as much chloride as the water from Detroit, and because the city failed to

treat the water, the high levels of chloride in the water began to corrode the pipes, which were

lined with lead (Edwards 2015; Wisely 2016). Approximately twelve residents died from

Legionnaires' disease, a severe lung infection, which experts associate with the contaminated

water (Fonger 2017). A local pediatric team found elevated levels of lead in children's blood

(Hanna-Attisha et al. 2016). Lead poisoning is known to hinder developmental and biological

processes, especially in children, including cognition, behavior, and life outcomes (Hanna-

Attisha et al. 2016), so it should be noted that the health impacts of the Flint Water Crisis may

continue to manifest for many years.

Research on disasters and mass-trauma events, like the FWC, often confronts methodological constraints (Galea et al. 2007). For example, much research on disasters is conducted post-hoc, so there often is no baseline of pre-disaster information for comparison. When there is pre-disaster data available, researchers tend to focus on either the changes in outcomes after a disaster or pre-event characteristics that predict particular outcomes (Rhodes et al. 2010). While this research is certainly important for disaster mitigation planning, this linear perspective ignores the possibility that crisis situations may induce a new social and psychological reality, one that operates quite differently than social and psychological processes during a more stable time period. Therefore, the predictors of health during a crisis situation may be different than when individuals are engaged with a more familiar environment.

Race, Marginalization, and Health

Many researchers within disaster sociology and other forms of disaster research have urged policymakers to view disasters as environmental justice issues (Tierney 2007). Race and ethnicity are perhaps some of the more salient predictors of social inequality and social vulnerability in the United States. Cutter et al. (2003) argue that race "contributes to social vulnerability through the lack of access to resources, cultural differences, and the social, economic, and political marginalization that is often associated with racial disparities" (253). These disparities may be especially pronounced in Flint, a city marked by economic depression, crime, and other correlates of poverty. About 57% percent of Flint residents identify as black either alone or in combination with other races, and about 43% of residents identify as white alone or in combination (U.S. Census Bureau 2019). Forty-one percent of Flint residents live under the poverty level, but that overall rate masks the uneven distribution of economic

disadvantage by race; 44% of blacks in Flint live under poverty, and the corresponding rate for

whites is 8 percentage points lower at 36% (U.S. Census Bureau 2019).

Race may also be centrally involved in the crisis itself. After receiving testimonies from

Flint residents and officials, the Michigan Civil Rights Commission concluded that the FWC

occurred because of systemic racism (Michigan Civil Rights Commission 2017). From their

report:

> In January 2016, a series of states of emergency for the city of Flint were declared
> by the Mayor, the Governor, and even the President…It was all hands on deck.
> From all accounts, the government was operating the way we would expect it to
> operate in response to an emergency. What then, was the problem? The timing.
> Preceding this flurry of "state of emergency" activity, Flint residents had been
> reporting heavily discolored and bad tasting water for well over a year. (2017).

They go on to argue that the FWC probably would not have happened in wealthier, whiter cities

with more political clout and a larger tax base. When residents raised concerns about their water

(Felton 2014) and when doctors presented evidence that blood levels in children were rising, city

and state officials minimized their concerns and tried to discredit them (Hanna-Attisha 2018). As

the Civil Rights Commission argues, systemic racism in Flint is not an intentionally racist

process by city and state officials, but rather, is the result of historical legacies of racism and so-

called NIMBY or "not in my backyard" policies (Mohai and Saha 2007; Saha and Mohai 2005).

This systemic, environmental racism has implications for health and well-being. Racial

disparities persist, even when accounting for socio-economic status (Williams et al. 2016).

Blacks and Hispanics are more likely to live in areas affected by air pollution, and relatedly,

asthma rates and heat-related mortality are higher among blacks (Frumkin 2002). Even prior to

the mass lead-poisoning in Washington, D.C., and Flint, Michigan, blacks were known to have

higher blood lead levels than whites (EPA 1992).

As a result of multiple, interlocking systems of racism, blacks and other ethnic minorities may find themselves living in areas home to hazardous waste sites (Lerner 2010; Taylor 2014), in areas prone to disaster (Rhodes et al. 2010), or, in the case of Flint, without proper water testing and treatment. Exposure to lead, particularly in childhood, is associated with many physical health issues, as well as cognitive issues that could affect a person's mental health (Hanna-Attisha et al. 2016). However, when residents voice concern about their health, and government officials refuse to respond to their concerns, new issues emerge (what Kai Erikson refers to as "a new species of trouble" (Erikson 1994)) as those in power deny any wrongdoing and further marginalize those whose health is at risk. Put another way, "…while it is common to hear the argument that 'the good of society' sometimes requires that local concerns be overlooked, a growing body of evidence now points to just the opposite conclusion: it can be the very 'overlooking' of supposedly 'local' concerns that may actually create the greatest risks to the social fabric…" (Freudenburg 1997:94). In sum, systemic racism contributes to health inequalities, and when people feel as if their concerns are not being heard or taken seriously, this can take an additional toll on their physical and mental health.

Sense of Community and Health

Sense of community is a general term to describe the feelings individuals have for and the experiences they have with their communities. For brevity's sake, I will not be discussing the theoretical differences between constructs that could contribute to a person's sense of community. While I do feel that there are important distinctions between these concepts, what is important is that they are all individual-level perceptions of their "community," as defined by individuals, and the people who make up that community.

In their seminal work on the systemic model of communities, Kasarda and Janowitz (1974) find that length of residence is a stronger predictor of community attachment (which they operationalize as social bonds) than population size or density. This stands in opposition to previous work that argued urbanization and industrialization inhibits sense of community (e.g. Wirth 1938). This is important in an urban area like Flint that changed dramatically after GM closed many of its facilities in the area. The crime, economic depression, and water crisis may at first make Flint seem like a place where residents have little community attachment. However, research suggests that if the place a person is tied to begins to fundamentally change, this may contribute to additional attachment (Low and Altman 1992), potentially strengthening the bonds a person feels for their physical community and the people within it.

The research on health and a person's connections to their community in a disaster context is mixed. In some cases, having strong social ties nearby can be beneficial in the aftermath of disasters (Fan et al. 2015; Rung et al. 2017). However, strong social ties can also be a source of stress, especially when the members of a person's social network are also under stress (Beaudoin 2011; Norris and Kaniasty 1996). This could be especially pronounced in the context of a technological disaster, where anger, uncertainty, and competing narratives of blame keep residents from feeling a sense of resolution. Sociologists of disaster refer to this process as "corrosive community" (Erikson 1976, 1994; Freudenburg 1997; Mayer et al. 2015; Picou and Gill 2007; Picou et al. 2004).

Another mechanism that explains the relationship between sense of community and health is time. For example, Lee and Blanchard (2012) found that, after the Deepwater Horizon oil spill, residents with higher levels of community attachment (measured by questions capturing respondents' satisfaction with their communities) reported more negative affect than residents

with less community attachment. However, subsequent research that included additional waves of data found that increased place attachment predicted better mental and physical health as time went on (Cope et al. 2013). This suggests that those who feel very satisfied with their communities might, at first, feel significant disruption brought upon by a disaster or other crisis (Weil et al. 2012), but over time, this rootedness within their communities helps them recover. Therefore, there may be distinct phases of a disaster or crisis, when there may be different predictors of health and well-being. Addressing this possibility fills a theoretical gap within the research on disasters and mass trauma events and advances our understanding of the consequences of these events. As such, we should be cognizant that what is beneficial under normal circumstances may not be the same as what is beneficial during a disaster or other traumatic event.

