PRINCIPAL LEADERSHIP AS A MODERATOR OF TEACHER TURNOVER FOLLOWING
NATURAL HAZARD EXPOSURE

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ABSTRACT

Megan K. Rauch Griffard: Principal Leadership as a Moderator of Teacher Turnover Following
Natural Hazard Exposure
(Under the direction of Lora Cohen-Vogel)

This study investigated principal leadership as a moderator of teacher turnover following

natural hazard exposure. Like other disruptions to schooling, such as pandemics, natural hazard

exposure is associated with a variety of negative outcomes in schools, including increased stress

for teachers and lowered achievement for students. Using statewide administrative personnel

records, I explored whether teacher turnover follows natural hazard exposure. I also explored the

extent to which natural hazard exposure is associated with teacher turnover by comparing

turnover rates across schools affected by one or more exposures. Using interview data, I also

investigated the support and care school principals exhibited toward teachers following a natural

hazard exposure. Through a sequential mixed methods design, I aimed to determine the influence

principal leadership may have on teacher turnover in schools exposed to a natural hazard through

leaders' crisis management and caring leadership behaviors. The study presents nuanced

evidence that can guide school and district leaders and policymakers looking for information

about how principal leadership can attenuate teacher turnover in the context of a school exposed

to a natural hazard. In addition, the study adds to the emerging literature on the effects of natural

hazard exposure on schools, as these effects are a pressing issue due to global climate change

and the expected increases in natural hazard exposure.

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LIST OF ABBREVIATIONS

FEMA   Federal Emergency Management Agency

NCTWCS North Carolina Teacher Working Conditions Survey

TWCs   Teacher Working Conditions

CHAPTER 1: INTRODUCTION

Natural hazards, such as earthquakes, volcanic eruptions, hurricanes, tsunamis, and mudslides, are "extreme events of nature that exceed the capabilities of the [human] system to reflect, absorb, or buffer" (Kates, 1971, p. 438). They are "events that overwhelm the coping capacity of the affected community" (de Goyet, et al, 2006, p. 1147). When they interact with the human environment, natural hazards can seriously impede the health and vitality of individuals and communities (National Oceanic and Atmospheric Administration, 2018; Tschakert et al., 2020). As the effects of climate change continue to become apparent, natural hazards are expected to increase in frequency and intensity, with regions prone to certain types of natural hazard exposures enduring unprecedented disruptions from them (Frimpong et al., in progress; Jasour et al., 2018; Tierney, 2019). Natural hazard exposure exacerbates existing social and economic ills and leads to a host of negative outcomes for affected communities, such as increased poverty, unemployment, and violence (Tierney, 2019).

Researchers have documented a number of negative effects for children as a result of natural hazard exposure. Much of this work has focused on the link between natural hazard exposure and mental and emotional health and wellbeing (Pfefferbaum et al., 2012). In schools, natural hazard exposure has been associated with increased stress, behavior challenges, and depressive symptoms (Fothergill and Peek, 2015; Gaffney, 2006; Pane et al., 2008; Swenson et al., 1996). It has also been linked to lowered student achievement (Fothergill and Peek, 2015; Fuller, 2014; Lamb et al., 2013; Ward et al., 2013). Researchers have identified a number of factors associated with lowered student achievement due to natural hazard exposure, such as

trauma, displacement, and other major life changes (Swenson et al., 1996; Ward et al., 2013).

Student and school demographic characteristics, such as race, socioeconomic status (SES), and

prior achievement, are also predictive of the impact on student achievement, with historically

marginalized students, students who identify as Black, Indigenous, and/or People of Color

(BIPOC), and students with low scores on statewide standardized assessments faring worse

following exposure to a natural hazard (Barrett et al., 2012; Fothergill and Peek, 2015; Schorr,

2006; Tian and Guan, 2015).

One factor affecting student achievement that has not yet been fully explored is teacher

turnover following natural hazard exposure. Teacher turnover is defined as a teacher changing

schools or leaving the profession of teaching altogether (Boe et al., 2002; Lindsay & Egalite, in

progress). Natural hazards research has shown that teachers experience increased stress and

burnout following a natural hazard exposure (O'Toole, 2018; Pane et al., 2008). In one recent

study, Kuntz et al. (2013) found that emotional exhaustion due to natural hazard exposure is

associated with a 30% increase in teachers' self-reported turnover intentions, but the authors did

not measure whether teachers acted on these intentions. Other prior research has found that

teacher turnover leads to lowered student achievement, even for students who were not directly

instructed by the teacher who left (Boe et al., 2002; Carver-Thomas and Darling-Hammond,

2017; Guin, 2004; Kraft et al., 2016; Ronfeldt et al., 2013). Furthermore, the negative effects of

teacher turnover are higher for students experiencing poverty and BIPOC students. For example,

in Ronfeldt et al.'s (2013) study of teacher turnover in New York City public schools over a five-

year period, all students in a given grade in schools, where the average teacher turnover in the

given grade in a given year was 37%, scored between two and four percent standard deviations

(SDs) lower in math achievement than students in a single grade in schools where the average

teacher turnover in a given grade in a given year was 0%. The authors noted that the majority of schools with higher rates of teacher turnover had higher proportions of low-income students, higher proportions of Black and Latinx students, and higher rates of suspensions and chronic absences. Together, the findings showed that student achievement decreases following natural hazard exposure and teacher turnover. I hypothesize that teacher turnover is a confounding factor that explains lowered student achievement following natural hazard exposure.

The study investigated teacher turnover following natural hazard exposure. In addition to exploring the salience of natural hazard exposure in predicting teacher turnover, my study also considered the extent to which principal leadership can moderate teacher turnover following natural hazard exposure. Prior research has shown that principal leadership is the single most important predictor of teacher turnover (Grissom et al., 2021; Johnson, 2006; Ladd, 2011). As the leader of the organization, a school principal has a powerful influence on the conditions under which teachers work and how teachers perceive their working conditions (Cha & Cohen-Vogel, 2011; Cucchiara et al., 2015; Grissom, 2011; Ingersoll, 2001; Ni, 2017). Teacher working conditions (TWCs) include "the nonpecuniary elements of the workplace that affect teaching" (Merrill, 2021, p. 172). They can influence satisfaction and other feelings related to one's job, including turnover intentions, and when school leaders implement strategies that cultivate positive TWCs, turnover can decrease (Borman and Dowling, 2008; Glaser, 2003; Kraft et al., 2016). When teachers perceive their working conditions favorably, not only does teacher turnover decrease, but also student achievement increases (Guin, 2004; Kraft et al., 2016; Ronfeldt et al., 2013).

Moreover, teacher turnover rates increase when teachers perceive a lack of organizational and personal support from their leader (e.g., Bickmore and Dowell, 2019; Boyd et al., 2011; Cha

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& Cohen-Vogel, 2011; Ingersoll, 2001). Exhibiting care, through behaviors such as deep listening, demonstrating empathy, and making decisions quickly using available information, is one way that school leaders can show support for teachers, especially during challenging times (Smylie et al., 2020; Steinbinder and Sisneros, 2020). In fact, principal leadership scholars have argued that caring should be an integral part of a school leader's job and should be integrated into the curriculum for principal preparation and development work (Green, 2014; Louis et al., 2016; Ricken, 2006 Smylie et al., 2020).

During times of crisis such as a natural hazard, school leaders are called upon to manage the crisis for their constituents, including teachers (Grissom & Condon, 2021). Principal leadership has been shown in natural hazards studies to play a critical role following natural hazard exposure because school principals, as local leaders, influence a variety of outcomes for communities affected by natural hazard exposure (Hoying et al., 2017; Kusumari & Alan, 2011; Sherrieb et al., 2012). Principals broker with outside agencies and supports, such as the Red Cross and FEMA, to obtain needed resources for their communities following natural hazard exposure (Halliger, 1992; Sherrieb, et al., 2012). School leaders sometimes manage the coordination of needed services and supplies, such as food, clothing, and shelters, for students, families, and community members (Lee et al., 2008; Ward & Shelley, 2008). They also lead efforts in helping students, teachers, and families emotionally recover from natural hazard exposure (Masten & Narayan, 2012; Pfefferbaum et al., 2012; Prinstein et al., 1996).

In this study, I employed a conceptual framework that incorporated crisis management and caring leadership to frame my investigation into whether school leaders may be able to moderate teacher turnover following a natural hazard exposure. The model is shown in Figure 1.1.

Figure 1.1

Logic Model Showing Principal Leadership as a Moderator of Teacher Turnover following Natural Hazard Exposure
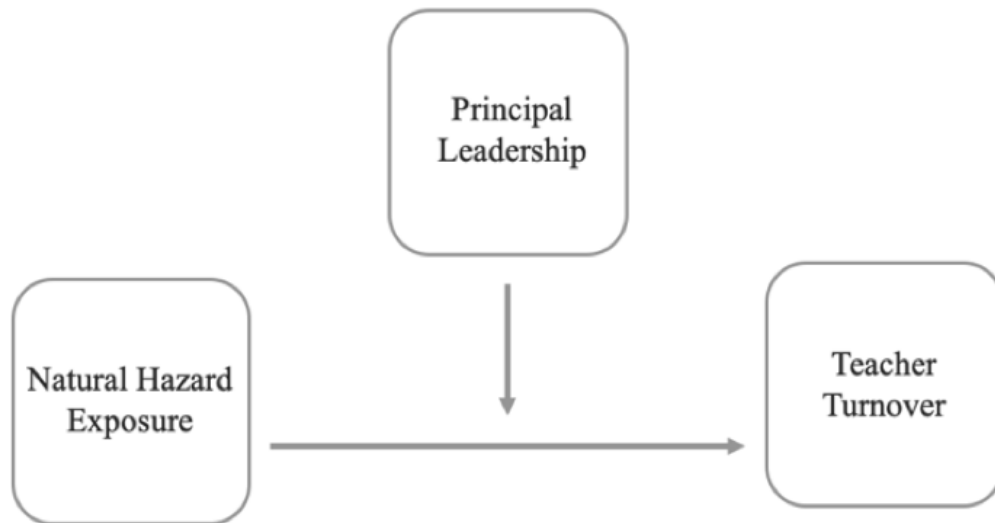
To investigate how principal leadership can moderate teacher turnover following natural hazard exposure, I employed an explanatory sequential mixed methods research design. An explanatory sequential study occurs in three phases. First, quantitative data is collected and analyzed. Second, qualitative is collected and analyzed second to further interpret or explain the quantitative findings. Third, the two phases are merged to produce meta-inferences and to further probe the phenomenon at hand (Creswell & Plano Clark, 2018). The process of mixing qualitative and quantitative data through mixed methods allows for a deeper, richer understanding of the data (Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009).

Key Terms

Before discussing how I conducted my study of whether principal leadership can moderate turnover following natural hazard exposure, it is prudent for me to identify several key terms that will be used throughout the study.

- **Natural Hazard Exposure** is the experience of going through a natural hazard, such as an earthquake, volcanic eruption, hurricane, tsunami, or mudslide. Natural hazard exposure is the lived experience of "events that overwhelm the coping capacity of the affected community" (de Goyet et al., 2006, p. 1147). Natural hazard exposure in this study is defined by whether a school is in located in a district in a county where residents were eligible to receive Individual Assistance from FEMA, the highest tier of federal financial support offered. Funds from the program are used to pay for temporary housing, repair and replacement of damaged homes, and other significant personal losses, such as the loss of a vehicle or funeral expenses (FEMA, 2021).

- **Teacher Turnover** consists of two possible paths an individual teacher could take that result in turnover, either the teacher has changed schools or he/she/they have left the profession (Boe et al., 2008; Lindsay & Egalite, in progress).

- **Teacher Retention:** The opposite of teacher turnover is teacher retention, which is when a teacher does not change schools or leave the profession from one year to the next (Kraft et al., 2016).

Setting and Methodological Approach

In this study, I focused on teacher turnover in North Carolina following Hurricane Matthew (SY2017) and Hurricane Florence (SY2019). In North Carolina, the two natural hazards were responsible for more than 110 direct deaths and more than $25 billion in damage (National Oceanic and Atmospheric Administration, 2016 and 2018). The eastern part of the state is comprised of low-lying coastal plains that are prone to flooding from the Atlantic Ocean, as well as the surrounding lakes and rivers. During hurricane season, which typically lasts from May to October, the region becomes especially susceptible to flooding (Frimpong et al., in

progress; Jasour et al., 2018). Fifty school districts met the eligibility criteria after Hurricane

Matthew (2017) and 37 school districts met the criteria after Hurricane Florence (2019). Of these

school districts, 30 met the criteria following both natural hazard exposures. (See Appendices A

and B).

An explanatory sequential mixed methods research design was employed to study teacher

turnover following natural hazard exposure. In an explanatory sequential design, quantitative

data is collected and analyzed first. The qualitative data is the collected and analyzed to bolster,

strengthen, and explain the findings from the quantitative strand (Creswell & Plano Clark, 2018).

A mixed methods research design, which leverages both qualitative and quantitative data, offers

unique insights into caring principal leadership and teacher turnover in post-hazard contexts.

Used alone, a quantitative analysis of teacher turnover in hazard-affected schools would paint an

incomplete picture of the role of caring leadership in turnover, as these behaviors are not

measured in the existing survey data and administrative records used in my analyses. Adding

qualitative data extracted from the principal interviews to the study illustrated how caring

leadership affects turnover.

Quantitative data for the study was extracted from a panel dataset containing North

Carolina administrative personnel records for all public school teachers in the state between 2016

and 2019. Using data prior to hazard exposure (Hurricane Matthew in SY2017 and Hurricane

Florence in SY2019) enabled me to observe trends in teacher turnover before the natural hazard

exposure(s) occurred. Using fixed effects regression models, I showed how teacher turnover

rates in schools that were affected by natural hazard exposure were higher than teacher turnover

in schools in North Carolina that were not exposed to a natural hazard in the same time period.

Because more than one natural hazard exposure occurred in the time frame of the study, I also

explored how different types of natural hazard exposure affected teacher turnover differently. The three models employed considered whether exposure to Hurricane Matthew, which was described as an acute, unexpected natural hazard for which affected North Carolina residents were unprepared; Hurricane Florence, which was a slower moving natural hazard for which residents were better prepared; and exposure to both natural hazards. My initial hypothesis was that exposure to more than one natural hazard would be associated with the largest increase in teacher turnover. However, the analyses revealed that the unprecedented and severe impact of Hurricane Matthew was actually associated with a statistically significant increase in teacher turnover. These estimates demonstrated that natural hazard exposure affects teacher turnover and showed that an acute, unexpected natural hazard exposure (Hurricane Matthew in 2017) influences teacher turnover.

Drawing on the literature on teacher turnover and historical information about natural hazard exposure in North Carolina, four additional subgroup analyses were run to show how natural hazard exposure exacerbated existing challenges (Tierney, 2019) in schools already experiencing high rates of teacher turnover. In the subgroup analyses, the sample was narrowed to: (1) schools serving predominantly students of color; (2) schools classified as low-performing according to the North Carolina Department of Public Instruction (NCDPI) school performance framework; (3) schools with a high proportion of students experiencing poverty (75% or more of students are eligible for free or reduced-price lunch); and (4) schools in Eastern North Carolina, a 41-county region that is particularly susceptible to hurricanes (Frimpong et al., in progress; Jaysour et al., 2018). In each of these subgroup analyses, the independent variable of interest was whether a school had been exposed to a natural hazard.

Qualitative data for this study will be derived from in-depth, semi-structured interviews with 38 school principals across 15 school districts in Eastern North Carolina. Eleven of the 15 school districts were located in counties where residents could apply for FEMA Individual Assistance after both Hurricane Matthew and Hurricane Florence. Two districts were only eligible after Hurricane Matthew, and the remaining two were only eligible after Hurricane Florence. As part of the interview protocol, principals were asked how the natural hazard exposure(s) personally impacted teachers, how the natural hazard exposure(s) impacted teachers' workplace experiences, and the ways in which the participant supported teachers following the hazard exposure. Examples of principal support included: flexibility for personal leave, listening to teachers' frustrations and emotions, and connecting teachers with needed resources, such as contacts for home repairs or mental health counseling. A conceptual framework looking at crisis management (Grissom & Condon, 2021) and caring leadership behaviors (Steinbinder and Sisneros, 2020) guided my analysis of the qualitative data. I also compared whether principals' descriptions of their support toward teachers following the exposure was oriented toward processes or outcomes (Van Kippenberg et al., 2006). Process-oriented school leaders focused on the day-to-day needs and challenges teachers and students experienced following natural hazard exposure. Outcome-oriented leaders were more focused on long-term objectives, such as a return to normalcy and student achievement. The three elements of my conceptual framework—crisis management, caring behaviors, and leadership orientation—helped me identify specifically how school leaders supported teachers following natural hazard exposure. During the data integration portion of the study, I was also able to descriptively show how leadership orientation may have influenced teacher turnover.

In the data integration phase of the study, I analyzed the relationship between caring leadership behaviors and teacher turnover in schools that were affected by natural hazard exposure. Using the evidence from the qualitative analyses, I categorized non-first year school principals by their leadership orientation, process or outcome. I then graphically depicted the relationship between principal leadership orientation and teacher turnover rates over time. In this visual, time served as the X-axis turnover rates served as the Y-axis, and average turnover rates for the caring behavior groups were graphed over time. The graph revealed which type of leadership orientation was descriptively correlated to lower teacher turnover rates and how teacher turnover rates between the two groups appeared to respond to leadership orientation following natural hazard exposure.

Additionally, I compiled a joint display, a figure that allowed me to draw meta-inferences leveraging findings from both the qualitative and quantitative strands of the data. The joint display was accompanied by a narrative discussion of the findings across both strands. The joint display and narrative components of the study allowed me to zoom out and look at the larger implications about the ways in which principal leadership can moderate teacher turnover following natural hazard exposure.

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Research Questions

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My dissertation addressed the following six research questions:

Quantitative Research Questions

1) **Does natural hazard exposure predict teacher turnover?** Extant literature has shown that natural hazard exposure adds stress and complications to teachers' working conditions, which are strongly correlated with teacher turnover. Using statewide administrative data and fixed regression estimation, I analyzed and compared teacher turnover rates in schools

located in FEMA Individual Assistance-eligible counties to schools in counties in the same state that did not receive this designation.

2) **Do different natural hazard exposure events affect teacher turnover differently?** Given that the time period of the study covers more than natural hazard exposures, I compared teacher turnover in schools that were affected only by Hurricane Matthew (2017), only by Hurricane Florence (2019), or by both natural hazard exposures. The purpose of these analyzes was to show how the type of natural hazard exposure impacted teacher turnover.

Qualitative Research Questions

3) **What strategies did school principals employ to support teachers following a natural hazard exposure?** Principals are responsible for managing a variety of responsibilities associated with natural hazard exposure, such as providing physical and emotional support to students and staff. Using interview data from 38 school principals who led schools affected by natural hazard exposure, I analyzed what specific supports and resources school principals provided to their teachers.

4) **Did school principals use caring leadership behaviors to support teachers following natural hazard exposure?** Leading educational leadership scholars argue that caring leadership is an essential part of the school principal's job. I identified whether school principals in the qualitative sample used caring leadership following natural hazard exposure and which particular caring leadership behaviors, if any, they exercised. Moreover, by classifying principals based on their leadership orientation (process or outcome), I was able to understand more clearly how principals exhibited caring behaviors toward teachers following natural hazard exposure.

5) **What is the relationship between caring leadership orientation and teacher turnover in schools that were exposed to a natural hazard?** This phase of the study offers descriptive insight into how principals' caring leadership orientation (process or outcome) may influence teacher turnover following natural hazard exposure.

6) **What deeper insights do the qualitative findings provide to help explain the quantitative results on teacher turnover in schools affected by natural hazard exposure?** By integrating the qualitative and quantitative phases of the research, I was able to observe and discuss points of agreement and disagreement across the two phases (Creswell & Plano Clark, 2018; Teddlie and Tashakkori, 2009).

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Significance of the Study

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My study offers a deeper understanding of teacher turnover, principal leadership, and natural hazard exposure, and more importantly, how these areas interact with each other. Findings provide new insights into how natural hazard exposure affects teacher turnover and whether caring principal leadership behaviors can moderate the relationship. Below, I discuss four distinct ways the dissertation advances prior conceptual and empirical research.

First, my study introduced natural hazard exposure as a factor that affects teacher turnover. The literature on teacher turnover has shown that negative perceptions of TWCs are associated with teacher turnover, more so than student demographics or salary (Johnson et al., 2005; Ingersoll and May, 2011, Kraft et al., 2016; Ladd, 2011). The literature on natural hazard exposure has found that teachers experience personal and professional challenges following natural hazard exposure (O'Toole, 2018; Pane et al., 2008; Kuntz et al., 2013). My study attempted to merge these two topics by showing how teacher turnover is affected by natural hazard exposure. Teacher turnover is a persistent organizational problem in schools, especially in

schools that serve BIPOC and students experiencing poverty (Borman and Dowling, 2008; Guin, 2004; Ingersoll, 2001). I hypothesized that natural hazard exposure exacerbates the existing organizational problems in schools, as it has been shown to increase stress and burnout among teachers and decrease teachers' positive perceptions of TWCs (O'Toole, 2018; Pane et al., 2008; Kuntz et al., 2013). Given the forecasted increase in natural hazards due to climate change (Frimpong et al., in progress; Jasour et al., 2018; Tierney, 2019), my study showed how teacher turnover may be yet another negative consequence associated with these events. The findings may help catalyze future policy and leadership measures to reduce teacher turnover in regions prone to natural hazards.

Second, researchers have identified school leaders as essential local leaders following natural hazard exposure (Halliger, 1992; Sherrieb, et al., 2012). They are responsible for providing a variety of support and care to students, teachers, and stakeholders (Lee et al., 2008; Masten & Narayan, 2012; Pfefferbaum et al., 2012; Prinstein et al., 1996Ward & Shelley, 2008). My study investigated whether crisis management and caring leadership, integral—but understudied—aspects of school leadership, (Green, 2014; Louis et al., 2016; Ricken, 2006 Smylie et al., 2020) are used to support teachers following natural hazard exposure. I also showed the possibility of a relationship between caring leadership orientation and teacher turnover.

Third, my study tested whether teacher turnover is another negative outcome associated with natural hazard exposure. In doing so, the research will establish future studies that can address whether teacher turnover is a confounding variable that can help explain why student achievement is lower following natural hazard exposure (Fothergill and Peek, 2015; Fuller, 2014; Lamb et al., 2013; Ward et al., 2013). Because I employed causal inference methods

through in my fixed effects regression models, my findings also add quantitative data to the literature on natural hazards and schools, which is a subfield dominated by qualitative case studies. Studying the impacts of natural hazards on schools using new methods may help move the topic into a more centralized area of focus within educational leadership and policy studies.

Fourth, my study emphasized the importance of caring leadership in education research. Caring leadership represents an understudied aspect of school leadership (Beck & Newman, 1992). As Smylie et al. (2020) pointed out, caring is highly variable in schools today. There are sociohistorical reasons why it has not been a more prominent topic of research in educational leadership (Lyman, 2000). Gilligan (1982) and Noddings (1984) associated caring with a feminine nature and disposition. However, Noddings (1992) emphasized that caring is not exclusive to women, as any individual is capable of showing care to others. Although caring has been cast as feminine, she calls on both male and female educational leaders to practice care. Therefore, by studying caring leadership in schools, I demonstrated its relevance to the operation of schools today for both male- and female-identifying school leaders. My work will affirm what Smylie et al. said, "Alternatives to caring are unacceptable" (p. 9).

The mixed methods research design employed for this study provided rich insights into how school leaders may moderate teacher turnover following natural disaster exposure. My study showed some of the ways that school leaders can moderate the negative impacts of natural hazard exposure on teachers and potentially reduce subsequent teacher turnover. It facilitated a clearer understanding of the challenges and successes school leaders experience following natural hazard exposure.

Overview of the Proposal

The remainder of this dissertation unfolds as follows: In the second chapter, I provide an overview of the existing literature relevant to the study, including discussions of teacher

turnover, the influence of principal leadership on teacher turnover, the effects of natural hazard exposure on schools, and the role of principal leadership following natural hazard exposure. The chapter also highlights the theoretical and methodological gaps that I attempted to fill with my study. In the third chapter, I describe the conceptual framework that guided my study, both in terms of hypothesis development and the analysis of the principal interviews. The framework combined crisis management, caring leadership, and leadership orientation frameworks. I drew on philosophical theories on caring and nursing leadership theory to discuss why caring leadership is an important aspect of principal leadership and what specific behaviors principals can employ to show care towards teachers. In the fourth chapter, I describe the qualitative, quantitative, and integrative phases of the research, including the data collection and analytical procedures for each. In the fifth chapter, I present the findings from the study in order of the research questions. In the sixth and final chapter, I discuss the implications of the findings for policy and practice, as well as the limitations of the study and the potential directions for future research.

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter provides an overview of literature relevant to my study of caring principal leadership as a moderator of teacher turnover during natural hazard exposure. The chapter begins with more general discussions of teacher turnover and principal leadership. Then it moves to discussing what is known about the impacts of natural hazard exposure on schools and the people who teach, learn and lead in them. Specifically, I begin by describing how teacher working conditions influence teacher turnover and the effect of teacher turnover on student achievement. Second, I review the literature to explain why principal leadership has been described as the most integral factor influencing teacher turnover in schools. Third, I discuss what scholars have found are the impacts of natural hazard exposure on schools. These impacts include increased stress for both students and teachers and lowered student achievement. Fourth, I detail the research on principal leadership during natural hazard exposure, which underscores the important role school principals play in shaping the various outcomes from natural hazard exposure for a school community. This chapter concludes with an explanation of the theoretical and methodological limitations of the research so far. The subsections in this chapter set the stage for the conceptual framework and methodological approach I used for the study (See Chapters 3 and 4.)

Through this review, I show that the current research has not yet considered how natural hazard exposure affects teacher turnover. Filling this gap is an important next step given that teacher turnover is tied to a host of student outcomes. As climate change continues to snowball, leading to more frequent and more intense natural hazard exposure, identifying negative

outcomes associated with these events (i.e., teacher turnover) and ways to disrupt them (i.e., principal leadership) is an important step for research and policy.

Teacher Turnover

To fully understand teacher turnover, it is important for the reader to be grounded in the interrelated factors that teacher turnover affects and is affected by. These factors include teacher working conditions (TWCs), student achievement, and teacher shortages. In comparison with other developed countries, U.S. students lag behind their peers academically, and there is substantial variation in student achievement within the fifty states when achievement is decomposed by student race, student socioeconomic status (SES), and school location (Dee, 2004; Hanushek et al., 2012; Morris, 2012; Young, 1998). Economist Eric Hanushek argued that closing the international education gap requires raising student achievement in the U.S., especially for disadvantaged student populations (Hanushek et al., 2012). He also posited that one solution is to reduce teacher turnover, as the cost of inducting replacement teachers to fill shortages diverts resources away from academic programs, especially in urban school districts serving high proportions of students living in poverty (Hanushek et al., 2005). Aside from the cost, teacher turnover negatively affects student achievement, especially in subject areas with standardized tests, for student receiving special education services, and in under-resourced schools and districts (Carver-Thomas and Darling Hammond, 2017; Johnson et al., 2005; Hanushek and Rivkin, 2010; Ingersoll and May, 2012). Moreover, teachers' perceptions of their working conditions is the biggest predictor of teacher turnover, more so than student demographics or salary (Johnson et al., 2005; Ingersoll and May, 2011, Kraft et al., 2016; Ladd, 2011). Understanding the relationship among teacher turnover, TWCs, teacher shortages, and student achievement helps motivate why studying factors that moderate teacher turnover, such as principal leadership, is important.

Background on TWCs

Before further exploration of teacher turnover can take place, it is important to understand what is meant by TWCs, given their salience in predicting turnover (Kraft et al., 2016; Ladd, 2011). In research, TWCs are somewhat of an amorphous concept, as there is no agreed-upon definition for TWCs (Merrill, 2021; Berry, 2008). Merrill (2021) suggested that one useful working definition for TWCs comes from Johnson (2006), who lists seven features and structures that compose TWCs. These include the physical, organizational, sociological, political, cultural, psychological, and educational features and structures (See Figure 2.1).

Figure 2.1

Johnson's (2006) Features and Structures that Define TWCs

Working conditions include the following:
- The *physical* features of buildings, equipment, and resources, which serve as a platform for teachers' work
- The organizational structures that define teachers' formal positions and relationships with others in the school, such as lines of authority, workload, autonomy, and supervisory arrangements
- The sociological features that shape how teachers experience their work, including their roles, status, and the characteristics of their students and peers
- The political features of their organization, such as whether teachers have opportunities to participate in important decisions
- The cultural features of the school as a workplace that influence teachers' interpretation of what they do and their commitment, such as values, traditions, and norms
- The psychological features of the environment that may sustain or deplete them personally, such as the meaningfulness of what they do day to day or the opportunities they find for learning and growth
- The educational features, such as curriculum and testing policies, that may enhance or constrain what teachers can teach.

Source: Johnson, S. (2006). *The Workplace Matters: Teacher Quality, Retention and Effectiveness.* Washington, D.C.: National Education Association, p. 2.

Although Merrill noted that Johnson's definition has not been widely applied in research, as it came out of a policy report for the National Education Association rather than peer-reviewed research, it does provide a comprehensive categorization of the key structures and features of TWCs. In her meta-analysis of TWC research, Merrill provided a more synthesized definition of TWCs, drawing from narrative definitions from nine articles. She defined TWCs as "the nonpecuniary elements of the workplace that affect teaching" (p. 172). Evans (1997) distinguished TWCs from job satisfaction or fulfillment by explaining that they are "the extent to which the individual is satisfied with, but not by, the conditions and circumstances of his/her

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job" (p. 327). Working conditions are not measures of personal fulfillment or performance, although TWCs can influence satisfaction and other feelings related to one's job (Evans, 1997; Merrill, 2021). Using these definitions as a foundation for understanding TWCs, I will now discuss their relationship to student achievement and teacher turnover.

As noted above, TWCs are an important aspect of schools because of their influence on student outcomes. In a 1996 report, *The Condition of Education,* the U.S. Department of Education summarized the role of TWCs in schools:

> To deliver high quality education, schools must attract, develop, and retain effective teachers. Working conditions play an important role in a school's ability to do so. Schools that are able to offer their teachers a safe, pleasant, and supportive working environment and adequate compensation are better able to attract and retain good teachers and motivate them to do their best (p. 1).

As the first four words of this statement suggest, TWCs are highly correlated with educational outcomes. More specifically, schools where teachers perceive their working conditions positively are better able to deliver high-quality education to students. As Hirsch and Emerick (2006) explained in an analysis of TWCs, "Teacher working conditions are student learning conditions" (p. 4). According to data from five U.S. states, they found that schools with the highest average student growth also had better TWCs when compared with the schools with the lowest growth. Using data from Massachusetts, Johnson et al. (2012) found a 1-standard deviation (SD) improvement in TWCs is associated with 0.15 SDs of growth in math and 0.20 SDs of growth in reading in one year. Similarly, in a study of TWCs in six urban school districts, Ye and Sing (2017) found that students' math standardized test scores were higher when their math teachers had more positive perceptions of their TWCs. Banerjee et al. (2017) also reported a positive relationship between TWCs and student achievement in a nationally representative sample of elementary school students. They found that a 1 standard deviation (SD) increase in teacher

satisfaction was associated with a 0.5 SD increase in reading achievement for first graders, a 1.1 SD increase in reading achievement for third graders, and a 0.75 increase in reading achievement for fifth graders. In a longitudinal study of the North Carolina Teacher Working Conditions Survey (NCTWCS), a biennial survey documenting teachers' perception of their working conditions across the state, Kaniuka and Kaniuka (2019) found that schools where teachers perceived their working conditions more favorably were more likely to have higher student achievement.

As the above findings imply, teachers' positive perceptions of TWCs lead to positive outcomes, but when teachers perceive their TWCs negatively, it can harm student achievement. Early research documented this relationship. In 1953, Lester Anderson explicitly studied the problem of negative perceptions of TWCs and lower student achievement. In a study of 20 teachers in Iowa, Anderson found that student achievement was lower in classrooms where the teacher reported low morale. According to Johnson's definition of TWCs, morale would be informed by perceptions of the organizational, sociological, psychological, and cultural features of schools. Of his findings, Anderson wrote that they are "one more vital reason for making every possible effort to provide conditions which will increase the possibilities of developing a high state of teacher morale in all schools throughout the nation" (p. 698).

However, more recent research has shown that many of the current conditions in schools have negatively affected perceptions of TWCs. For example, in a mixed methods research study of 800 high school teachers' TWCs, Mirra and Rogers (2016) found that pressure to improve student performance and "overwhelming student needs" negatively affected TWCs, especially in schools with high concentrations of poverty (p. 1046). Other characteristics that contribute to poor TWCs include: large class sizes (Cannata, 2008; Carver-Thomas and Darling-Hammond,

2077) poor facilities and resources (Carver-Thomas and Darling-Hammond, 2017), student misbehavior (Farinde-Wu and Witchett, 2018), large district size (Ingersoll 2001), long work hours (Cannata, 2008), and limited classroom autonomy and involvement in instructional leadership (Achinstein et al., 2001; Ingersoll and May, 2012; Ingersoll et al., 2018). Moreover, some recent policy measures that are aimed at raising student achievement, such as reforms to teacher evaluation systems and new school accountability policies, have disincentivized new teachers from entering the profession, leading to teacher shortages (Darling-Hammond, 2007; Kraft et al., 2019; Hanushek and Rivkin, 2010; Murnane and Papay, 2010; Reback et al., 2014; Smith and Kovacs, 2011).

Teacher Working Conditions, Turnover and Shortages

As Johnson (2006) explained, efforts to address teacher shortages have often focused on recruiting new teachers, rather than retaining existing ones by improving TWCs. Citing the results of two studies that examined relationship among TWCs, teacher shortages, and teacher turnover (Ingersoll, 2004; Liu et al., 2004), Johnson wrote, "High levels of ongoing turnover disable schools by undermining progress in school improvement and by continuously diverting scarce resources to recruitment and hiring when these funds might better be used on other needs, such as professional development. Working conditions proved far more important in retaining teachers than school officials originally anticipated" (p. 3-4). Her argument was supported by Hanushek et al. (2005), who added that induction costs compose a higher proportion of the budgets in high-poverty, urban school districts than in more affluent, suburban ones. Ingersoll (2001) described the teacher shortage problem as the result of a "revolving door" through which qualified teachers exit due to negative perceptions of TWCs (p. 501).

Teacher Turnover and Student Achievement

When schools attempt to fill teacher shortages, they often hire less qualified, less experienced teachers, which leads to lower student achievement (Goe, 2007; Ingersoll and Smith, 2003; Sadler, et al., 2013). However, when schools address poor TWCs, teacher turnover decreases and student achievement increases, as Kraft et al. (2016) found in their study of TWCs, teacher turnover, and student achievement in New York City public schools. Using a panel containing five years of data, the authors found that improvement in certain aspects of teacher turnover (i.e., leadership, academic expectations, teacher collegiality, and school safety) were associated with lower teacher turnover and higher academic gains for students. A one SD improvement in teachers' perceptions of their TWCs were associated with student achievement gains of up to an 0.06 SD increase in math and an 0.03 SD increase in reading on standardized tests.

Other research has also highlighted the link between higher rates of teacher turnover and lower student achievement. Moreover, this relationship disproportionately affects schools in urban areas and those serving low SES students and students of color. For example, Ronfeldt et al. (2013) found that teacher turnover negatively affected math and reading achievement for all students in a school, not just for students whose teacher left. In the year after teacher turnover occurred, schools with the highest rates of teacher turnover (40 to 100% turnover) scored lower than students in schools where little to no teacher turnover occurred by approximately two percentage points of an SD in both math and reading on standardized assessments. The researchers also found that the effect sizes were higher in schools with higher proportions of Black students and low-achieving students who scored below proficiency on statewide standardized exams. The authors listed a number of disruptions teacher turnover creates within a school that contribute to lowered student achievement, including reduced quality of collegial

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relationships, reduced collaboration, and lost institutional memory. In a study of another large urban school district, Guin (2004) found statistically significant negative correlations between student achievement in reading and math in schools with the highest rates of teacher turnover, a -0.306 correlation in math and -0.282 in reading. She also noted that turnover rates were nearly twice as high as the district average in schools serving higher percentages of non-white students.

The Salience of TWCs in Teacher Turnover Decisions

However, it is important to reiterate that *it is primarily the working conditions, not the students*, that motivate teacher turnover. Dissatisfaction with TWCs bears considerable weight on existing teachers' career decisions, more so than other factors such as student demographics or compensation. In a review of six studies that investigate teacher turnover in high-poverty schools, Simon and Johnson (2015) found that teacher turnover is more strongly associated with working conditions than student demographics. As the authors explained, "The six overarching studies reviewed here collectively suggest that teachers who leave high-poverty schools are not fleeing their students. Rather, they are fleeing the poor working conditions that make it difficult for them to teach and for their students to learn" (p. 1).

Using the NCTWCS, several studies have found that working conditions in North Carolina, the state in which the current study will take place, are highly correlated with teacher turnover. North Carolina teachers who indicate satisfaction with their working conditions on the NCTWCS are more likely to remain at their schools than teachers who indicate dissatisfaction (Hirsch and Emerick, 2007). As Ladd (2011) described, "Variation across schools in working conditions as perceived by teachers is highly predictive of individual teachers' turnover intentions" (p. 253-254). She found that controlling for working conditions increased the explanatory power of turnover intention estimates for elementary school teachers in North Carolina by 60 percent. In distributing the NCTWCS to a sample of Arizona teachers, Geiger

and Pivovarova (2018) found that teachers who did not leave their schools reported satisfaction with their working conditions, although this finding was not statistically significant.

TWCs are also more predictive of teacher turnover than salary and benefits. In examining two cohorts' responses to the Schools and Staffing Survey (SASS) and Teacher Follow-up Survey (TFS), nationally representative longitudinal surveys of TWCs, Ingersoll and Smith (2003) found that approximately 90 percent of exiting novice teachers stated that some aspect of their working conditions influenced their decision to leave, compared with 78 percent who cited low salary. In their preliminary analyses of an $1,800 retention bonus for math and science teachers in North Carolina, Clotfelter et al. (2008) found that working conditions were more important than the modest amount of the incentive in predicting teacher turnover. Additionally, in an analysis of the federal Schools and Staffing Survey and Teacher Follow-up Survey, Cha and Cohen-Vogel (2011) found that the negative relationship between working conditions and teacher turnover behavior was nearly two times stronger than the relationship between salary and turnover (p. 388).

As these findings have shown, TWCs are more strongly associated with teacher turnover than other aspects of teaching. These findings are consistent with organizational behavior research more broadly, as the consensus in this field is that dissatisfaction with working conditions is the most common antecedent of attrition among working adults, more so than labor market forces, personal attributes, or job satisfaction (Cotton and Tuttle, 1986; Currivan, 1999). Moreover, current rates of teacher turnover are distinguished from healthy turnover, which is expected and considered a sign of growth in well-run organizations because teacher turnover is preceded by poor TWCs (Borman and Dowling, 2008; Guin, 2004; Ingersoll, 2001). As Schaefer et al. (2014) found, teachers often leave the profession in search of an improved quality of life

with fewer work hours, less emotional responsibility, and reduced stress. Hope for reducing teacher turnover is not lost, however. As the next section explains, school leadership plays a powerful role in mitigating teacher turnover.

The Role of School Leadership in Reducing Teacher Turnover

Principal leadership can moderate the relationship between TWCs and teacher turnover. Ladd (2011) named the quality of school leadership "the most salient factor" (p. 251) in reducing turnover. Johnson (2006) described principals as "the broker[s] of workplace conditions" whose influence shapes the experiences of teachers and their turnover decisions (p. 15). As the leaders, school principals have the capacity and responsibility to set the tone for their workplace environment, and their leadership impacts most of the facets that compose TWCs (Johnson, 2006). Improvements to leadership are shown to improve working conditions and decrease turnover (Burkhauser, 2017; Johnson et al., 2012; Kraft et al., 2016). In a synthesis of the research on principal leadership from the past 20 years, Grissom et al. (2021) found that the impact of the principal on a school has likely been "*understated*, with impacts being both greater and broader than previously believed" (p. 9). Among these impacts is the influence of principal leadership on fostering positive TWCs and reducing teacher turnover.

In this section, I synthesize the relevant literature; together, the evidence shows the profound impact principal leadership can have on TWCs and teacher turnover. I also explain how principal leadership influences other closely related outcomes, such as student achievement and teachers' instructional behavior.

The Power of School Leadership

Prior research describes a "domino effect" among principal leadership, TWCs, and teacher turnover. When teachers perceive principal leadership as ineffective, TWCs are subsequently perceived poorly, leading to higher teacher turnover; conversely, where positive

perceptions of leadership are high, so too are TWCs and lower turnover rates follow. Although TWCs can vary across school type and school performance level, school leadership consistently influences how teachers perceive TWCs across different contexts, as well as their turnover intentions (Cucchiara et al., 2015; Grissom, 2011; Ni, 2017). In a comparison of organizational commitment (a predictor of turnover) between teachers in charter schools and traditional public schools, Ni (2017) found that charter school teachers' commitment was lower and that the difference was largely due to poor perceptions of TWCs and principal leadership. In study comparing TWCs in underperforming schools in the process of turnaround (a wide-scale reform strategy that involves replacing school leadership, staff, and operations), Cucchiara et al. (2015) found that teachers perceived TWCs more favorably and were more optimistic about the turnaround when they had favorable views of school leadership. The authors suspected that the student achievement gains made at the school where leadership and TWCs were most favorably perceived were more sustainable than at schools where leadership and TWCs were viewed less favorably or had mixed perceptions. Similarly, Burkhuaser (2017) found that improving principal leadership by one SD could improve teachers' perceptions of TWCs by as much as 0.60 SDs. She also found that if the leader of a school changes, teachers' views of TWCs will also change, trending either positively or negatively depending on their perceptions of the effectiveness of the new leader (Burkhauser, 2017).

Moreover, the positive perceptions of school leadership have an even greater impact in schools with high proportions of students of color and low income students, where, as noted previously, TWCs are often perceived more negatively by teachers and teacher turnover is higher. Grissom (2011) found that effective principals have greater influence on improving TWCs and reducing turnover in disadvantaged schools, with turnover lower in schools where

teachers positively perceive leadership. Using SASS/TFS data from 2003-05, Grissom found that including principal effectiveness in regression estimations of teacher turnover reduced the impact of student demographics as explanatory variables for teacher turnover. For example, the coefficient for black students decreased by almost 50 percent, from 0.135 to 0.073. Moreover, when also controlling for working conditions in the estimates, the coefficient on principals remained stable (-0.014), which, according to the author, underscores the powerful influence principals have on TWCs and turnover. Grissom's findings signal the importance of principal leadership in challenging school contexts. As explained later in this chapter, one challenging context that the literature on teacher turnover and principal leadership has not yet considered is natural hazard exposure. The goal of my study is to address this gap by exploring how principal leadership affects teacher turnover in schools affected by natural hazard exposure.

Other research also reinforces the importance of principal leadership on TWCs and turnover by highlighting some of the specific deficits of school leadership that motivate turnover. For example, using SASS/TFS data, Carver-Thomas and Darling Hammond (2017) found that teachers who viewed their school principal as unsupportive were twice as likely to leave their schools than those who perceived their school principal as supportive. This finding mirrored results by Cha and Cohen-Vogel (2011) that used earlier versions of the SASS/TFS data. Bickmore and Dowell (2019) and Ingersoll (2001) also found that turnover rates were amplified when teachers perceive a lack of organizational and personal support from their leaders. Furthermore, turnover is especially high among early career teachers who perceive their school leaders as unsupportive (Boyd et al., 2011; Kim, 2013; Wynn et al., 2017). On the other hand, when school leaders implement strategies that foster a supportive work environment, turnover has been shown to decrease (Borman and Dowling, 2008; Glaser, 2003; Kraft et al., 2016).

Principal Leadership & Student Achievement

An important reason to understand the prevailing influence of principal leadership on TWCs and turnover is because, as noted in the previous section, TWCs and turnover are closely related to student outcomes. School principals are the second-most influential factor affecting student outcomes after classroom teaching (Leithwood et al., 2008; Slater, 2011). Leithwood et al. (2004 and 2020) elaborated in their review of the literature on school leadership that school leaders' influence on student achievement is the result of their influence on TWCs. Grissom et. al. (2021) also found that how principals support teachers and foster a positive climate affects student achievement. Principals who do not improve or foster positive TWCs are likely to lead schools with high teacher turnover rates and poor student outcomes, as teacher turnover negatively affects student achievement (Boe et al., 2002; Carver-Thomas and Darling-Hammond, 2017). To bolster student achievement, school principals must first improve working conditions for teachers (Hallinger, 2005; Johnson, 2006; Leithwood et al., 2004). School leaders drive the greatest improvements for schools when they set teachers up to be successful, especially when they foster teacher collaboration and involve teachers in instructional decision-making (Drago-Severson, 2012, Ingersoll et al., 2018; McLeskey et al., 2016; Stein et al., 2016). In their study of TWCs in Massachusetts, Johnson et al. (2012) found that students performed better on statewide standardized assessments in math and reading in schools where teachers perceived principal leadership more favorably than schools where teachers rated principal leadership poorly. They also found that positive perceptions of school leadership, relationships with colleagues, and school culture often occurred simultaneously in the same school. The researchers concluded that effective school principals are nurturing the positive culture and relationships that allow teachers to teach effectively and produce better results for students. Without a school leader fostering collegial relationships and a positive school culture, teachers'

abilities remain inert, as Johnson and Donaldson (2011) found in their case study of a school with a principal who did not foster relationships among colleagues and a positive school culture. As Darling Hammond (2003) explained, "Great school leaders create nurturing school environments in which accomplished teaching can flourish and grow" (p. 13). Teacher turnover in schools where the leader fosters positive TWCs that allow for flourishing and growth is also lower (Grissom, 2011; Hanushek and Rivkin, 2010; Grissom, 2011; Kraft et al., 2016). This point underscores the moderative effect school leadership has on teacher turnover. Effective school leadership is linked to better working conditions for teachers (Ni, 2017), which in turn influences teachers' instructional behavior and student outcomes (Byrk et al., 1996; Leithwood et al., 2004 and 2020; Walker and Slear, 2011).

The Impacts of Natural Hazard Exposure on Schools

Since the Coleman Report was produced in 1966, education scholars have sought to uncover the extent to which non-school factors influence outcomes in school. In my study, the non-school factor under investigation is natural hazard exposure and its relationship to principal leadership and teacher turnover. Natural hazards are defined as "extreme events of nature that exceed the capabilities of the [human] system to reflect, absorb, or buffer [and] that lead to the harmful effects, ofttimes dramatic, that characterize our image of natural hazards" (Kates, 1971, p. 438). Tschakert et al. (2020) listed a number of extreme events that, when they interact with and cause harm to the human environment, are considered natural hazards. These events include earthquakes, volcanic eruptions, hurricanes, tsunamis, and mudslides. According to Tschkert et al., the most extreme natural hazards are sometimes called natural disasters, although there is no quantifiable distinction between the two.

Student Impacts

Non-school factors, such as living in a stressful home environment, low SES, and domestic violence, can interfere with students' development and ability to learn (Adams & Adams, 1984; Norris & Uhl, 1993; Plyer & Oritz, 2011). In the seminal text on natural hazard exposure and its impacts on children, Fothergill and Peek (2015), leading researchers in the field, described the myriad of non-school factors that affect children's academic performance following hazard exposure. They explained:

> Hazards may disrupt children's education process and diminish their long term educational outcomes as well…Children's intellectual growth is hindered when they miss school or cannot concentrate in the classroom, and children who have to change schools are more likely to drop out altogether. Hazards may cause students to lose valuable instruction time, and when they fall behind in their academic work, they may find it difficult, if not impossible to catch up. When teachers are overwhelmed, upset, and distracted, they may not be able to provide the care and support that are necessary for children's sense of safety and security within schools (p. 22).

Lamb et al. (2013) provide an example of how natural hazard exposure causes "more than just physical damage" (p. 80). In a study of Mississippi third grade, fifth grade, eighth grade, and Algebra I students' math achievement after Hurricane Katrina in 2005, the researchers found that all students' scores were lower compared to prior years. The largest drops in scores were for students attending rural schools and for students in schools closest to where the hurricane made landfall. Lamb et al. (2013) posited that the effects in rural schools could be explained by lack of access to resources and that the effects for schools near where Katrina initially struck could be explained by more substantial impacts from the exposure, such as displacement, damage to home, or parental job loss. While math achievement scores in Mississippi eventually returned to their pre-Katrina levels, the researchers also found that rebound occurred more quickly in more populated, affluent school districts. Similarly, in their study of displaced Mississippi students (students who had to change schools due to damaged or

destroyed residences) after Hurricane Katrina, Ward et al. (2013) found that these students were already academically behind their peers and the gap widened in the years after Hurricane Katrina. The researchers posited that displaced students' drop in performance was due to "the compounding effects of trauma and displacement upon what is already weaker academic performance" (p. 315).

While Lamb et al. (2013) found that achievement eventually rebounded after Hurricane Katrina, other researchers noted that the effects of natural hazard exposure can be long lasting. Fuller (2014) found that prenatal exposure to a natural hazard is associated with an average of -0.036 SDs in elementary math achievement, and the effect size was larger for children born to Black women at -0.040. Fuller also noted that children in her sample born to highly educated mothers were more likely to receive special education services, which she suggested may be because "highly educated mothers are more likely to respond to small changes in their child's cognitive abilities by seeking special education placement" (p. 1513). Fuller's findings highlight the gaps in how natural hazard exposure has different effects on subgroups, with less economically advantaged groups often faring worse or having less access to resources after the event.

Esnard and colleagues (2017) specifically compared school closures in Texas school districts around Hurricane Ike (2009) using binomial regressions and spatial distribution patterns. They found that schools in more urbanized counties were more likely to experience longer school closures, which may be negatively correlated with student achievement. The authors noted that a limitation of their findings was that they could not specifically correlate their findings to students' SES or other demographics, as data was analyzed at the district level. However, they referred to a number of case studies (e.g., Fothergill & Peek, 2015) that have

shown that student backgrounds are highly predictive of outcomes following natural hazard exposure.

Adding to this point, Schorr (2006) found that affluent school districts in Mississippi were able to reopen more quickly than schools in other areas affected by Hurricane Katrina. By reopening more quickly, wealthier school districts were able to reenroll students more quickly than school districts that were closed longer, which often pushed families to enroll their children in these wealthier districts. Enrollment drops in affluent districts averaged around 14 percent, but the drops were as high as 40 percent in poor parts of Mississippi that were affected by the hurricane. By reenrolling more students, the wealthier districts in Mississippi were able to maintain the local tax base that funded schools. Moreover, the wealthy districts also rebounded more quickly academically than less advantaged districts.

Fothergill and Peek's (2015) work highlighted how children's backgrounds influenced their long-term academic outcomes after Hurricane Katrina. Following a cohort of Black children affected by Hurricane Katrina for seven years (2005-2012), the researchers showed how less affluent children and children of color, especially Black children living in the historically Black neighborhoods in the city, experienced the biggest disruptions to their lives and their schooling following the hurricane. In one case, the researchers described how an honor roll student, Cierra, lost interest in school after discovering that all her previous academic awards had been destroyed by the hurricane. When she enrolled in school in Lafayette, a city further inland in Louisiana, her grades dropped considerably. In another case, a first-generation college student, Mekana, dropped out of her college in New Orleans after Hurricane Katrina. When her family relocated to Colorado after the hurricane, she struggled academically and financially in the city without them. As the researchers explained, "For Mekana and many other Katrina youth, dealing

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with the challenges of being the first in their families only added to the stress and challenges of hazard displacement and disruption; it seemed, in fact, that perhaps, they needed interdependence—and the guidance of adults—over independence at this point in their hazard recovery" (p. 85). The authors added that by dropping out of college, Mekana's career prospects and future earning potential were seriously diminished. Through these case studies, Fothergill and Peek showed natural hazard exposure negatively affected children's academic trajectories.

Fothergill and Peek's case study of how Hurricane Katrina changed Mekana's academic future is but one example of how natural hazard exposure changes college students career paths, even though college students are, as the authors noted, usually more independent than young children. Di Pietro (2017) conducted a quantitative analysis on higher education outcomes to show how natural hazard exposure affected students' trajectories. Using difference-in-difference regressions, Di Pietro compared college enrollment, persistence, and on-time graduation in the L'Aquaila province of Italy after a major earthquake in 2009 to enrollment and persistence in other Italian regions. He found that the natural hazard exposure was negatively associated with all three outcomes for L'Aquila students compared with other Italian university students. Di Pietro attributed the L'Aquila student's lowered success in college to the negative affects the earthquake had on their psychological and emotional well-being.

Other researchers have also observed how natural hazard exposure negatively affects children's non-cognitive outcomes. For example, Swenson, et al. (1996) observed that preschool children whose parents experienced sudden life changes, such as marriage, death, or loss of property, around the time of Hurricane Hugo were more likely to exhibit behavior problems in school. Prinstein et al. (1996) found that schools that offered psychological and emotional support to children after Hurricane Andrew reported fewer students struggling with post-

traumatic stress disorder (PTSD) 10 months after the hurricane. As with academic outcomes, a school's ability to address psychological and emotional needs after natural hazard exposure is influenced by the school's SES and demographic profile. Barrett et al. (2012) found that schools in wealthier areas of Dallas-Fort Worth were overall better equipped to support displaced students' needs after Hurricane Katrina, as these schools had better trained teachers and more supportive leadership. However, they also found that these schools had the lowest proportion of Black students. The researchers also noted that schools with fewer Black students were also less consistent and fair in how they treated students generally.

As Barrett et al. (2012) suggested, natural hazard exposure affects school discipline. Several researchers have found that discipline incidents for children exposed to Hurricane Katrina increased after they experienced the hazard. Tian and Guan (2015) found that displaced New Orleans students who were subsequently enrolled in other school districts in Louisiana after Hurricane Katrina had a 7.3 percent increased probability of receiving a discipline infraction in the years following the hurricane than non-displaced students. The researchers attributed the increased rate of infractions to the lack of mental health services in schools, which prevented displaced students from receiving needed psychological and emotional support after Hurricane Katrina. Moreover, certain subgroups were more likely to receive discipline infractions or have behavioral issues. In a qualitative study of displaced students in Louisiana, Fothergill and Peek (2006) noted that school professionals said displaced boys were more likely to have discipline problems than displaced girls, although boys typically received more disciplinary infractions at baseline. In a study of New Orleans charter schools after Hurricane Katrina, Jeffers (2014) added that Black students and students with disabilities were more likely to receive discipline infractions.

Furthermore, the psychological and emotional effects of natural hazard exposure are not isolated to the children who experienced the natural hazard exposure. Researchers have documented how exposure to a natural hazard or another crisis has a spillover effect onto the peers who attend schools with them after the event. Imberman et al. (2012) found that other students attending Houston high schools where high concentrations of students displaced by Hurricanes Katrina and Rita were enrolled had higher rates of absenteeism and disciplinary problems after the displaced students enrolled. Similarly, a 10 percentage point increase in displaced students increased disciplinary infractions between 0.2 to 0.4 percent. Although not a natural hazard study, Gershenson and Tekin (2018) also noted the significance of peer spillover effects. They found that proficiency rates dropped among Virginia children who attended public elementary schools close to places where 2002's Beltway Sniper attacked. Gershenson and Tekin also noted that the schoolwide drop in test scores are likely because exposure to the negative event had a spillover effect from peer to peer.

Across these studies, the research has shown that natural hazard exposure is associated with a host of negative outcomes for students, including both cognitive and non-cognitive outcomes. Negative outcomes from natural hazard exposure also affect students of all ages, even higher education students. Natural hazard exposure impacts students in the acute weeks and months immediately after, as well as for years after the event. Moreover, the negative effects even influence outcomes for other students who were not directly exposed, as Imberman et al. (2011) and Gershenson and Tekin (2018) found.

Teacher Impacts

As Fothergill and Peek (2015) explained, teachers' exposure to a natural hazard influences their ability to meet students' needs. The researchers wrote, "When teachers are overwhelmed, upset, and distracted, they may not be able to provide the care and support that are

necessary for children's sense of safety and security within schools" (p. 22). As this quote suggests, teachers are both experiencing the impacts of natural hazard exposure and supporting their students (and families and communities) who have had the same experience. Known as a "double psychic event" (Romano et al., 2006, p. 208) or complicated grief (Kristensen et al., 2010), natural hazard exposure brings new complications and challenges to teachers' lives.

O'Toole (2018) captured this phenomenon in her study of New Zealand teachers after a major earthquake. Using a mood meter to monitor teachers' feelings over 18 months, she found that New Zealand teachers felt higher rates of burnout in the months immediately following a major earthquake. She found a negative correlation between teachers' moods and their emotional exhaustion and burnout, and the correlation was higher among teachers addressing especially challenging personal (e.g., damage to property or loss of a loved one) or professional circumstances (e.g., school building destroyed, students with major personal losses). In a follow-up interview, one teacher summarized his experience in juggling personal and professional challenges in the wake of the natural hazard exposure. He described having "no downtime" between dealing with students' needs and their own personal issues after the earthquake (p. 1096). He said, "I've got a broken home and a broken school. There is no normality in my life" (p. 1097). Another participant added that helping students with their experiences of the earthquake increased the emotional toll the hazard took on her personally. "Working with children who are already emotionally fragile anyway, it was a double whammy. The better I did, the more of these kids I got and the more drained I became" (p. 1094). Other participants in the study also shared their struggles to find balance between students' and their personal needs following a natural hazard exposure.

One participant in O'Toole's (2018) study shared that the earthquake led her to leave her job. The participant shared that she no longer felt as though she could work in a job that was "continuing to traumatize" her (p. 1095). In another study of the effects of the New Zealand earthquakes on teachers, Kuntz et al. (2013) found that a one SD increase in emotional exhaustion following the natural hazard exposure was associated with a 0.30 SD increase in turnover intentions. The researchers explained that this relationship showed how important working conditions are in influencing teacher turnover intentions. It is important for the purposes of my study to note that Kuntz and colleagues' work only explored turnover *intention*, as opposed to actual turnover, in which a teacher changes his/her/their job (Boe et al., 2002; Lindsay and Egalite, in progress.)

The negative outcomes teachers experience after a natural hazard exposure are not limited to the teachers themselves, as their experiences can also negatively affect students. Seyle et al. (2013) found that teachers in a rural community of Indonesia that was affected by a major earthquake in 2013 reported higher rates of burnout. As a result of burnout, the teachers also reported lower self-efficacy and were more likely to interpret students' actions as behavior infractions. Seyle et al. described how the effects of hazard exposure on teachers affected larger recovery efforts in the region, as the teachers were unable to provide students with safe, caring environments after the earthquake. Similarly, in a study of Mississippi schools after Hurricane Katrina, Ward et al. (2008) found that administrators reported moderate to severe psychological trauma for teachers and staff after the hurricane. The researchers suggested that negative trends in student achievement, especially in the hardest-hit areas of the state, could be partially explained by teachers' stress. The authors explained, "The stresses endured by teachers and other

staff members, many of whom may, themselves, have been impacted by the crisis, may negatively impact instruction and students" (p. 300).

Similar to peer spillover effects, teachers are also negatively impacted by students' natural hazard exposure even when they themselves did not experience the event. Louisiana teachers in Fothergill and Peek's (2006) study reported that they felt more stress and exhaustion after the influx of displaced New Orleans students arrived after Hurricane Katrina. Teachers struggled balancing being responsive to students' personal losses and challenges while also reinforcing the routines and structures of school. One participant recalled reprimanding a student who was wearing the incorrect uniform socks, only to later learn the student had lost all her belongings in Katrina's floods. Another teacher struggled with whether to give a student detention for missing homework, knowing that the student's family was living in a small apartment with six other family members, making it difficult for the student to complete assignments at home. Many teachers also described going above and beyond to support students and make them feel welcome in their new schools. For example, teachers encouraged old students to make friends with the new arrivals, and at one school that required uniforms, teachers set up a uniform donation drive to help new families obtain them. Supporting their original students in addition to supporting and addressing the needs of displaced students were new stressors for teachers. As a policy recommendation, Fothergill and Peek suggested that schools offer professional development training on cultural sensitivity and trauma-informed practices to help teachers in schools that receive an influx of displaced students from a natural hazard.

The research discussed here has shown how teachers may be negatively impacted by natural hazard exposure, both on a personal and professional level, even when they themselves were not personally exposed to the hazard. While not explicitly labeled as such, the findings

suggest that natural hazard exposure has a profound impact on TWCs. Moreover, the findings motivate the need to connect natural hazard exposure to teacher turnover, as negative perceptions of TWCs precedes turnover (Kuntz et al., 2013). My study will empirically test how natural hazard exposure predicts turnover. Furthermore, given the influence of school principals on teachers, the next section discusses the relationship between school principals and teachers following natural hazard exposure and whether school leadership can moderate turnover.

<center>**Principal Leadership and Natural Hazard Exposure**</center>

Despite evidence that natural hazard exposure is only expected to increase, natural hazards are often perceived as as isolated incidents—part of "God's law" (Akbaba-Altun, 2005, p. 312; Caney, 2005; Tierney, 2019). As a result, the burden of recovery management often falls to the local level, as outside interventions may not arrive for days or weeks following a hazard exposure and because state and federal governments often fail to recognize the systemic inequalities and demographics that influence post-hazard outcomes (Caney, 2005; Cohen & Werker, 2008; Davis et. al., 2021; Perrow, 2007). Given the all-too-common weak or absent interventions from higher levels of government, school principals, who are already leaders in their communities, are responsible for navigating students, teachers, and families due to natural hazard exposure (Hoying et al., 2017; Kusumari & Alan, 2011; Sherrieb et al., 2012). Based on the narrative case study of a school leader after a series of catastrophic tornadoes in Texas, Potter et al. (2021) listed the new responsibilities school leaders may encounter following natural hazard exposure, which include communicating with staff and the media, making decisions quickly and under pressure, assessing students' needs, managing outside support, and integrating stakeholder voices into planning.

At a basic level, principals' efforts during recovery can involve the provision of physical necessities, which is often the first and highest priority during hazard recovery. For example,

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after a devastating tornado in Joplin, Missouri, the school superintendent worked to provide free meals to students and families, more than half of whom lived below the federal poverty line before the hazard (Goswick et al., 2018; Kanter & Abramson, 2014). Schools have also distributed clothing and other supplies to the community for months after a hazard (Lee et al., 2008; Ward & Shelley, 2008). Moreover, because of their relationships and knowledge of local contexts, those who study natural hazard preparation and response argue that school leaders should play an essential role in emergency planning and preparedness for inevitable hazards in the future (Grigg, 2012; Jimerson et al., 2005; McKen, 2011; Ozmen, 2006; Useem et al., 2015). Taking the steps to have a plan in place, when done effectively, also includes processes for navigating the emotional impact of a hazard, another aspect of recovery for which school leaders are responsible.

After ensuring students, families, and communities' most basic needs are met, the second priority for school leaders is emotional recovery (Masten & Narayan, 2012; Pfefferbaum et al., 2012; Prinstein et al., 1996). Principals broker and leverage both school-based and outside resources to help facilitate healing for students and staff (Halliger, 1992; Sherrieb, et al., 2012). Doing so is important because experiencing a traumatic event hampers a child's ability to learn (Adams & Adams, 1984; Gershenson & Tekin, 2018; Norris & Uhl, 1993; Plyer & Oritz, 2011; Swenson et al., 1996)—even if the traumatic event occurred when the child was in utero (Fuller, 2014). Moreover, child victims of previous natural hazards and other types of trauma may experience more negative emotions after exposure to suffering peers (Carrell & Hoekstra, 2010; Jaycox, et al., 2006; Noffsinger, et al., 2012). In children, these secondary effects of trauma can manifest as absenteeism, behavior challenges, difficulty retaining information, withdrawal, and physical symptoms, such as upset stomach, difficulty breathing, or irregular heartbeat (Pane et

al., 2008). Displaced students are more likely to experience these symptoms (Gaffney, 2006; Pane et al., 2006). For teachers, stress from the storm often manifested as increased absenteeism, burnout, and irritability (Pane et al., 2008).

Researchers have connected these findings to the role of school leadership in emotional recovery. In her study of principal leaders after the New Zealand earthquakes, Mutch (2015a) found that the most emotionally supportive principals assumed "roles that went beyond a focus on educational leadership to dealing with an immediate crisis, managing their schools as post-hazard community hubs, rebuilding the fabric of their school communities and all the while being sensitive to the physical, emotional, social, and psychological needs of their staff, students and families" (p. 192). For example, a study of school principals showed how they prioritized managing the trauma in the hours, days, and weeks after a major earthquake in New Zealand in 2011 that happened in the middle of a school day. Principals reported spending a great deal of time comforting crying children, while pushing their own fears about the earthquake aside in order to maintain an appearance of calm authority (O'Connor et al., 2013). As one principal explained, "That's what a principal does; it's like being the captain of a ship" (p. 427). Another remarked, "I put on my principal's smile. Parents arrived and were standing on the outside. I realised then that I had an audience and my response needed to be calm and instantaneous, I had to look like I was in control" (p. 427). O'Connor et al. (2013) described these school leaders as having "a pedagogy grounded in love" to help support their traumatized school communities (O'Connor, Mutch, & Marlowe, 2013, p. 431). Ultimately, the decisions these principals made in the hours immediately after the earthquake signal the important role of school leaders in the hazard. Students and teachers were looking to them for decisions and answers. Even when they themselves were emotionally fraught, the principals recognized the needs of the community and

shifted their leadership to a broader role in supporting the community during the recovery process (Bowman, 2008; Fletcher & Nicholas, 2016; O'Connor et al., 2014).

School leaders have also spearheaded projects that allow students to express their emotions, and these measures that have helped students process the trauma of a hazard (McGrath, 2016; Mutch & Gawith, 2014, Nastasi et al., 2011). Providing these and other mental health supports, like on-site counseling, can help reduce long-term negative mental health effects from hazards—both for teachers and students (Lee et al., 2008). School leaders surveyed in Lee et al.'s study reported that making counseling services available to teachers and students helped them navigate the stress and transitions associated with their exposure to Hurricane Katrina. Participants also recommended that principals be prepared to run payroll by hand or take other measures to ensure teachers were paid on time because participants said teachers needed to be able to pay for home repairs, medical bills, and other expenses caused by Hurricane Katrina. Successful school leaders also supported students and staff returning to school and reassuring them about school safety (Kusumari et al., 2011; Mutch, 2015b). Mutch (2015b) found that many students and staff experienced anxiety around returning to school after the New Zealand earthquakes, which took place during the school day. School leaders who created opportunities for students and staff to discuss their fears and who went over safety protocols when school reopened helped create a sense of calm and routine in their schools.

In a narrative case study of a principal's experience leading his school after deadly tornadoes destroyed the school building, Potter et al. (2021) described how the principal, Mr. Potter, worked to support teachers after the hazard exposure, which he found particularly difficult because he had only served as principal for a few months. First, Mr. Potter described taking a protective role toward teachers by not burdening them with extraneous tasks and

responsibilities outside of supporting their students. For example, when the school was inundated with excess and unneeded donations, he encouraged donors to send gift cards to teachers. He also turned down a press opportunity that would not have aligned with the needs of students and teachers and would have wasted teachers' time and energy. Second, although Mr. Potter had not served as principal for long, he leveraged the existing positive school environment to encourage teachers as they transitioned from the damaged school building to a new building in a short period of time. Through these efforts, Mr. Potter recalled that he built trust with teachers and was able to help them overcome their stress about changing buildings. As he explained, "Because I started at Walnut Hill only months before the tornado, in some ways the hazard helped to establish my identity as a leader and served to accelerate the trust-building process between myself, families, and staff. Immediately, the school saw my leadership in action" (p. 104). Potter et al.'s case study (2021) demonstrated some of the ways a school leader can support teachers following a natural hazard exposure.

Like Mr. Potter, school principals who demonstrate care toward the needs of teachers can help schools navigate challenging circumstances during "normal" times. For example, in the case study of two African American principals in Chicago Public Schools (CPS), when new accountability policies that emphasized student performance on standardized tests were instituted, Lipman (2002) found that the principals vocally opposed the new policies to CPS leaders because they increased teachers' anxiety and attitudes around testing. The researchers described how teachers, fearful of the consequences of low test scores (i.e., school closure or dismissal from job), admonished students for not performing well and focused curriculum and lesson planning around testing. The principals felt the changes eroded the positive school culture and working conditions for teachers, which harmed how they interacted with students. Although

their efforts did not ultimately result in any changes to the CPS testing policy, the principals'

efforts signaled their support for their teachers, which helped ease some of the teachers' stress.

As a part of the climate and context in which teachers work, natural hazards also affect

teacher working conditions and can contribute to teacher burnout, as discussed above (Kuntz et

al., 2013; Le Brocuqe et al., 2016; O'Toole, 2017 & 2018). There are very serious and practical

implications of teacher stress, emotional exhaustion, and burnout after a natural hazard exposure,

as these emotions are linked with turnover and attrition (Kuntz et al., 2013). For example, a study

of teachers in rural Indonesia after a major earthquake found that teachers who suffered from

burnout had lower self-efficacy and were more likely to interpret students' actions as behavior

infractions (Seyle et al., 2013). In the long-term, burnt-out teachers' actions ultimately hampered

community recovery (Seyle et al., 2013).   Kuntz, et al. (2013) explained, "The onus is therefore

placed on organizations to manage their job requirements and support systems available in a

hazard context" (p. 66). As organizational leaders, this reminder is critical for school principals,

who must remember that supporting teachers is another way of supporting students and

supporting the community. This dissertation explores what behaviors school leaders can engage

in to best support teachers and reduce turnover.

Common Features of the Literature on Principal Leadership and Natural Hazards

As observed in the previous section, the type of research conducted is often qualitative in

nature. Researchers working in this field overwhelmingly relied on qualitative case studies to

investigate the effects of crises and hazards (e.g. Kanter & Abramson, Lipman, 2002; Ngo, 2013;

McGee & Bernardo, 1999; Mutch & Gawith, 2014; Mutch & Marlowe, 2013; 2014; O'Toole,

2017, 2018, & 2019; Sutherland, 2017). Given the nature of the data, the findings from these

inquiries cannot offer generalizations that can be applied broadly across schools and across

hazards. While case studies are often criticized in social science research for their limited sample

sizes and lack of generalizability, Siggelkow (2007) affirms: "A single case can be a very powerful example" (p. 20). In natural hazard and crisis research, the most important insights may come from working with individuals and communities who were hardest-hit by the event. Therefore, obtaining a larger or more representative sample may not be prudent for the type of knowledge natural hazard research produces. Thomas (2010) concurs, "It seems to me that any argument about the weakness of case study that rests on its lack of generalizability fails to recognize the limits of induction in social science generally and fails simultaneously to acknowledge the significance of abduction. It fails, in other words, to recognize the offer that can be made in local circumstances by particular kinds of looser generalization" (p. 577). As Flyvbjerg (2011) argues, qualitative case studies offer "practical wisdom [and] common sense" (p. 313). The case studies at hand illustrate just how much truth exists in Flyvbjerg's position because many of the case studies offer very practical recommendations from participants about how to improve hazard response in schools. For example, in both Ward and Shelly (2008) and Lee, et al. (2008)'s studies, participants discussed usable tools that could assist school leaders in navigating natural hazard recovery, such as designating a point person to manage donations and volunteers. The next step in advancing the field is to connect the behaviors principal leaders employ after natural hazard exposure to key outcomes for schools, such as the supports they may provide to mitigate against teacher turnover. This is an important next step as it can help identify how successful school leaders moderate the negative outcomes associated with natural hazard exposure.

Significance of the Study

This literature review has covered four subject areas that inform my research study: teacher turnover, principal leadership, the impact of natural hazard exposure on schools, and school principals' role during natural hazards. In this section, I summarize how my dissertation

contributed to each of these areas by showing the epistemological and/or methodological gaps that my mixed methods study identifying how caring principal leadership can moderate teacher turnover addressed.

Teacher Turnover

The extant literature discussed here underscores how teacher turnover is most often preceded by untenable TWCs, which have far stronger associations with turnover than salary or student demographics (Johnson et al., 2005; Ingersoll and May, 2011, Kraft et al., 2016; Ladd, 2011). My study considered how natural hazard exposure may influence turnover decisions, as the literature on teachers who have experienced natural hazard exposure face new stresses in both their personal and professional lives (O'Toole, 2018; Pane et al., 2008).