Research Questions

1. Do self-rated physical and mental health scores significantly differ between 2013 and 2015 in Flint, Michigan?

2. What are the relationships between race, perceived marginalization, sense of community, and self-rated physical and mental health in 2013 and 2015?

3. Do the relationships race, perceived marginalization, and sense of community have with self-rated physical and mental health differ between 2013 and 2015?

Methods

Data

Data for this paper come from the 2013 and 2015 waves of the Speak to Your Health! Community Survey (STYH). STYH is a biennial cross-sectional survey that has been conducted since 2003 to explore a range of issues related to health and well-being in Genesee County, Michigan. STYH is funded by the Centers for Disease Control and Prevention and the Genesee County Health Department. The goals of STYH are to (University of Michigan School of Public Health 2018):

> 1) understand residents' health-related behaviors and perceptions; 2) provide information for needs assessments and evaluations of projects; 3) identify community assets; 4) understand the associations between residents' health-related behaviors and perceptions, social determinants, and health outcomes; 5) provide training opportunities; and 6) develop a community health agenda that is widely disseminated and democratic.

The 2013 data were collected between October 2013 and December 2014 (n=1,056), and the 2015 data were collected between September 2015 and September 2016 (n=880). Based on census tracts, participants were randomly recruited from address lists from the United States Post Office. Recruitment also occurred through social media postings and community-based collection efforts. Additionally, prior survey participants were re-contacted via email. The survey could be completed as a hard copy or as an online questionnaire (Kruger 2018; Kruger et al. 2017). Using the 2013 and 2015 waves of STYH data allows for an examination of mental and physical health change after the announcement that the Flint River water was unsafe in early 2015. This is roughly the same time frame used in previous research (Hanna-Attisha et al. 2016).

Measures

Dependent Variables

The dependent variables for this paper are self-rated physical and mental health. Respondents were asked to rate their physical and mental health as *poor, fair, good, very good, or excellent* (Ware and Sherbourne 1992). Responses were coded from 0 to 4, with higher scores indicating better health.

Key Independent Variables

Race is measured as a dichotomous variable where white=1 and all others=0. Very few respondents selected options other than white or black, so I opted to dichotomize the measure. For the few respondents who selected more than one race, such as white and black, respondents were then included in the "all others" category. This approach has been used with previous waves of STYH data (Mathis et al. 2016).

Perceptions of marginalization are measured with five questions. Respondents were asked to think how often the following situations had occurred in the past 12 months:

1. How often do you think you have been ignored, overlooked, or not given service (in a restaurant, store, etc.)?
2. How often do you think you have been treated rudely or disrespectfully?
3. How often do you think you have been observed or followed while in public places?
4. How often do you think you have been treated as if you were "stupid," being "talked down to?"
5. How often do you think your ideas or opinions have been minimized, ignored, or devalued?

Response options were *never*, *rarely*, *sometimes*, and *often* and coded so that more frequent perceived marginalization had a higher score. These items were summed, creating a scale of perceived marginalization ranging from 0 to 15 ($\alpha=0.88$).

Four separate variables were used to capture sense of community. The first, *length of residence*, is measured in years. The second, *quality of life*, is a four-point categorical variable indicating how satisfied respondents are with the quality of life of their neighborhoods (higher scores indicate more satisfaction). The third measure, *social support*, is a scale ranging from 0 to 28, which reflects how connected residents report being to their family, friends, and community ($\alpha=0.86$). The fourth measure is a scale, ranging from 0 to 16 indicating how much *trust* respondents have in others in their neighborhood ($\alpha=0.87$).

I also include a series of control variables, including *education* (less than high school=0, high school or GED=1, some college=2, technical or associate degree=3, bachelor's degree=4, masters degree or more=5), *age* (continuous), *sex* (female=1), *marital status* (married=1), and *employment* (employed=1).

Analytic Strategy

To prepare data for analysis, I first pooled the two waves of data together. After listwise deletion of cases with missing variables, 1,635 cases were available for analysis (n=873 at Time 1 and n=762 at Time 2). I then ran descriptive statistics and t-tests to determine if there are differences in the means of the variables of interest over time.

Next, to explore whether processes of corrosive community emerged after the announcement of the FWC, I examined predictors of self-rated health by running ordinary least squares regression models to determine what relationships the key independent variables (race, marginalization, sense of community, and the demographic controls) had with self-rated physical and mental health at Time 1 and Time 2.

Results

Descriptive statistics are presented in Table 1, including the mean/percentages and standard deviations of variables in the 2013 and 2015 waves, as well as significance levels for the t-tests. Physical health scores increase marginally, and mental health scores decrease significantly. This suggests that, compared to 2013, residents reported better physical health and worse mental health.

There are also some changes with respect to the key independent variables. For example, 2015 respondents report significantly more perceived marginalization than 2013 respondents, and they report a significantly shorter length of residence and significantly less social support. Race, quality of life, and trust do not significantly change over the two waves.

Table 2.1. Descriptive statistics

	2013		2015		
	Percentage or Mean	Standard Deviation	Percentage or Mean	Standard Deviation	Two-Tailed T-Test P Value
Self-rated physical health	2.1	1.0	2.2	1.0	0.050
Self-rated mental health	2.7	1.0	2.5	1.0	0.000
White	68.3%	-	67.1%	-	0.602
Perceived marginalization	4.3	3.4	5.8	3.9	0.000
Length of residence	20.7	17.0	16.5	15.6	0.000
Quality of life	2.1	0.9	2.0	0.9	0.366
Social support	18.2	4.5	17.5	5.3	0.019
Trust	10.7	3.5	10.4	3.7	0.149
Education					
Less than high school	5.1%	-	3.2%	-	0.012
High school or GED	27.1%	-	20.0%	-	0.001
Some college	25.0%	-	22.0%	-	0.214
Technical/associates	15.0%	-	17.6%	-	0.396
Bachelor's	16.3%	-	20.1%	-	0.079
Masters or more	11.5%	-	17.3%	-	0.000
Age	61.4	16.4	51.9	17.4	0.000
Female	67.6%	-	71.6%	-	0.089
Married	47.6%	-	42.0%	-	0.012
Employed	29.4%	-	47.0%	-	0.000
N	873		762		

Data: Speak to your Health! Community Survey, 2013 and 2015

Physical Health

Table 2 presents four OLS regression models predicting self-rated physical and mental health in 2013 and 2015. In 2013, being white is associated with worse physical health (B=-0.15; p=0.041), counter to expectations. Perceived marginalization, however, is significantly associated with worse physical health (B=-0.05; p=0.000), as expected. Overall, variables representing sense of community are related to better health; length of residence, quality of life, and social support each have a significant, positive relationship with better self-reported physical health, while trust does not have a significant relationship with self-reported physical health. Compared to those without a high school degree, respondents who received at least some college credit or more had significantly better health. Being married (B=0.14; p=0.029) and being employed (B=0.35; p=0.000) are both positively associated with better self-rated physical health. Increased age is negatively associated with self-rated physical health (B=-0.01; p=0.036), and sex had no significant relationship with self-rated physical health.

In 2015, two of the focal variables, race and social support, no longer have a significant relationship with self-rated physical health. This suggests that these traits, while predictive of pre-disaster or baseline self-rated physical health, are not as beneficial during a disaster. I find the same is true for being married. In contrast, perceived marginalization (B=-0.03; p=0.000), length of residence (B=0.01; p=0.013), quality of life (B=0.15; p=0.002), increased education, age (B=-0.01; p=0.001), and being employed (B=0.27; p=0.000) all continue to have a significant relationship with better self-rated physical health. The processes linking these factors to physical health appear to be more consistent across pre- and post-disaster contexts. Notably, while trust does not have a significant relationship with self-rated physical health in 2013, increased levels of trust are associated with better self-rated health in 2015 (B=0.02; p=0.029).

This is an important shift and suggests that, in stressful contexts, a sense of trust may help people

feel healthy and resilient.

Table 2.2. Predictors of self-rated health before and after the announcement of the Flint Water
Crisis

	Self-Rated Physical Health		Self-Rated Mental Health	
	2013	2015	2013	2015
	B (SE)	*B* (SE)	*B* (SE)	*B* (SE)
Marginalization				
White	-0.15 (0.08)*	-0.05 (0.07)	-0.28 (0.07)***	-0.08 (0.07)
Perceived Marginalization	-0.05 (0.01)***	-0.03 (0.01)***	-0.07 (0.01)***	-0.08 (0.01)***
Sense of Community				
Length of Residence	0.00 (0.00)*	0.01 (0.00)*	0.01 (0.00)***	0.00 (0.00)
Quality of Life	0.09 (0.04)*	0.15 (0.05)*	0.11 (0.04)**	0.09 (0.05)
Social Support	0.03 (0.01)***	0.00 (0.01)	0.05 (0.01)***	0.01 (0.01)*
Trust	0.01 (0.01)	0.02 (0.01)*	0.00 (0.01)	0.02 (0.01)
Demographic Controls				
Education				
Less than High School (ref)				
High School or GED	0.22 (0.16)	0.74 (0.22)**	0.35 (0.16)*	0.26 (0.23)
Some College	0.38 (0.16)*	0.75 (0.22)**	0.44 (0.16)**	0.33 (0.23)
Technical/Associates	0.50 (0.17)**	0.78 (0.22)***	0.61 (0.16)***	0.44 (0.24)
Bachelor's	0.78 (0.17)***	0.88 (0.22)***	0.66 (0.17)***	0.56 (0.24)*
Masters or More	0.64 (0.18)***	1.02 (0.23)***	0.66 (0.17)***	0.49 (0.24)*
Married	0.14 (0.07)*	0.09 (0.07)	0.19 (0.07)**	0.13 (0.07)
Age	-0.01 (0.00)*	-0.01 (0.00)**	0.00 (0.00)	0.00 (0.00)
Female	0.00 (0.07)	0.09 (0.07)	-0.08 (0.07)	-0.03 (0.08)
Employed	0.35 (0.08)***	0.27 (0.08)***	0.38 (0.08)***	0.23 (0.08)**
Intercept	1.12 (0.125)***	1.29 (0.28)***	1.02 (0.25)***	1.61 (0.30)***
R2	0.21	0.18	0.24	0.20
N	873	762	873	762

Data: Speak to your Health! Community Survey, 2013 and 2015
Notes: *p<0.05; **p<0.01; ***p<0.001.

Mental Health

In the 2013 model predicting self-rated mental health, race (B=-0.28; p=0.000) and perceived

marginalization (B=-0.07; p=0.000) are significantly negatively related to mental health. Again,

white respondents tend to have worse mental health scores in Flint. Length of residence (B=0.01;

p=0.000), quality of life (B=0.11; p=0.009), and social support (B=0.05; p=0.000) are all

positively associated with self-rated mental health, but trust does not have a significant

relationship with mental health. Increased education, being married (B=0.19; p=0.004), and

being employed (B=0.38; p=0.000) are associated with better self-rated mental health. Age and

sex do not have a significant relationship with mental health; the former is different from the

comparable 2013 physical health model, while the latter is consistent with the 2013 physical health model.

In 2015, perceived marginalization (B=-0.08; p=0.000), social support (B=0.01; p=0.038), having received at least a four year degree, and being employed (B=0.23; p=0.006) continue to have significant relationships with self-rated mental health. However, a number of variables no longer have a significant relationship with self-rated mental health: race, length of residence, quality of life, having less than a bachelor's degree, and being married. This differs from the self-rated physical health model in that there are no new or stronger predictors of self-rated mental health in 2015.

Aside from the surprising result that nonwhite respondents reported better health scores, these findings support previous research. For example, the consistent relationship between perceived marginalization and poorer self-rated health speaks to the existing body of work on community corrosion (Freudenburg 1997). The pre-disaster relationships between sense of community and health scores affirm existing work on social capital, community sentiments, and health (Beaudoin 2011; Cope et al. 2013; Lee and Blanchard 2012; Rung et al. 2017), and the reduction in significance of these variables when predicting mental health in the midst of a disaster suggests that social processes may differ when individuals are under stress. Therefore, the connections people have to others may not continue to serve as resilience-building capacities when their communities are under stress. In other words, "the need for support may simply exceed the amount of support available" (Norris and Kaniasty 1996:507), and the benefits of being connected to others may wane in stressful contexts.

In addition, I ran partial-F (Chow) tests to determine whether there are significant statistical differences in the predictors of self-rated physical and mental health across time (see

Table 3). The results indicated that the predictors of self-rated physical health are statistically significantly different across time, whereas the predictors of self-rated mental health did not significantly change over time.

Table 2.3. Tests for differences in predictors of self-rated physical and mental health over time