Principal Leadership

As "the most salient factor" (Ladd, 2011, p. 251) influencing teacher turnover decisions, principal leadership is an important component in any study of teacher turnover. My study considered how principal leaders' behaviors toward teachers when they are facing the personal and professional challenges associated with exposure to a hurricane natural hazard exposure can moderate turnover. Case studies from Potter et al. (2021) and Lipman (2002) have shown that principals can have a powerful impact on teachers' experiences when they demonstrate care and concern. My study specifically identified the caring behaviors principal leaders can employ to moderate teacher turnover after natural hazard exposure.

The Impacts of Natural Hazard Exposure on Schools

The current research on how natural hazard exposure affects student and teacher outcomes primarily focuses on student achievement and the mental health effects of natural hazard exposure on students and teachers. As the prior research on teacher turnover has shown, student achievement is strongly influenced by teacher turnover. The only research study to date

that considers teacher turnover in the setting of a natural hazard is Kuntz et al. (2013), although they only consider teachers' self-reports of turnover intentions, but did not follow up with actual cases of a teacher leaving a teaching position. My study showed that teacher turnover is an important consequence of natural hazards, which can be easily identified and quantified to demonstrate the effects natural hazards can have on student achievement. Although I will not be testing this, given its negative effect on student achievement, teacher turnover may help explain some of the negative outcomes following natural hazard exposure.

Principal Leadership and Natural Hazard Exposure

The research on principal leadership during natural hazard exposure is predominantly limited in two ways. First, most studies consist of qualitative case studies, which cannot be generalized to other contexts or time periods (Marshall and Rossman, 2016). Second, these case studies cover a breadth of topics related to a school leader's shifting roles and responsibilities due to natural hazard exposure. My study used mixed methods to explore how the behaviors of school leaders toward a specific population (teachers) can lead to an outcome that is important for schools (teacher turnover).

Quasi-Experimental Design

Natural hazards have unfortunately become an inevitable part of school life (Gainey, 2010; Gardiner, 2004). Educational leadership scholars should look causally at their impact on teacher turnover, an important predictor of student achievement. Some researchers have already shown how natural hazard exposure affects student achievement, (e.g. Cerqua & Di Pietro, 2016; di Pietro 2017; Fuller, 2014, etc.), but the relationship between natural hazard exposure and teacher turnover has not been fully explored. Only Kuntz et al. (2013) have considered how natural hazard exposure may influence teacher turnover intentions, which is different from fully

realized turnover. Moreover, research has not specifically identified the behaviors that school leaders can employ in natural hazard settings to reduce teacher turnover.

A feasible, cost effective methodological approach to understanding the relationship among natural hazard exposure, principal leadership, and teacher turnover is a quasi-experimental design. Quasi-experiments are experiments "in which units are not assigned to conditions randomly" (Shadish, et al., 2002, p. 12). Nevertheless, these research designs, when implemented correctly, still allow researchers to make causal inferences (Murnane & Willet, 2011). Using administrative data on teachers in North Carolina, I employed one such design—a fixed effects regression estimation—to show how natural hazard exposure influences teacher turnover. The quasi-experimental research design is a key component of my larger mixed methods research design.

A Case for a Mixed Methods Design

Although some prior research has taken a mixed methods approach to study teacher working conditions (e.g., Coryn et al., 2014; Jiang et al., 2016; Mira & Rogers, 2020) or school leadership (e.g., Jang, 2008), I added the complex factor of natural disaster exposure, which shifts the responsibilities of school leaders. This change has been thoroughly documented qualitatively. Using both qualitative and quantitative methods, my study evaluated how natural hazard exposure affects teacher turnover and whether caring principal leadership can moderate the effect. As noted in Chapter 1, mixed methods research "combines elements of qualitative and quantitative research approaches, (e.g., viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration" (Johnson, et al., 2007, p. 123). When used correctly, mixed methods research designs address complex social issues (Giddings, 2006; Morse, 2015). Given the influence of school leadership

on teacher turnover and the important role school leaders play during natural hazard exposures, principal leadership during natural hazard exposure is a complex social problem.

Using mixed methods research to examine this complex social problem holds new opportunities for research and practice in education policy and leadership. First, mixed methods research enables scholars to more deeply study the effects of natural hazard exposure and the effects of caring principal leadership. Extant research focuses on the short-term priorities of school leadership during natural hazard exposure, such as reopening schools and providing resources to the community (Goswick et al, 2018; Mutch, 2015b; O'Connor et al., 2013; Ward & Shelley, 2008). As discussed above, much of the extant research is descriptive and qualitative in nature, leaving open many unanswered questions. Quantitative evidence can illustrate the end results of these efforts, as it can empirically describe how natural hazard exposure and principal leadership influence teacher turnover. Combining the qualitative and quantitative data in my study, I was better able to illustrate the overall picture and can provide information about best practice that is not feasible by a singular method.

In Chapter 4, I describe in greater detail the mixed methods research design I will employ in this study. First, in Chapter 3, I explain the conceptual framework of crisis management, caring leadership, and leadership orientation that I will use to examine how principals can support teachers during natural hazard exposure. This framework was chosen based on the literature discussed in this chapter on principal leadership as a moderator of teacher turnover and during natural hazard exposures.

CHAPTER 3: CONCEPTUAL FRAMEWORK: CARING LEADERHSIP, CRISIS MANAGEMENT, AND LEADERSHIP ORIENTATION

Introduction

Understanding the influence of school principals on teachers' turnover decisions in schools affected by natural hazards required an analysis of how principals offered support to teachers following natural hazard exposure and of the behaviors school leaders employ to shape both their relationships with their staff and the overall culture of the school. As explained in Chapter 2, prior research has shown that school leadership is the most salient factor in turnover decisions. When teachers receive support from their principals, such as when principals exhibit caring behaviors, this support can buffer the challenges individuals may experience in post-hazard settings. To analyze the influence of school leaders on turnover in the post-hazard context, I employed a conceptual framework the incorporated the concepts of crisis management leadership (Grissom and Condon, 2021), caring leadership behaviors (Steinbinder and Sisneros (2020), and leadership orientation style (Van Kippenberg et al., 2006). I describe these three elements of the conception framework in this chapter, but first, I provide a brief overview of other frameworks that scholars have employed to understand principal leadership. I conclude the chapter with a discussion of how this conceptual framework informed my study and how using this framework will bolster our understanding of the relationship between principal leadership and teacher turnover following natural hazard exposure.

Frameworks for Understanding Principal Leadership

While a full literature review of the vast literature on principal leadership frameworks is beyond the scope of this review, this section briefly situates caring leadership as one approach for leadership study. Another component of this review sets up the conceptual framework used in my study. There are numerous frameworks that researchers have employed to understand principal leadership, especially as it relates to teacher turnover. In this section, I summarize the ways that researchers have studied school leadership. In doing so, I identify the common themes of care across these frameworks and show that leadership behaviors, as opposed to leadership traits or styles, are associated with reductions in teacher turnover. This section motivates how I conceptually framed my study.

First, Daniels et al. (2019) conducted a narrative review on the five most widely used school leadership frameworks in educational leadership research: instructional (leaders focus on curriculum and student learning), transformational (leaders motivate staff for student success), distributed (leadership is collaborative and shared), situational (context shapes leadership), and leadership for learning (team oriented, collaborative, and contextual approach to student achievement). Across these five frameworks, the researchers determined that an effective school leader focuses on effective communication, maintains good relationships, shapes school culture, defines the school's mission, and invests in personnel. It is through these five tasks that a school principal is able to improve student learning and outcomes. As Chapter 3 shows, these five main tasks compose the behavior of caring leadership.

Second, Cansoy (2019) conducted a systematic review of the findings on principal leadership and teacher job satisfaction between 2014 and 2017. Job satisfaction is informed by TWCs (Merrill, 2021; Evans 1997) and TWCs are predictive of teacher turnover (Johnson et al., 2005; Ingersoll and May, 2011, Kraft et al., 2016; Ladd, 2011)). Cansoy found that leadership

behaviors, as opposed to leadership traits or leadership styles, were positively associated with a variety of outcomes for teachers related to their job satisfaction and TWCs. Across 15 studies on principal leadership, leadership behaviors positively affected motivation, performance, organizational justice, climate, culture, and student achievement, while simultaneously reducing stress, burnout, and turnover intentions. These leadership behaviors included inspirational motivation, individual interest, intellectual stimulation, supportive leadership, and rational decision-making. The behaviors were common to multiple types of leadership (e.g., transformational leadership, servant leadership, etc.) and appeared in multiple studies. As the remainder of this chapter shows, all of these leadership behaviors are encapsulated within the framework I used my study. Crisis management and caring leadership captures the best elements of other frameworks and are well-suited for an investigation of a challenging school context: natural hazard exposure.

<center>**Crisis Management**</center>

Background and Motivation

Following the widespread school closures due to the COVID-19 global pandemic, Grissom and Condon (2021) introduced a crisis management framework to guide school leaders during challenging and unprecedented times. The purpose of their framework was to offer an initial framework to guide and prepare school leaders to be effective crisis managers. The authors noted that, in light of the pandemic, crisis management is an important aspect of school leadership. However, crisis management is not included in most principal preparation programs or in-service trainings. Moreover, it is not part of the national standards for educational leaders. Consequently, educational researchers have not fully explored how school leaders lead during times of crisis. My study, which looked at crises prior to the pandemic (Hurricane Matthew in

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SY2017 and Hurricane Florence in SY2019), offers initial insight into how school leaders can serve as crisis managers.

Key Terms

The framework introduced two key terms that are relevant to the study of natural hazard exposure. First, the authors defined a crisis as an "unexpected, fundamental disruption to school functioning with potentially high consequences for the organization, its stakeholders, and its reputation" (p.315). As noted in Chapter 1 and will be further discussed in Chapter 4, the two natural hazard exposures in North Carolina, Hurricane Matthew in SY2017 and Hurricane Florence in SY2019, disrupted school operations and functioning. The potentially high consequence addressed in this study is teacher turnover, which as noted in the literature review, has significant impacts on a school's environment and student achievement.

Second, drawing on prior research from Gainey (2009), Grissom and Condon (2021) defined crisis management as the "strategies for preparing organizations for crises—that is, making them 'crisis ready'—and handling them when they arise in ways that minimize their damage to the organization and its stakeholders" (p.315). The authors posited that school leaders who are better trained to execute crisis management strategies will be more effective at reducing the consequences of a crisis for their schools. They noted that one potential negative outcome that effective crisis management leaders can mitigate is student learning loss. As discussed in Chapter 2, student achievement is negatively impacted by both teacher turnover and natural hazard exposure. Accordingly, the use of a crisis management framework is appropriate for the study of principal leadership as a moderator of teacher turnover following natural hazard exposure.

Phases of Crisis Management

Leveraging prior research on crisis management more broadly (Weick, 1988, Deloitte, 2018, and Robertson, 2017), Grissom and Condon (2021) described how a crisis is not a singular, one-off event, but rather, it is an ongoing, lengthy process. The authors presented a model to illustrate the life cycle of a crisis in schools, as shown in Figure 3.1.

Figure 3.1

Phases of Crisis Management
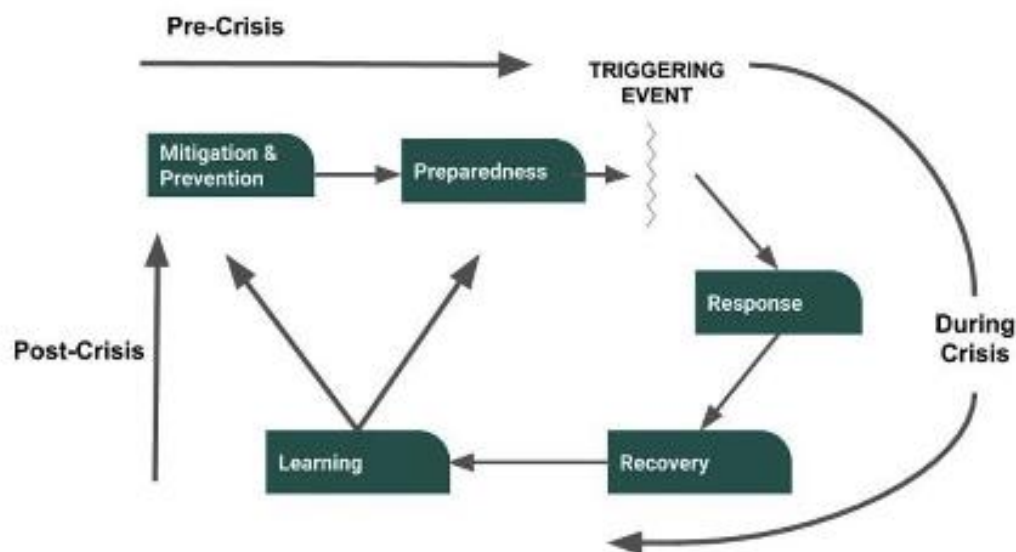
Source: Grissom & Condon, 2021, p.316

As depicted in the figure, crisis management consists of five distinct phases. The conceptual framework employed in this study explored how school leaders offered support to teachers during each of these five phases. Each phase of the crisis management is defined as follows:

- **Mitigation and prevention** "include all activities that pertain to predicting and minimizing the likelihood of different types of crises that could occur" (Grissom &

Condon, 2021, p.316). During this phase, school leaders should be taking steps to identify potential crises and minimize them. The goal of mitigation and prevention is to avert potential crises from occurring.

- **Preparedness** follows mitigation and prevention. This phase acknowledges that some crises are not preventable, and therefore, formal plans and protocols should be enacted to ready a school for a crisis. Plans and protocols should include things like communication and strategies for improving response and recovery.

- **Response** occurs when a crisis management plan is formally enacted following the triggering event, as shown in Figure 3.1. Grissom and Condon (2021) note that the response phase is an ongoing, iterative process during which school leaders adjust and adapt based on available information.

- **Recovery** consists of more sustained efforts that school leaders employ as they move away from the triggering event to addressing longer term needs. Grissom and Codon (2021) noted that one of the key goals of the recovery phases is a reestablishment of pre-crisis routines as much as possible and achieving a sense of normalcy despite the ongoing difficulties the crisis continues to present.

- **Learning** occurs when the leader is able to retrospectively evaluate the crisis experience. Grissom and Condon (2021) explained that learning is used to "to understand the factors that caused or exacerbated the crisis, what strategies the organization might have taken to mitigate or prevent it, the effectiveness of the crisis management plan, and success of actions taken to respond to and recover from the crisis" (p.318). The goal of learning is to improve crisis management going forward.

These five phases of crisis management were employed as the a priori coding framework for Research Question 3, which asks what strategies did school leaders use to support teachers following natural hazard exposure.

Core Competencies

In addition to the five phases of crisis management, Grissom and Condon (2021) listed three sets of core competencies that should guide school leaders' interactions with their constituents, such as teachers, during a crisis. These competencies are: (1) communication, (2) emotional intelligence, and (3) analysis, sensemaking, and judgment. Regarding communication, the authors emphasized that transparent, frequent, and consistent communication from the leader is essential for building trust and buy-in during a crisis. Emotional intelligence requires school leaders to recognize and respond to the stress and trauma a crisis introduces. According to the authors, by employing emotional intelligence, school leaders can have better long-term outcomes and a stronger, more stable school community following a crisis. Lastly, the analysis, sensemaking, and judgment competency calls on leaders to make the best use of available information to guide decision-making. Grissom and Condon explained that decisions may need to be made with imperfect or incomplete information. Using this final competency, school leaders can act in the moment and can also reflect later on to adjust how they would respond differently in the same situation in a future crisis.

These three core competencies are woven throughout all five phases of crisis management. The qualitative analyses in my student presented evidence of how school leaders used these competencies during these five phases following natural hazard exposure.

Caring Leadership

Defining Caring

The first step in understanding caring leadership in education is to understand what caring means. Beck and Newman (1996) explained that because the term "caring" is rather ubiquitous, pinpointing a precise definition is difficult, as it has multiple meanings (Beck & Newman, 1996). Some of the deepest discussions on caring are found in philosophy and ethics. First, many scholars have defined caring as relational: the exchanges and interactions between the person providing the care and the person receiving it. Mayeroff (1971) argued that the purpose of caring is to be devoted to the growth of another person without self-interest. He wrote, "To care for another person in the most significant sense is to help him grow and actualize himself" (p. 1). For Mayeroff, caring in this way provides meaning to a giving person's life. Gilligan (1982) added that practicing care requires the practitioner to be flexible and unbound by arbitrary rules and constraints. Gilligan defined caring as an orientation toward others, rather than thoughts or feelings (Timothy et al., 1996). Noddings (1984), with her three books on the topic, is most often associated with the scholarship of care in education, characterized caring as a relationship – as being "charged with the protection, welfare, or maintenance of something or someone" (p. 9). Louis and colleagues (2016) summarized the core ideas presented by Mayeroff, Gilligan, and Noddings when they wrote, "These authors reflect a common assumption that caring is a property of relationships that is expressed through action and interaction" (p. 313).

Second, philosophers and ethicists also defined caring by its purposes, or the reasons why caring is conducted. These purposes of caring are: (1) to promote another's growth and well-being, (2) to address another's needs, and (3) to develop another's capacity to care (Louis et al., 2016). Smylie et al. (2020) argued that this third point is one of the main motivations underscoring why caring leadership is an important part of schooling. Caring is an iterative

process, in which an individual who receives care is then more likely to give care to others (Noddings, 2005). Beck (1992) and Roffey (2006) described how caring is a learned set of behaviors for which a person increases his/her/their capacity through caring for another and being cared for by another.

Third, caring can be defined by its outcomes and the end results that it produces. These outcomes can be both near- and long-term (Louis et al., 2016). Caring can resolve an individual's immediate need, such as giving food or clothing to a person who is hungry or cold, or accrue over time to produce a beneficial outcome, such as increased growth in a student's academic performance. As Louis et al. explained, "The focus of much of the writing on caring and human development emphasizes its role in promoting the 'success' of individuals over the life course" (p. 313).

Origins of Caring Leadership as a Conceptual Framework

As researchers developed conceptual frameworks for studying caring leadership, we observe echoes of these definitions of caring in them. The caring leadership conceptual framework originated in nursing leadership research. The nursing literature on caring leadership defines it as the responsibility to minister to patients, with this idea of ministry and vocation being key to the identity and actions of the leader (Erikksson, 1992 & 1997). Caring leaders consider each person's dignity, uniqueness, and value during interactions and when making decisions (Bondas, 2003; Näsman, 2018). Through in-depth interviews with nurse leaders, Steinbinder and Sisneros (2020) identified five specific behaviors that caring leaders use with their teams: (1) self-awareness, (2) deep listening, (3) being curious, (4) demonstrating empathy, and (5) decisiveness (Steinbinder & Sisneros, 2020). Table 3.1 defines each of these behaviors.

Table 3.1

The Five Behaviors of Caring Leadership

Behavior	Definition
	A caring leader who is self-aware:
(1) Self-Awareness	• knows him/herself/themselves and his/her/their values and beliefs well.
	• understands how others perceive her/him/them and how these perceptions are important to leadership
	• knows how his/her/their values and beliefs could be challenged and prepares him/her/them for managing potential conflict.
	• maintains respect for others during every interaction.
	A leader who listens deeply:
(2) Deep Listening	• Understands that another's perspective is paramount to caring leadership.
	• Limits potential outside distractions during each interaction.
	• Maintains eye contact.
	• Connects what a person is communicating to the larger picture.
	• Withholds judgment.
	• Makes sure others know that what they have to say matters.
	A leader who is being curious:
(3) Being Curious	• Appreciates that curiosity and asking questions leads to new, unexpected information and solutions.
	• Asks questions for greater understanding, clarity, and new possibilities.
	• Is intellectually humble and often asks more than speaks.
	• Encourages others to use their knowledge and expertise to address the complex issues that the organization faces.
	A leader who demonstrates empathy:
(4) Demonstrating Empathy	• Hears another's story or perspective and recognizes the emotions that are being conveyed.
	• Suspends his/her/their own judgement and allows others to feel acceptance for who they are without feeling judged, ashamed, or inadequate.
	• Can be with another and simply listen without trying to make things better.

	• Does not share his/her/their own experiences as a comparison or looks for the silver lining in the current situation.
	• Knows that empathy can strengthen connections with others.
	A decisive leader:
(5) Decisiveness	• Is willing to make decisions with the information at hand.
	• Knows that adjustments may be needed along the way.
	• Trusts himself/herself/themselves.
	• Seeks new information and acts when needed so that forward movement continues.
	• Knows that without decisiveness, others are left waiting and have no confidence in their leader.

Source: Adapted from Steinbinder & Sisneros. (2020). Achieving uncommon results through caring leadership. *Nurse Leader, 18*(3), 243–247.

Armed with these behaviors, caring leaders in nursing then use love and healing on the job—a less clinical and more holistic approach to patient management (Watson, 1979). Caring leadership in nursing emphasizes more than just the relationships between an individual leader and an individual person, as a caring leader also carries caring behaviors into decision-making and organizational improvements (Näsman, 2018). As a whole, the behaviors of a caring nurse leader have been shown to lead to improved patient outcomes (Bondas, 2003). Similarly, schools are also sites where practicing care is important. Caring leadership in education, as discussed next, also leads to improvements for schools.

Caring Leadership in Education

Like nursing leadership researchers, educational leadership scholars have investigated caring leadership. Smylie et al. (2020) offered four reasons why caring leadership is an important and relevant conceptual framework for both studying and practicing school leadership (See Table 3.2). First, caring is an intrinsic social good that is a worthy endeavor. When a person receives care, s/he is more likely to then practice care themselves. Second, caring improves the learning

and development of children in school. Third, the lack of care or harmful uncaring negatively

affects children's learning and social development. Fourth, care is not consistently applied or

practiced in schools, especially in schools that serve students of color, students of low

socioeconomic status, students with low achievement, and students placed at risk.

Table 3.2

Why Caring Leadership Matters in Schools

Reason	Rationale
Caring is an intrinsic good.	Caring is a foundational part of the human condition and a worthy endeavor in its own right.
Caring is crucial to the learning and development of children and youth and their success in school.	Caring improves brain development and cognitive and social-emotional functioning. Receiving care from others leads an individual to be more caring themselves.
The alternatives to caring are unacceptable.	Lack of caring negatively affects children's learning and social development.
Caring is highly variable in schools today.	Educators often perceive evidence of caring when students do not, especially in schools with high proportions of students of color, students of low socioeconomic status, students with low achievement, and students placed a risk.

Source: Adapted from Smylie, M.A., Murphy J.F., Louis, K.S. (2020). "Why care about caring?. *Stories of Caring School Leadership.* Thousand Oaks, CA: Corwin Press, Inc., p. 1–2.

Despite the importance of caring leadership, Smylie et al. argued that caring behaviors are often

underutilized in schools because schools are not structured in ways that promote care. They

elaborated:

> The way in which most schools are organized makes caring problematic. Bureaucratic
> structures and hierarchical relationships, lack of resources, inconsistencies among
> programs and policies, and the stresses and strains these conditions impose restrict
> opportunity and create obstacles to meaningful, caring relationships in schools.
> Moreover, the approaches we have taken recently to improve schools, notably regimes of

curricular specification, testing, and accountability, have made developing supportive caring relationships among adults and students all the more difficult (p. 2).

As this quote explains, the conditions of modern schooling do not readily enable caring behaviors. Lyman (2000) noted that caring leadership is often ignored as a meaningful component of school leadership. In today's complex, turbulent educational environment, researchers posit that caring leadership should be an integral part of a principal's job (Green, 2014; Louis et al., 2016; Ricken, 2006; Smylie et al., 2020).

As discussed below, caring leadership has been shown to lead to a plethora of improvements in schools. These improvements can be categorized in four ways: for students, for teachers and staff, for the community and stakeholders, and as organizational outcomes. Each will be discussed in turn.

Student Outcomes from Caring Leadership

Just as caring leadership in nursing leads to improved patient outcomes (Bondas, 2003), caring leadership in education has been shown to improve student outcomes. Lawrence-Lightfoot (1983) found that caring leadership is foundational to a school's academic success. In her year-long case studies of six high schools in varying locations and contexts, she found that caring leadership was related to a school's performance and reputation. Caring leaders buffer students from the stressful environment of contemporary schooling, the structures of which (i.e., high-stakes standardized testing, curricular specification, and accountability) can interfere with students' ability to learn (Lyman, 2000; Smylie et al., 2020; Slywester, 1995). In their literature review on caring in schools, Murphy and Holste (2014) found that care positively affects student outcomes through institutional affiliation (a student's positive associations with his/her/their school), engagement (orientation toward learning), and learning (as measured by attainment and

achievement). The researchers concluded that the relationship between engagement and learning may even be more powerful than a student's ability.

As Smylie et al. (2020) noted in their list of why caring leadership matters in schools, caring leadership is particularly important in schools serving higher-need or at-risk student populations. In her ethnographic study of a caring principal whose early childhood center served low-income families in Illinois, Lyman (2000) found that the principal's care was associated with better learning for students, including children who received special education services. Based on the caring environment the principal created, Lyman concluded that caring leadership should be required in any school serving an urban population.

Similarly, in a case study of an alternative school that served a predominantly African American student population, Polite et al. (2009) found that the principal's care for students and staff ultimately enabled students to return to their mainstream schools within the academic year. In another study of caring leadership at an alternative school, Cassidy and Bates (2005) found that students attributed their changed perspectives about their futures and improved decision-making to the care they received at the school. The researchers observed that caring at this school began with the principal. As one student participant shared, "Other principals just judge me and my life. The principal here, he understands. He knows what's going on" (p. 88).

Teacher and Staff Outcomes from Caring Leadership

Caring leadership has been shown to produce three outcomes for teachers and staff at a school. First, by demonstrating care, caring school leaders facilitate teachers' ability to succeed in both caring for their students and helping them succeed. As Ricken (2006) explained, a caring leader "motivates staff to reach for a higher level of professional practice" (p. 6). Caring leadership improves both teachers' sense of responsibility for their work and student learning (Louis et al., 2016). In a case study of the assistant principal at a diverse Texas high school,

Madhlangobe and Gordon (2012) found that her care toward teachers helped them become more confident in supporting their culturally and linguistically diverse students. She encouraged teachers to model the same care she showed them toward their students. As this assistant principal explained to the researchers, her job as a caring leader was to "design a school environment that encourages building confidence, trust, and interest among faculty and staff so they in turn can help their students to become organized and disciplined to learn" (p. 183). Her position echoes the philosophical concept that caring fosters more caring (Beck,1992; Noddings, 2005; Roffey, 2006).

Second, a part of the care a school leader provides to his or her faculty and staff is being able to make and communicate clear decisions, even when those decisions may be contentious or unpopular. Steinbinder and Sisneros (2020) noted that decisiveness is one of the behaviors nursing leaders employ to show care. Ricken (2006) explained, "The truly courageous leader must recognize that at times, the position requires a tough taskmaster—a person who cannot afford to worry about winning the congeniality award. It would be foolhardy at such times to be concerned about one's popularity. The primary task is to focus one's energy on doing what's best for children" (p. 2).

The final outcome is that caring leadership can positively influence the environment in which teachers work. Louis et al. (2016) found that caring leadership in schools creates more care among staff and students. Their findings reinforce the ideas of caring as a relationship between people (Gilligan 1982; Noddings, 1984) and as a way of building more care (Noddings, 2005). As Louis et al. explained, "Schools may be in a better position to create networks of reciprocity than other settings because they tend to have more stability in both their professional personnel and their student bodies and more opportunities for adults to work with students in

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longer term relationships" (p. 318). Brisse et al. (1995) observed that the opposite phenomenon is also true. In their analysis of teacher burnout turnover, the researchers, using surveys on teacher's opinions and work histories, found that in schools with high rates of turnover, remaining teachers had fewer satisfying, caring relationships with students, administrators, and other teachers.

Community and Stakeholder Outcomes from Caring Leadership

Murphy et al. (2017) stated that, effective school leaders do not only "focus on individual student outcomes but also attend to the needs of students' families and communities" (p. 22). According to Siraj and Hallet (2013), engaging with parents and other stakeholders is an important way to ensure a student's needs are fully met. They explained, "The ethic of care involves developing and maintaining caring relationships with children, parents and caregivers, and multi-agency professionals, which guides professional action, placing the welfare, interests, and outcomes for children at the center of the service" (p. 21). According to Gilligan (1982) and Noddings (1984), meeting the needs of an individual is a hallmark of caring. Therefore, building caring relationships with stakeholders can help leaders achieve this mandate for caring.

In addition to helping the students in his or her charge, a leader's care can bring about positive improvements for the stakeholders themselves, such as parents. Lyman (2000) observed that the principal, Ken Hinton, engaged parents through regular classroom meetings and one-on-one conversations. Hinton encouraged struggling parents with ways to positively interact with their children and even coached one parent to continue her education. He also urged parents to look after and care for each other's children, building a culture of care that extended beyond the school walls. Lyman wrote that she was surprised by how far Hinton's care reached because of his efforts with parents. She admitted that she expected his caring leadership to affect teachers and staff at the school, but she had not expected such deep care for parents. Similarly,

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Madhlangobe and Gordon (2012) that the caring assistant principal in their study invited parents to become actively involved in their children's learning by participating in a curriculum evaluation and observing their children's classrooms. Parents said these experiences made them care more about the teachers and administration at their school. They also shared that they wanted to continue to be actively involved in their children's education in the future. Both Lyman's and Madhlangobe and Gordon's findings harken back to the philosophical argument that caring begets more caring (Beck,1992; Noddings, 2005; Roffey).

Organizational Outcomes from Caring Leadership

Finally, caring leadership can evoke improvements for a school as an organization. Ryu et al. (2020) characterized caring leadership as "a property of the organizational culture" of a school (p. 3). In their qualitative case study of two school leaders, they observed that a caring relationship between two individuals, such as a teacher and a student, is cultivated by a caring environment actively and intentionally facilitated by the principal. The school leader sets the caring tone and the caring agenda in a school. Similar to the philosophical arguments made by Beck (1992), Noddings (2005), and Roffey (2006), Ryu et al. conclude that individual caring is developed when a person first receives care from another. As Ryu and colleagues explain, "The basis for success may lie in a leader's relational competency and genuine caring behaviors that have the greatest direct impact on the school-wide caring culture" (p. 15).

Furthermore, in a portrait study of six caring male suburban school principals, Lawrence-Lightfoot (1983) observed that these school leaders' caring contributes to the overall effectiveness of the school. She believed these schools' exceptionality extends beyond exceptional student performance and influences students' characters. In their case study of an alternative school, Cassidy and Bates (2005) also attribute the students' emotional and academic growth to the school's caring environment. The school's leadership created a "philosophy of

providing a safe, respectful, and nurturing community. [Teachers] say that this unites all staff members in a common purpose to care for students who have been unsuccessful at other schools" (p. 82-83). Both Lyman's and Cassidy and Bate's findings underscore the philosophical point Mayeroff (1977) made that receiving care promotes an individual's self-actualization.

Caring Leadership & Natural Hazards: Toward a Relational and Cultural Framework

Given that caring leadership is linked to many positive outcomes in schools (for students, for teachers and staff, for the community and stakeholders, and as organizations), it is necessary to identify the behaviors of a caring leader. The leading educational leadership scholars have identified the characteristics of caring leadership. In studying the relationship between caring leadership and quality of relationships in schools, Louis et al. (2016) listed the five elements of caring relationships. They are:

1. Attentiveness*:* Giving the receiver of care attention to respond to his/her/their needs.

2. Motivational displacement: Placing the needs of the other ahead of one's self-interests.

3. Situation contex: Being flexible and dynamic in responding to another's needs in a certain context.

4. Mutuality: Having a sense of responsibility toward another's success.

5. Authenticity: Being open, transparent, and genuine in interactions.

While these elements provide useful insights, these scholars posited that they paint an incomplete picture of caring relationships. In a later paper, Ryu et al. (2020) argued that focusing on relationships as the only outcome of caring leadership in schools limits our understanding of its impact. They found that caring leadership cultivates a schoolwide culture of caring. Several other scholars (e.g., Cassidy & Bates (2005); Lyman (2000); Madhlangobe and Gordon, 2012) also

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found that the caring leaders in their case study created a community of care for all members, including teachers.

My study on how caring leadership moderates the relationship between teacher working conditions and turnover following a natural hazard exposure requires an understanding of both the relationships and the culture in a school. In Chapter 2, I discussed how research tells us that both relational and cultural aspects of school leadership affect turnover decisions. Teachers who have supportive relationships with their principals and teachers who perceive their school leaders as fostering positive working conditions are less likely to leave their schools. As I will discuss in Chapter 4, my qualitative analysis requires a way to capture how caring leadership shapes the relationship and the culture for teachers in the post-hazard context. In reviewing the various approaches to characterizing caring leadership, Steinbinder and Sisneros (2020) have developed a relevant, usable framework for capturing the caring behaviors of a leader as it relates to their interactions and effects on the members of their team (See Figure 1). These behaviors ((1) self-awareness, (2) deep listening, (3) being curious, (4) demonstrating empathy, and (5) decisiveness) address both the relational and cultural aspects of caring school leadership. In Table 3.3, I label each of these behaviors as relational, cultural, or both.

Table 3.3

Caring Leadership Behaviors as Influencing School Leader's Relationships and School Culture

Behavior	Definition
(1) Self-Awareness	*A caring leader who is self-aware:* • knows him/herself/themselves and his/her/their values and beliefs well. *Both* • understands how others perceive her/him/them and how these perceptions are important to leadership. *Relational* • knows how his/her/their values and beliefs could be challenged and prepares him/her/them for managing potential conflict. *Both* maintains respect for others during every interaction. *Relational*
(2) Deep Listening	*A leader who listens deeply:* • Understands that another's perspective is paramount to caring leadership. *Relational* • Limits potential outside distractions during each interaction. *Relational* • Maintains eye contact. *Relational* • Connects what a person is communicating to the larger picture. *Relational* • Withholds judgment. *Relational* • Ensures others to know that what they have to say matters. *Relational*
(3) Being Curious	*A leader who is being curious:* • Appreciates that curiosity and asking questions leads to new, unexpected information and solutions. *Cultural* • Asks questions in order to greater understanding, clarity, and new possibilities. *Both* • Is intellectually humble and often asks more than speaks. *Cultural* • Encourages others to use their knowledge and expertise to address the complex issues the organization faces. *Cultural*
(4) Demonstrating Empathy	*A leader who demonstrates empathy:* • Hears another's story or perspective and recognizes the emotions that are being conveyed. *Relational* • Suspending his/her/their own judgement and allows others to feel acceptance for who they are without feeling judged, ashamed, or inadequate. *Relational*

	• Can be with another and simply listen without trying to make things better. *Relational* • Does not share his/her/their own experiences as a comparison or looks for the silver lining in the current situation. *Relational* Knows that empathy can strengthen connections with others. *Both* *A decisive leader:*
(5) Decisiveness	• Is willing to make decisions with the information at hand. *Cultural* • Knows that adjustments may be needed along the way. *Cultural* • Trusts himself/herself/themselves. *Cultural* • Seeks new information and acts when needed so that movement forward continues. *Cultural* • Knows that without decisiveness, others are left waiting and without confidence in their leader. *Cultural*

Source: Adapted from Steinbinder & Sisneros. (2020). Achieving uncommon results through caring leadership. *Nurse Leader, 18*(3), 243–247.

Figure 3 shows how Steinbinder and Sisneros's framework addresses the two areas of caring leadership that prior researchers have shown to be relevant to school leadership. Their framework also provides descriptions of specific, identifiable behaviors that leaders can use to show care to their staff. Steinbinder and Sisneros's framework will help guide my qualitative data analysis as I examine interviews containing principals' self-reports of their caring leadership toward teachers in schools affected by hurricanes in Chapter 4.

Moreover, understanding whether a principal's behaviors toward teachers were caring following hazard exposure will provide important context for both my qualitative and quantitative results. Given that natural hazard exposures introduce a host of new complexities into the conditions under which teachers work and that challenging TWCs are highly predictive of teacher turnover, I hypothesized that when their principals demonstrate the caring behaviors, as described by Steinbinder and Sisneros (2020) that turnover in those schools will be lower in

the year following the hazard exposure. As the logic model shows (see Figure 3.2), principals

have the potential to disrupt the possible relationship between hazards and turnover. Care is one

potential way that principals can moderate this relationship. By integrating the qualitative and

quantitative data in my study, I present initial evidence about whether caring leadership

influenced teacher's perceptions of their working conditions and their turnover in hazard-

affected school districts.