	Self-Rated Physical Health		Self-Rated Mental Health	
	Model 1a	Model 1b	Model 2a	Model 2b
	B (SE)	B (SE)	B (SE)	B (SE)
Marginalization				
White	-0.11 (0.05)*	-0.15 (0.07)*	-0.20 (0.05)***	-0.28 (0.07)***
Perceived Marginalization	0.04 (0.01)***	-0.05 (0.01)***	-0.07 (0.01)***	-0.07 (0.01)***
Marginalization * Time				
White * Time		0.11 (0.01)		0.20 (0.10)
Perceived Marginalization * Time		0.02 (0.01)		-0.01 (0.01)
Sense of Community				
Length of Residence	-0.01 (0.00)***	0.00 (0.00)*	0.01 (0.00)***	0.01 (0.00)***
Quality of Life	-0.11 (0.03)***	0.09 (0.04)*	0.10 (0.03)**	0.11 (0.04)*
Social Support	-0.02 (0.00)**	0.03 (0.01)***	0.03 (0.01)***	0.05 (0.01)***
Trust	0.02 (0.01)**	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)
Sense of Community * Time				
Length of Residence * Time		0.00 (0.00)		0.01 (0.00)
Quality of Life * Time		0.06 (0.06)		-0.03 (0.07)
Social Support * Time		-0.03 (0.01)**		-0.03 (0.01)**
Trust * Time		0.01 (0.02)		0.01 (0.02)
Demographics				
Education				
Less than High School (ref)				
High School or GED	0.43 (0.13)**	0.22 (0.15)	0.34 (0.13)**	0.35 (0.16)*
Some College	0.53 (0.13)***	0.38 (0.15)*	0.40 (0.13)**	0.44 (0.16)**
Technical/Associates	0.61 (0.13)***	0.50 (0.16)**	0.56 (0.13)***	0.61 (0.17)***
Bachelor's	0.80 (0.13)***	0.78 (0.17)***	0.65 (0.13)***	0.66 (0.17)***
Masters or More	0.79 (0.13)***	0.64 (0.17)***	0.59 (0.14)***	0.66 (0.18)***
Married	0.11 (0.05)*	0.14 (0.06)*	0.16 (0.05)**	0.19 (0.07)**
Age	-0.01 (0.00)***	-0.01 (0.00)*	0.00 (0.00)*	0.00 (0.00)
Female	-0.04 (0.05)	0.00 (0.07)	-0.05 (0.05)	-0.08 (0.07)
Employed	0.31 (0.06)***	0.35 (0.08)***	0.31 (0.06)***	0.38 (0.08)***
Demographics * Time				
Education				
Less than High School (ref)				
High School or GED * Time		0.52 (0.28)		-0.09 (0.28)
Some College * Time		0.37 (0.27)		-0.11 (0.28)
Technical/Associates * Time		0.28 (0.28)		-0.16 (0.29)
Bachelor's * Time		0.10 (0.28)		-0.10 (0.29)
Masters or More * Time		0.39 (0.29)		-0.17 (0.29)
Married * Time		-0.06 (0.10)		-0.06 (0.10)
Age * Time		0.00 (0.00)		0.00 (0.00)
Female * Time		-0.09 (0.01)		0.05 (0.10)
Employed * Time		-0.08 (0.11)		-0.15 (0.11)
Intercept	1.26 (0.19)***	1.12 (0.25)***	1.31 (0.19)***	1.02 (0.25)***
F-Test Comparing Models		2.15**		1.46
F-Test (df1, df2)		(15, 1603)		(15, 1603)

Data: Speak to your Health! Community Survey, 2013 and 2015
Notes: *p<0.05; **p<0.01; ***p<0.001.

Figures 1 and 2 show the predicted values of self-rated physical and mental health, respectively, among respondents in the different survey waves as the social support scores increased. The black portions of the lines indicate where the predicted values are significantly different from one another. In 2013, increasing social support was associated with increasing physical and mental health scores. In 2015, however, increased social support did not significantly increase health scores. Furthermore, there were significant differences between respondents in different waves. In 2013, social support was associated with significantly worse self-rated physical health than in 2015, but in 2015, the effect of social support on physical health scores did not change, whereas in 2013, there was a dramatic increase in physical health scores as social support increased.
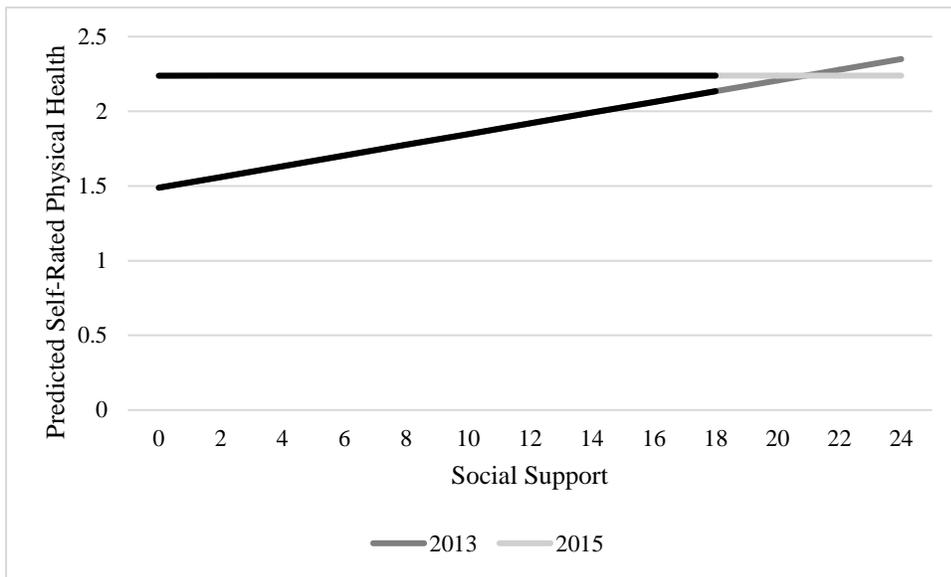

Figure 2.1. Predicted self-rated physical health
Data: Speak to your Health! Community Survey, 2013 and 2015

In predicting mental health scores, a similar trend emerged, where respondents with low social support in 2013 had significantly lower self-rated mental health scores than respondents in 2015 with low social support. However, as social support continues increasing, respondents in

2013 have higher predicted mental health scores than respondents in 2015. These findings

suggest that the benefits of social support may depend on context. More specifically, it aligns

with past research that explores the potentially harmful (or ineffective) effects of social capital,

especially in the context of disasters (Beaudoin 2011; Lee and Blanchard 2012; Weil et al. 2011).
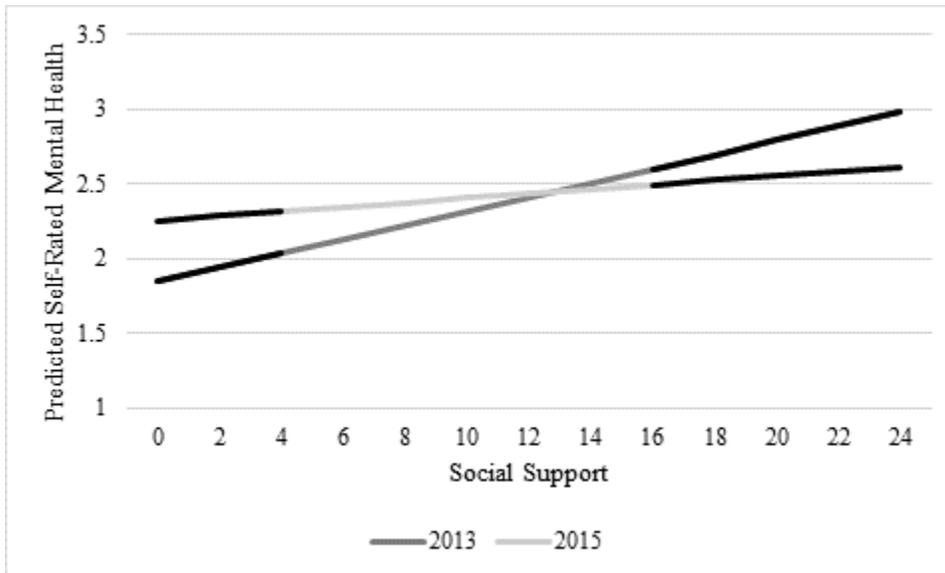
Figure 2.2. Predicted self-rated mental health
Data: Speak to your Health! Community Survey, 2013 and 2015

Discussion

STYH data provide a unique opportunity to explore the changes within a community over time.

In these analyses, I examined whether the predictors of physical and mental health changed after

the announcement of the FWC. In doing so, I brought together two existing areas of research: 1)

environmental justice research on vulnerable populations, and 2) disaster research predicting

health outcomes. I did so in a novel way by considering that the pre-disaster and post-disaster

social and psychological realities may be different, not just predictors of one another.

As anticipated, respondents reported worse mental health in 2015. This is consistent with

previous research on disasters and environmental justice issues (Rhodes et al. 2010; Rung et al.

2017), as events like the FWC can disrupt feelings of safety and community (Ritchie and Gill 2007; Ritchie et al. 2014), as well as residents' everyday activities (Parks et al. 2018).

Unexpectedly, respondents reported significantly better physical health in 2015. There are a number of reasons why this might be the case. One possible explanation is that the 2015 sample is simply physically healthier. Another explanation may have to do with how respondents in 2015 interpret the question. Data collection for the 2015 wave began as Governor Rick Snyder was acknowledging that the Flint water was unsafe. It is possible that respondents may rate their health better *because* of the context. Many residents of Flint were complaining of skin rashes, digestive issues, and headaches; some were suffering and dying from Legionnaires' disease. With this in mind, respondents not dealing with major health issues assumed to be related to lead-ridden water may rate their health slightly higher, knowing that their friends, family, and neighbors have very real and very serious health concerns. That said, these possible explanations are speculative.

In the regression analysis, I show that the different predictors of mental and physical health across time. Only one variable, social support, has a significantly different relationship with both physical and mental health across time points. This all suggests that disaster or crisis periods induce a different type of functioning, where those affected may benefit from different capacities than during a less disruptive time, particularly as this pertains to the resources they receive from their social support networks.

While I feel that these analyses take a novel approach to our understanding of stressful contexts and health, there are a number of limitations I want to address. For example, these are cross-sectional data that are not totally representative of the Genesee County population, and the representation changes across waves. It is possible that some differences in the relationships

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between the independent and dependent variables across time points have to do with the representativeness of the sample.

The data collection efforts roughly reflect pre-FWC and mid-FWC conditions, but there is some overlap. Data collection for the first wave ended in December 2014, which was eight months after the switch to the Flint River water. By the beginning of data collection for the 2015 wave, doctors were finally able to convince Governor Rick Snyder that the water was unsafe to drink. Also during the 2015 wave, there was an outbreak of Legionnaire's disease, several emergency declarations were issued, and a number of state officials were charged for their roles in the FWC. So, it is possible that some of the 2013 respondents were dealing with the early effects of the FWC.

Relatedly, I am cautious to describe the 2013 data as a "baseline" or "static state" because of Flint's tumultuous recent history. Flint can be considered what sociologists refer to as a "community of fate," that has been marked by declines in resources and opportunity over time (Logan 1978; Stinchcombe 1965). However, 2013 was certainly a more stable time for Flint residents than 2015, when the reality of the FWC was on full display. As such, I feel comfortable describing 2015 as a disaster or mass-trauma time period in contrast to 2013.

I also want to address the use of the disaster sociology frame I have used to guide this research. Many people see disasters as acts of God, completely out of our control; even technological disasters evoke the idea of an accident, where responsibility is obfuscated through the failures of multiple people and systems (Perrow 1984; Ritchie et al. 2013). While I draw on paradigms from research on disasters, I do not mean to imply that the FWC was an "accident" or "act of God." Rather, it was a technological failure brought upon by systemic racism (Hanna-Attisha 2018). It is not the first disaster of this type (Erikson 1994), and it will not be the last.

Accordingly, I use disasters as a frame of reference because of the robust body of research on health and disasters. This work spans many disciplines and aims to understand how humans respond to stress and loss. In this way, I argue that the findings from this study inform our understanding of how individuals characterize their health.

Conclusion

In this paper, I have shown that self-rated health may depend on different personal characteristics depending on the context. As the FWC unfolded, there was a shift in the significance of the resilience-building capacities of Genesee County residents. More specifically, the self-rated physical and mental health of Genesee County residents were predicted by different characteristics in 2013 and 2015, before and after the announcement of the FWC. This suggests that disasters and other mass-trauma events create a new social-psychological landscape, where a person might feel better or worse for different reasons than they would in a less stressful context. For example, I have demonstrated that social support, while beneficial to health in a more stable time frame, may not provide the same resources or health benefits during a crisis or disaster. This is a marked departure from other research on health and disasters because it acknowledges that the perceptions of health may differ based on the temporal context.

This research underscores the need to approach disasters or other mass-trauma situations as *events* (Kreps 1984), that not only exacerbate existing inequalities, but also disrupt routine functioning. As such, qualitative data that explore how individuals perceive their health and what factors support their health, both during "normal" circumstances and during more disruptive circumstances, are critical to building the knowledge base on health and disasters. In the absence of such information, I recommend researchers not only consider what pre-disaster factors are

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associated with health (Rhodes et al. 2010), but also how people's formulations of what health is

and what supports their health change in the aftermath of a disaster.

Chapter 3. Social Support, Religious Ecology, and Alcohol Misuse in the Gulf Coast

Introduction

There is mounting evidence that disasters contribute to negative health outcomes (Goldstein, Osofsky, and Lichtveld 2011; Norris 2006; Norris et al. 2002). Research has shown that disaster-affected individuals fare better if they have reserves of social capital to draw upon (Ritchie and Gill 2007). However, there is also evidence that social capital can induce additional stress as resources are spread thin (Norris and Kaniasty 1996) and people are faced with collective traumas (Beaudoin 2011; Weil, Lee, and Shihadeh 2012). Despite the contributions and advancements of disaster research, socio-cultural dynamics and contexts are sometimes overlooked. In the Gulf Coast, religion, in particular, is a powerful social force that should not be overlooked. In this paper, I examine whether the relationship between social capital and alcohol misuse depends upon the religious context. In doing so, I bring together research on disasters, social capital, and religious ecology.

Background

Alcohol and Disasters

Patterns of substance misuse after disasters bear additional research. Researchers have documented the extent to which disasters have affected residents' mental health states (Goldstein et al. 2011; Norris 2006; Norris et al. 2002). These impacts are often conceptualized through the Conservation of Resources (CoR) Model, which suggests that loss begets additional losses (Hobfoll 1989; Hobfoll and Lilly 1993). When individuals experience loss, whether that means losing one's job or experiencing strain on an important interpersonal relationship, that can impact

feelings of security or cause a person to experience other forms of loss so that a "loss spiral" ensues, which can severely impact a person's mental health. It is reasonable to assume that this would extend to behavioral health as well (Keyes, Hatzenbuehler, and Hasin 2011; Stewart 1996).