Figure 3.2

*Logic Model Showing Principal Leadership as a Moderator of Teacher Turnover following
Natural Hazard Exposure*
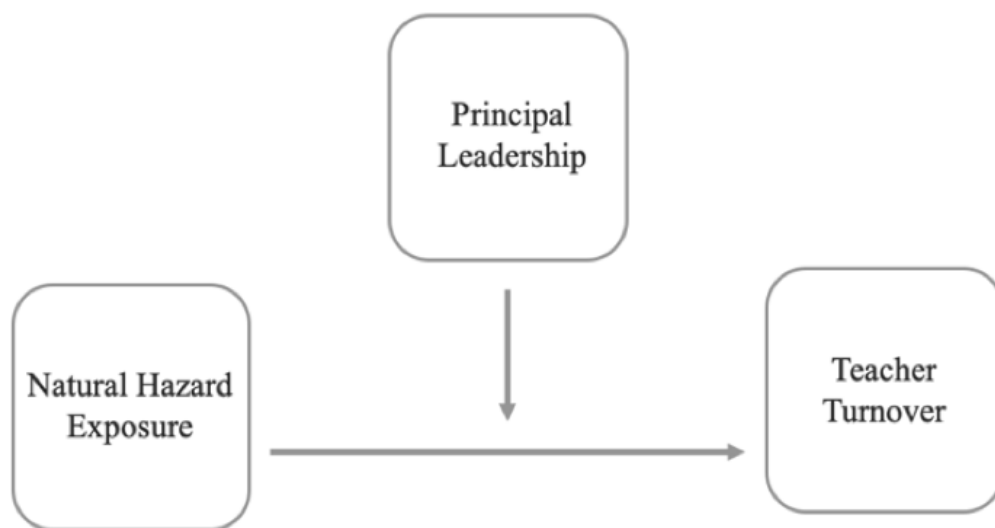
Leadership Orientation

As I will discuss more fully in the findings chapter (Chapter 5), my initial analysis of

principals' caring leadership behaviors consisted of categorizing principals as either high caring

or low caring principals. However, something about this categorization began to feel

inflammatory, especially given the discussion in Chapter 2 about educators as caring

professionals. It began to feel unlikely that principals were actually low caring, especially in the

context of a traumatic event like a natural hazard exposure. My concern that my analysis was headed in a troubling direction was confirmed when I shared some of these results with a member of the sample. The member found the categorizations of high and low caring to be extremely problematic. The member shared that all principals most likely do care, but what they care about might look different than my analysis showed. In reviewing the data again, I then found that caring manifested in two ways: process and outcome orientation. While the caring behaviors from the framework were still applicable, I needed to analyze them as either process- or outcome-oriented.

Van Kippenberg and colleagues (2006) described process and outcome orientations as two leadership styles that often serve as the hallmarks of how an organization and a leader manage periods of organizational change. Arguably, a natural hazard exposure is a period of significant organizational change for schools because the natural hazard exposure leads to disruptions and changes to school operations and school environments. Van Kippenberg and colleagues define process orientation as concerns with the change processes, such as procedures, voice, and participation options. Outcome orientation is defined as longer term outcomes related to the organizational change, such as salary and expenses. The experiment the authors conducted showed that employees' orientations, either process or outcome, influenced how they responded to organizational change. Van Kippenberg and colleagues argued that organizational leaders should understand their employees' different orientation and adjust their management and leadership of organizational change to fit their employees' preferences.

In my study, I looked instead at how school leaders' orientation style shaped the way in which they led and supported their teachers following natural hazard exposure. My approach placed the onus on school leaders to have teachers buy into their leadership orientation to address

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the myriad of stressors and difficulties the natural hazard exposure introduced. Additionally, using leadership orientation helped better explain the caring leadership behaviors school principals employed to support teachers following Table 3.4 presents the criteria for whether school leaders' responses about their caring behaviors toward teachers following natural hazard exposure were process- or outcome-oriented. In the qualitative portion of the study, I looked at how caring leadership behaviors were categorized as either process- or outcome-oriented. Then, in the mixed methods section, I looked descriptively at how teacher turnover rates are influenced by school leaders' orientation styles.

Significance of the Study

Applying this conceptual framework, which looks at crisis management, caring leadership, and leadership orientation, is an important contribution to the study of school leadership for several reasons. Specifically, my study leverages two essential but understudied aspects of school leadership: crisis management and caring leadership.

First, my study offers empirical evidence for how crisis management can be used by school leaders following natural hazard exposure. As Grissom and Condon (2021) explained, crisis management is a critical but neglected aspect of school leadership training. My study showed how school leaders can use crisis management to support teachers following natural hazard exposure. The goal was not only to show how school leaders can be effective crisis managers but also to show areas where their management could have been improved with training and support from pre-service programs, districts, and states, as Grissom and Condon argued is needed in light of the Covid-19 pandemic.

Second, my study highlights the importance of caring leadership. My dissertation advances the study of caring leadership, since I will empirically test the framework for caring leadership behaviors developed by Steinbinder and Sisneros (2020). In their qualitative study, the

researchers developed the framework using grounded theory, wherein researchers develop hypotheses and theories throughout the research process (Charmaz and Belgrave, 2009). For Steinbinder and Sisneros, the Five Behaviors of Caring Leadership framework developed through in-depth interviewing with three caring nurse leaders. In my study, I applied this framework in a new context by analyzing how school principals' caring leadership behaviors influence turnover.

Using the caring leadership behaviors framework, my study will shed new light on the importance of caring leadership in education research. Caring leadership occupies a small but growing corner of the research on educational leadership (Beck & Newman, 1992). As Smylie et al. (2020) pointed out, caring is highly variable in schools today. It is also understudied, and there are sociohistorical reasons why it has not been a more prominent topic of research in educational leadership (Lyman, 2000). Gilligan (1982) argued that caring has been depicted as a women's approach to morality. Both she and Noddings (1984) associated caring with a feminine nature and disposition. However, Noddings (1992) emphasized that caring is not exclusive to women, as any individual is capable of showing care to others. Although caring has been cast as feminine, she calls on both male and female educational leaders to practice care. Additionally, in her qualitative study of male caring principals, Lawrence-Lightfoot (1983) showed that male school principals are more than capable of serving as caring leaders. She explained that while caring is traditionally viewed as feminine, caring behaviors "are critical to the expression of a non-caricatured masculine leadership" (p. 25). Therefore, by studying caring leadership in schools, I demonstrated its relevance to the operation of schools today for both male- and female-identifying school leaders. My work affirms what Smylie et al. states, "Alternatives to caring are unacceptable" (p. 9).

Additionally, using leadership orientation, I am able to shed light on how school leaders exhibit caring behaviors toward their teachers in the context of natural hazard exposure. Not all leaders exhibit caring behaviors in the same way. Rather, as I learned through the process of member checking, school leaders express their care based on their underlying leadership orientation style. Process-oriented leaders exhibited care by giving thought, concern, and attention to the day-to-day struggles and experiences of teachers following natural hazard exposure. Outcome-oriented leaders exhibited care by focusing on long-term goals for their schools, especially goals around student achievement and a return to normalcy.

In Chapter 4, I detail how the conceptual framework informed the research design I employed in this study.

CHAPTER 4: A CONVERGENT MIXED METHODS RESEARCH DESIGN

Introduction

This chapter provides an overview of the methods I used in this research study. First, I describe the convergent mixed methods research design and why this design is appropriate for answering my research questions. Next, I provide the context for the study, as well as information about site and participant selection. Then, I describe the data collection and analysis plans for the quantitative, qualitative, and integrative strands of the study.

Convergent Mixed Methods Research Design

As stated in Chapter 1, my dissertation will answer the following six questions:

1) Does natural hazard exposure predict teacher turnover?

2) Do different natural hazard exposure events affect teacher turnover differently?

3) What strategies did school principals employ to support teachers following a natural hazard exposure?

4) Did school principals use caring leadership behaviors to support teachers following natural hazard exposure?

5) What is the relationship between caring leadership orientation and teacher turnover in schools that were exposed to a natural hazard?

6) What deeper insights do the qualitative findings provide to help explain the quantitative results on teacher turnover in schools affected by natural hazard exposure?

To answer these questions, I used an explanatory sequential mixed methods research design. An explanatory sequential study occurs in three phases. First, in the quantitative strand,

data is collected and analyzed, followed by qualitative strand, during which the qualitative data leveraged to further interpret or explain the quantitative findings. The two phases are then merged to further probe the phenomenon at hand and to produce meta-inferences (Creswell & Plano Clark, 2018). By integrating qualitative and quantitative data, mixed methods research merges the discrete findings of qualitative and quantitative approaches, leading to a more thorough understanding of a complex problem (Creswell & Plano Clark, 2018; Giddings, 2006; Morse, 2015). Here, the complex problem is the relationship between caring principal leadership and teacher turnover following natural hazard exposure.

As Johnson et al. (2007) summarized, mixed methods research "combines elements of qualitative and quantitative research approaches, (e.g., viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration" (p. 123). I answered Research Questions 1 and 2 using quantitative data and Research Questions 3 and 4 using qualitative data. The findings were then integrated to help to answer Research Questions 5 and 6.

A mixed methods research design offered a particular advantage for my study, as it allows for qualitative and quantitative data to be merged to show points of agreement and contention. The quantitative data was used to measure teacher turnover rates among schools that were exposed to a natural hazard. The qualitative data collected for the study showed how principals supported teachers following a natural hazard exposure. In the mixed methods phase of the study, I will be able to descriptively analyze whether there is a relationship between reported caring leadership behaviors and teacher turnover using two-way time series plots (Mitchell, 2012).

The explanatory sequential mixed methods research design provided unique insights into the relationship between principal leadership and teacher turnover in the context of natural hazard exposure. Used alone, a quantitative analysis of teacher turnover in hazard-affected schools would paint an incomplete picture of the role of caring leadership in turnover, as these behaviors are not measured in the existing survey data and administrative records used in my analyses. Adding qualitative data to the study allowed me to demonstrate how school leadership influenced teacher turnover.

Similarly, a qualitative analysis of caring leadership in hazard-affected schools alone would not allow for empirical estimates that show how natural hazard exposure affected teacher turnover. The mixed methods phase of the study allowed me to combine evidence from the qualitative and quantitative strands to descriptively and narrative probe the relationship between principal leadership and teacher turnover following natural hazard exposure. As I discussed in Chapters 2 and 3, principal leadership is the most significant factor impacting teacher turnover in schools, and principal leadership can account for the behaviors school principals may employ to moderate teacher turnover. My study includes a discussion of the relationship between the quantitative results and the interview data to gain a more complete understanding of teacher turnover in hazard-affected schools.

Context of the Study: North Carolina after Hurricane Matthew (SY2017) and Hurricane Florence (SY2019)

This study investigates the effects of two major hurricanes on schools in Eastern North Carolina: category five Hurricane Matthew in SY2017 and category four Hurricane Florence in SY2019. These natural hazards were among the most devastating in recent North Carolina history, bringing two 500-year floods in the span of just 24 months (Sullivan et al., 2019). A 500-year flood has a 1 in 500 probability, or 0.2 percent chance, of occurring in a given year

(U.S. Geological Survey, 2018) In North Carolina, the two storms were responsible for more than 110 direct deaths and more than $25 billion in damage (National Oceanic and Atmospheric Administration, 2016 and 2018).

Although this study investigated two of the same kind of natural hazard—hurricanes—the impacts of these storms in North Carolina were not entirely the same. The first natural hazard exposure included in this study is Hurricane Matthew, which made landfall in North Carolina on October 8, 2016. Hurricane Matthew was not expected to be an intense hazard because it had been downgraded to a Category 1 Hurricane before making landfall in North Carolina, according to the National Oceanic and Atmospheric Administration (NOAA) (2016). However, the storm brought intense winds and a massive storm surge for which residents and communities in North Carolina were unprepared. As a report from the Centers for Disease Control (CDC) stated, Hurricane Matthew was "a more direct hit on inland southeastern NC – and stalled before heading back out to sea. The storm's slow movement across the region caused devastating and unanticipated flooding" (CDC, 2020, p.1). *The Outer Banks Voice* reporter Russ Lay (2016) wrote that residents of the area were shocked and overwhelmed by the flooding and destruction Hurricane Matthew caused. Homes and businesses were filled with water from the storm surge, as well as seepage from heavy rainfall.

Just two years later, many residents in North Carolina were impacted by Hurricane Florence, which made landfall in the state on September 14, 2018. While its winds were less intense than Hurricane Matthew's, Hurricane Florence caused as much as 30 inches of rain in some parts of North Carolina, the highest amount ever recorded in the state (NOAA, 2018). Both residents and government agencies in North Carolina were more organized and more prepared

for Hurricane Florence after the intense, unprecedented experience of Hurricane Matthew (NOCOE, 2019).

Although the destruction from these back-to-back hazards was unprecedented, hurricane exposure in North Carolina is nothing new. According to the North Carolina Climate Office (2018), at least one tropical storm has affected the state every two years between 1851 and 2016. The Federal Emergency Management Agency (FEMA) has issued 11 Major Disaster Declarations for hurricanes and tropical storms in North Carolina over the past 20 years (FEMA, 2017).

Many of the communities impacted by Hurricane Matthew (2017) and Hurricane Florence (2019) are located in Eastern North Carolina. Given their proximity to the coast, the 41 counties composing the Eastern North Carolina region are especially vulnerable to hurricane exposure, including exposure to Hurricane Matthew (2017) and Hurricane Florence (2019) (Frimpong et al., in progress; Jaysour et al., 2018). The topography of Eastern North Carolina consists of low-lying coastal plains that are prone to flooding from the Atlantic Ocean, as well as the surrounding lakes and rivers. During hurricane season, which typically lasts from May to October, the region becomes especially susceptible to flooding (Frimpong et al., in progress; Jasour et al., 2018). Map 4.1 shows the approximate boundaries of the 41-county region defined geographically, economically, and historically as Eastern North Carolina (Eastern North Carolina Dataset Project, 2006; NC East Alliance, 2019; North Carolina Office of Archives and History, 2004). Map 4.2 shows the topography of North Carolina, highlighting the low elevation of the eastern part of the state, which makes it susceptible to flooding from coastal storms. Some or all of the counties in Eastern North Carolina have been included in every coastal storm, tropical storm, or hurricane FEMA disaster declaration since 2000 (FEMA, 2017).

Figure 4.1

Boundaries of Eastern North Carolina
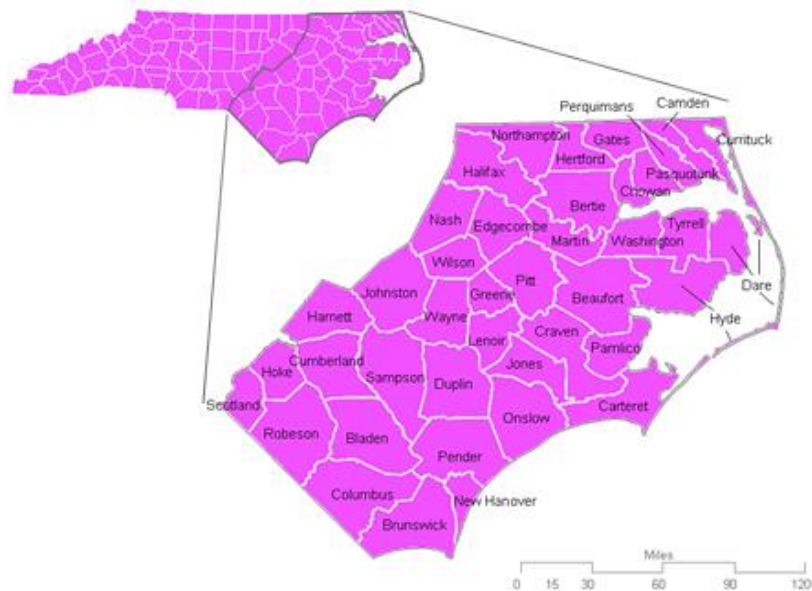
Source: Eastern North Carolina Dataset Project (2006).

Figure 4.2

Topography of North Carolina

Source: World Atlas (2021).

In addition to the region's environment, there are socioeconomic and historical factors that make natural hazards like Hurricanes Matthew (2016) and Florence (2018) particularly difficult experiences for Eastern North Carolina residents. Natural hazards have been shown to have more intense and longer lasting impacts on regions where rurality is high, the proportion of residents of color is high, and earnings and income are low (Davis et al., in progress; Marino & Faas, 2020). These three characteristics are highly salient in Eastern North Carolina. First, rural communities may have limited access to crucial resources and slower recoveries after hazard exposure (Davis et al., in progress; Marino & Faas, 2020). More than half of the state's 3.2 million rural residents reside in Eastern North Carolina (NCEast Alliance, 2018). Second, the counties that experienced the most storm damage between 2016 and 2019 have higher proportions of Black and African-American residents than the rest of the state. Non-white residents of Eastern North Carolina reported experiencing more difficulty obtaining FEMA assistance after Hurricane Florence (Sturgis, 2018; U.S. Census Bureau, 2019). Third, Eastern North Carolina residents have less education and less income than other North Carolina residents (U.S. Census Bureau, 2019). While Eastern North Carolina once prospered as the result of agricultural and textile production in the 18th and 19th centuries, it is now the poorest region in the state and among the poorest regions in the U.S. (Berner et al., 2016; Nichol & Hunt, 2018; Saporito & Sohoni, 2007).

Communities in regions like Eastern North Carolina are often still recovering from one hazard when another strikes, as was the case with the close succession of Hurricane Matthew (201) and Hurricane Florence (2019) (Santos, 2019; Sullivan et al., 2019). Moreover, as global warming continues, natural hazards are only expected to increase in frequency and intensity, leading to more and more challenges for hazard-prone regions (Frimpong et al., in progress;

Jasour et al., 2018; Tierney, 2019). As Tierney (2019) explained, natural hazards exacerbate existing social and economic ills, such as those experienced by Eastern North Carolina residents. Deciding how to reduce the negative outcomes associated with these events has become an urgent policy problem (Exec. Order No. 080, 2018). State-level leaders have also expressed concerns about the effects of hurricanes on the region. In 2019, the North Carolina General Assembly passed legislation to help support recovery, resiliency, and disaster mitigation efforts in Eastern North Carolina following Hurricane Florence (2018) (S.L. 2019-224, General Assembly of North Carolina, 2019).

As I discuss below, some of my quantitative sub-analyses are focused on the impact of natural hazard exposure in Eastern North Carolina. However, counties close to but not part of the region were also affected by Hurricane Matthew, Hurricane Florence, or both. Specifically, 10 of the 51 counties (20%) (Anson, Chatham, Durham, Guilford, Lee, Moore, Orange, Richmond, Union, and Wake[1]) in which residents were eligible to receive FEMA Individual Assistance following one or both natural hazards are not part of Eastern North Carolina. In an assessment of the possible effects of climate change in North Carolina, an independent group of climate change scientists found that it is likely that the frequency and intensity of flood-producing hurricanes and annual precipitation, especially extreme rainfall conditions associated with tropical storms and hurricanes, are expected to increase in North Carolina (Kunkel et al., 2020). Overall, my study aimed to increase understanding of one small aspect of natural hazard exposure in North Carolina: how school leadership can moderate teacher turnover. From a policy perspective, the findings may be used to help school leaders in hazard-prone communities better support for teachers and reduce subsequent teacher turnover following inevitable future hazards.

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[1] Wake County was not included in the quantitative analyses. See page 92 for more information.

Quantitative Data and Analysis Plan

In this section, I describe my plan for the quantitative strand of my study. I describe my approach to answering the first and second research questions, which ask the extent to which natural hazard exposure predicts teacher turnover and whether different natural hazard exposure events affect teacher turnover differently. I begin the section by providing an overview of the data, sample, and variables for the analysis. Then, I discuss the quantitative approach that I used to answer the question. The approach, fixed effects regression modeling, will help me establish that there is indeed a relationship between natural hazard exposure and teacher turnover.

Data Source

For the quantitative analyses, I constructed a panel leveraging data from the Education Policy Initiative at Carolina (EPIC), the North Carolina Department of Public Instruction (NCDPI), and the National Center for Education Statistics (NCES). The panel contained data for all teachers employed in North Carolina public schools between 2016 and 2029. Using a dataset that includes data prior to hazard exposure (Hurricane Matthew in 2017 and Hurricane Florence in 2019) enables me to observe trends in teacher turnover before the natural hazard exposure(s) occurred. These trends will absorb other exogenous events, such as state-level policy changes, that could influence teacher turnover in North Carolina. I was also able to control for student achievement using data from NCDPI. As I described in Chapter 2, schools with lower student achievement often have higher rates of teacher turnover, although achievement is not the most salient factor motivating teacher turnover (Carver-Thomas and Darling-Hammond, 2017; Kraft et al., 2016).

The combination of these datasets enabled me to construct models that reflect the environment in which teachers in North Carolina work. These datasets include information on teachers, schools, and students:

- For teachers and principals, the relevant data included administrative records of an employee's position each year (2014-2020), annual salary, year of bachelor's degree attainment, and demographic characteristics (age, gender, and race/ethnicity). Teacher demographics were aggregated to the school level. I also used school-level data from the North Carolina Teacher Working Conditions Survey, a biennial survey of teacher's perceptions of their working environment, including school leadership.

- For schools, the relevant data included whether the school had ever been categorized as low-performing according to the NCDPI School Performance Framework.

- For students, the relevant data included proportions of students who were eligible for free or reduced-priced lunch and proportions of students by race and ethnicity.

In Appendix I, I listed more details of the data files that will be leveraged in the study, as well as the units of analysis in each dataset, years used, a description of the data, the rationale for using the data, and the sources of the data. By combining the data provided by EPIC, NCDPI, and NCES, I will be able to compare teacher turnover rates in school districts with hazard exposure (as measured by FEMA Individual Assistance eligibility) (see Appendix J) to turnover rates among teachers whose districts were not exposed to hazards. By constructing these datasets as a panel, I will be able to analyze the relationship between teacher turnover and exposure to Hurricane Matthew (2016), Hurricane Florence (2018), or both storms using a robust set of variables.

Sample and Variables

Sample Description

The sample for this study is North Carolina public schools between 2015-16 (one year before Hurricane Matthew) and 2019 (the most recently available year for which the teacher turnover rate could be calculated). I restricted the sample by excluding the two most populated

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counties in North Carolina, as their school districts are considerably larger than the other school

districts in the state, and accordingly, these school districts are not reflective of North Carolina's

rurality (NCEast Alliance, 2014; US Census Bureau, 2012). These two counties, Wake and

Mecklenburg, are each home to more than one million residents and two of the 40 most

populated cities in the U.S. Their populations are more than twice as large as the third most

populated county in the state. As noted in Chapter 2, teacher turnover tends to be higher in urban

localities (Carver-Thomas & Darling-Hammond, 2017). Given that the majority of the state is

classified as rural, including these two larger counties, would dilute the results. The final sample

consisted over 8,152 school-per-year observations.

Outcome Variable

The outcome variable for the quantitative analyses was the teacher turnover rate.

According to the literature, natural hazard exposure is linked to increased teacher stress (Pane et

al., 2006). Teacher stress is associated with turnover (Akar, 2018; Brunsting et al., 2014). My

quantitative analysis attempted to link these two findings together by testing whether teacher

turnover is higher in schools that were affected by natural hazard exposure. Turnover consists of

five possible paths an individual teacher could take: either the teacher has changed to teach in

another public school, changed to teach in a private school, changed to teach in another state, left

the profession altogether, retired or is deceased (Boe et al., 2008; Lindsay & Egalite, in

progress). In most cases, turnover creates a vacant position for which a school leader is

responsible for finding a replacement. While we can observe that turnover has occurred, the

reason for turnover cannot be observed in the data. For the purposes of this study, turnover is

defined as having changed or left a school at least one time between 2016 and 2019 (Lindsay &

Egalite, in progress). Following the method for estimating teacher turnover using NCERDC data

on teacher personnel and pay files outlined by Lindsay & Egalite (in progress), I used the

September pay period (Pay Period 3) as a snapshot of the employee's status for the year. Examining this pay period, which occurs early in the school year, showed whether the teacher remained at the same school or left the school compared with the same pay period from the previous school year. A teacher who has changed schools will have a new school code associated with their record for that year. Second, teachers who appear in the dataset in Pay Period 3 in Year t but do not appear in the dataset in Pay Period $t + 1$ will be presumed as having left the profession in Year t. This method of accounting for teachers who drop out of the panel is an imperfect measure of teachers who have left the profession because some teachers may drop out of the for reasons other than leaving the profession, such as moving to teach at a private school or moving to teach in another state. However, this method provides the closest approximation for teacher turnover given the data available.

Following Lindsay and Egalite's method, I used Pay Period 3 to construct a binary variable that equals 0 for teachers who have not changed schools between 2015 and 2019 and 1 for teachers who have either changed schools or dropped out of the panel. Individual teacher turnover will then be aggregated up to the school level, for which the percent of teachers who turnover in each school year between 2014 and 2019 will be calculated. This new variable that represents the teacher turnover rate at a given school will be the outcome variable of interest in my main analyses.

In Table 4.1, I present the summary statistics for teacher turnover by year for the sample of North Carolina schools.

Table 4.1

School-Year Summary Statistics by Type of Natural Exposure, 2016-2019

	All School-Year Observations	All School-Year Obs. with No Exposure	Any Exposure after 2016	Hurricane Matthew	Hurricane Florence (may incl. Matthew Exposure)	Hurricane Florence (does NOT incl. Matthew)	Both Hurricanes
				Hurricane Exposure Type			
Number of Schools-Year Observations	12,186	9,669	2,517	714	915	353	562
Turnover Rate	19.16%	18.69%	20.99%	21.90%	20.37%	20.21%	20.47%
	(11.02)	(10.78)	(11.69)	(11.71)	(11.20)	(12.36)	(10.42)
Average Teacher Monthly Net Pay	2333.55	2300.20	2461.63	2316.02	2634.80	2688.69	2600.95
	(279,71)	(268.13)	(286.28)	(282.37)	(196.59)	(185.44)	(196.00)
Average Teacher Years of Experience	12.58	12.65	12.30	12.26	12.24	12.48	12.09
	(2.75)	(2.71)	(2.90)	(2.76)	(2.86)	(2.80)	(2.89)

Student-Teacher Ratio	15.30	15.31	15.29	15.38	15.20	14.93	15.37
	(3.54)	(3.59)	(3.32)	(3.14)	(3.50)	(3.79)	(3.30)
Percent of Low-Performing Schools	15.99%	15.14%	19.23%	20.17%	17.16%	18.13%	16.55%
	(36.65)	(35.85)	(39.42)	(40.15)	(37.72)	(38.58)	(37.19)

Percent of Teachers by Race and Ethnicity, Gender, Master's Degree, Years of Experience, and National Board Certification

American Indian/Alaska Native	1.02%	0.70%	2.25%	2.58%	2.07%	0.24%	3.21%
	(5.89)	(4.58)	(9.23)	(10.00)	(8.85)	(0.99)	(1.11)
Asian	0.66%	0.64%	0.76%	0.64%	0.87%	1.28%	0.61%
	(1.84)	(1.78)	(2.05)	(1.62)	(2.07)	(2.45)	(1.74)
Black or African American	12.96%	11.38%	19.04%	17.85%	19.06%	22.17%	17.11%
	(16.92)	(15.76)	(19.64)	(19.00)	(18.91)	(20.87)	(17.29)
Latinx	1.79%	1.61%	2.46%	2.17%	2.80%	2.87%	2.74%
	(2.96)	(2.85)	(3.26)	(3.06)	(3.49)	(3.79)	(3.30)
Other/ Two or More Races	0.74%	0.83%	0.38%	0.55%	0.29%	0.35%	0.25
	(1.89)	(2.00)	(1.32)	(1.76)	(0.99)	(1.11)	(0.91)
White	79.86%	82.27%	70.62%	72.20%	70.36%	68.31%	71.66%
	(20.31)	(18.60)	(23.71)	(23.12)	(22.59)	(22.05)	(22.84)
No Race Reported	2.97%	2.57%	4.48%	4.00%	4.55%	0.00%	4.41%
	(4.82)	(4.10)	(6.70)	(6.23)	(6.34)	(0.00)	(6.92)
Female	81.34%	81.25%	81.70%	81.86%	81.29%	80.08%	82.05%
	(15.21)	(15.42)	(14.32)	(14.31)	(14.36)	(14.49)	(14.25)

Master's Degree	14.67%	14.47%	15.42%	16.35%	17.53%	19.75%	16.14%
	(8.32)	(8.20)	(8.72)	(7.69)	(8.77)	(9.02)	(8.32)
National Board Certification	10.60%	11.34%	7.77%	7.53%	8.21%	10.17%	6.99%
	(9.26)	(9.42)	(7.98)	(7.60)	(8.50)	(9.23)	(7.76)

Percent of Students by Free and Reduced-Price Lunch Eligibility, Race and Ethnicity

Free and Reduced-Price Lunch	65.37%	63.58%	72.16%	73.97%	69.07%	60.35%	74.54%
	(26.32)	(25.69)	(27.59)	(25.00)	(29.84)	(32.13)	(26.94)
American Indian/Alaska Native	1.44%	1.11%	2.68%	3.16%	2.36%	0.03%	3.66%
	(6.76)	(5.60)	(9.91)	(10.74)	(9.35)	(0.45)	(11.75)
Asian	1.84%	1.94%	1.44%	0.96%	2.30%	4.26%	1.06%
	(3.20)	(3.29)	(2.82)	(1.59)	(4.07)	(5.63)	(1.76)
Black or African American	24.94%	22.53%	34.07%	34.23%	32.31%	33.72%	31.25%
	(22.75)	(21.83)	(23.82)	(23.98)	(21.64)	(22.87)	(20.79)
Latinx	15.77%	15.55%	16.58	15.83%	18.40%	19.03%	18.00%
	(12.28)	(12.18)	(12.62)	(12.33)	(13.04)	(13.36)	(12.83)
Two or More Races	4.16%	4.03%	4.64%	4.55%	4.68%	4.13%	5.03%
	(2.31)	(2.19)	(2.68)	(2.75)	(2.53)	(1.92)	(2.79)
White	51.73%	54.71%	40.42%	41.11%	39.90%	38.45%	40.81%
	(26.38)	(26.21)	(23.87)	(23.55)	(23.86)	(25.90)	(22.46)

Average Ratings of Teacher Working Conditions

Support Received from School Leadership	3.12	3.11	3.15	3.15	3.14	3.08	3.17

	(0.30)	(0.30)	(0.29)	(0.28)	(0.30)	(0.31)	(0.28)
Leadership's Efforts to Address Teacher Concerns	3.02	3.02	3.03	3.04	3.01	2.95	3.06
	(0.28)	(0.28)	(0.28)	(0.27)	(0.29)	(0.31)	(0.27)
Effective Use of Time	2.77	2.76	2.82	2.82	2.81	2.76	2.83
	(0.31)	(0.31)	(0.30)	(0.29)	(0.31)	(0.32)	(0.30)
Availability and Reliability of Facilities and Resources	3.11	3.11	3.10	3.10	3.10	3.05	3.12
	(0.25)	(0.25)	(0.24)	(0.24)	(0.25)	(0.25)	(0.24)
Community Support and Involvement	3.06	3.06	3.04	3.05	3.05	3.06	3.04
	(0.27)	(0.27)	(0.27)	(0.26)	(0.28)	(0.31)	(0.26)
Minimal Issues with Student Conduct	3.03	3.05	2.99	3.03	2.97	2.91	3.01
	(0.33)	(0.33)	(0.33)	(0.32)	(0.34)	(0.36)	(0.32)
Overall Rating of TWCs	3.21	3.21	3.22	3.21	3.21	3.15	3.24
	(0.34)	(0.34)	(0.33)	(0.32)	(0.34)	(0.36)	(0.31)

Percent of Teachers by Turnover Intention

Remain at Current School (No Turnover)	79.88%	79.87%	79.95%	79.42%	79.71%	78.03%	80.77%
	(12.86)	(13.08)	(11.97)	(11.92)	(12.24)	(12.83)	(11.75)
Leave Current School but Remain in District	4.46%	4.46%	4.45%	3.77%	5.31%	6.45%	4.59%
	(6.56)	(6.89)	(6.02)	(5.39)	(6.68)	(7.52)	(5.99)
Leave Current District but Remain in State	3.05%	2.94%	3.47%	4.02%	3.06%	2.98%	3.10%
	(4.31)	(4.24)	(4.54)	(4.63)	(4.13)	(3.88)	(4.29)
Leave Teaching Entirely	5.29%	5.62%	4.05%	4.90%	3.75%	3.90%	3.65%
	(5.28)	(5.49)	(4.20)	(4.67)	(3.92)	(4.02)	(3.86)
Willingness to Stay at Current School Is Because of School Leadership	29.64%	29.52%	30.11%	29.67%	30.36%	30.06%	30.55%
	(13.43)	(13.44)	(13.35)	(13.88)	(12.84)	(12.62)	(12.98)

Independent Variables

Variables that describe the characteristics of teachers working in North Carolina between 2016 and 2019, as well as the characteristics describing the schools and districts in which teachers are employed, will be used as both control variables and in interaction terms to determine the effect of natural hazard exposure on teacher turnover. Taken from administrative personnel files, teacher variables include teacher race, gender, salary, position held, years of teaching experience, Title I status, and level of education. Teacher race and gender are time-invariant variables, and the other variables are time-varying. The teacher-level variables allow me to control for variation in teachers' background and experience. The school-level control is a binary variable, coded as 1 if the school was classified as low-performing according to the North Carolina Department of Public Instruction (NCDPI) school performance framework between 2016 and 2019. Student-level controls, which the NCES Public School Universe, include proportions of students who are eligible for free or reduced-price lunch and proportions of students by race and ethnicity. These variables are time-varying. As discussed in the literature review, school-level factors, especially student achievement and demographics and TWCs, are associated with turnover. By including these variables in the model, I will be able to control for their effect on turnover at schools that have been exposed to natural hazards.

Where it is called for in the equations below, I will employ a constructed indicator variable to account for natural hazard exposure, where 1 indicates the school was exposed to a natural hazard, based on the criterion of county-level FEMA Individual Assistance eligibility and 0 indicates that the school was not exposed to a natural hazard based on this criterion. This variable is a lagging time variable. Schools that were exposed to Hurricane Matthew are coded as 1 for the year of exposure, 2017, as well as the subsequent school years, 2018 and 2019. Schools

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that were exposed to Hurricane Florence were coded as 1 in 2019. Schools exposed to both

natural hazards are coded as 1 in 2017, 2018, and 2019.

Analysis

Summary Statistics

In Table 4.1, I present the summary statistics for the sample, which includes ~17,500

school-year observations (see page 95). These schools are composed of teachers who were

employed in North Carolina between 2016 (one before Hurricane Matthew) and 2019 (one year

after Hurricane Florence and the most recently available year of data). These statistics are

presented for three groups: the entire population of North Carolina schools between 2014-15 and

2019-20, the treatment group (teachers employed at schools where natural hazard exposure

occurred), and the control group (teachers working in schools that were not exposed to a natural

hazard and are not in a county with a major city). For the sample, the turnover rate is 20.8%

percent.

Models

To answer the first research question, I needed to establish that natural hazard exposure

predicted teacher turnover. To do this, I began with a fixed effect regression model to formally

estimate whether natural hazard exposure influenced teacher turnover in North Carolina. The key

independent variable of interest in this model is natural hazard exposure. The fully specified

model employed is:

$$(1)\ Turnover_{sdt} = \beta_0 + \beta_1 Exposure_{sdt} + \beta_2 Teachers_{sd} + \ SchoolPerformance_{sdt} +$$
$$\beta_3 Students_{sd} + \delta_d + \gamma_s + \theta_t + \varepsilon_{sdt}$$

where $Turnover_{sdt}$ is the turnover rate at school s in district d in year t, $Exposure_{sdt}$ is a binary

variable that equals 1 if school s is located in district d that was exposed to a natural hazard

during time t, $Teachers_{sdt}$ represents a vector of time-varying teacher characteristics for all

teachers in school s in district d in year t (e.g., salary, years of experience, etc.), $Students_{sdt}$ represents the school characteristics of school s in district d in year t (e.g., student racial demographics, etc.), $SchoolPerformance_{sdt}$ is a binary variable that equals 1 if school s in district d was characterized as low-performing per NC DPI criteria in year t, $EasternNC_{sd}$ is a binary variable that equals 1 if school s in district d is located in Eastern North Carolina , δ_d represents a district fixed effect and ε_{sdt} is a stochastic error term clustered at the school level. β_1 is the coefficient of interest in Equation 1.