Indeed, research suggests that disaster exposure is related to alcohol use, such as among Manhattan residents in the years after 9/11 (Vlahov et al. 2004; Welch et al. 2014) and among adults after Hurricane Katrina (Beaudoin 2011; Flory et al. 2009). In the months after the DHOS, research indicated that there were minimal to no changes in alcohol consumption among residents of the Gulf Coast (Gould et al. 2015). However, the effects of disasters are known to play out over time (Gill et al. 2014). More research is needed in the U.S. Gulf Coast to examine whether residents exhibit patterns of problem drinking in the years following disasters.

Alcohol and Social Capital

Social capital is often considered one of the cornerstones of resilience (Abramson et al. 2010; Norris et al. 2008). Social capital refers to the features of social organization "which act as resources for individuals and facilitate collective action" (Lochner et al. 1999). Social capital is a multi-faceted concept that encompasses a range of capacities that involve the exchange of resources through social networks. One such capacity is social support, which can be defined as "social interactions that provide individuals with actual assistance and embed them into a web of social relationships perceived to be loving, caring, and readily available in times of need" (Norris et al. 2008:138).

When individuals face stressors, they may turn to their support networks to cope (Cherry et al. 2015; Fan et al. 2015; Rung et al. 2017). However, there is evidence that being part of a close-knit community can be a source of stress after a disaster (Lee and Blanchard 2012; Weil et

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al. 2012) and may even encourage alcohol misuse (Beaudoin 2011). This may be due to a collective strain on resources, where "the need for support may simply exceed the amount of support available" (Norris and Kaniasty 1996:507). This underscores the utility of close ties outside one's immediate community in order to access diverse resources that could offset disaster impacts (Cope et al. 2018; Elliott et al. 2010; Granovetter 1973; Hurlbert et al. 2000).

Outside of the disaster context, evidence for the relationship between social capital and alcohol misuse is also mixed. For example, there is evidence that social capital may protect against binge drinking behaviors among college students in the United States (Weitzman and Chen 2005; Weitzman and Kawachi 2000). However, studies in Scandinavia found that social capital is sometimes associated with heavy drinking behaviors (Demant and Jarvinen 2011; Lindstrom 2005), suggesting that the effect of social capital may not be consistent in different contexts.

Alcohol and Religious Context

Perhaps one of the most ubiquitous social institutions in the United States is religion, particularly Christianity. For several decades, sociologists have applied the religious ecology or "moral communities" hypothesis to their research (Cochran and Akers 1989; Stark, Kent, and Doyle 1982). The religious ecology hypothesis argues that the more religious a community, the less delinquent its residents.

However, the beliefs of the various Christian denominations vary widely. Communities' so-called mortality theodicies, defined as the "theological factors that shape collectively held ideas about mortality, health, and illness" (Blanchard et al. 2008:1595), may shape societal norms about deviance (Lee and Bartkowski 2004), health, and views about alcohol, in particular (Bock, Cochran, and Beeghley 1987). For example, Catholics and Mainline Protestants have

more permissive views about alcohol, whereas Evangelical (Conservative) Protestants tend to be rather proscriptive about alcohol use (Clarke, Beeghley, and Cochran 1990; Ford and Kadushin 2002). These denominational differences may contribute to contextual cultural differences in attitudes toward alcohol.

The U.S. Gulf Coast

This paper focuses on the U.S. Gulf Coast region, where environmental and industrial hazards consistently threaten the natural environment and residents. In recent years, this area of the country has been struck by multiple hurricanes (including Katrina, Rita, Harvey, Irma, Nate, and Michael) and has experienced countless oil spills, including the largest marine oil spill in history, the DHOS (Robertson and Krauss 2010). The Gulf Coast is an apt study site, not only because of its exposure to disasters and environmental stressors, but also its rich cultural diversity.

This study examines the relationships between social capital and alcohol misuse while accounting for the role that more alcohol-permissive religious contexts may have on these relationships. This is critical in a region that routinely experiences disasters (Ayer et al. 2018) and where research has shown geographic variation in health outcomes (Ramchand et al. forthcoming). Furthermore, the Gulf Coast is home to both alcohol-permissive and alcohol-prohibitive denominations, which I argue may have an effect on alcohol misuse. Specifically, I anticipate that respondents with more local ties will be more likely to screen positive for potential alcohol misuse, relative to those with more extra-local ties, as the percentage of Catholics and Mainline Protestants increases. I argue that social embeddedness in alcohol-permissive contexts may contribute to increased alcohol consumption.

Research Questions

1. Is alcohol misuse related to religious context?

2. Does the relationship between social capital and alcohol misuse depend upon religious context?

Methods

Data

Survey of Trauma, Resilience, and Opportunity of Neighborhoods in the Gulf

Individual-level data are drawn from the Survey of Trauma, Resilience, and Opportunity among Neighborhoods in the Gulf (STRONG). The STRONG was designed to assess the health and well-being among residents of the Gulf Coast region. The sample includes adults (≥18 years) living in 56 counties/parishes on or near the Gulf of Mexico coast across five states (TX=16 counties, LA=12, MS=3, AL=2, FL=23) from April to August 2016.

The total sample includes 2,520 adult residents of the targeted geographic region. This total includes a traditional landline telephone sample yielding 1,617 respondents, combined with a sample of cell phone users yielding 903 respondents. The landline sample drew both listed and unlisted telephone numbers using random digit dialing. The overall landline sample was drawn at the county level and grouped into 11 regions across the five states to ensure respondents were drawn evenly from across the geography of interest and that respondents from major metropolitan areas did not dominate the sample. Additional information about sampling and response rates has been detailed elsewhere (Ayer et al. 2018; Drakeford et al. forthcoming; Ramchand et al. forthcoming).

Religious Congregations and Membership Study

County/parish-level data on religious adherence come from the Religious Congregations and Membership Study (RCMS) (Grammich et al. 2012). The RCMS, designed and disseminated by the Association of Statisticians of American Religious Bodies (ASARB), contains information about religious participation at the county level.

Weights

Individual/household-level weights were computed to improve the representativeness of the STRONG sample. First, a base weight was computed to account for the probability of selection into the study based on the population density of a given county/parish and the number of adults in the household (for landline respondents). Second, the base weight was adjusted using raking (Battaglia et al. 2009), an iterative procedure that matched specific demographic characteristics of the region (age, sex, race, ethnicity, education, and household income) to the population profile for the specified region from the 2012-2016 American Community Survey 5-year estimates (United States Census Bureau 2018). The final weights represent the number of individual adults in the specified population represented by a particular survey respondent. It is important to note that weighting cannot eliminate every source of nonresponse bias. However, proper conduct of random sampling and rigorous efforts to contact sampled persons, combined with accepted weighting techniques, have a strong record of reducing such bias. While our weighting scheme brings the STRONG sample more in line with the regional population on key sociodemographic measures, we cannot know how differential rates of response may have impacted other measures.

Measures

Dependent Variable

     Alcohol Misuse. I assessed alcohol misuse using the three-item Alcohol Use Disorders

Identification Test (AUDIT-C). The AUDIT-C captures both binge and frequent drinking and

provides an indication of whether a respondent is potentially at risk for alcohol misuse (Bradley

et al. 2007; Bush et al. 1998). The scores for the following questions are added together.

1. How often do you have a drink of alcohol? (*Never = 0, once a month or less = 1, 2-4 times a month = 2, 2-3 times a week = 3, or 4 or more times per week = 4*)
2. How many standard drinks containing alcohol do you have on a typical day? (*1 or 2 = 0, 3 or 4 = 1, 5 or 6 = 2, 7 to 9 = 3, 10 or more = 4*)
3. How often do you have six or more drinks on one occasion? (*Never = 0, less than monthly = 1, monthly = 2, weekly = 3, daily or almost daily = 4*)

Scores greater than or equal to 4 for males and 3 for females meet the prescribed threshold for

potential alcohol misuse. Respondents meeting these criteria were coded as meeting this

threshold (yes=1).

Independent Variables

     Social Capital. In these analyses, I am making a distinction between two types of social

capital: local and extra-local support. Numerous studies have shown the wide-ranging benefits of

these different forms of support (Cope et al. 2018; Elliott et al. 2010; Granovetter 1973; Hurlbert

et al. 2000). Because research has shown that a wide variety of network structures are captured

by reference to 20 alters (individuals to whom a person has social ties) or fewer (McCarty,

Kilworth, and Rennell 2007), we asked respondents to think twenty close ties. Specifically,

respondents were asked, "How many of the twenty people emotionally closest to you live near

you?" If respondents reported that ten or more of the people emotionally close to them lived

nearby, they were coded as 1, and if they reported that nine or fewer emotionally close ties live

nearby, they were coded as 0. In other words, respondents with more local ties were coded as 1, and respondents with more extra-local ties were coded as 0.

Religious Ecology. The RCMS provides denominational adherence rates, based on the total adherence rates within a given county. Adherents, as defined by the RCMS, are "members, including full members, their children and the estimated number of other participants who are not considered members; for example, the 'baptized,' 'those not confirmed,' 'those not eligible for Communion,' 'those regularly attending services,' and the like" (Grammich et al. 2012). Previous research using STRONG data has used RCMS data to assess overall religious adherence within Gulf Coast counties and parishes (Drakeford et al. forthcoming), but given the differences in denominational attitudes toward alcohol, I examine the percentage of Catholic and Mainline Protestant adherents in the counties within the STRONG, as these denominations have demonstrated more permissive attitudes toward alcohol and may be more tolerant of alcohol use.

Controls. I also control for *sex* (female=1), *race* (white=1), ethnicity (Hispanic=1), *age* (using a quadratic term for respondents' ages), *education* (technical degree or some college=reference, less than high school=1, high school=2, and bachelor's degree or more=3), *employment status* (employed full time=reference, employed part time=1, retired=2, unemployed and looking for work=3, not employed and not looking for work=4, and on disability=5), *marital status* (married=1), self-reported DHOS-related losses (yes=1), and *personal religiosity* (not religious at all=0, somewhat religious=1, fairly religious=2, very religious=3).

Analytic Strategy

After deletion of cases with missing values, 2,123 cases were available for analysis. All analyses are weighted. I first present descriptive statistics for the sample, followed by bivariate logistic regression models for the aforementioned independent variables to show their respective

relationships with alcohol misuse. Then I present a multivariate logistic regression model that includes a multiplicative interaction term between the dichotomous variable for local versus extra-local support networks and the continuous variable for percentage of Catholic and Mainline Protestant religious adherents by county. To facilitate interpretation of the results of the model (Long and Mustillo 2018), I also present the predicted probabilities of potential for alcohol misuse among those with more local versus more extra-local support as the percentage of Catholic and Mainline Protestant adherents in a county increases.

Results

Descriptive statistics for the variables used in these analyses are presented in Table 1. Just over 27% of respondents met the prescribed threshold for a positive alcohol misuse screening. About 47% of respondents reported having a larger local support network than extra-local support network. On average, counties and parishes included in the STRONG sample have about a 24% combined Catholic and Mainline Protestant adherence rate.

Table 3.1. Descriptive statistics

	Percentage/Mean	Standard Deviation
Positive Alcohol Misuse Screening	27.1	-
Local Support Network	46.5	-
Female	53.3	-
White	77.8	-
Hispanic	15.4	-
Age	48.6	18.2
Education		
Less than High School	12.7	-
High School	28.4	-
Technical Degree/Some College	32.3	-
Bachelor's Degree or More	26.7	-
Employment Status		
Full Time	43.4	-
Part Time	10.5	-
Table continued		

	Percentage/Mean	Standard Deviation
Retired	23.6	-
Unemployed and Looking for Work	10.2	-
Not Employed and Not Looking for Work	8.2	-
On Disability	4.0	-
Married	46.6	-
Oil Spill Loss	38.3	-
Personal Religiosity	1.9	1.0
Catholic and Mainline Protestant Adherence	24.3	8.8

N = 2,123
Data: STRONG (2016), RCMS (2010)

To examine the relationships social support, religious context, and the control variables have with alcohol misuse, I specified a series of bivariate logistic regression models, which are presented in the "Bivariate Models" column in Table 2. The results indicate that respondents who report having a larger local support network than extra-local support network have more than twice the odds of a positive alcohol misuse screening (OR=2.01; p<0.001). Two other variables have a significant positive relationship with alcohol misuse: being employed full time (OR=1.91; p<0.01) and having at least a four-year degree (OR=1.80; p<0.01). Conversely, three variables have a protective effect against alcohol misuse, including being older (OR=0.99; p<0.01), being retired (OR=0.50; p<0.001), and personal religiosity (OR=0.72; p<0.001).

Table 3.2. Logistic regression models predicting alcohol misuse

	Bivariate Models		Multivariate Model	
	OR	RSE	OR	RSE
Local Support Network	2.01***	0.37	2.50	1.32
Female	0.72	0.14	0.83	0.16
White	1.46	0.39	1.46	0.42
Hispanic	0.81	0.25	0.67	0.22
Age	0.99**	0.00	0.99	0.00
Education				
Less than High School	0.46	0.04	0.59	0.26
High School	0.83	0.19	0.94	0.25
Technical Degree/Some College	0.95	0.19	-	-
Bachelor's Degree or More	1.80**	0.34	1.52	0.35

Table continued

	Bivariate Models		Multivariate Model	
	OR	RSE	OR	RSE
Employment Status				
Full Time	1.91**	0.36	-	-
Part Time	1.54	0.47	1.07	0.37
Retired	0.50***	0.09	0.54*	0.14
Unemployed and Looking for Work	0.48	0.21	0.43	0.22
Not Employed and Not Looking	0.64	0.24	0.63	0.24
On Disability	0.93	0.50	1.24	0.73
Married	1.09	0.20	0.93	0.18
Oil Spill Loss	1.06	0.20	0.97	0.18
Personal Religiosity	0.72***	0.07	0.73**	0.07
Catholic and Mainline Protestant Adherence	1.02	0.01	1.02	0.01
Local Support * Adherence			0.99	0.02

N = 2,123

Data: STRONG (2016), RCMS (2010)

Notes: OR = odds ratio. SE = robust standard error. *p<0.05; **p<0.01; ***p<0.001.