Over the course of the school years for which I have data, a school could experience a natural hazard during the 2017 school year for Hurricane Matthew and/or during the 2019 school year for Hurricane Florence. Because of the panel nature of the data, each school has multiple observations within the data. This means that a school's natural hazard exposure would be coded as 0 in the years when a natural hazard did not occur. A school that was affected by both storms would have a 1 for exposure in 2017, 2018, and 2019 for Hurricane Matthew and a 1 in 2018-2019 for Hurricane Florence. All schools that did not meet the criteria for natural hazard exposure would be coded as 0 across all four years.

By adding school and district fixed effects to the model, I was able to better control for unobserved characteristics about the schools and districts in the sample. However, there may be aspects of both that would change over time that are not observed in the data that may vary over time. These unobserved, time-invariant variables would bias the results. Moreover, the model does not capture the reason(s) why an individual teacher changes schools or leaves the profession. Rather, it shows the rate of a teacher turnover given the conditions specified in the model, including, for some, whether the school where the teacher worked in a given year

experienced natural hazard exposure. Using Equation 1, I will establish that a relationship between natural hazard exposure and teacher turnover exists.

Equation 1 only established that the relationship between natural hazard exposure and teacher turnover exists, not the extent of this relationship. Part of the goal of this study, given what is known about the expected increase in natural hazards, is whether more than one hurricane exposure has a different effect on teacher turnover than the mere existence of a natural hazard.

The second research question, asks whether different types of natural hazard exposure affected teacher turnover differently, was satisfied by Equations 2, where the exposure binary variable is coded as 1 for a specific type of natural hazard exposure. The different types of natural hazard exposure investigated were: exposure to Hurricane Matthew only, exposure to Hurricane Florence only, and exposure to both natural hazards. The second question builds on these findings and asks whether different exposure events affect teacher turnover differently. To answer this question, I conducted three new regressions that estimated teacher turnover rates with new independent variables of interest based on natural hazard exposure events using the same 2016-2019 panel. The first regression compared turnover rates for schools that were exposed to Hurricane Matthew to schools that were not exposed, with the exposure coded as 1 in the school-year observation when the natural hazard occurred for exposed schools. The second regression compared turnover rates at schools that were only exposed to Hurricane Florence to schools that were not exposed, with the exposure coded as 1 in the school-year observation when the natural hazard occurred for exposed schools. The third regression compared schools that were exposed to both natural hazards to schools that were exposed to neither, with the exposure coded as 1 in the school-year observation when the second event, Hurricane Florence, occurred.

The fully specified model for Equation 2 is:

$$(1)\ Turnover_{sdt} = \beta_0 + \beta_1 Exposure_{sdt} + \beta_2 Teachers_{sd} + \ SchoolPerformance_{sdt} +$$
$$\beta_3 Students_{sd} + \delta_d + \gamma_s + \theta_t + \varepsilon_{sdt}$$

where $Turnover_{sdt}$ is the turnover rate at school s in district d in year t, $Exposure_{sdt}$ is a binary

variable that equals 1 if school s is located in district d that was exposed to a specfic natural

hazard during time t (Hurricane Matthew only, Hurricane Florence only, or both natural

hazards), $Teachers_{sdt}$ represents a vector of time-varying teacher characteristics for all teachers

in school s in district d in year t (e.g., salary, years of experience, etc.), $Students_{sdt}$ represents

the school characteristics of school s in district d in year t (e.g., student racial demographics,

etc.), $SchoolPerformance_{sdt}$ is a binary variable that equals 1 if school s in district d was

characterized as low-performing per NC DPI criteria in year t, $EasternNC_{sd}$ is a binary variable

that equals 1 if school s in district d is located in Eastern North Carolina , δ_d represents a district

fixed effect and ε_{sdt} is a stochastic error term clustered at the school level. β_1 is the coefficient

of interest in Equation 2.

As I will explain in Chapter 5, I expected to see differences in teacher turnover rates

according to the type of natural hazard exposure event. Hurricane Matthew was an unexpected,

catastrophic event that severely impacted a concentrated area of North Carolina. Hurricane

Florence, while also a historically destructive natural hazard, had a more widespread, less acute

impact on North Carolina due to its path. Given both the intensity of Hurricane Matthew and its

proximity to when Hurricane Florence occurred, it is likely that schools exposed only to

Hurricane Florence absorbed lessons from schools exposed to Hurricane Matthew. This ripple

effect would theoretically reduce the consequences of hazard exposure on teacher turnover in

schools that were exposed to Hurricane Florence but not Hurricane Matthew. Similarly, for

schools that were exposed to both hazards, prior knowledge obtained due to Hurricane Matthew likely would decrease the effect of the second exposure on turnover.

Subgroup Analyses

To further parse out the effect natural hazard exposure has on teacher turnover rates in schools, I conducted additional analyses on subgroups of schools that, either based on the literature review in Chapter 2 or due to their susceptibility to hurricanes, may experience higher rates of teacher turnover schools. The four subgroups discussed are schools where the majority of students are of color (50% or more), schools considered high poverty (75% or more of students are eligible for free or reduced-price lunch), academically low performing schools, and schools in Eastern North Carolina. Four separate regressions using the preferred model with the same covariates and fixed effects were run on a sample narrowed to only schools that met the criteria for the subgroup category. The purpose of these subgroup analyses was to show how natural hazard exposure further exacerbates these schools' ongoing challenges with teacher turnover.

Robustness Checks

Three robustness checks were performed to ensure the accuracy of the quantitative results. As a first check of robustness, I regressed teacher turnover rates in 2014 through 2016, the years leading up to the first natural hazard exposure using the same covariates and district and year fixed effects. In this model, the independent variable of interest was a binary variable coded as 1 for schools that will be exposed to a natural hazard in future years (2017 and/or 2019) and 0 for schools that will not be exposed.

As a second robustness check, I regressed teacher turnover rates using a larger but noisier panel of data, years 2016 through 2019. However, using this larger panel of data would not be appropriate for two reasons. First, FEMA declared a disaster for severe storms, flooding, and

mudslides in the northwestern part of North Carolina near the beginning of the 2013-2014 school year (FEMA, 2013). This natural hazard exposure may have affected teacher turnover in the affected region. Because this event was a different type of natural hazard than Hurricanes Matthew and Florence, including the school year when it occurred could potentially bias the results. Additionally, the North Carolina General Assembly implemented a $500 billion budget cut to education during 2013 biennium, which would have affected school and district finances that would have affected the 2014 and 2015 school years.[1] How schools and districts addressed the resultant budget shortfalls would likely change between these two school years, and the impact would likely vary between these two school years. The district fixed effect included in the model would not resolve the effect of this policy, as it would only account for unobserved time-invariant variables. The year fixed effect would only account for teacher labor market conditions in a given year, and the fiscal changes would likely impact more than just labor market conditions in 2014 and 2015.

Lastly, because the preferred model includes time fixed effects and clustered standard errors, the traditional Durbin-Wu-Hausman model specification test cannot be employed. However, an auxiliary regression and joint Wald test (Woolridge 2010, p.332) showed that the time fixed effect model is the preferred model over a random effects model. A Benajami-Hochberg (1995) procedure was also used to show no false positives occurred among the significant findings.

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[1] While the budget cut occurred for the 2015 school year, given that it was passed in 2013, I expect that some schools and districts may have preemptively responded during the 2014 school year.

Qualitative Data Analysis and Plan

Site and Participant Selection

Site and participant selection for the qualitative stand of the study was part of a larger mixed methods research project that investigated the effects and impacts of Hurricane Matthew (2016) and Hurricane Florence (2018) on schools in Eastern North Carolina conducted by a team of researchers at the Education Policy Initiative at Carolina (EPIC), a research organization housed within the School of Public Policy at the University of North Carolina at Chapel Hill. In this section, I provide an overview of the selection and recruitment process used. Two primary criteria were used to select sites for the study. First, schools must be located in school districts in a county where residents were eligible for FEMA Individual Assistance after Hurricane Matthew, Hurricane Florence, or both hurricanes (n=51). Second, given the prevalence of natural hazard exposure in Eastern North Carolina (Kunkel et al., 2020), the school district must be located in one of the counties belonging to this region (n=41) (Eastern North Carolina Dataset Project, 2006; NC East Alliance, 2019; North Carolina Office of Archives and History, 2004).

Using these criteria, site selection for the study was narrowed to school districts located in Eastern North Carolina counties (n=45), as residents of all 41 counties were eligible to apply for FEMA Individual Assistance after Hurricane Matthew (2016), Hurricane Florence (2018), or both hurricanes. (See Appendix C). School districts in the region are located in counties that were affected by at least Hurricane Matthew or Hurricane Florence, if not both, according to eligibility for Individual Assistance from FEMA.

Recruitment began by sending invitation letters to the superintendents or research administrators for each of the 45 school districts in Eastern North Carolina. Of these school

districts, one-third (n=15) granted permission for school leaders to be interviewed.[2] Eleven of the

15 participating districts were located in counties where individuals could apply for FEMA

assistance after both Hurricane Matthew and Hurricane Florence. Two districts were only

eligible after Hurricane Matthew and the remaining two were only eligible after Hurricane

Florence (see Appendix D). Across these 15 districts, 39 school leaders (principals) participated

in interviews: 15 elementary school principals, 11 middle school principals, and 12 high school

principals (see Appendix E).[3] As will be explained below, interview data from these principals

were matched with corresponding administrative data on teachers and teacher survey responses.

Data Collection Procedures

My third and fourth research questions, which asked how principals supported teachers

and whether they exhibited caring leadership behaviors toward teachers following natural hazard

exposure, were answered using the qualitative data collected from the 38 interviews with school

principals in North Carolina public schools. Interviews were conducted between March 2019 and

May 2019, between seven and nine months after Hurricane Florence (2018) made landfall in the

region. The interview protocols (see Appendix F) were updated versions of a protocol used for

interviewing school leaders and district administrators from a prior study conducted by EPIC that

investigated natural hazard exposure impacts on schools in North Carolina and Texas in 2016.

The three protocols used in this study covered the same topics but were differentiated based on

whether the participant's school district was affected by Hurricane Matthew, Hurricane Florence,

or both hurricanes, depending on FEMA Individual Assistance eligibility. School leaders serving

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[2] For privacy purposes, the names of these school districts, the schools, and the individual participants are
confidential. Pseudonyms will be used throughout the remainder of the dissertation.

[3] Fourteen school district administrators also participated in interviews as part of the larger study. However, their
interviews were not used in this study.

in counties that were impacted by Hurricane Florence or both storms were also asked how they leveraged the knowledge from their prior natural hazard exposure or the natural hazard exposure of nearby counties to inform how they addressed Hurricane Florence.

The interview protocols followed a semi-structured format (See Appendix F). In *The Oxford Handbook of Qualitative Research (2nd Edition),* Brinkmann (2020) defined the semi-structured interview:

> Compared to structured interviews, semi-structured interviews can make better use of the knowledge-producing potentials of dialogues by allowing much more leeway for following up on whatever angles are deemed important by the interviewee; as well, the interviewer has a greater chance of becoming visible as a knowledge-producing participant in the process itself, rather than hiding behind a preset interview guide. And, compared to unstructured interviews, the interviewer has a greater say in focusing the conversation on issues that he or she deems important in relation to the research project (p. 16).

The semi-structured interview approach allows participants to form a unique, individualized interpretation of their personal experiences through an open exchange that feels more conversational (Seidman, 2005; Spradley, 1979; Warren, 1981).

During the semi-structured interviews, the 38 participating school principals recalled experiences related to Hurricane Matthew (2016), Hurricane Florence (2018), or both storms, depending on whether residents in the county where their school district is located were eligible for FEMA Individual Assistance. Three major topics related to caring principal leadership toward teachers were covered (See Appendix F). First, principals were asked how the hazard exposure(s) personally impacted teachers. Examples of personal impacts included: personal loss, injury, and property damage. Second, they were asked how the hurricane(s) impacted teachers' workplace experiences. Examples of workplace impacts included: lost instructional time, accountability for student performance on statewide standardized exams, and needing to offer emotional support to students and colleagues. Third, participants were asked about how they

supported teachers following the hazard exposure(s). Examples of principal support included: flexibility for personal leave, listening, and connecting teachers with needed resources,   such as for home repairs or mental health counseling.

As Smith (1995) explained, the answers participants provide in a semi-structured interview reveals information about their beliefs, values, and priorities, more so than a structured interview, survey or questionnaire can. How school principals responded to questions about teachers following the hazard exposure(s) will reveal whether they exhibited caring leadership behaviors toward teachers. For example, school leaders were asked how they addressed challenges experienced by teachers following the hazard(s). Principals who shared that they were empathetic and supportive of teachers' emotional and personal needs following the storm exhibit the caring leadership behaviors of deep listening and demonstrating empathy. Some participants also described how they balanced teachers' stress about lost instructional time due to school closures and being held accountable by the North Carolina Department of Public Instruction (NCDPI) for student performance on high-stakes statewide standardized tests. These principals demonstrated self-awareness, for which Steinbinder and Sisneros's (2020) definition includes conflict management.

Data Analysis

Analyzing the qualitative interview data used in this study was an iterative process. The crisis management framework (Grissom and Condon, 2021), caring leadership behaviors (Steinbinder and Sisneros, 2020), and process and outcome orientations (Van Kippenberg et al., 2006) informed the construction of the a priori codes in the coding framework. During coding, I refined these codes to better capture the data. I began my analysis by reviewing each interview transcript and writing a post-interview form (PIF) that captures my initial thoughts and impressions of the interview (Miles & Huberman, 1994; Cohen-Vogel et. al., 2015) (See

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Appendix G). This inductive phase of analysis assisted me in "discovering patterns, themes, and categories" in the data (Patton, 2002, p. 542). The PIFs may reveal themes beyond the behaviors of caring leadership, and in that case, these new themes will be added to the coding framework.

After completing this initial review and memo process to develop and fine-tune my coding framework, I used direct content analysis to analyze the data. Direct content analysis is a type of analysis used for "identifying, organizing, and categorizing the content of narrative text" (Patton, 2002, p. 551). During this phase, I took both deductive and inductive approaches to the analysis. Deductively, I developed the preliminary codebook based on the themes that emerged from the analytic memos in the inductive phase, as well as themes from the conceptual framework (Grissom & Condon, 2021; Steinbinder & Sisneros, 2020; Van Kippenberg et al., 2006) (See Appendix H). Using this preliminary codebook, a colleague with qualitative analysis training and I each coded three interviews separately over the course of three weeks, meeting weekly to discuss findings and reach consensus about codes. Over the course of these three weeks, I refined the codebook based on these findings. Each of these three interviews were coded again to reflect changes in the codebook. Using another coder to refine the codebook increases the reliability and validity of my findings (Marshall & Rossman, 2016). Next, I coded the remaining twelve interviews, while continuing to revise and refine the codebook along the way. Throughout this iterative coding process, I ensured that each interview and document use the same coding framework by analyzing each interview multiple times as needed.

After finishing coding, I conducted a summative content analysis of the coded interview data. In this summative analysis, I featured frequency counts of codes and summarize the contents of each code (Boyatzis, 1998; Hsieh & Shannon, 2005). I created a new series of analytic memos that assisted me in interpreting the findings from the codes and themes that

emerged during the deductive coding process (Harrison et al., 2019; Marshall & Rossman, 2016). Within the analytic memos, I included summaries of the findings, as well as supporting evidence from the interview data. Following the process described by Harrison et. al. (2019), the memos will be organized based on the coding framework and will depict "the major findings emerging in each phase—including dominant themes aligned (or not) to the analytic framework and the major challenges, successes, and lessons revealed through interaction with the data (p. 16). These memos informed the write-up of the findings and discussion chapters for this study. As Harrison et al. (2019) explained, the analytic memos are informative of subsequent phases of data analysis. In my mixed methods study, the analytic memos and coding were also be important for my proposed data integration, as what I observed in the qualitative data will inform how principal leadership is related to teacher turnover.

Additionally, I used the analytic memos to produce summary reports that I shared with participants. I invited them to comment and provide feedback on the findings. By member-checking my findings, I was able to further enhance the reliability and validity of my study (Marshall & Rossman, 2016). As I explain in more detail in Chapter 5, the process of member checking allowed me to inductively improve the quality of my analysis by more developing a process to more precisely capture how school leaders exhibited caring leadership toward teachers following natural hazard exposure.

Limitations

There are four main limitations of the qualitative data I used in this study. First, the interview participants can only offer their own perspectives on their caring leadership toward teachers following natural hazard exposure. While collecting and analyzing interview data from principals only was an appropriate way to manage the scope of this study, how their caring leadership behaviors were interpreted by others is not readily apparent in the qualitative data.

However, there are a number of measures I took to ensure that the principals' descriptions of their caring behavior aligned with the lived experiences of teachers at their schools. As part of the larger EPIC study, district administrators also completed in-depth interviews following the same storms. I cross-referenced their interview transcripts with the interview transcripts from the school principals to find confirmatory evidence of the principals' statements. I also shared the summary reports with district administrators to ensure accuracy. In addition, staff at several schools completed surveys. When possible,[4] I also cross-referenced principals' transcripts with the responses from their school staff. The biennial North Carolina Teacher Working Conditions Survey (NCTWCS) also occurred during two school years that correspond with the occurrences of the two natural hazard exposures including in this study. I used the data from this survey, which asks about perceptions of leadership, as another way to check the data provided principal interviews.

Second, principals in the sample whose schools were affected by Hurricane Matthew (2016) were asked to recall their experiences two to three years after the natural hazard exposure occurred. Given that people's memories are not always precise, especially with the passage of time, it is possible that they will misremember details from that time. Not remembering the details of experiences accurately is also possible for participants whose schools were only affected by Hurricane Florence (2018), although I would expect that the details of the more recent storm would be fresher in a participant's mind. Of course, there is no way to account for the inaccuracy of people's memories, aside from the checks described above.

Third, my study only investigates principal leadership behaviors in *one region* and *one type of storm*. The qualitative data alone is not generalizable beyond the sampled population of

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[4] Because participation was voluntary and not compensated, not every school in the sample had teachers and staff who completed the survey.

school leaders in North Carolina following Hurricane Matthew (2017) and Hurricane Florence (2019). Future research should test whether the findings hold true for other types of natural disasters, such as wildfires or tornadoes. Moreover, given the years-long road ahead for recovery from COVID-19 for schooling, the period of disruption and recovery for these two hurricanes seems relatively short. Future research could also investigate whether caring leadership practices impact turnover during and after the pandemic. Doing so will be an important next step for understanding the role of caring school leadership in moderating teacher turnover following major disruptions to schooling, as pandemics are expected to occur more frequently (GAVI, 2020).

Fourth, because the 38 principals interviewed as part of this study are only from schools in Eastern North Carolina, the qualitative data cannot explain caring leadership practices in school districts in the 10 counties where residents were eligible for FEMA Individual Assistance following Hurricane Matthew (n=2), Hurricane Florence (n=5), or both storms (n=3) (See Appendix A and B).

Integrative Analysis Plan

The empirical models used during the quantitative phase can only show that natural hazard exposure is associated with teacher turnover, not why the relationship exists. Similarly, school leaders' qualitative descriptions of their caring leadership behavior after natural hazard exposure does not explain its effects on teacher turnover. In the third phase of data analysis, I integrated the qualitative and quantitative parts of the study to answer my fifth and sixth research questions. As Creswell and Plano Clark (2018) explained in their text on mixed methods research, data integration is "central to mixed methods research" (p. 220). The purpose of data integration is "to develop results and interpretations that expand understanding, are comprehensive, and are validated" (Creswell & Plano Clark, p. 221). In this section, I describe

the ways in which I integrated the quantitative and qualitative data to provide a deeper, richer understanding of the relationship between natural hazard exposure and teacher turnvover. I also discuss how I maintained internal validity and interpretive rigor throughout.

A visual representation of the relationship between caring leadership, teacher turnover, and natural hazard exposure was used to answer the fifth research question, which asks whether caring leadership behaviors moderated teacher turnover in schools that were exposed to a natural hazard. Comparing and contrasting the results through a narrative and a joint display answered the sixth research question, which asks how the findings from the qualitative and quantitative phases provide a deeper understanding of how principal leadership can moderate teacher turnover in disaster-affected regions.

Visual Representation of Findings on Caring Leadership and Teacher Turnover

For the fifth research question, I began by narrowing the existing quantitative and qualitative samples into components that can be matched across datasets. For the qualitative data in this analysis, I will narrow the interview data collected from the 38 school principals in the qualitative sample to only those who have served in their role for more than one year (n=31) (see Appendix K). Doing so eliminates the possibility that having a new school leader confounds teacher turnover. As a result, the sample will be narrowed to 31 participants, with four principals leading schools exposed to Hurricane Matthew, five principals leading schools exposed to Hurricane Florence, and 21 principals leading schools exposed to both storms. For the quantitative data, I will narrow the existing sample of North Carolina teachers to include only teachers employed at the schools where these principals are the school leaders. Leveraging the qualitative data on caring leadership behaviors and principals' process and outcome orientations, I categorized each principal according to their orientation. Seventeen schools (55%) had

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principals who were categorized as process-oriented and 14 (35%) had principals who were categorized outcome-oriented.

I used a graphical descriptive approach to descriptively show the relationship between the leadership orientation principals employed to show caring behaviors toward teachers and teacher turnover. Using the process and outcome categories, I created a graph that illustrated the relationship between teacher turnover, caring leadership behaviors, and time.

The relationship between turnover and caring behaviors in the three different types of hurricane exposure (Hurricane Matthew (2016) only, Hurricane Florence (2018) only, and both storms) were also be visually represented by this type of graph.

Narrative Comparison and Contrast of Findings

After completing the data transformation, I leveraged the quantitative and qualitative datasets and analyses produced for the integrative analyses. The goal was to compare and contrast the findings across the two strands and to make larger inferences (meta-inferences) about the relationship of caring leadership to teacher turnover in schools that have experienced natural hazard exposure. As Creswell and Plano Clark (2018) explain, a narrative analysis compares and contrasts findings side-by-side from the qualitative and quantitative phases to enable observation of similarities and points of divergence. My aim was to determine whether the findings from each phase are consistent with each other and whether the findings support my original conceptual framework of caring leadership.

As part of this portion of the integrative analyses, I also used a joint display, which is a visual representation of the convergence and divergence across the qualitative and quantitative results (Creswell & Plano Clark, 2018). Table 4.2 presents a template of the joint display I intend to use.

Table 4.2

Example of Joint Display for Convergent Mixed Method Study of Caring School Leadership as a Moderator of Teacher Turnover following Natural Hazard Exposure

Caring Leadership Behaviors	Qualitative Results	Qualitative Evidence	Quantitative Results	Mixed Methods Meta-Inferences	Alignment with Conceptual Framework
Self-awareness	*[Add relevant themes.]*	*[Include summary, quotes, or references relevant to theme.]*	*[Add relevant quantitative results.]*	*[Describe relationships between qual. and quant. findings.]*	*[Explain how results fit in with conceptual framework.]*

Source: Adapted from Creswell & Plano Clark (2018)

As Table 4.2 shows, this part of the integrative analysis includes making meta-inferences, which are larger conclusions drawn from comparing the results across the two strands (Creswell & Plano Clark, 2018). Following the approach described by Teddlie and Tashakkori (2009), I ensured that the meta-inferences I am making maintain interpretive rigor. Specifically, for each meta-inference, I checked for consistency across the interpretations, underlying theories, and in the integration. As the authors explained, interpretive consistency ensures that meta-inferences are informed by evidence, theoretical consistency ensures that the meta-inferences are related to the conceptual framework employed in the study, and integrative consistency ensures that meta-inferences are drawn from both prior phases of the study.

CHAPTER 5: FINDINGS

In this chapter, I present the findings of the study, organized by the four research questions listed in the previous chapter. I first provide the quantitative results of the first two research questions: whether and the extent to which natural hazard exposure affects teacher turnover. I also include the supplementary quantitative analyses and the results robustness checks. Next, I share the qualitative findings from the interviews conducted with principals whose schools were exposed to natural hazards. I conclude the chapter with the integration of the quantitative and qualitative results, discussing how the latter elucidates the former.

Research Question 1: Does Natural Hazard Exposure Predict Teacher Turnover?

The first research question asks, "Does natural hazard exposure predict teacher turnover?" As described in Chapter Four, the model employed was a regression model exploring teacher turnover from 2016 to 2019 with school, district, and year fixed effects. The dependent variable is the teacher turnover rate at the school level. The independent variable of interest is whether a school district has been exposed to a natural hazard, with the hazard being Hurricane Matthew, Hurricane Florence, or both. Control variables added included teacher characteristics, teacher working conditions, school performance, and student characteristics. The results show a statistically significant relationship between natural hazard exposure and increased teacher turnover. Table 5.1 presents these findings, with column 5 as the full model that encapsulates all the dependent variables and fixed effects.

Table 5.1

Estimates of Teacher Turnover Rates following Natural Hazard Exposure Table 1

Independent Variable	(1) Any Exposure	(2) Teacher Characteristics	(5) Turnover Intentions	(4) School Performance	(5) Student Characteristics
Exposure	0.0041 (0.004028)	0.0046* (0.0027)	0.0069* (0.0041)	0.0070* (0.0041)	0.0074* (0.0042)
Average Years of Experience		-0.0046*** (0.0005)	0.0091*** (0.0015)	0.0091*** (0.0015)	0.0092*** (0.0014)
Percent of Black Teachers		0.1802*** (0.0089)	0.0685 (0.0463)	-0.0683 (0.0462)	-0.0762* (0.0461)
Percent of AmIn/ AK Teachers		-0.0826*** (0.0239)	-0.0580 (0.1735)	-0.0569 (0.1737)	-0.0566 (0.1721)
Percent of Asian Teachers		0.0257*** (0.0691)	0.0995 (0.2068)	0.1015 (0.2066)	0.1010 (0.2068)
Percent of Latinx Teachers		0.0671 (0.0436)	-0.1006 (0.1080)	-0.1037 (0.1081)	-0.1156 (0.1065)
Percent of Other Race Teachers		0.1213 (0.0823)	0.1856 (0.1150)	0.1866 (0.1144)	0.1888 (0.1152)
Percent with Master's Degrees		0.1810 (0.0142)	0.0107 (0.0224)	0.0108 (0.0222)	0.0094 (0.0225)
Percent with NBC		-0.1256*** (0.0171)	-0.0750 (0.0718)	-0.0750 (0.0720)	-0.0749 (0.0703)
Remain at Current School			-0.1100*** (0.0245)	-0.1003*** (0.0332)	-0.1081*** (0.0326)
Staying due to School Leaders			-0.0166 (0.0127)	-0.0163 0.0120	-0.0167 (0.0125)
Intend to Remain in Current District			0.0040 (0.0373)	(0.0436) (0.0436)	0.0047 (0.0429)
Intend to Remain Teaching in State			-0.0091 (0.0470)	0.0029 (0.0512)	-0.0124 (0.0499)
Intend to Leave Teaching				0.0229 (0.0433)	0.0205 (0.0426)

Low Performing School				0.0133**	0.0126**
				(0.0059)	(0.0059)
Percent of FRPLE^^ Students					-0.0058
					(0.0225)
Percent of Black/AA Students					0.2387**
					(0.1009)
Percent of AmIn/AK Students					-0.5748
					(0.4715)
Percent of Asian Students					-0.1590
					(0.3157)
Percent of Latinx Students					0.0675
					(0.1087)
Percent of Students of 2+ Races					0.1309
					(0.1823)
Constant	0.1870***	0.2321***	0.1796***	0.1672***	0.1141**
	(0.0011)	(0.0071)	(0.0289)	(0.0372)	(0.0545)
Observations	8152	8152	8152	8152	8152

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

As Table 5.1 shows, there is evidence to suggest that exposure to a natural hazard has a statistically significant effect on teacher turnover in the year of the exposure and subsequent school years, 2017-2019 for Hurricane Matthew and 2019 for Hurricane Florence. For schools that were exposed, teacher turnover increased by an average of 0.74 percentage points (p.<0.10). This is equal to approximately a 3.5% increase in the total turnover rate for a school exposed to a natural hazard. Given that the average teacher turnover rate between 2016 and 2019 for exposed schools was 20.99% and for unexposed schools it was 18.34%, at least 0.74% of this difference can be attributed to natural hazard exposure. To rephrase, approximately one-third of the difference in turnover rates between exposed and unexposed schools can be explained by natural

hazard exposure. The increase in turnover suggests that about 1 in 20 teachers who have left teaching due to natural hazard exposure alone.

Additionally, other characteristics that have been shown to be historically associated with teacher turnover and are present in many of the exposed schools, particularly those in Eastern North Carolina, were also significant. Classification as a low performing school per the North Carolina Department of Public Instruction (NCDPI) school performance framework, was associated with a 1.24 percentage point increase in teacher turnover across all school-year observations included in the model. For the student characteristics, the percent of Black or African American students in a school was significantly associated with teacher turnover.

For the teacher-level variables, the average years of experience for teachers at a school is associated with a 0.92 percentage point increase in teacher turnover ($p < 0.01$). This finding suggests that teachers with more experience have more mobility and are perhaps more marketable to other schools or other professions. For teacher turnover intentions, if school respondents on the North Carolina Teacher Working Conditions Survey (NCTWCS) indicated that they intended to remain at their current school for the upcoming school year, this intention was associated with an average 10.49 percentage point decrease in teacher turnover. This finding suggests that teachers who intend to stay at their jobs generally do so.

Results of Subgroup Analyses

This subsection describes the results of the main analyses performed on subgroups of schools that, either based on the literature review in Chapter 2 or due to their susceptibility to hurricanes, may experience higher rates of teacher turnover schools. The four subgroups discussed are schools where the majority of students are of color (50% or more), schools considered high poverty (75% or more of students are eligible for free or reduced-price lunch), academically low performing schools, and schools in Eastern North Carolina. Four separate

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regressions using the preferred model with same covariates and fixed effects were run on a sample narrowed to only schools that met the criteria for the subgroup category. The purpose of these subgroup analyses was to show how natural hazard exposure further exacerbates these schools' ongoing challenges with teacher turnover. Table 5.2 presents the results for natural hazard exposure for each subgroup analysis. Appendix L contains the results of the analyses for all covariates in the model.

Exposure to a natural hazard did not have an effect on teacher turnover rates in majority non-white or low performing schools. Among high poverty schools, natural hazard exposure was associated with a 1.49 percentage point increase in teacher turnover, significant at the 0.05 level. This finding is important because prior literature (e.g. Simon and Johnson, 2015) has shown that high poverty schools already experience higher rates of teacher turnover relative to other schools. Additionally, the variable representing teachers who reported on the NCTWCS that they intended to leave education altogether was associated with an 11.63 percentage point increase in turnover (p <.10); whereas the variable for teachers who intended to stay at their school was associated with a 9.18 percentage point decrease in teacher turnover (p.<0.05) (see Appendix L). Together, these two findings emphasize the importance of working conditions and leadership as a moderating factor in turnover, especially in light of hazard exposure. Of course, these results should be taken cautiously, as the TWC and turnover intention variables were recorded during the 2014, 2016, and 2018 school years, but the natural hazard exposures occurred during the 2017 and 2019 school years.

When narrowing exposure to compare teacher turnover rates in Eastern North Carolina with unexposed schools in the rest of the state, the results show that exposure does not affect teacher turnover. This finding suggests that, particularly in places where natural hazard exposure

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has become endemic, simply being exposed to a natural hazard is not enough to induce increased teacher turnover. Rather, other confounding factors are likely impacting turnover decisions following natural hazard exposure. First, the severity of a natural hazard exposure may play a role in turnover. Second, how school leaders support teachers following an exposure may also be influential. The qualitative portion of the study will investigate this second point. The second quantitative research question, which I discuss in the next section, addresses how different types of natural hazard exposure affect teacher turnover by differentiating the teacher turnover rates across three different groups of schools: those exposed to Hurricane Matthew in 2017, those exposed only to Hurricane Florence in 2019, and those exposed to both hazards.

Table 5.2

Estimates of Subgroup Teacher Turnover Rates following Natural Hazard Exposure

| | Natural Hazard Exposure | | | |
| | | Robust | | |
Subgroup	Coefficient	S.E.	P-Value	Observations
(1) Majority Non-White Schools	0.0059	0.0063	0.355	3,715
(2) High Poverty Schools	0.0149**	0.0074	0.045	3,165
(3) Low Performing Schools	0.0051	0.0112	0.646	1,268
(4) Eastern NC Schools	0.0068	0.0066	0.297	2,629

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and
*** indicates significant at the 0.01 level

Note. Observations vary across analyses because each analysis was narrowed to only
include schools meeting the criteria for the subgroup category.

Additional Robustness Checks

As a first check of robustness, I regressed teacher turnover rates in 2014 through 2016,

the years leading up to the first natural hazard exposure using the same covariates and district

and year fixed effects. In this model, the independent variable of interest was a binary variable

coded as 1 for schools that will be exposed to a natural hazard in future years (2017 and/or 2019)

and 0 for schools that will not be exposed. The results showed that the possibility of future

exposure is not associated with teacher turnover (see Table 5.3). This first robustness check

affirmed that the independent variable of interest does indeed account for natural hazard

exposure and not some other unobserved characteristic about affected schools

As a second robustness check, I regressed teacher turnover rates using a larger but noisier

panel of data, years 2014 through 2019, which produced relatively similar coefficients in

magnitude and direction across the covariates in the model (See Appendix M). However, using this larger panel of data would not be appropriate for two reasons. First, FEMA declared a disaster for severe storms, flooding, and mudslides in the northwestern part of North Carolina near the beginning of the 2013-2014 school year (FEMA, 2013). This natural hazard exposure may have affected teacher turnover in the affected region. Because this event was a different type of natural hazard than Hurricanes Matthew and Florence, including the school year when it occurred could potentially bias the results. Additionally, the North Carolina General Assembly implemented a $500 billion budget cut to education during 2013 biennium, which would have affected school and district finances that would have affected the 2014 and 2015 school years.[1] How schools and districts addressed the resultant budget shortfalls would likely change between these two school years, and the impact would likely vary between these two school years. The district fixed effect included in the model would not resolve the effect of this policy, as it would only account for unobserved time-invariant variables. The year fixed effect would only account for teacher labor market conditions in a given year, and the fiscal changes would likely impact more than just labor market conditions in 2014 and 2015.

Because the preferred model includes time fixed effects and clustered standard errors, the traditional Durbin-Wu-Hausman model specification test cannot be employed. However, an auxiliary regression and joint Wald test (Woolridge 2010, p.332) showed that the time fixed effect model is the preferred model over a random effects model. The results of the Benajami-Hochberg (1995) procedure confirmed that no false positives occurred among the significant findings.

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[1] While the budget cut occurred for the 2015 school year, given that it was passed in 2013, I expect that some schools and districts may have preemptively responded during the 2014 school year.

Table 5.3

Estimates of Teacher Turnover Rates Prior to Natural Hazard Exposure, 2014-2016

Independent Variable	Coefficient	Robust S.E.
Will be Exposed	0.0262	(0.0218)
Average Years of Experience	-0.0032***	(0.0009)
Percent of Black/AA Teachers	0.0297	(0.0191)
Percent of AmIn/ AK Teachers	-0.0342	(0.0774)
Percent of Asian Teachers	0.0686	(0.0125)
Percent of Latinx Teacher	0.0520	(0.0573)
Percent of Other Race Teachers	0.2172*	(0.1257)
Percent with Master's Degrees	-0.0066	(0.0236)
Percent with NBC	-0.0197	(0.0215)
Remain at Current School	-0.1794***	(0.0281)
Staying due to School Leaders	-0.0010	(0.0115)
Remain in Current District	0.0397	(0.0412)
Remain in State	0.1044**	(0.0518)
Leave Education Entirely	-0.0203	(0.0370)
Low Performing School	0.01288***	(0.0047)
Percent of FRPLE^^ Students	0.0093	(0.0084)
Percent of Black/AA Students	0.1109***	(0.0156)
Percent of AmIn/AK Students	0.0280	(0.0767)
Percent of Asian Students	0.0049	(0.0586)
Percent of Latinx Students	0.0139	(0.0169)
Percent of Students of 2+ Races	0.0122	(0.0836)
Constant	0.0306***	(0.0346)
Observations	5,947	

^N.B.C. stands for National Board Certification
^^FRPLE. stands for Free and Reduced-Price Lunch Eligible
*indicates significant at the 0.10 level, ** indicates significant
at the 0.05 level, and *** indicates significant at the 0.01 level

Summary

The results for the first research question showed that natural hazard exposure is associated with an increase of teacher turnover. Across all schools that were exposed, the increase was an average of 0.74 percentage points. Furthermore, the results showed a 1.49

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percentage point increase in turnover among high poverty schools exposed to a natural hazard compared with other high poverty schools in the state. This finding is especially important in light of extant research that has found high poverty schools already experience higher teacher turnover rates than lower poverty schools. These outcomes signal the role school leaders can play in mitigating the impact of natural hazard exposure on teachers. In doing so, they may be able to reduce the resultant increase in teacher turnover. The qualitative portion of the study will explore how school leaders in exposed schools supported teachers.

Research Question 2: Do Different Natural Hazard Exposure Events Affect Teacher Turnover Differently?

The first quantitative research question asked if natural hazard exposure affects teacher turnover. The second question builds on these findings and asks whether different exposure events affect teacher turnover differently. To answer this question, I conducted three new regressions that estimated teacher turnover rates with new independent variables of interest based on natural hazard exposure events using the same 2016-2019 panel. The first regression compared turnover rates for schools that were exposed to Hurricane Matthew to schools that were not exposed, with the exposure coded as 1 in the school-year observation when the natural hazard occurred for exposed schools. The second regression compared turnover rates at schools that were only exposed to Hurricane Florence to schools that were not exposed, with the exposure coded as 1 in the school-year observation when the natural hazard occurred for exposed schools. The third regression compared schools that were exposed to both natural hazards to schools that were exposed to neither, with the exposure coded as 1 in the school-year observation when the second event, Hurricane Florence, occurred.

As discussed in Chapter 4 and as the qualitative results will elaborate, Hurricane Matthew was an unexpected, catastrophic event that severely impacted a concentrated area of North

Carolina. Hurricane Florence, while also a historically destructive natural hazard, had a more widespread, less acute impact on North Carolina due to its path. Given both the intensity of Hurricane Matthew and its proximity to when Hurricane Florence occurred, it is likely that schools exposed only to Hurricane Florence absorbed lessons from schools exposed to Hurricane Matthew. This ripple effect would theoretically reduce the consequences of hazard exposure on teacher turnover in schools that were exposed to Hurricane Florence but not Hurricane Matthew. Similarly, for schools that were exposed to both hazards, prior knowledge obtained due to Hurricane Matthew likely would decrease the effect of the second exposure on turnover. The results discussed below confirm these hypotheses, as do the subgroup analyses.

Table 5.4

Estimates of Teacher Turnover Rates for Different Natural Hazard Events

	Natural Hazard Exposure Event					
	Hurricane Matthew		Hurricane Florence		Both Exposure Events	
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0126***	(0.0046)	0.0036	(0.0047)	-0.0011	(0.0052)
Average Years of Experience	0.0092***	(0.0014)	0.0092***	(0.0014)	0.0092***	(0.0014)
Percent of Black/AA Teachers	-0.0740	(0.0460)	-0.0749	(0.0461)	-0.0738	(0.0460)
Percent of AmIn/ AK Teachers	-0.0521	(0.1711)	-0.0534	(0.1717)	-0.0510	(0.1718)
Percent of Asian Teachers	0.1053	(0.2084)	0.1030	(0.2074)	0.1036	(0.2079)
Percent of Latinx Teacher	-0.1146	(0.1064)	-0.1137	(0.1064)	-0.1130	(0.1062)
Percent of Other Race Teachers	0.1816	(0.1159)	0.1815	(0.1155)	0.1802	(0.1158)
Percent with Master's Degrees	0.0102	(0.0224)	0.0101	(0.0225)	0.0111	(0.0224)
Percent with NBC	-0.0748	(0.0708)	-0.0752	(0.0704)	-0.0746	(0.0705)
Remain at Current School	-0.1065***	(0.0326)	-0.1073***	(0.0326)	-0.1072***	(0.0326)
Staying due to Sch. Leadership	-0.0165	(0.0125)	-0.0164	(0.0125)	-0.0165	(0.0125)
Remain in Current District	0.0066	(0.0430)	0.0043	(0.0429)	0.0042	(0.0430)
Remain in State	-0.0144	(0.0501)	-0.0119	(0.0500)	-0.0120	(0.0500)
Leave Education Entirely	0.0213	(0.0428)	0.0199	(0.0427)	0.0197	(0.0428)
Low Performing School	0.0125**	(0.0059)	0.0125**	(0.0058)	0.0124**	(0.0059)
Percent of FRPLE^^ Students	-0.0009	(0.0222)	-0.0027	(0.0222)	-0.0013	(0.0223)
Percent of Black/AA Students	0.2299**	(0.1011)	0.2347**	(0.1010)	0.2329	(0.1010)
Percent of AmIn/AK Students	-0.6122	(0.4703)	-0.5811	(0.4739)	-0.5886	(0.4743)
Percent of Asian Students	-0.1576	(0.3163)	-0.1654	(0.3162)	-0.1627	(0.3163)
Percent of Latinx Students	0.0628	(0.1093)	0.0649	(0.1089)	0.0650	(0.1090)

Percent of Students of 2+ Races	0.1302	(0.1824)	0.1308	(0.1829)	0.1312	(0.1829)
Constant	0.1133**	(0.0547)	0.1131**	(0.0546)	0.1124**	(0.0546)
Observations	8,118		8,118		8,118	

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

Table 5.4 summarizes the results according to each natural hazard exposure event. As column 1 shows, exposure to Hurricane Matthew had a statistically significant impact on teacher turnover. Exposure to this natural hazard increased teacher turnover by 1.26 percentage points. Given that the average teacher turnover between 2016 and 2019 for schools exposed to Hurricane Matthew was 21.90% and for unexposed schools it was 18.89% across the entire panel, at least 1.25% of this difference can be attributed to Hurricane Matthew exposure. To rephrase, approximately 33% of the difference in turnover rates can be explained by exposure to Hurricane Matthew between 2017 and 2019. These findings show that exposure to this acute, unexpected natural hazard induced an increase in teacher turnover. It suggests Hurricane Matthew introduced new and unforeseen challenges for teachers. Given the preeminence principal leadership has in reducing teacher turnover, perhaps leadership in schools that were exposed to Hurricane Matthew could not buffer these difficulties. The qualitative results will further explore the impact of Hurricane Matthew and how school leaders supported teachers following Hurricane Matthew.

In the next two regressions, which looked at exposure to Hurricane Florence only and exposure to both natural hazards, no effect on teacher turnover was found. For schools exposed to both events, it is likely that teachers who experienced challenges or dissatisfaction following Hurricane Matthew turned over before Hurricane Florence occurred. The results of these two regressions provide further evidence of Hurricane Matthew as a focusing event. The qualitative results will probe how school leaders' responses to Hurricane Matthew informed responses to Hurricane Florence. Whether through observation and sharing between exposed and unexposed schools or through learned experience in schools affected by both events, Hurricane Matthew influenced how schools and school leaders in North Carolina responded to subsequent hazard

exposures. Taken altogether, the quantitative findings highlight the impact of an acute natural hazard exposure on teacher turnover. The subgroup analyses, discussed below, further confirm this outcome.

Results of Subgroup Analyses

For the subgroup analyses comparing turnover rates in majority non-white schools, high poverty schools, and low performing schools, the samples were narrowed to only include schools that met the criteria for that category. Turnover rates in Eastern North Carolina were compared to turnover rates in the rest of the state. As with the main analyses, the independent variable of interest was whether the school was exposed to the natural hazard event. Table 5.5 presents these results. Appendix N shows the full outputs across all models.

Similar to the initial findings on the impact of Hurricane Matthew, the results showed that this exposure event had a significant effect on teacher turnover in majority non-white schools, high poverty schools, and schools in Eastern North Carolina. For majority non-white schools, Hurricane Matthew exposure was associated with a 1.20 percentage point increase in teacher turnover ($p.<0.10$). For high poverty schools, exposure was associated with a 2.09 percentage point increase in turnover ($p.<0.05$). Exposure to only Hurricane Florence and exposure to both hazard events was not associated with an increase in teacher turnover. Much like the subgroup results for Research Question 1, these findings highlight that exposure to an unprecedented, severe natural hazard exacerbates turnover in schools where turnover is likely already an issue.

The results of the analysis for Eastern North Carolina schools also showed a significant effect on turnover due to Hurricane Matthew. Teacher turnover increased by an average of 1.67 percentage points ($p.<0.05$). This finding is consistent with the previous findings, which suggested that Hurricane Matthew's severe and unexpected impact hampered working conditions

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and leadership effectiveness in exposed schools, leading to an increase in teacher turnover. Like the other subgroup analyses and the main analyses, exposure to only Hurricane Florence and exposure to both natural hazard events was not associated with an increase in teacher turnover

Table 5.6 presents the results of exposure events on teacher turnover for majority non-white, high poverty, and low performing schools in Eastern North Carolina to teacher turnover rates in the rest of the state. Exposure to Hurricane Matthew was associated with a 1.67 percentage point increase in teacher turnover in high poverty schools. This finding reinforces prior results that showed Hurricane Matthew exposure worsened turnover in schools where it is likely already a challenge. It also emphasizes the acute crisis Hurricane Matthew created in schools that were exposed, leading to increased turnover.

Table 5.5

Estimates of Subgroup Teacher Turnover Rates for Different Natural Hazard Events

	Natural Hazard Exposure Event						Observations
	Hurricane Matthew		Hurricane Florence		Both Exposure Events		
Subgroup	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.	
(1) Majority Non-White Schools	0.0120*	(0.0070)	0.0044	(0.0078)	-0.0016	(0.0077)	3,715
(2) High Poverty Schools	0.0209**	(0.0081)	0.0021	(0.0086)	-0.0036	(0.0087)	3,165
(3) Low Performing Schools	0.0089	(0.0132)	0.0091	(0.0143)	0.0034	(0.0156)	1,268
(4) Eastern NC Schools	0.0112**	(0.0047)	-0.0045	(0.0052)	-0.0036	(0.0054)	8,118

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Table 5.6

Estimates of Subgroup Teacher Turnover Rates in Eastern North Carolina following Natural Hazard Exposure across Different Natural Hazard Events

	Natural Hazard Exposure Event						
	Hurricane Matthew		Hurricane Florence		Both Exposure Events		Observations
Subgroup	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.	
(1) Majority Non-White Schools	0.0079	(0.0070)	-0.0003	(0.0077)	0.0006	(0.0078)	3,715
(2) High Poverty Schools	0.0167**	(0.0081)	0.0167	(0.0081)	-0.0038	-0.0088	3,165
(3) Low Performing Schools	0.0040	(0.0137)	0.0134	(0.0155)	0.0125	(0.0160)	1,268

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robustness Check

An auxiliary regression and joint Wald test (Woolridge 2010, p.332) showed that the time fixed effect model is the preferred model over a random effects model. Additionally, the results of the Benajami-Hochberg (1995) test showed that none of the significant results found in the analyses needed to be rejected.

Summary

The analyses for Research Question 2 parsed out the different effects natural hazard exposure events have on teacher turnover. The results showed that Hurricane Matthew as an acute and unexpected natural hazard event had a significant impact on teacher turnover. The effect on turnover was higher for majority non-white and high poverty schools, which emphasizes how crises can exacerbate existing turnover challenges in these types of schools. Schools in Eastern North Carolina were also found to have increased turnover following Hurricane Matthew, which highlights how critical the event was for exposed schools. The qualitative results offer the opportunity to explore more in-depth how Hurricane Matthew impacted schools and the differences between this event and Hurricane Florence.

Research Question 3: What Strategies did School Principals Employ to Support Teachers Following a Natural Hazard Exposure?

Findings from interviews with 38 principals in 15 school districts related to Research Question 3 are presented in three subsections. The themes presented here evolved from the five a priori codes based on Grissom and Condon's (2021) framework for crisis management: (1) mitigation and prevention, (2) preparedness, (3) response, (4) recovery, and (5) learning (See Chapter 3). This framework outlines temporally what effective leaders should be doing through each phase of a crisis. Figure 5.1 shows Grissom and Condon's adapted model for crisis management in schools. The crisis management framework also embeds three core

competencies—(1) emotional intelligence, (2) communication, and (3) analysis, judgment, and sensemaking—into each phase that research suggests leaders should apply in crisis times. Evidence of the three core competencies are apparent throughout each phase of crisis management. During the second stage of coding, after having identified the content of the text assigned to these codes, I, with the assistance of my coding partner, developed etic themes that synthesized the findings across the framework and explained the key ideas revealed in these codes.

Grissom and Condon's (2021) crisis management framework does hold up against the data. When unpacking the phenomenon of natural hazard exposure and its impact on teachers, the framework illustrates the various points of entry during which a school principal must act.

Figure 5.1

Phases of Crisis Management
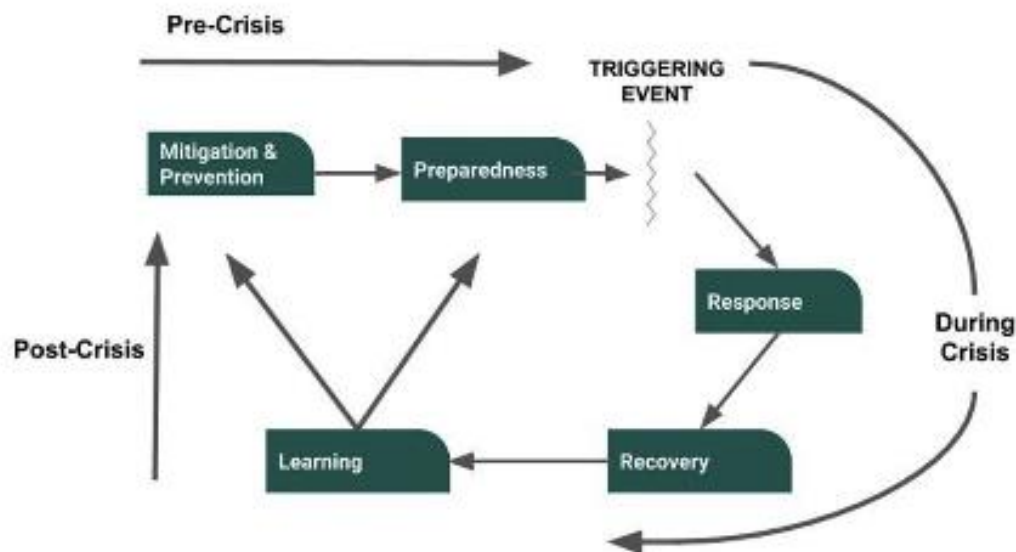
Source: Grissom & Condon, 2021, p.316

In the first subsection here, I discuss school leaders' efforts around mitigation and prevention as well as preparedness—concepts that align with the first to components of the coding framework. Findings related to these efforts show the ways how school leaders attempted to minimize the impacts of natural hazard exposure before they occurred. As I will show, school principals often felt the resources and guidance provided by school districts, coupled with the unpredictability of natural hazard exposure, left them with little control over mitigation and prevention. What participants were able to control was building-level preparedness for an impending natural hazard by helping teachers prepare and protect their classrooms and supplies from damage.

In the second subsection, I discuss the themes that emerged related to the response and recovery codes, namely (1) immediate teacher turnover, (2) lost instructional time and accountability pressure, (3) supporting students, (4) the emotional toll of natural hazard exposure on teachers, and (5) additional supports for teachers. The themes capturing teachers' experiences emerged from the response and recovery codes. The themes in this subsection also describe the school principals' reported responses to the myriad of professional and personal challenges teachers faced. Together, the themes in this section illuminate why teachers may be induced to turn over following natural hazard exposure and also underscore the need for school leadership support for teachers in this context.

The final subsection explores the lessons school leaders learned from each natural hazard exposure, which emerged from the learning code as well as the analysis, sensemaking, and judgment competency code. Notably, this subsection also explains how exposure to Hurricane Matthew informed leaders' responses to Hurricane Florence, either through first-hand experience

of exposure to Hurricane Matthew or through observation and communication of schools that were exposed to Hurricane Matthew (in the event the participant's school was not exposed).

Mitigation, Prevention, and Preparedness

As a reminder, by mitigation and prevention, the framework means efforts to minimize the likelihood of a crisis exposure. By preparation, it is referring to steps to reduce the impact of an impending crisis exposure. Table 5.7 provides excerpts of data coded for *mitigation and prevention* and *preparedness.* Table 5.8 presents the frequency count of participants by school district for the five emergent themes related to the mitigation and prevention and preparedness codes.

Table 5.7

Illustrative Assignment of Qualitative Data to Thematic Codes on Mitigation, Prevention, and Preparedness

(1) Mitigation Efforts	(a) "[Our district has] a multi-hazard or multi-crisis plan that we use. Actually, right now, I'm in the process of looking over it to see what else that we can add to it. I'm sure that the district [leadership] will have some things that we can add to it as well. It addresses severe storms. It addresses our fire drills. If there's a gas leak, what to do. [It addresses] other natural events as well."
	(b) "Most times with a hurricane, more than likely we're out of school. We talk about getting our students prepared beforehand, which we actually did before Florence. We told [teachers] what to do, gave them a checklist of what to go over with their children as well. That's something that comes from the district office. I'm sure as we prepare for this [next school] year, the district will continue to give us things to go over with our students and our staff as well in order to prepare for that."
	(c) "There have been multiple multi-agency meetings already over the past couple of months to plan for in the event of another storm and in the event of us having to open schools as shelters. They are going through these agencies, dividing up duties, and really coming to a common agreement on who will do what and what it will that look like."
(2) Confusion and Uncertainty about Mitigation and Prevention	(a) "I don't know that we have a set policy as far as a natural disaster plan and hurricanes go."

(b) "I definitely think across the district we need to have some shared protocol for what happens when we found out a student it is displaced."

(c) "I would say the answer is we really didn't feel like there was a great plan in place going into Florence, and if there was a plan, none of us knew it. There was a plan as far as which schools would be shelters, but that was about the extent of the plan. Moving forward I think there will be a much better plan with concrete procedures as to who does what and what that will look like."

(3) Hazard Exposure as Beyond Participants' Control

(a) "We're not in control of nothing but our decisions. And you can think you got it made, but the Good Lord can come along and leave very quickly. That's what I get from it. Everything you got can be taken away overnight."

(b) "With Florence, because it lasted so long, it was like waves of things happened. The initial stuff was over, here comes more flooding. Then you think everything's okay, and then bam. It was odd. Usually it's a hit and go. Florence was not like that. It seemed to be the never-ending system. It was just one thing and then the dam would breach and boom. It was devastating to our community."

(c) "With Matthew, I remember we were without power for about 6 days. I remember when I saw the crews down the road working, I cried. It just puts you in such a state. I just bawled seeing those men up there working. You don't realize what you have until you don't have it."

(4) Hazard Exposure as Endemic

(a) "This is a community that's very seasoned in dealing with this. Right now, we're pouring millions of dollars fixing that middle school up for the second time now and in 2 months we could be right back where we were in September again. The community is it's sad to say but it's routine. It's like living in Oklahoma and having tornadoes. You know the people keep coming right back and living there. It's part of what we do here."

(b) "But the reality is, what choice do we have right now? You go back, and you rebuild, and you go back in knowing that we do some things differently. Of course, every time you learn a little bit from it."

(c) You know, I can't remember. How about that? [My school is a] shelter and there's been so many. I've lost track, I'll be honest with you. I'm always here for shelter duty...They all run together."

(4) Improvements to School-Level Preparedness

(a) "Teachers were instructed to put things up in their classrooms, so they would be very strategic about where they put things so that they would not be lost in case of a flood because at that point we didn't know what would happen. The preparation put on the teachers' minds a mode of 'I have to be ready.' They really prepared as much as possible, as much as you can prepare."

(b) "We were good about moving stuff up so we didn't have damage like that, but things like paper towels and those types of things. We didn't lose any major equipment. We did a good job preparing, getting everything up off the floors, things like that. We learned; we learned after Matthew."

(c) "Any furniture, plants, and stuff that's outside, we got those inside. We know we have an area of our school that any time it rains, water gets in. We went and got sandbags and we strategically put those sandbags in different areas of the school where when it rains hard that area would flood. Not only our school but other schools in the area did that as well. There was some great preparation put in place for this particular storm, to prevent a greater catastrophe than what it already was."

Table 5.8

Frequency Count of Participant Responses by School District for Emergent Themes Related to Mitigation and Prevention and Preparedness Codes

		Theme			
School District	Total Number of Participants	(1) Mitigation Efforts	(2) Confusion about Mitigation and Prevention	(3) Natural Hazard Exposure as Beyond Participants' Control	(4) Improvements to School Level Preparedness
Beige	3	0	3	3	3
Black	2	2	0	2	2
Blue	3	3	0	3	3
Brown	2	2	0	2	2
Gold	3	3	0	2	3
Gray	3	3	0	3	3
Green	2	2	0	2	2
Indigo	2	0	2	2	2
Magenta	1	1	0	1	1

Pink	3	3	0	2	3
Purple	2	0	2	2	2
Red	3	0	3	3	3
Silver	3	3	0	2	3
Violet	3	0	3	1	3
Yellow	3	3	0	2	3
Total	38	25	13	32	38

Theme 1: Mitigation Efforts

All 38 school leaders shared that mitigation and prevention efforts occurred at the district

level. However, as the first two themes listed in Table 5.7 show, district efforts varied widely

across affected schools, with some districts. Three participants from three different school

districts (Black, Brown, and Silver districts) described checklists that their school districts

provided schools. Participants from seven other school districts (Blue, Gold, Gray, Green,

Magenta, Pink, and Yellow districts) described receiving some kind of detailed plan from their

school districts. Not only did these checklists help mitigate physical damage to school buildings,

but they also helped prepare students' emotionally and physically for an impending natural

hazard. An elementary school principal working in a district affected by exposure to both

Matthew and Florence described sharing the checklist with students and families before

Hurricane Florence:

> *[We tried] to prepare families and students for hurricanes with things that they*
> *could put in place beforehand to be as much prepared as possible. That means*
> *educating students as well with what they can do to be prepared. As we start the*
> *school year, one of the things that we'll talk about is hurricane preparedness.*

The participant explained that the checklist employed to help ready school communities for

Hurricane Florence was developed after Hurricane Matthew "caught people off guard."

Moreover, when issues did arise, whether related to the emotional impacts of natural hazard

exposure or the logistics of providing transportation for displaced students, plans for addressing

them were already firmly in place and followed. With firm plans for preparing for challenges and

addressing them as they arose, teachers dealt with fewer disruptions and distractions from

learning.

In addition to providing detailed plans themselves, many participants shared that their

school districts were actively coordinating mitigation efforts with other local government

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agencies and non-profits. One participant explained why inter-agency coordination is an essential aspect of mitigation, especially when it comes to a mitigating lost instructional time through the use of online resources, a tool the district implemented during hurricane-related school closures:

> *[It is important to be] having a conversation with emergency management personnel and developing a plan that is in conjunction with everything. When it comes to disaster, we can have the best plan in place of a virtual platform to be able to provide education, but if we don't have the infrastructure to do it and we don't have the ability to coordinate that on a grander scale with everything else going on, it won't be utilized.*

This remark underscores how mitigation and prevention efforts are directly related to a primary concern for teachers: lost instructional time. When the appropriate infrastructure is in place, teachers may be able to deliver content to students virtually, which mitigates against learning loss and lower scores on high-stakes standardized tests—a key concern for teachers. As will be discussed in the next set of themes, teachers experienced considerable stress because they were still held accountable for the results of these tests by the state, even though many schools exposed to a natural hazard had lost weeks of instructional time.

Theme 2: Confusion about Mitigation and Prevention

While participants from 10 school districts described detailed planning, participants from the remaining five districts (Beige, Indigo, Purple, Red, and Violet districts) reported less support from their district around mitigation. Unclear policies created confusion and uncertainty. Three of these participants, as shown in Table 5.7 were unaware of whether their district had any mitigation plans in place. One participant who said plans from the district either did not exist or had not been communicated to principals added that the lack of mitigation plans likely led to more damage to supplies and resources stored in school buildings. The loss and damage of materials stored in school buildings contributed to teachers' increased stress, as the items would have to be recreated, replaced, or not used as instructional tools.

Moreover, principals shared that receiving payments from FEMA and insurance companies, which was handled at the district level, was often a slow process and likely made it difficult for teachers to secure and replace necessary resources for their classrooms. These findings show the importance of mitigation efforts in reducing the impacts of natural hazard exposure on teachers' working conditions, but they also show how school principals felt they had little control over mitigation efforts.

Theme 3: Hazard Exposure as Beyond Participants' Control

Similarly, themes related to prevention showed that many participants viewed natural hazard exposure as beyond their control. Thirty-five principals from 14 districts described natural hazard exposure this way. One participant posited that preventing the effects of a natural hazard is nearly impossible because "every storm is so different, and while there are some commonalities, [it depends on] when [a hurricane] comes through, at one point in the year we're actually in, and who's the most affected." Other participants' responses also suggested that the unpredictability of a natural hazard makes prevention seem like an impossibility. As listed in Table 5.7, one school principal described how the slow-moving nature of Hurricane Florence created "waves" of new problems and that the natural hazard felt like "the never-ending system" of destruction. Another participant said:

> *God forbid something like this ever happens again. Hopefully, we will not have a storm that has this significant of an impact.*

Although this remark reflects the stress and strain exposure to a natural hazard produces, it also seemingly disregards tangible ways that school leaders can take steps to reduce the threats natural hazards pose to school organization and operations. Likewise, another school principal noted that frequent exposure to hurricanes may actually reduce prevention efforts. The

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participant explained that frequent exposure is a "kind of a double-edged sword because you tend to get complacent, even when you see a bad storm coming in."

Theme 4: Natural Hazard Exposure as Endemic

Like the last participant in Theme 3 explained, many participants called hurricanes "a part of life" or "routine" and said that they were "used to it." Thirty-two participants from all 15 school districts described natural hazard exposure as endemic to life in their communities and as a regular part of school operations. One school principal even said there had been too many exposures to keep track of anymore. Another participant, who resided in the county since age six, joked about being too old to remember the specifics of the many natural hazards that had occurred over the years. While natural hazard exposure may be a part of life in the region, as observed in other themes, it does not minimize the stress major events like Hurricane Matthew and Hurricane Florence can produce.

Theme 5: Improvements to School-Level Preparedness

Because of their prior experiences with natural hazard exposure, especially in the time between Hurricane Matthew and Hurricane Florence, many school leaders found ways to improve preparedness in their schools, which greatly benefitted teachers. Principals had learned to improve these efforts after watching teachers struggle with damage from prior exposures. As one participant explained:

> *"Losing things out of your classroom is fairly traumatic."*

For this reason, all participants with prior exposure experience described new techniques for reducing losses in school buildings, especially for teachers. These techniques included having teachers take valuables home, storing items in water-tight containers, and storing items off shelves. The illustrative quotes in Table 5.7 for the Improvements to School-Level Preparedness theme detail some of these techniques as well.

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Summary

Overall, the themes that emerged from the mitigation and prevention code and the preparedness code present a somewhat disjointed picture of these efforts from school leaders. Regarding mitigation and prevention, school leaders looked to district leaders for resources and guidance, and in the absence of this support, many seemed at a loss for how to address future exposure to natural hazards. At the same time, participants acknowledged that natural hazard exposure is endemic to their region. The resultant confusion and uncertainty from a lack of or unclear mitigation and prevention plans trickled down to impact teachers, who lost instructional time and resources. Still, many school leaders sought ways to prepare for natural hazard exposure within their locus of control by preparing their school building and teachers. They also leveraged prior experience with exposure to improve the outcomes from these building-level efforts to reduce the devastation that damage to school facilities had previously caused teachers. In the following subsection, I describe how principals provided support to teachers during response and recovery explore in-depth how teachers were impacted by natural hazard exposure.

Response and Recovery

The themes that emerged from the data coded for the response and recovery phases were synthesized to capture the experiences of teachers following natural hazard exposure and the ways in which school leaders offered support to them. During the coding process, through the use of analytic memos and collaboration with a coding partner, I observed that these two phases of crisis management were most often where school leaders applied emotional intelligence to support teachers. The first theme, Immediate Teacher Turnover, consists of participants' observations of teacher turnover during the crisis response phase, the time between the exposure event and school reopening. The theme highlights how hazard exposure can induce teachers to immediately vacate their positions following either Hurricane Matthew or Hurricane Florence

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making landfall. The first theme leads into the various obstacles that teachers encountered during the recovery phase, which was described as the remainder of the school year during which the exposure occurred. As Grissom and Condon (2021) explain, recovery is when leaders "transition from an acute to a sustained response that promotes recovery" (p.317). With these themes, school leaders describe their efforts to support teachers throughout the school year following the natural hazard exposure. As I will show, plethora of challenges that arose during this time lend credence to the quantitative findings showing that teacher turnover increases after natural hazard exposure. The challenges described also affirm the need for school leaders to apply emotional intelligence and caring leadership behaviors, as discussed in Research Question 4, toward teachers to moderate turnover. Table 5.9 provides examples of interview data that were associated with these themes. Table 5.10 presents the frequency count of participant responses by school district for emergent themes related to response and recovery.

Table 5.9

Illustrative Assignment of Qualitative Data to Thematic Codes on Response and Recovery

(1) Immediate Teacher Turnover	(a) "I do know within [our] county, we did have staff members who moved and didn't come back...especially for some of our younger or beginning teachers. If their apartment complex was damaged, they just up and moved back home with their parents or whoever. For some of our people who were renting, whose landlords called and said, 'There's damage and it's going to be months before we can fix it,' they up and left. They called principals and said, 'I'm moving back to Raleigh or I'm moving back to the mountains or wherever.' Principals were kind of stuck having to figure out what to do with that position."
	(b) "I had five teachers out of 20 who lost their houses and had to rebuild. I had one teacher who never returned. [Due to] the anxiety and the stress of it, she ended up moving because she didn't have a place to stay. Her building was shut down because the landlord said, 'I can't fix it right now, and you'll have to find another place to live.' She and her son ended up living all the way in [Town], which is another 25 minutes away. She just never came back, and we had to replace her position. She actually took medical leave for anxiety and depression. It was yucky."
	(c) "My art teacher just resigned. I've worked with her for so long!"

(2) Lost Instructional Time and Accountability Pressure

(a) "I feel that we did pretty well [on statewide assessments]. We're happy with our results [and] how we did in school this year, but we know that there's definitely some holes that the kids are struggling with. The curriculum had to be compacted so there wasn't as much review time. Some of our lower kids, the kids who were lower aptitude, are struggling right now all because they were not given that opportunity to have the time they needed to learn the curriculum. It was kind of a compacted, fast-paced school year for them. I think we're going to see struggles, academic struggles, for at least a couple more years – and barring any more horrendous, other hurricanes coming through."

(b) "Other than that, all state reporting, all state testing, all of those things still had to happen in the same time frame. Unfortunately for us, our test scores this year...our test scores will still be compared to other districts that did not miss any school. We were talking about our high school students who are going to colleges and colleges aren't sitting around taking that into account necessarily. Some of that is concerning to our district."

(c) "The thing that is most disconcerting is that we lost six weeks of instruction, yet the level of accountability for the school's performance is no different than had it been a regular school year. And that doesn't quite seem fair. Shame on North Carolina for that."

(3) Supporting Students

(a) "[We greeted kids with] a wheelbarrow full of compassion. That's the big thing, just knowing that whenever students were coming back to you, they were coming back with issues beyond their control, and just looking in their eyes and seeing that this is not normal for them. Some students struggled to get back on track."

(b) "These kids are still trying to keep their grades up and are still worrying about where they're going to lay their heads at night or having a hot meal and things like that. Kids worry about those types of things too."

(c) "We addressed their social and emotional needs very carefully and very closely. We saw an uptick in behaviors."

(4) The Emotional Toll of Hazard Exposure on Teachers

(a) "I'm going to tell you that the stress on teachers was literally not noticed until we closed up for the end of summer. When it was finally the end of the year, that's when everybody's like, 'I'm done.' Because the year was long. It was long and it was short. This is what I keep saying. It was 28 days less than we usually are in school. But those 28 days didn't feel like vacation, because you never knew, 'Are we starting school next week? Are we starting school tomorrow?'"

(b) "I think that our overall morale was the biggest victim of the storm. The teachers were just very – it was a demoralizing thing particularly to those teachers who had been through it before. It was very difficult to lose things, and even when things may not have been lost outright. They may have been boxed up, packaged up and inaccessible to the point where they couldn't use 'em [school materials]. Then many of the things that they had made or had in their rooms were thrown away and did have to be discarded due to mildew and mold and things that just ruined it. You know the teachers, they spend, in many cases, more time at school than they do at their own homes, and so there is a tremendous amount of ownership there, and so to be completely flooded out of your home away from home certainly does something to the psyche. And uh, it was a tough year. It was a tough year for everyone.

(c) "I think the adults handle things worse than the kids do, honestly. It seems like they get thrown out of a routine; I mean the kids don't like being thrown out of a routine either, but they take things in stride. The adults had more questions and 'what are we going to do about this and that?' They tend to be a little less flexible than the kids."

(5) Additional Supports for Teachers

(a) "After the storm, we made allowances because [teachers] had adjusters coming to look at the house, and insurance folks. You have to go when those folks are going to show up, so everybody kind of pitched in. Especially if it was an adjuster, you know, I'll go cover that person's class while they go meet [them].

(b) "We just talked about how the [teachers] were feeling first of all. Did they have any traumatic feelings or things of that nature that we needed to address? Then we made sure that if anyone needed to talk with anyone, our social worker or guidance counselor, our other support staff was available to talk about any traumatic things they might have experienced, just having had two major hurricanes happen back-to-back."

(c) "I think now we're seeing that we have to pour into our teachers some resilience training and how to deal with trauma because now we need our teachers to be compassionate about whatever is happening in their home, that may or may not be linked to the storm, but definitely those who are going through housing issues and replacement, and all that stuff. We're having to try to make sure our staff is equipped to be able to handle that place wherever our students come to them and still be able to provide good solid instruction."

Table 5.10

Frequency Count of Participant Responses by School District for Emergent Themes Related to Response and Recovery Codes

		Theme				
School District	Total Number of Participants	(1) Immediate Teacher Turnover	(2) Lost Instructional Time and Accountability	(3) Supporting Students	(4) The Emotional Toll of Hazard Exposure on Teachers	(5) Additional Supports for Teachers
Beige	3	3	3	3	3	3
Black	2	2	2	2	2	2
Blue	3	3	3	3	3	3
Brown	2	2	2	2	2	2
Gold	3	2	3	3	3	3
Gray	3	0	3	3	3	1
Green	2	0	2	2	2	2
Indigo	2	2	2	2	2	2
Magenta	1	0	1	1	1	0

Pink	3	0	3	3	3	0
Purple	2	0	2	2	2	0
Red	3	3	3	3	3	2
Silver	3	1	3	3	3	3
Violet	3	1	3	3	3	3
Yellow	3	2	3	3	3	3
Total	38	21	38	38	38	29

Theme 1: Immediate Teacher Turnover

The first theme in this section, Immediate Teacher Turnover, summarizes the teaching

positions that were vacated almost immediately after a natural hazard exposure occurred.

Twenty-one participants (54%) shared that teachers in their district had left their positions

immediately following a natural hazard exposure. Eight shared that teachers at their school had

turned over, while the remaining 13 shared that other schools around them experienced

immediate turnover.

As several of the respondents reported, much of the immediate teacher turnover consisted

of younger, less experienced teachers. Box 1a in Table 5.9 shows this, as do the remarks of

another participant, who shared:

> *Frankly, [the teachers who left] said, 'This is too much. I can go live somewhere*
> *else and work and not have to deal with this ever again.' They didn't have any*
> *roots established. They were young, single. [They] decided, while living at the*
> *beach, although nice, 'I don't want to do this anymore. I'll go back to where I*
> *came from and I'll get a job there.' They knew they could do so.*

This type of turnover emphasizes how important it is for school principals to build trusting

relationships with teachers early on. A trusting relationship may have provided the roots and

community attachment these teachers lacked that contributed to their turnover decisions. As the

teacher working condition literature has found, having a trusting relationship with a school leader

reduces teacher turnover. Given that both natural hazard exposures occurred during the first two

months of the school year, there may not have been sufficient time for school leaders to build

trust with first-year teachers, but not all young teachers would necessarily have been in their first

year of teaching.