Moving to the multivariate analysis, I present a logistic regression model predicting a positive screen for alcohol misuse in the "Multivariate Model" column in Table 2. The model includes a multiplicative interaction term between individual-level social support and county-level Catholic and Mainline Protestant adherence rate.[4] After the inclusion of all the variables in the model, only being retired (relative to being employed full time) (OR=0.54; p<0.05) and personal religiosity (OR=0.73; p<0.001) continued to have a significant relationship with alcohol misuse. Based on the p-value, the interaction between social support and religious adherence is not significant. However, in order to compare the differences in potential alcohol misuse between those with local and extra-local social support at different values of religious adherence, I present the predicted probabilities of potential alcohol misuse among those with local versus extra-local support as Catholic and Mainline Protestant adherence increases in Figure 1.

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[4] Given that religious context is measured at the county-level, I also ran this model as a random intercept multilevel model using a series of county-level controls and a rescaled weight (Chantala et al. 2011). However, the intraclass correlation was low (0.018), none of the contextual controls had a significant relationship with alcohol misuse, and the results are quite similar to those from the single-level model. Thus, I present the single-level model for simplicity.
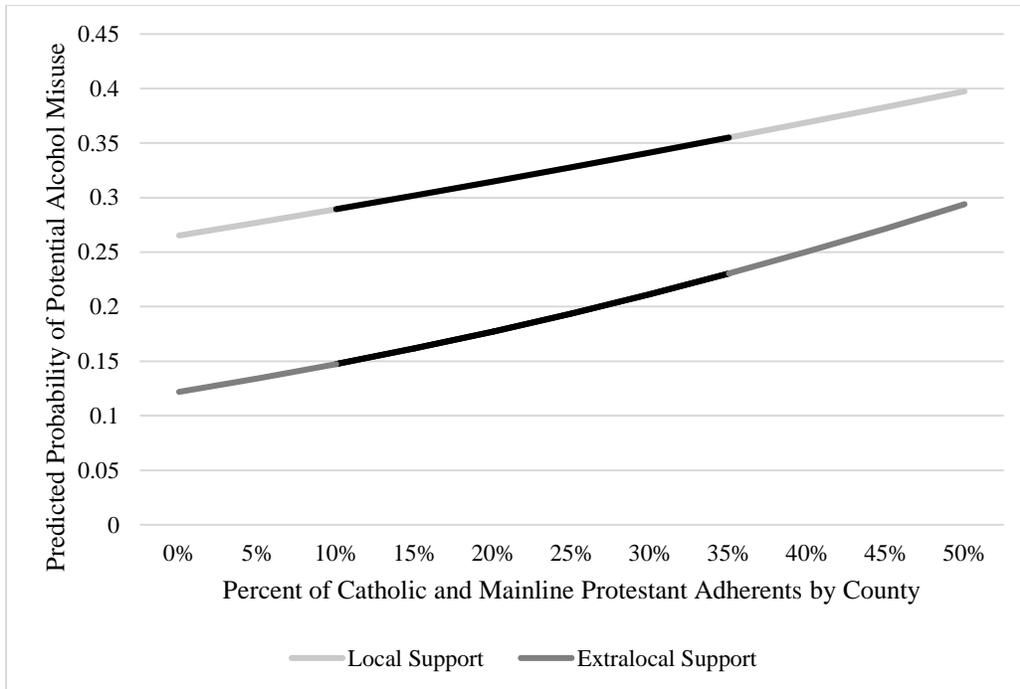
Figure 3.1. Predicted probabilities of potential alcohol misuse
Data: STRONG (2016), RCMS (2010)

Statistically significant differences between individuals with more local versus extra-local social support are indicated by the black portion of the lines. The predicted probabilities of potential alcohol misuse of the two social support groups become significantly different when about 10% of residents in a county or parish are actively participating in Catholic or Mainline Protestant congregations. This difference continues until a county reaches about 35% Catholic and Mainline Protestant. Perhaps due to a small number of respondents living in counties or parishes with low and high percentages of Catholic and Mainline Protestant adherents, the confidence intervals are wide enough that the two groups are not statistically different from each other counties with very low adherence and very high adherence.

Discussion

These analyses explore the relationships between local and extra-local social support, religious ecology, and alcohol misuse. Specifically, I found that individuals whose social support tends to come from local ties are more likely than those with primarily extra-local ties to potentially misuse alcohol as the share of individuals participating in Catholic and Mainline Protestant churches in a county increase. Put another way, in contexts that may be more permissive toward alcohol (Clarke et al. 1990; Ford and Kadushin 2002), being more locally oriented is associated with potential alcohol misuse. Additionally, there are steady increases in the probability of potential alcohol misuse as the percentage of Catholic and Mainline Protestants increases, in both the more locally and more extra-locally oriented groups.

These finding speak to the larger bodies of work related to disasters, social capital, and religious ecology, bringing them together to show that the culture associated with religion may have implications for population health. Furthermore, these analyses suggest that religious ecology may help explain the inconsistencies in the relationships between social capital and health outcomes, particularly in U.S. Gulf Coast, where both environmental stressors and religious traditions are particularly salient. Future research examining health outcomes in the U.S. Gulf Coast should be attuned to the roles particular mortality theodicies may have on individuals living in particular religious contexts (Blanchard et al. 2008).

There are a number of considerations I wish to address related to the operationalization of the key variables: alcohol misuse, social support, and religious adherence. First, the variable measuring alcohol misuse is a three-item measure used in clinical settings meant to capture whether a person might need additional screening for alcohol misuse (Bradley et al. 2007; Bush et al. 1998). A positive screening, therefore, is not a diagnosis of alcohol misuse, but rather, an

indicator of whether a person meets a threshold for needing more detailed screening. That said, the AUDIT-C is a widely used, validated, and clinically-relevant measure. Second, I readily acknowledge that there are many components to social support. Comparing respondents with larger local and extra-local support networks is a way to gauge the value of different resources and determine what relationship the geography of those resources has with behavioral health. Such discussions are critical for understanding disaster resilience (Cope et al. 2018; Elliott et al. 2010). Third, while I feel that the RCMS' religious adherence data provides valuable information about religious culture within counties, it may almost serve as a kind of proxy measure in this case. I argue that the religious adherence measure used in these analyses may be a conservative estimate of religious culture, particularly in the Gulf Coast region. Since the RCMS only captures individuals who are formally affiliated with congregations, it does not capture individuals who are religious but do not attend church, nor does it capture the religiously-derived norms and values that affect individual behaviors.

Even with the limitations of those in mind, this research makes novel and apt connections between research on disasters and health, social capital and alcohol, and religious ecology to explore how social capital relates to alcohol misuse in a region with a robust religious culture and a history of disasters. Specifically, I find that the relationships between social support and alcohol misuse may depend on religious context. This is critical to understand since, so often, social capital (and, even more narrowly, social support) is considered to be helpful in disaster contexts. While I certainly do not wish to argue that social support is not beneficial, my findings do suggest that particular types of social capital may be more beneficial to health outcomes depending on the context.

Conclusion

In this paper, I have shown that individuals with more local ties may be more likely to potentially misuse alcohol, compared to those with more extra-local ties, depending on the religious ecology of their county or parish of residence. Gulf Coast residents will continue to face both acute and chronic environmental hazards which may affect their health and well-being. Findings such as these can provide healthcare providers and community leaders with culturally-specific health information.

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Vita

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