Moreover, the two illustrative quotes in Boxes 1b and 1c in Table 5.10 suggest that not

all immediate turnover was simply a result of the exposure and a lack of deep relationships

within the school and larger community. Participants described navigating immediate teacher

turnover as "very difficult." Still, many participants shared that the number of teachers who left their schools seemed to be less than at other schools, for which they were grateful. As one principal remarked:

> *We were blessed. We had about 90% of our staff that could come back. The elementary school wasn't quite as fortunate. They were probably more 80/20.*

According to the quantitative panel, the average school in North Carolina staff consists of about 35 teachers. Even a loss of just 10%, as this principal described, is still three to four positions that were vacant immediately following the natural exposure. A middle school principal echoed how substantial the loss of just a few teachers can be:

> *I have a small staff, and I had two teachers completely gone.*

Beyond the loss of the teachers themselves, it is possible that immediate turnover impacted working conditions, teacher morale, or confidence and trust in the school leader. Another middle school principal who lost two teachers recalled that teachers in her building felt stressed for the rest of the school year and were completely exhausted by the end. These factors may then lead to increased turnover in the future.

Furthermore, because immediate teacher turnover was "very difficult" for school leaders, the additional stress it may have created for school leaders could influence how they engage with the remaining teachers at their schools. The Boxes 1.b and 1.c in Table 5.10 underscore this point. The first participant describes the loss of one teacher due to anxiety and depression as "yucky." The second participant lamented the loss of a longtime colleague following the exposure.

At face value, the loss of a handful of teachers immediately following the storm may seem relatively inconsequential. However, as the themes discussed reveal, drilling down into the consequences of these losses are longer-lasting and more wide-reaching. Given the impact that

immediate turnover can have on both other teachers and school principals, it provides a more complete picture of response and recovery from hazard exposure. It also sheds light on why delayed teacher turnover may also increase.

Theme 2: Lost Instructional Time and Accountability

Every participant in the study shared that the biggest stressor the teachers at their school experienced once schools reopened was lost instructional time due to school closures and the pressure to prepare students for statewide standardized assessments. These tests are tied to teacher incentives, school ratings, and funding. Principals described teachers as feeling resentful that their students were still required to take the tests despite many days of missed school. One participant summarized the feeling of unfairness underpinning testing requirements:

> *When it all shakes out, we don't know what our test scores will look like in comparison to other districts who did not miss as much school, because the state didn't really make a lot of accommodations as far as that was concerned.*

Principals' frustration around testing requirements operated on two levels. First, they described feeling incensed that there was "no relaxation" in testing and accountability for exposed schools because they felt these tests inauthentically represented students' growth and opportunities to learn. Another participant said teachers felt "cheated" by lost instructional time and testing requirements.

Second, participants were discouraged that they were not able to buffer teachers from mandated testing requirements. Principals shared that teachers had to make difficult instructional decisions around addressing lost learning time. One participant, whose school was closed for 20 days after Hurricane Florence, summarized how teachers processed this:

> *[Lost instructional time] made it difficult for my teachers to determine, 'What part of this curriculum do I get to throw away? That's four weeks that I'm not going to teach, so what are the essentials?' That of course caused stress, because teachers had to revamp their lesson plans.*

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Prior research has shown that school performance is often tied to teacher turnover, with higher rates at low performing schools. This theme offers some insight into how turnover might be affected by testing requirements. Moreover, it illustrates the stress teachers felt around testing, which could also contribute to turnover. Interestingly, one participant noted that students' test scores actually improved after Hurricane Matthew because the lost instructional time forced teachers to cut "a lot of the fluff." Of course, limited "fluff" in the curriculum and higher test scores may not necessarily correlate to decreased teacher turnover. In fact, it is possible that the emphasis on curriculum and testing may have lowered working conditions in that school. It suggests the principal may not have fully considered the implications the curriculum cuts may have had on teachers' working conditions. Other participants acknowledged that the pressure to have students perform well on tests reduced morale, school culture, and positive perceptions of working conditions. As one participant explained, all field trips for the year were canceled to recoup lost instructional time, which was disappointing to teachers and students alike because "people love field trips." The mixed methods portion of the study will evaluate how school principals' care toward teachers reduced teacher turnover.

Furthermore, as will be elaborated on in Theme 3, supporting students through the emotional impact of natural hazard exposure often superseded curriculum and instruction. Many principals discussed caring for students' wellbeing became more important than teaching and testing. One participant summarized how this looked in practice:

> *I think if you poll teachers, they will tell you that they did the best they could. This was not their best instructional semester. This was not their best instructional year. They probably feel like some of the students did not get exactly what they needed instructionally due to a lot of different reasons — they lost instructional time, they lost ability to roll efficiently through a curriculum because they did the important task of educating the human being. They spent more time doing that than they would have otherwise.*

This remark shows what some principals and teachers prioritized following natural hazard exposure. Some principals described how they worked to create a healthy balance for teachers to support students on personal and academic levels. One participant described how this was done:

> *Our students went through that and our results were quite good, all things considered. But that's only one metric. The other is more of a subjective thing. It's more of a feeling that I just want our overall climate to be one where teachers feel comfortable in the building they're in and feel good about the space that they have and the resources they have to do their job each day.*

This statement reflects the emotional intelligence the participating principal employed to navigate the challenges of state-level testing requirements and supporting teachers. Grissom and Condon (2021) describe how leaders can accomplish this objective. The authors explained, "The emotionally intelligent leader recognizes community stress and assumes that a positive, reassuring, courageous stance can promote community members' coping" (p.319).

Theme 3: Supporting Students

As the prior theme touched on, many principals shifted their focus from academics to supporting students' wellbeing following the traumatic experience of natural hazard exposure. Principals recognized that many students would be returning to school unable to learn due to the ways in which they were personally affected by exposure. Student needs included emotional support, as well as physical supplies such as food and clothing. Several participants shared that they and their counseling department met with teachers and support staff prior to reopening to discuss how to best support students emotionally and how to prepare them for learning. As one participant explained:

> *Our biggest effort was more just removing any barriers, so making sure students had clothing food and things that they basic necessity so they can come to school ready to learn. Then, when they're in their classroom, we couldn't stress enough to teachers that [a high] level of emotional support that was going to be needed directly after the storm for so many students.*

Teachers served on the frontline for identifying and providing support to students upon their return to school. As another principal explained, the responsibility of addressing students' emotional needs was often thrust upon teachers because mental health infrastructure in schools was lacking. The participant also added that this responsibility regularly falls on teachers, even in the absence of natural hazard exposure. The principal said:

> *Our teachers did a good job dealing with the kind of day-to-day emotional pieces. However, I do think that all the time this is a much bigger issue than a storm, but we don't have the mental health services in public schools that we wish we had. If there was an area of weakness, that might be it. I wish we were able to provide even more emotional support to students than what we can provide. At this point it was day-to-day teachers dealing with it.*

Another participant described why supporting students emotionally became the priority following exposure. Having just experienced a traumatic event, students were not "in a place to receive academic instruction." As a result, teachers shifted their focus to making sure "the whole child was okay and stable." These observations revealed an important aspect of teacher working conditions following natural hazard exposure. They showed how teachers were not able to focus on the primary aspect of their professional role: delivering academic content to students. The findings related to this theme harken back to the first theme because they show how natural hazard exposure can result in lost instructional time, even when schools have reopened. Another principal added that helping students process the emotional impacts of natural hazard exposure exposed them to secondary trauma, which as noted in Chapter 2, is associated with workplace burnout and turnover. As a result of this responsibility, teachers often felt "a mental drain," according to another participant. The following theme unpacks this mental drain by exploring the emotional toll of hazard natural exposure had on teachers and how principals sought to mitigate that.

Theme 4: The Emotional Toll of Hazard Exposure on Teachers

In addition to supporting students, teachers were also grappling with their own challenges related to natural hazard exposure. One participant remarked that teaching is "stressful as it is," but that natural hazard exposure adds "one more layer" of stress. Schools were "understaffed" and teachers were "overworked." Unfortunately, many principals acknowledged that the heavy emphasis on supporting students meant that teachers' needs often went unnoticed. Box 4a in Table 5.9 provides an example of a principal who did not recognize until later that teachers needed emotional support and reassurance. Similarly, another participant shared:

> *Initially, with my staff, it took me a long time to realize that some of them were having a hard time, just with regrouping and realizing they didn't have their stuff and their things.*

Another principal perfectly encapsulated the emotional toll of the storm on teachers by calling morale "the biggest victim of the storm." As the fifth theme will explore, many principals have sought ways to course correct this oversight by providing support to teachers personally, as well as professional development training to help them manage students' emotional needs. While these future efforts may be instrumental in reducing turnover due to future natural hazards, it is likely that the "mental drain" and lack of support due to Hurricane Matthew and Hurricane Florence contributed to the increases in teacher turnover observed in the quantitative data.

For teachers at two schools that serve historical marginalized communities, the emotional toll was compounded by issues of equity. While they personally may have been spared the worst effects of a natural hazard exposure, the students and families they serve were gravely impacted by the exposure, and the differences in their experiences of the exposure were largely due to racial and economic differences. As one principal explained:

> *Another issue may be just like synonymous with survivor guilt in terms of, what does it look like to have white privilege and serve in a community is 80% children of color. For you to live in the same town be completely unaffected [by the storm].*

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How are we contributing to this issue of environmental racism and what that means for our kids?

This statement shows the complexity of natural hazard exposure on many teachers' feelings following the exposure. The literature discussed in Chapter 2 included how turnover is often induced by feelings of helplessness, which may have been the experience for teachers struggling with the ways in which their privilege contributed to the harmful effects of the hazard on their students.

Some principals were cognizant of the tremendous burdens that teachers experienced following hazard exposure. Like with finding a balance between delivering academic instruction to students and addressing their non-academic needs, principals shared how these decisions came with trade-offs. For example, one principal canceled after-school clubs and other events to reduce teachers' stress, but this may have worsened overall morale and culture within the school, as well as opportunities for teachers to build relationships with students in a non-academic setting. As the participant explained:

> *[Teachers are] people and they have their own issues. There's sort of a breaking point that you can reach. I was very cognizant of that, and I didn't want to push them beyond what I felt like they were doing. Our priorities were teaching the kids and doing the best we can for the kids. Some of the extras that we might have had like clubs and our athletic activities that we did, although we still had our seasons and our games and everything, but pep rallies, those kinds of things weren't possible. We didn't push [teachers] too hard because I thought many of them were at the point of exasperation, just from personal and professional challenges that they were facing due to the hurricane.*

As Research Question 4 will explore, principals making these kinds of difficult decisions were actually demonstrating caring leadership.

Not all principals expressed as much compassion for teachers, as the quote in Box 4.c Table 5.9 showed. This participant described teachers as inflexible and handling hazard exposure worse than students. Another participant whose school was temporarily reassigned to another

location in the district while repairs were completed said that teachers were more bothered than students by the change. They described the experience as "very stressful for staff," but that the students "didn't care where we were" because they were "just glad to be back at school." As the principal who canceled clubs and activities noted and as alluded to in some of the quotes from Theme 1, teachers often had logistical personal challenges to address following natural hazard exposure. Many participants shared that a few of their teachers had lost their homes during either Hurricane Florence or Hurricane Matthew. Some had children, further complicating their experience of exposure and the stress of finding adequate housing. In one extreme example, a principal shared that a teacher had lost her home during Hurricane Matthew, had it rebuilt, and was flooded out again during Hurricane Florence, after living in the rebuilt home for only six months. While students certainly also faced many difficult losses as well, in most cases, they would not have been responsible for managing the logistics of housing loss and displacement. When principals made these unfair comparisons, it is possible that they inadvertently contributed to teacher turnover by not exercising emotional intelligence toward teachers' experiences.

Theme 5: Additional Supports for Teachers

Although there was the rare example of principals, such as the ones discussed above, who were not compassionate toward teachers during recovery, many principals found ways to go above and beyond to ensure that teachers were provided with the necessary support to manage the personal impacts of natural hazard exposure. In many cases, this meant providing teachers with the flexibility to address their outside needs during the school day. As one participant recalled, not all teachers were able to return to school upon reopening. The principal found other ways to ensure classes were covered despite teacher absences. As the participant explained:

> *Our staff population here was not [all] able to return on that day we went back to school. We did combine some classes. My assistant principal and I, we were in*

some classes. We had teaching assistants covering classes. We did what we had to do.

This statement underscores how many principals did not penalize teachers who had personal issues due to hazard exposure that kept them away from school. Rather, they saw providing this support as an extension of their leadership role. One participant shared that giving teachers this flexibility was a matter of "just trying not to add to that stress and making it difficult for them." Box 5a in Table 5.9 provides another example of how school leaders viewed accommodating teachers' personal needs as part of the job. As another example, one principal hired substitute teachers for a teacher who was "very, very scared" after her first natural hazard exposure until she was emotionally ready to come back to school. It is very possible that teachers who received this support were less likely to turnover because these principals sought to build trust with their teachers and exercised emotional intelligence in responding to their needs.

The illustrative quotes Box 5b and 5c in Table 5.9 touch on how school principals sought to provide support to teachers for addressing students' and their own emotional needs following natural hazard exposure. The timing of when these supports were offered are tenuous in light of teacher turnover. As noted previously, many school principals recognized that they failed to provide teachers with sufficient support during the school year of an exposure event. It is expected that the failure to address teachers' stress may have induced some turnover. Additionally, teachers assumed a mental health and emotional support role for their students following natural hazard exposure, which created "a mental drain" and exposed them to secondary trauma. By providing training to teachers on how to provide emotional support to students, school leaders can mitigate some of the stress this role can create. However, if these trainings were not offered and implemented during the year of exposure, they would not have influenced teacher turnover decisions. Nevertheless, offering these supports will likely lead to

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reductions in turnover following future natural hazard exposures. The mixed methods portion of the study will present descriptive evidence supporting possible benefits of these supports.

Learning

In the final set of themes, principals shared their "intentional learning from the crisis and the organization's crisis experience" (Grissom & Condon, 2021, p.318). As Grissom and Condon explained, leaders need to make sense of the event retrospectively and apply these lessons moving forward. In the analysis of the interview data, two main themes emerged. First, leaders who were exposed to Hurricane Florence discussed how they improved their mitigation, prevention, preparation, response, and recovery by learning and analyzing these phases during Hurricane Matthew, whether it was through firsthand exposure experience or by learning from neighboring schools and districts. Second, while Theme 1 does address teacher issues, the second theme focuses specifically on concepts principals to support teachers through either natural hazard exposure event. In addition to providing detailed information on principal leadership during natural hazard exposure, this section lends further support to the quantitative research questions in two ways. First, Theme 1 shows how the crisis phases during Hurricane Florence were handled differently, which lends support to the quantitative finding that turnover was significant following exposure to Hurricane Matthew but was not significant during Hurricane Florence or if schools experienced both exposures. Second, Theme 2 describes ways in which principals have learned to moderate the impact of natural hazard exposure on teachers, which may play an important role in reducing teacher turnover. Table 5.9 provides illustrative quotes for these two themes.

Table 5.11

Illustrative Assignment of Qualitative Data to Thematic Codes on Learning, Analysis, Sensemaking, and Judgment

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(1) Lessons from Hurricane Matthew

(a) "With Hurricane Matthew, it just caught everybody off guard. And so literally everyone was in shock. Whereas this one, there were things put in place this time around that prevented it from being the huge catastrophe that it could have been. It was already bad but it could've been worse. I think things were put into place to better prepare."

(b) "I think because of Matthew, teachers were a little more concerned about what happened when Florence hit. It puts you in the mode of preparation, for one. Before we left for Florence, teachers were instructed to put things up in their classrooms, so they would be very strategic about where they put things so that they would not be lost in case of a flood, because at that point we didn't know what would happen."

(c) "We didn't know what would happen [when Hurricane Florence happened]. The preparation put on the teachers' minds, a mode of, 'I have to be ready.' They really prepared as much as possible, as much as you can prepare."

(2) Lessons on Supporting Teachers

(a) "As the principal of the school, I think just continued support. Several months after, as a school, as a community, we try to meet all the needs. There are still staff members and students that are impacted, even today. Just long-term support, especially with emotional support is something that is challenging."

(b) "I would say that the teachers were affected by the students' situations. They really had to have empathy for their students."

(c) "Even with our teachers here, we try to talk and discuss and counsel each other and make sure that we knew what to say to students and things like that when they came back and making sure that we knew what the best thing was for our kids, how to get things back to rolling again."

Table 5.12

Frequency Count of Participant Responses by School District for Emergent Themes Related to Learning

		Theme	
School District	Total Number of Participants	(1) Lessons from Hurricane Matthew	(2) Lessons on Supporting Teachers
Beige	3	0	2
Black	2	2	2
Blue	3	3	3
Brown	2	2	2
Gold	3	3	2
Gray	3	3	3
Green	2	2	1
Indigo	2	2	1
Magenta	1	0	1

Pink	3	3	1
Purple	2	0	2
Red	3	3	1
Silver	3	0	2
Violet	3	3	3
Yellow	3	3	1
Total	38	29	27

Theme 1: Lessons from Hurricane Matthew

To begin, participants from 13 school districts that were exposed to Hurricane Florence, which includes 11 school districts exposed to both natural hazards, shared that they felt their management of Hurricane Florence was a great improvement over their management of Hurricane Matthew. Similar to the themes around mitigation, prevention, and preparation, many participants described how natural hazard exposure is endemic to parts of North Carolina, but they also added that Hurricane Matthew was a wake-up call to be more vigilant about preparation. One participant whose school was exposed to both explained why Hurricane Matthew became such a focal event. The principal said:

> *We're down here on the coast. I'm not saying we're used to it, we don't like it, but we kind of know what to do. And sometimes that's kind of a double-edged sword, because you tend to get complacent, even when you see a bad storm coming in.*

Another participant, as shown in Table 5.9 explained that Hurricane Matthew "caught everybody off guard." A third principal called Hurricane Matthew "traumatic [and] eye opening." These three statements underscore why participants were compelled to improve their leadership and management following Hurricane Matthew. The remarks speak to how Hurricane Matthew was a more severe, crippling event than Hurricane Florence for the communities that were affected by it.

Principals shared that the experience of Hurricane Matthew informed how teachers at their school prepared for Hurricane Florence. Participants described how teachers brought home paper copies of their class rosters to be able to reach students. As Boxes 1b and 1c in Table 5.11 show, teachers were more diligent in preparing their classrooms and preventing damage to their supplies prior to Hurricane Florence. Teachers even found ways to mitigate some learning loss during school closures due to Hurricane Florence. When schools were closed for several weeks after Hurricane Florence, some teachers offered lessons at firehouses and churches. Others

created packets for parents to pick-up from the library. Over and over, participants reiterated that Hurricane Matthew served as a valuable learning tool for their approach to future natural hazard exposures. Even in counties where the damage from Hurricane Florence was more substantial than the damage from Hurricane Matthew, principals said the effects of the hazard exposure was lessened because of the insights they had gained from prior experience. Nevertheless, principals also talked about how stressful and anxious teachers were as Hurricane Florence approached. The second theme explores how principals learned to support teachers when a natural hazard occurs.

Theme 2: Lessons on Supporting Teachers

As the themes on response and recovery showed, principals often had to learn to recognize the emotional toll natural hazard exposure had on teachers. This theme reiterates many of those points. Twenty-seven principals (71%) shared that they had already or were currently working with school counselors and central office staff on professional development training to prepare teachers for dealing with the emotional and academic impacts of natural hazard exposure. These trainings are especially important because principals acknowledged that teachers "were affected by their students' situations." Principals who implemented professional development recognized that teachers' empathy, while so important for supporting students, could potentially increase their emotional exhaustion and burnout. Resources and support to reduce the emotional toll can serve as a protective factor against potential increases in turnover.

Participants whose schools were exposed to both natural hazards learned to frontload these trainings as schools reopened to help prepare teachers to manage their and their students' emotions. One participant recalled the staff training where the teachers participated in a sharing exercise that could be used with students. The principal explained:

> *In our staff meeting, we said, 'This is what we would like you to do with your kids when they come on Monday or Tuesday.' There was a PowerPoint presentation that we went through that just kind of allows people to talk. We had tears in our staff meeting. It was kind of a very somber kind of thing. We were able to determine what it was going to look like with our kids and plan for that. If you see kids falling apart in class, do this, so that was what we did.*

The benefits of this training exercise were twofold. First, the training presented teachers with an opportunity to process their own experiences with natural hazard exposure in a supportive environment. Second, it enabled teachers to anticipate how students might be feeling and prepared them to respond accordingly. Likewise, another principal distributed a survey to teachers to assess their emotional state and needs. The participant said that even for teachers who were not comfortable sharing how they were personally affected by the natural hazard exposure, the survey allowed the principal to show empathy and support. Having supports like this in place following exposure to Hurricane Florence likely contributed to the null effects shown for Hurricane Florence in the Research Question 2 analyses.

Principals also employed informal structures for supporting teachers following natural hazard exposure, as shown in Box 2c in Table 5.9. The principal noted that the staff "counseled" each other. One participant shared how their conversations with teachers during a faculty lunch revealed the exhaustion teachers felt after Hurricane Florence. The principal noted that teachers wanted to share and vent their feelings about the school year. These unstructured channels of support correlate with important aspects of teacher working conditions, such as open communication and trust. As a result, it is possible that turnover was lower in schools where principals facilitated and encouraged these informal channels of support.

Summary of Research Question 3

Grissom and Condon's (2021) conceptual framework on crisis management guided the analysis investigating how school principals supported teachers following natural hazard exposure. The first set of themes revealed how principals implemented supports for teachers within their locus of control through their building-level preparations for an impending hazard. In many cases, support from the district for mitigation and prevention did not exist or not shared with principals. Principals also described how natural hazard exposure has become almost a routine part of school life. As the third theme explored, the regularity of natural hazard exposure in parts of Eastern North Carolina may have actually contributed to lackluster preparations for Hurricane Matthew.

The second set of themes explored how principals supported teachers through response and recovery. These themes first highlighted the sources of stress for teachers. For teachers who turned over immediately, loss of housing or the stress and anxiety of natural hazard exposure induced turnover. The loss of these teachers likely hurt morale and created more stress for principals, which may have impacted the leadership and interactions with the remaining teachers. Lost instructional time, accountability pressures, and students' emotional needs created considerable stress for teachers. Many principals acknowledged the emotional toll natural hazard exposure took on teachers, although they often acknowledged this realization came at the end of the school year. This means that there was not an opportunity for principals to moderate the impact of natural hazard exposure. Some principals discussed their plans to improve their support for teachers moving forward. On the other hand, some principals demonstrated less empathy toward their teachers' experiences, which likely impacted teacher turnover in their schools. The mixed methods portion of this study will explore this more in depth. Throughout the analysis of these themes, many potential links between principal supports and teacher

turnover were found. Because the data is qualitative, no formal associations between the two can be determined. In the data integration portion of the study, I descriptively connect turnover and principal support by categorizing principals' care toward teachers to their schools' turnover rates.

My third research question asked generally about support. Research Question 4 will look specifically at one type of support, care, using a caring leadership conceptual framework.

Research Question 4: Did School Principals Use Caring Leadership Behaviors to Support Teachers Following Natural Hazard Exposure?

The conceptual framework guiding the analyses for the fourth research question came from the research on nursing leadership (Steinbinder & Sisneros, 2020). The preliminary codebook identified five main behaviors (major codes), each with multiple sub-behaviors (minor codes) (See Table 3.1).

During the coding process, the codebook was refined to more accurately reflect the data available. This meant that some major and minor codes were eliminated. That is not to say that principals did not employ these behaviors following hazard exposure. Rather, there is no evidence of these behaviors in the available data, which used an interview agenda that covered a broad range of topics. The topics covered included how principals supported teachers, but the interview was not exclusively about teachers, as it also covered facilities damage, transportation challenges, student impacts, and district crisis and natural hazard exposure planning. Most likely, given the breadth of topics covered and the short time of each interview (one hour), an in-depth exploration of caring leadership was not possible. Nevertheless, there was evidence of some caring leadership sub-behaviors: manages conflict, maintains respect, larger picture, recognizes emotions, suspends judgment, and decisiveness. These remaining codes were turned into the themes that will be discussed in this section. In some cases, the original code definitions were modified to better capture the data. Table 5.11 presents the final coding framework for the caring

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leadership sub-behaviors found in the interview data. The analyses revealed that each of the five caring leadership sub-behaviors corresponded to a specific theme related to some issue or challenge teachers experienced following natural hazard exposure. The five themes were: testing and accountability (manages conflict); other teacher concerns (maintains respect); support for students (larger picture); teachers' exhaustion, grief, and losses (recognizes emotions); return to normalcy (suspends judgment), and non-academic events in schools (decisiveness).

In the early analyses, I attempted to provide evidence of high and low caring for principals across the caring behaviors. However, something about this categorization began to feel inflammatory, especially given the discussion in Chapter 2 about educators as caring professionals. It began to feel unlikely that principals were actually low caring, especially in the context of a traumatic event like a natural hazard exposure. My concern that my analysis was headed in a troubling direction was confirmed when I shared some of these results with a member of the sample. The member found the categorizations of high and low caring to be extremely problematic. The member shared that all principals most likely do care, but what they care about might look different than my analysis showed. In reviewing the data again, I then found that caring manifested in two ways: process and outcome orientation. While the caring behaviors from the framework were still applicable, I needed to analyze them as either process- or outcome-oriented. (See Chapter 3 for a more detailed explanation of leadership orientation as part of the conceptual framework.)

Rather than revealing that principals were high caring or low caring in their support of teachers following natural hazard exposure, the analyses uncovered that principals' priorities fell into either process or outcome orientations. Principals whose responses were process-oriented tended to be more empathetic to teachers' day-to-day experiences and provided support for the

challenges they experienced due to natural hazard exposure. Principals whose responses were outcome-oriented tended to be more focused on long-term outcomes, especially student performance and a return to routine operations. These principals' focus was on the success of their school in providing academic instruction and establishing a sense of normalcy. Table 5.12 shows the criteria for how participants' responses were coded as either process- or outcome-oriented. Table 5.13 shows the frequency counts for leadership orientation by school district.

The remainder of this section compares process and outcome-oriented responses principals provided for the five themes that emerged from the caring leadership sub-behavior codes. Table 5.14 presents illustrative quotes for each of the themes related to caring leadership behaviors, organized by process and outcome leadership orientation. Table 5.15 shows the frequency count of participants by school district for the themes related to caring leadership behaviors. Table 5.16 provides illustrative quotes for caring leadership behaviors, organized by leadership orientation. Table 5.17 presents the frequency count of participant responses by school district for caring leadership themes. Later, in Research Question 5, I will more deeply probe the relationship between principals' orientations and teacher turnover.

Table 5.13

Final Coding Framework for Caring Leadership Behaviors

Major Code	Minor Code Name	Definition
1. Self-awareness		
	a. Manages conflict	Participant describes knowing how to prepare for managing potential conflict or distress.
	b. Maintains respect	Participant describes responding in a thoughtful way to challenges and problems that arise.
2. Deep Listening		
	a. Larger picture	Participant describes connecting what a person is communicating to the larger picture.
3. Demonstrating Empathy		
	a. Recognizes emotions	Participant describes hearing another's story or perspective and recognizes the emotions that are being conveyed.
	b. Suspends judgment	Participant describes suspending his/her/their own judgement and allows others to feel acceptance for who they are without feeling judged, ashamed, or inadequate.
4. Decisiveness		
	a. Decisiveness	Participant describes knowing that without decisiveness, others are left waiting and without confidence in their leader.

Table 5.14

Criteria for Process and Outcome Orientations

Orientation	Criteria
Process	(1) Awareness of the context (i.e., stress, anxiety, loss, etc.) of natural hazard exposure
	(2) Careful consideration of the steps and processes needed to ensure teachers and students are supported
	(3) Thoughtful of how decisions can lead to unintended consequences
	(4) Acknowledgement of and responsiveness to emotions
Outcome	(1) Emphasis on end goals, such as student performance and re-establishing a sense of normalcy
	(2) Prioritization of end goals over contextual factors and unintended consequences
	(3) Decision-making guided by practicality over emotions

Table 5.15

Frequency Count of Participants by Leadership Orientation

		Orientation	
School District	Total Number of Participants	Process	Outcome
Beige	3	2	1
Black	2	0	2
Blue	3	3	0
Brown	2	1	1
Gold	3	1	2
Gray	3	2	1
Green	2	2	0
Indigo	2	2	0
Magenta	1	0	1
Pink	3	1	2
Purple	2	2	0
Red	3	1	2
Silver	3	2	1
Violet	3	2	1
Yellow	3	1	2
Total	38	22	16

Table 5.16

Illustrative Quotes for Caring Leadership Behaviors by Leadership Orientation

		Leadership Orientation	
Behavior	Theme	Process	Outcome
Manages conflict	(1) Testing and accountability	(a) "The thing that is most disconcerting is that we lost six weeks of instruction, yet the level of accountability for the school's performance is no different than had it been a regular school year. And that doesn't quite seem fair."	(b) "What's crazy is our test scores were higher the year of Matthew. I think the teachers felt so much pressure to compact the curriculum, a lot of the fluff was left out. They were so focused on getting everything in. Our test scores actually went up that year."
Maintains respect	(2) Other school-related teacher concerns	(a) "It's stressful for them, just like it would be for kids, because you're talking about their livelihood, their actual profession being affected. Teachers are ultimately, they care about kids. When you see your kids in trouble, that causes a lot of additional stress on you."	(b) "I think that everything they needed was met. For the staff, a big deal is, every time we close school, you've got those that want to come in for an optional workday and don't understand why they can drive from five minutes away and come to school, and then you've got someone like me who lives 25 miles away that, if it flooded in certain areas, can't get in. That's a challenge every time. Do you make in an optional day or do you make it nobody comes in?"
Larger picture	(3) Support for students	(a) "[We greeted kids with] a wheelbarrow full of compassion. That's the big thing, just knowing that whenever students were coming back to you, they were coming back with issues beyond their control, and just looking in their eyes and seeing that this is not normal for them. Some students struggled to get back on track."	(b) "These kids are still trying to keep their grades up and are still worrying about where they're going to lay their heads at night or having a hot meal and things like that. Kids worry about those types of things too."

| Recognizes emotions | (4) Teachers' exhaustion, grief, and losses | (a) "I think that our overall morale was the biggest victim of the storm. It was a demoralizing thing particularly to those teachers who had been through it before...You know the teachers, they spend in many cases, more time at school than they do at their own homes, and so there is a tremendous amount of ownership there, and so to be completely flooded out of your home away from home certainly does something to the psyche. And uh, it was a tough year. It was a tough year for everyone." | (b) "For the teachers that lost classrooms, I would say that they went through the stages of grief in a manner similar to if they'd lost their homes. They would say, 'Oh the filing cabinets that I had all my tests done over the last 5 years [are gone].' Things that, over the course of time, are recoverable. In some case [it was loss of] memento type things...it was more direct emotional grief than I anticipated, like if you were out of your home. That's what it seemed like when I would talk to them and kind of experience it with them...Staff was also out of work for, not 55 calendar days, I'm going to say more like 30-ish plus. They were not even permitted to get back on the clock, and so I'm not exactly sure who was around directly afterwards, but we were prohibited from returning to the building, which a number of us violated anyway. They were actually off the clock and that was a source of stress because at that point, we didn't know if people were going to get paid or not...But ultimately there were reserves and their salaries were not impacted." |

Suspends judgment	(5) Return to normalcy

(a) "It was not only a matter of, 'Hey, we're going back to school, but we need you back teaching while your life is completely turned upside down. [I was] just trying to be mindful and respectful of that and of their children and working with staff members to coordinate scheduling. I think about a teacher that I have that came to me in tears. She said, 'I hate to ask for time off when we just got back to school, but I have a guy that can come and give me an estimate on my HVAC that completely has to be redone and ripped out of the bottom of my house, but he can only come during business hours.' We were in school, [which means] we are business hours. It was just working to kind of cover and make sure that people could meet with FEMA and people could work with and meet with insurance adjusters or we even had insurance adjusters come here to meet with our staff so they could kind of go over things, because everybody's got to get things taken care of."

(b) "The adults tend to be a little less flexible than the kids... I think [the exposure] took that wind out of the staff's sails a little bit. We had to get pumped back up when we got back, and everybody was glad to get back. But we had to get back in the groove, and I don't think it ever felt exactly like most school years do feel."

Decisiveness | Non-academic events in schools

(a) "You had teachers who were dealing with damaged houses and personal issues and things like that, so I didn't want to keep them after school for hours on end to meet. The classrooms are free after school, but it gets to the point where, you know, they're people and they have their own issues, and there's sort of a breaking point that you can reach. I was very cognizant of that and I didn't want to push them beyond what I felt like they were doing. Our priorities were teaching the kids and doing the best we can for the kids. Some of the extras that we might have had like clubs and our athletic activities that we did, although we still had our seasons and our games and everything, but pep rallies, those kinds of things weren't possible. We didn't push [teachers] too hard because I thought many of them were at the point of exasperation, just from personal and professional challenges that they were facing due to the hurricane."

(b) "One of the things – people love field trips – we knew that our testing calendar was pushed back. With missing 30 days, we cut out field trips, because we really had to focus. By the time we came back from Christmas, I think It was like a week or so to remediate and review before exams."

Table 5.17

Frequency Count of Participant Responses by School District for Caring Leadership Themes

		Theme					
School District	Total Number of Participants	(1) Testing and Accountability	(2) Other School-Related Concerns	(3) Support for Students	(4) Teachers' Exhaustion and Grief	(5) Return to Normalcy	(6) Non-academic Events in Schools
Beige	3	3	3	3	2	3	3
Black	2	2	2	2	2	2	0
Blue	3	3	2	3	3	3	0
Brown	2	2	2	2	2	2	0
Gold	3	3	3	3	2	3	2
Gray	3	3	1	3	3	3	1
Green	2	2	1	2	1	2	2
Indigo	2	2	2	2	1	2	2
Magenta	1	1	0	1	0	1	0
Pink	3	3	1	3	1	3	2

Purple	2	2	1	2	1	2	0
Red	3	3	0	3	1	3	0
Silver	3	3	1	3	2	3	1
Violet	3	3	2	3	3	3	2
Yellow	3	3	2	3	1	3	0
Total	38	38	23	38	25	38	15

The first theme covered how principals addressed the main conflict teachers encountered following natural hazard exposure: being held accountable for student performance on high-stakes standardized tests. In the analysis, all 38 participants identified testing as the primary source of tension and conflict teachers experienced once schools reopened. Schools that were affected by natural hazard exposure were still held accountable for student performance on these tests, even though many schools were closed for weeks at a time. Process-oriented responses showed that principals were aware of the pressure this created for teachers. Outcome-oriented responses focused on the results of these assessments, rather than the process it took for teachers to produce them. In Box 1a., the process-oriented response showed that the principal was aware of and empathetic to teachers' frustrations about the required state assessments. While there was nothing the participant could do to mitigate the effects of the policy, the response suggests an understanding of and an empathy toward how teachers felt. On the other hand, the outcome-oriented response describes how the end result of lost instructional time was higher test scores. The participant attributes the successful test scores to teachers' efforts to "leave a lot of the fluff out." Although this participants' remarks do not consider the steps teachers took to reach the outcome, it does suggest the principal wanted teachers and students ultimately to be successful on this important performance metric.

The second theme, other-school-related, captured how participants evaluated the other school-based issues teachers experienced following natural hazard exposure. Twenty-three principals (61%) described non-testing related concerns that teachers reported, such as how to deal with student concerns and the ability to return to their classrooms quickly. Respondents described how they carefully considered addressing teachers' concerns. Responses that demonstrated more emotionally-based consideration for what teachers experienced were coded

as process-oriented. These responses did not necessarily take into consideration solutions to these problems. On the other hand, responses that focused more on how to solve the problems that teachers faced, rather than how teachers were affected by them, were coded as outcome-oriented. Principals whose responses suggested they wanted to be equitable and fair in how they addressed teachers' concerns were coded as outcome oriented. The process-oriented response shown in Box 2a showed that the participant had a high level of respect for what teachers do as professionals and how they felt as their students grappled emotionally and personally following the exposure. The outcome-oriented response, which described whether to have optional workdays knowing some teachers would not be able to attend, focused more on the decision than what impact the decision might have on teachers. The response does not consider the underlying anxiety teachers may have felt being away from their classrooms, nor does it consider how to support the teachers who are isolated. The response does consider how to fairly address teachers' needs to ensure that no one is left behind or excluded from being able to return to campus.

The third theme, support for students, described how school principals observed students' needs and how teachers addressed these needs. All 38 principals (100%) described students' needs as something they and their teachers cared about following natural hazard exposure. Their care was shown in how they helped teachers meet student's needs. Responses considered the larger picture of how students' needs connected to an overarching goal for schools. For process-oriented school leaders, the larger picture was about how teachers and schools could support students' emotional needs following the trauma of natural hazard exposure. For outcome-oriented school leaders, the larger picture was about meeting students' needs in a more practical way to get them ready to learn. In Box 3a in Table 5.14, the process-oriented leader describes "a wheelbarrow full of compassion" that was used to provide emotional support for the various

challenges that students experienced following natural hazard exposure. For outcome-oriented leaders, students' needs were viewed more practically, such as the need for meals or a place to sleep. These respondents shared that they were more concerned about addressing these needs in an effort to meet the long-term goal of having students able to focus on academics.

The next theme, teachers' exhaustion, grief and losses, explores how principals responded when teachers displayed emotions due to natural hazard exposure. The theme is related to the caring sub-behavior of recognizing emotions because principals either recognized or failed to recognize the intense emotional experiences teachers had due to the losses associated with natural hazard exposure. Twenty-five respondents (66%) described teachers as experiencing emotional exhaustion and grief. Principals who gave process-oriented responses connected teachers' experiences of the natural hazard exposure to lowered morale. Several process-oriented respondents described how upset teachers were over the loss of items in their classrooms. They sensed that the losses represented more than just the materials. The materials represented the effort teachers made in creating them or the sentimental value of the items. They also represented the process of repairing or replacing lost items, an additional source of stress for teachers. As the process-oriented principal shared, the loss of classroom items was "demoralizing" for teachers and contributed to an overall decrease in morale among the staff. Conversely, the outcome-oriented response minimizes the sense of loss for teachers whose personal items and teaching materials were ruined by the natural hazard exposure. The principal stated that these things can be replaced, which suggests that the respondent perceived the loss of instructional materials as less upsetting than teachers' reactions conveyed. Indeed, the respondent recalled being surprised at the level of emotion teachers expressed about the loss and damage of their items. While the respondent does acknowledge teachers' emotions, as an outcome-oriented leader, the participant

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also connected the emotions to a very practical issue, the potential loss of salary during the prolonged school closure. As a long-term goal, ensuring that teachers were paid when the school was not in session was a way for the outcome-oriented leader to recognize and mitigate one potential source of grief and loss for teachers.

The fifth theme, return to normalcy, showed the ways in which principals supported teachers' efforts to reestablish aspects of their pre-exposure lives, whether those aspects were personal or professional. All participants in the study described efforts to do this. The theme of returning to normalcy connects to the caring sub-behavior of suspending judgment because principals were required to accept and accommodate how teachers were feeling and what their needs were following natural-hazard exposure. For process-oriented principals, their care and efforts toward returning to normalcy focused primarily on helping teachers address their personal needs related to natural hazard exposure. Teachers' personal needs included things like providing classroom coverage so teachers could meet with contractors and repairmen about their homes or allowing teachers to meet with insurance adjusters on school grounds during the school day. Process-oriented principals described being empathetic and making accommodations for teachers. Box 5a shows how the participant recognized that teachers' personal lives were "turned upside down" because of the hazard. When a teacher approached this principal in tears about needing time off, the principal did not make a judgement call about the teacher's emotions. Rather, the principal worked with all teachers to ensure that their personal needs were address. At the end of the quote, the participant lists the various ways that this was accomplished. The response suggests an awareness that teachers were struggling and a willingness to take steps to reduce their stress. The outcome-oriented responses reflected a more professional, school-based focus, with the emphasis on providing a return to normalcy during the school day for students.

As the illustrative quote showed, the principal, whose school was temporarily relocated following Hurricane Florence, pushed for teachers to "get back in the groove." The participant did not acknowledge how this outcome might be unattainable when being out of the school building would cause tremendous disruption to teachers' working conditions.

The final theme, non-academic events in schools, examines principals' decisions and how their decision-making may have affected teachers' working conditions and morale. In particular, principals had to make difficult decisions to cut certain things following hazard exposure. The underlying reasons why principals chose to cut these shows the differences in process and outcome orientations. Process-oriented principals shared responses that carefully considered how natural hazard exposure affected teachers. They sought to make decisions that protected teachers from additional stress. The process-oriented illustrative quote showed that the principal chose to cancel some after-school activities to protect teachers' time after school. This decision allowed teachers to handle their personal needs, and it also gave them some separation from school. The principal said this decision kept teachers from reaching their breaking point. Outcome-oriented principals' decision were protective of one of their ultimate goals, which was student performance on statewide standardized assessments. The quote from the outcome-oriented principal in Table 5.11 showed that the principal canceled field trips to focus on academic instruction. The participant does acknowledge that "people love field trips," but the response does not fully consider the impact that canceling field trips may have on teachers and students.

Summary

From an analytical perspective, the a priori coding framework needed to be adjusted during the coding process to more accurately capture the interview data. Moreover, the coding process revealed that no principals lacked caring, but the ways that they expressed care differed. Process-oriented principals cared about how to cultivate an environment and conditions that

recognized the complexities natural hazard exposure introduced in schools. Outcome-oriented principals focused on ensuring sure that teachers were successful in preparing students for statewide standardized assessments, for which they knew teachers would be held accountable, and for reestablishing the routines and norms of schools. At times, the qualitative data suggested that this approach may undermine the stress that natural hazard exposure introduces for teachers. However, the qualitative data alone cannot determine the relationship between a principal's caring orientation and teacher turnover. In the mixed methods research question, which will be discussed next, the first part of the research question does examine this relationship.

In addition to providing insights into principals' caring behaviors, the analyses conducted here demonstrate the value of member checking as part of the analytical process in qualitative research.

Research Question 5: What is the Relationship Between Caring Leadership Orientation and Teacher Turnover in Schools that were Exposed to a Natural Hazard?

The empirical models used in the quantitative portion of this study can only show that natural hazard exposure is associated with teacher turnover. It cannot offer insights into why the relationship exists. Similarly, the qualitative analyses cannot establish a relationship between principal leadership and teacher turnover following natural hazard exposure. With my fifth research question, I integrated the quantitative and qualitative strands to provide a descriptive look at teacher turnover in exposed schools and principal leadership.

As I described in Chapter 4, I did this by narrowing the sample of exposed schools to include the 31 exposed schools where principals had worked for at least two years or more. Leveraging the qualitative data on caring leadership behaviors and principals' process and outcome orientations, I categorized each principal according to their orientation. A total of 31 schools were included in the sample. Of these, 17 had principals who were categorized as

process-oriented and 14 were categorized outcome-oriented. Table 5.12 summarizes the criteria used in determining whether a principal was process- or outcome-oriented. These criteria were based on what was observed in the qualitative analyses for Research Question 5. Appendix O lists each principal in the sample, their orientation, and the evidence supporting the orientation classification.

Having established the orientations for each school principal in the sample, the next task for data integration was to compare how the two orientations impacted teacher turnover. First, I compared teacher turnover rates between 2016 and 2019 for any exposure event (Hurricane Matthew, Hurricane Florence, or both exposures). Following the same process as employed in Research Question 1, Hurricane Matthew exposure and both exposures were coded as lagged time variables, which means they were coded as 1 between 2016 and 2019. Exposure to Hurricane Florence only was coded as 1 in 2019. In the subsequent analyses, which compared orientations for each type of exposure event, the same process was also followed. Table 5.18 shows teacher turnover rates by principal caring orientation for the different exposure events between 2016 and 2019.

Table 5.18

Teacher Turnover by Principal Caring Orientation across Natural Hazard Exposure Events

	Any Exposure								
	2016		2017^		2018^		2019^		No. of
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Schools
Process Orientation	21.18	11.19	20.97	10.98	18.55	9.42	22.51	10.99	17
Outcome Orientation	19.66	6.63	18.88	10.72	18.55	7.75	16.61	4.91	14

	Hurricane Matthew Exposure								
	2016		2017^		2018^		2019		No. of
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Schools
Process Orientation	20.16	14.47	23.03	13.97	17.41	10.49	20.36	6.48	9
Outcome Orientation	21.45	9.06	18.36	14.25	16.03	10.14	14.95	5.54	6

	Hurricane Florence Exposure								
	2016		2017		2018		2019^		No. of
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Schools
Process Orientation	22.20	7.52	18.65	6.42	19.84	8.59	24.93	14.68	8
Outcome Orientation	18.31	4.27	19.26	8.23	20.43	5.36	17.85	4.34	8

	Exposure to Both Natural Hazard Events								
	2016		2017^		2018^		2019^		No. of
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Schools
Process Orientation	19.23	16.93	13.18	5.70	10.18	5.10	18.67	6.59	4
Outcome Orientation	18.06	13.75	35.42	2.95	28.21	7.25	17.05	11.25	2

^ Exposure Year

As seen in Table 5.18, there are differences in turnover rates between the two types of principal orientations. For the most part, the patterns that emerges showed that schools with outcome-oriented principals have lower turnover rates in the years of exposure. For schools with multiple years of exposure (any exposure, Hurricane Matthew exposure, exposure to both events), the gap in turnover between outcome and process-oriented principals narrows in 2018, one year after the initial or only event. The gap in turnover rates then increases again in 2019. Of course, the number of schools in each category is quite small, as few as two schools in the case of schools with exposure to both that have outcome-oriented principals. Therefore, this table, as well as the graphs that will be discussed next, can only offer descriptive evidence about how principal orientation may influence turnover rates in the context of natural hazard exposure.

Figure 5.2 provides a visual comparison of turnover rates between schools with process and outcome-oriented principals across all exposure events. In the year prior to exposure, teacher turnover is slightly higher for schools with process-oriented principals, and this trend continues for all years, except 2018 when turnover was equal between both schools. In 2017 and 2018, turnover in schools with process-oriented principals actually decreased slightly from the year prior, which suggests that these principals may have demonstrated caring behaviors that teachers found beneficial. However, the slope takes a sharp turn upward in 2019, which suggests that the process orientation no longer benefits teachers. The slope between 2017 and 2018 for schools with outcome-oriented principals also shows a slight decrease in turnover (approximately 0.33 percentage points, as shown in Table 5.18). The slope decreases even further in 2019 for the second exposure event in outcome-oriented schools. This suggests that teachers in those schools may also appreciate outcome orientation. The difference in slopes for the school year of the second exposure perhaps speaks to the community's perception that natural hazard exposure is

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endemic to school life in the eastern parts of North Carolina. Teachers with outcome-oriented principals may appreciate the focus on a return to normalcy by the time a second event occurs. They may also get a sense of job security or pride due to these principals' focus on student performance on statewide standardized assessments. Certainly, however, because principals have worked at their schools for multiple years, it is also possible that teachers have selected into schools where the principals' orientation matches their own orientation preferences.

A very similar pattern to Figure 5.2 is observed in Figure 5.3, which compares turnover rates by principal orientation for schools exposed to Hurricane Matthew. Interestingly, in 2016, on year prior to exposure, the mean turnover rate among schools with outcome-oriented principals is slightly higher than schools with process-oriented principals. The slope for schools with outcome-oriented principals steadily decreases over time, with the lowest turnover rate occurring in 2019. This suggests that outcome-oriented principals are more successful in reducing turnover in the year of and after a natural hazard exposure. Perhaps teachers in these schools feel a sense of comradery in working toward a common goal of student success that induces them to stay at the school. On the other hand, schools with process-oriented principals have an increase in turnover in the year of exposure. The turnover rate then falls in 2018 and rises again in 2019 to about the same exposure rate as 2016, which is still slightly below the turnover rate in the exposure year. The pattern suggests that perhaps teachers do want some priority placed on academic outcomes in the exposure year, but they may appreciate process orientation in the year after. This observation aligns with evidence from the qualitative data, in which many principals acknowledge that they were negligent of teachers' needs in the exposure but sought to implement supports and professional development in following years to better equip teachers with the tools to better navigate the impacts of natural hazard exposure.

Figure 5.2

Teacher Turnover by Principal Caring Orientation for Any Natural Hazard Exposure
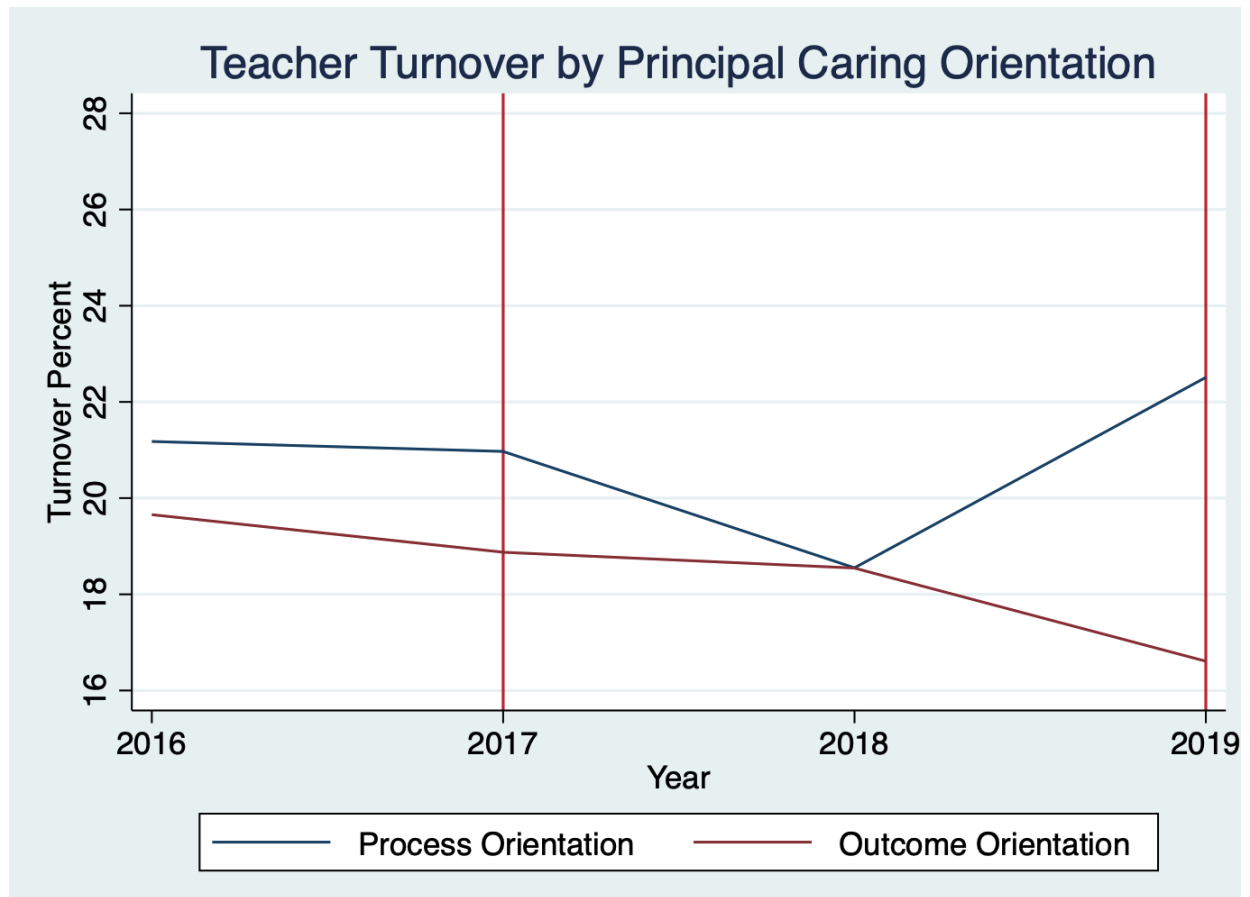
Figure 5.3

Teacher Turnover by Principal Caring Orientation for Hurricane Matthew Exposure
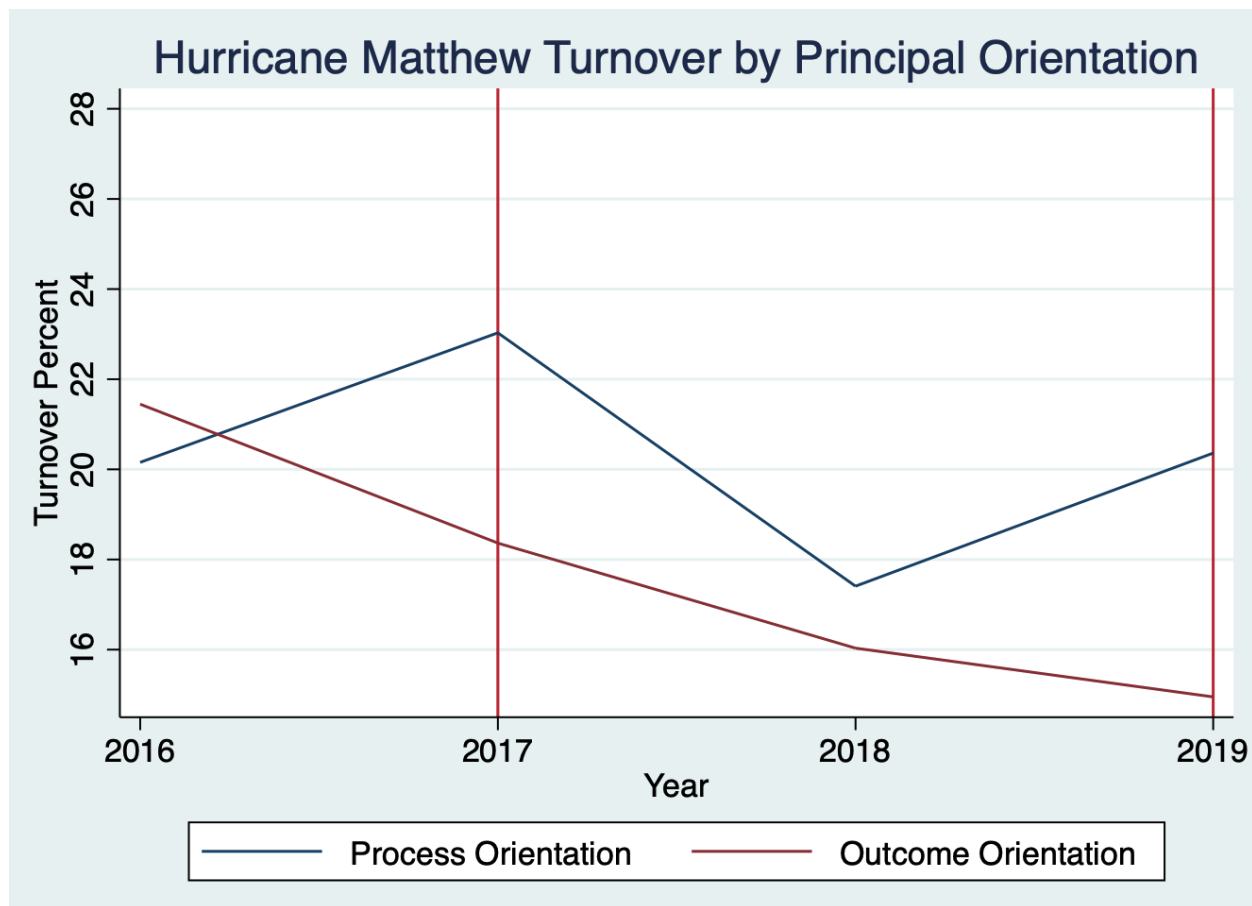
Yet again, in comparing the turnover rates by principal orientation for Hurricane

Florence, the turnover rate in 2019, the year of the exposure event, schools with process-oriented

principals have higher turnover rates in 2019 than schools with outcome-oriented principals (See

Figure 5.4). The turnover rate for schools with process-oriented principals was highest in the

year of exposure, which suggests a negative relationship between process orientation and teacher

turnover. Conversely, the turnover rate in schools with outcome-oriented principals fell to its

lowest rate in 2019, which suggests a positive relationship between outcome orientation and

teacher turnover. As discussed with the two prior exposure events, this suggests that outcome-

oriented principals may be more successful in reducing turnover in the year of exposure. Given that these principals also had the opportunity to learn from and observe schools exposed to Hurricane Matthew, they may have focused and applied their learning on producing successful outcomes and returning to normalcy. Due to the limitations of the data, it cannot be observed how turnover rates were influenced by principal orientation in the years after the exposure event.

Lastly, in comparing turnover rates for schools that experienced both exposure events, turnover rates were much lower 2017 and 2018, the year of and after exposure to Hurricane Matthew for schools with process-oriented principals. Interestingly, despite the large difference in turnover rates between the two orientations, schools with outcome-oriented schools experienced a dramatic decrease in turnover in 2018 and 2019, with turnover actually falling below both their initial turnover rate in 2016 and below the rate for schools with process-oriented principals in 2019. This suggests that teachers may have been especially appreciative of principals' outcome orientations in light of multiple exposures. However, it is very important to note that only two school in the sample met the criteria for exposure to both events. The high turnover rates in these schools in 2017 suggests that there are other confounding factors at the school level that contributed to the high turnover rate observed.

Figure 5.4

Teacher Turnover by Principal Caring Orientation for Hurricane Florence Exposure
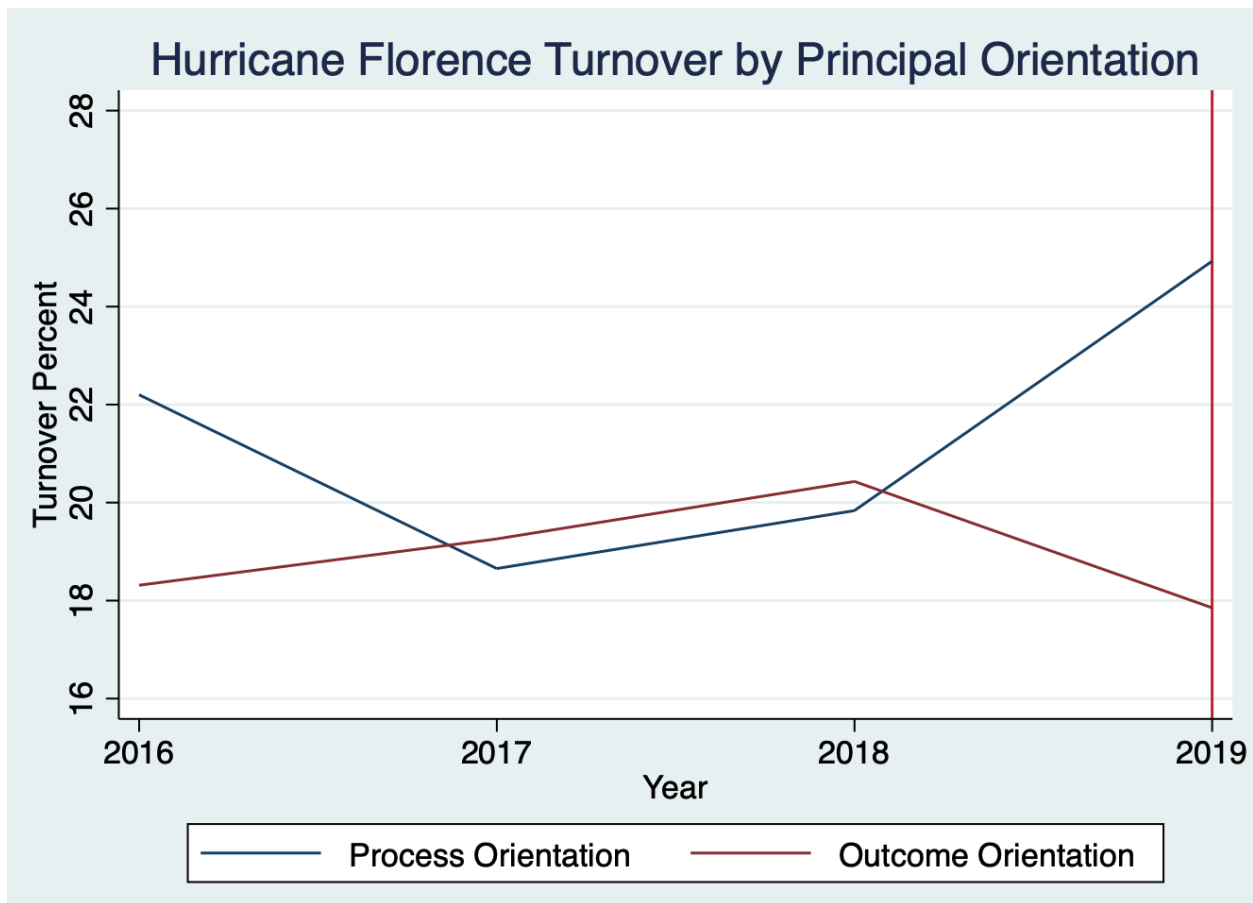
Figure 5.5

Teacher Turnover by Principal Caring Orientation for Exposure to Both Events
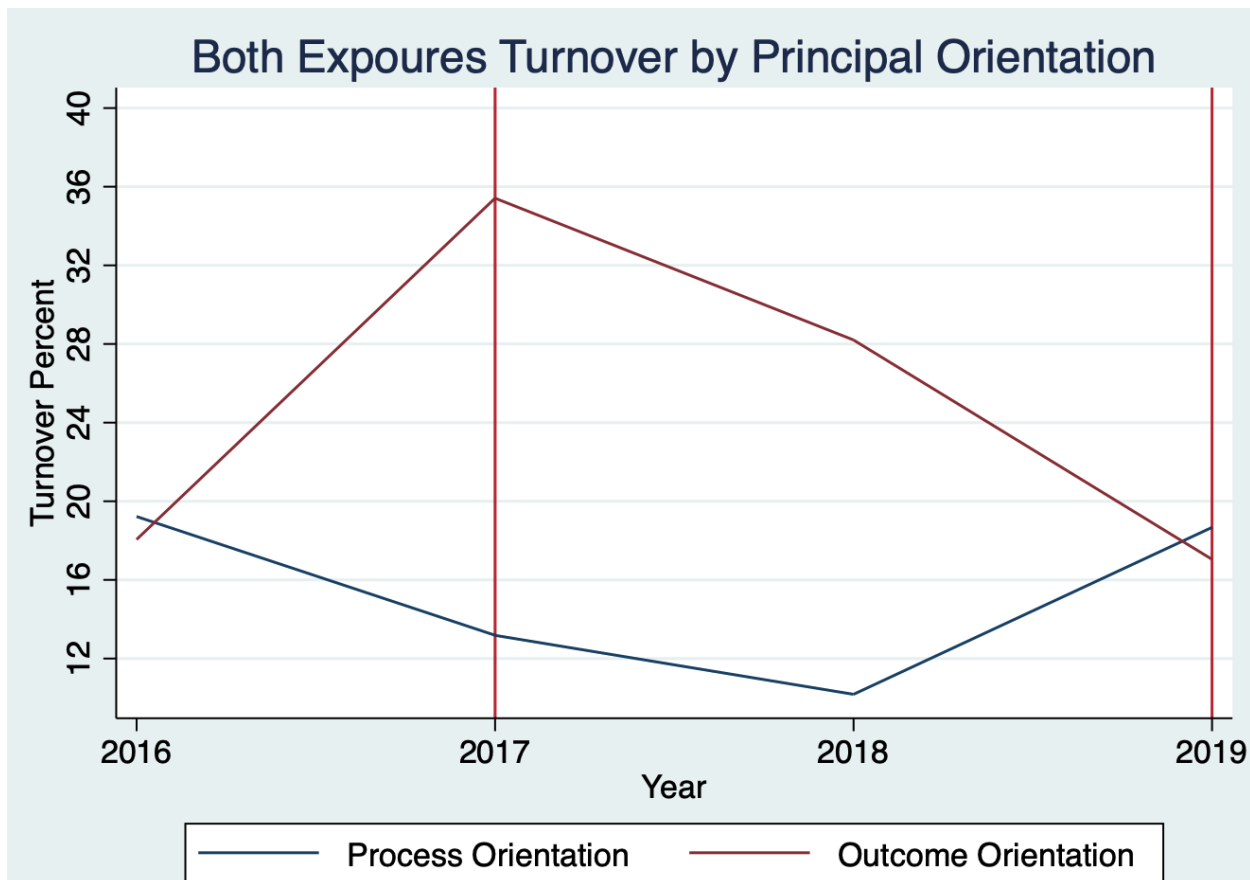
Summary

The analysis for Research Question 5 offers descriptive insight into how principals' caring orientations may influence teacher turnover in schools exposed to natural hazards. Altogether, the trends show that schools with outcome-oriented principals have lower turnover rates in the year of an exposure event. Schools with process-oriented principals tend to reduce turnover in the year after an exposure event. These findings suggest that teachers may appreciate outcome-oriented principals' focus on student performance and a return to normalcy in the year of an exposure event. The qualitative analyses indicated that teachers with outcome-oriented

principals were required to limit "the fluff" from the curricula to achieve positive test results. While this extra work may have been stressful initially, teachers may have appreciated the ultimate outcome. Since test scores are released at the end of the school year, the test results may have induced some teachers remain at their schools despite a difficult year.

Conversely, process-oriented principals may not have placed enough emphasis on student performance. Since student performance is the primary metric of a teacher's success, regardless of a natural hazard exposure during that academic year, teachers in schools with process-oriented principals may not have felt successful in their job in the year of exposure. However, in the year after an exposure, when turnover in schools with process-oriented principals fell, teachers may have appreciated the focus on process when it was coupled with distance from the exposure event. Turnover in schools with a process-oriented principal tended to be more volatile, which suggests that perhaps outcome-oriented principals were more consistent in their relationships with teachers, their goals, and their influence on teacher working conditions.

Of course, this descriptive analysis is limited by the very small sample sizes, and in some cases, the small sample sizes suggests there are other confounders at the school level that impacted turnover. Moreover, because new principals were not included in the sample, there is a strong possibility that teachers had self-selected into schools where the principals' orientation matched their own preferences. Future analyses could explore whether new principals' orientations influenced turnover. The analyses are also limited by the qualitative evidence used to categorize principals. The categorization of principals as process or outcome orientation was only based on principals' self-reports during interviews. Future analyses could also employ observation data or interviews with teachers to determine the accuracy of principals' viewpoints.

Research Question 6: What Deeper Insights Do the Qualitative Findings Provide to Help Explain the Quantitative Results on Teacher Turnover in Schools Affected by Natural Hazard Exposure?

My final research question uses a joint display and narrative to explore how the qualitative findings converge and diverge from the quantitative results. In the analyses for Research Question 5, the focus was on the relationship between principals' caring leadership orientation and teacher turnover. This final research questions incorporates findings from both qualitative research questions with the quantitative results. The integration of the two strands of data paints a more inclusive picture of the complex problem of teacher turnover due to natural hazard exposure. The benefit of the sequential design is that it allowed me to make meta-inferences. The meta-inferences leverage the qualitative data to fill-in what is potentially happening behind the scenes for the qualitative results. Table 5.19 presents the mixed methods joint display with the meta-inferences.

Table 5.19

Joint Display for Sequential Mixed Methods Study of Principal Leadership as a Moderator of Teacher Turnover following Natural Hazard Exposure

Quantitative Findings	Qualitative Findings	Mixed Methods Meta-Inferences
Teacher turnover increases by 0.74 percentage points due to natural hazard exposure.	Principals reported that teachers experience both professional and personal stress due to natural hazard exposure.	Natural hazard exposure has an impact on teachers' experiences, and the quantitative results suggest that the impact induces teacher turnover.
Subgroup analyses revealed that teacher turnover is higher in high-poverty schools due to natural hazard exposure.	Principals reported that teachers were often greatly impacted by their students' suffering, often prioritizing students' emotional needs ahead of academics. In one high poverty school, the principal said teachers felt "survivor's guilt" because their homes were not as damaged nor were their lives as disrupted as their students'.	Prior literature has shown that natural hazard exposure exacerbates pre-existing trends. In high poverty schools, the pre-existing trend is high teacher turnover. The quantitative and qualitative findings suggest that teachers in high poverty schools may be more likely to turnover because the emotional demands of their jobs increase even more following natural hazard exposure.
Across the different natural hazard exposure types, teacher turnover rates were the highest following exposure to Hurricane Matthew.	Participants described Hurricane Matthew as an unexpected exposure event for which many communities and schools were unprepared. They also said that the severe impacts of Hurricane Matthew were likely worse because the natural hazard's intensity caught people off guard.	The qualitative and quantitative findings suggest that an acute, extreme exposure event induces higher turnover rates, especially when people are unprepared prepared.
Null effects from exposure to Hurricane Florence and exposure to both natural hazards were found.	Principals described how they applied the lessons learned from how difficult Hurricane Matthew was to lessen the impact of Hurricane Florence.	Turnover rates were not significant due to exposure to Hurricane Florence and exposure to both natural hazards because school principals had experience or knowledge in managing a severe crisis.

Table Design Adapted from Creswell & Plano Clark (2018)

In the quantitative analyses, natural hazard exposure was found to increase teacher turnover by 0.74 percentage points, significant at the 0.10 level. Evidence from the qualitative data supported this result because principals described how challenging natural hazard exposure was for teachers, both professionally and personally. Several additional findings from the qualitative analyses lend additional insights into this quantitative result. First, principals discussed how some teachers turned over immediately following an exposure due to the stress this created. It is likely that the loss of colleagues during the school year negatively impacted teacher morale. It is also possible that the stress of filling these vacant positions after the school year began created stress for principals, which may have impacted how they interacted with teachers. Second, many principals acknowledged that they did not recognize how much teachers were struggling until the end of the school year. They noted that future professional development training and support would be implemented to better help teachers during future hazard exposures. The mixed methods findings from Research Question 5, which descriptively showed that teacher turnover decreased in 2018 for school exposed to Hurricane Matthew, may be related to these supports being in place. Moreover, Research Question 5 showed that teacher turnover increased following the second natural hazard exposure for schools that had process-oriented principals. This finding suggests that outcome-oriented principals who had put support in place for teachers after Hurricane Matthew may have been able to reduce turnover because the teachers were equipped to deal with the exposure and were focused on the common goal of student performance.

Subgroup analyses showed that high-poverty schools experienced even higher teacher turnover rates following natural hazard exposure (1.49 percentage points, $p < 0.05$). In Chapter 2, I discussed several researchers (e.g., Kraft et al., Carver-Thomas & Darling Hammond, Ladd,

Hanusheck, etc.) whose work showed that high poverty schools are plagued with high teacher turnover rates at baseline. The additional obstacles that natural hazard exposure creates for teachers is likely the underlying cause of increased teacher turnover in these already stressful environments. The qualitative findings support this assumption. Principals shared that teachers were deeply affected by and were empathetic to how their students were impacted by natural hazard exposure. While many teachers also experienced personal difficulties, they likely had the resources to address them. As noted in Chapter 4, Eastern North Carolina, where the sampled principals worked, is typically characterized as a region with a weak economy, high unemployment, and low educational attainment. FEMA and insurance companies in these regions often have bureaucratic processes that have historically caused inequitable distributions of payouts between white, affluent residents and poor residents of color. These factors indicate that many families in the region may not have the financial resources to address problems caused by natural hazard exposure. Student's' families may also not have the skill or knowledge to navigate the FEMA and insurance bureaucracies to obtain outside financial support. In addition to being better equipped to address personal challenges that arose from natural hazard exposure, many teachers were also given the support and flexibility at work to deal with insurance adjusters and repairmen, according to many principal interviews. In some cases, the differences in post-exposure impacts and outcomes, teachers may have felt "survivor's guilt" for the ways in which hazard exposure exacerbates pre-existing inequities. While it cannot be determined from the data whether this perception induced turnover, the likely increase in workplace challenges in high-poverty schools may explain why the turnover rate in this sub-group was high.

As the final two rows in Table 5.14 showed, there were differences in teacher turnover across the different types of natural hazard exposure events, with Hurricane Matthew showing

the largest and only significant increases in turnover. Many principals in the qualitative analyses shared that Hurricane Matthew was an unexpected, acute natural hazard event. They posited that the impact of Hurricane Matthew may have been worse due to inadequate preparation. The resultant challenges for teachers lend insight into why teacher turnover was so high following exposure to Hurricane Matthew compared to turnover following other natural hazard events.

Interview participants also shared that Hurricane Matthew was a wake-up call to take natural hazards more seriously in the future. Principals described this wake-up call in two different ways. First, they detailed how their preparations for Hurricane Florence helped reduce damage from the exposure, even in places where the overall impact of the storm was actually worse. This change, in addition to being a practical, economic decision, also had emotional implications for teachers. Many principals noted that teachers had an emotional response to the loss and damage of their classroom items, similar to the loss and damage of their homes. One principal believed that these losses contributed to weakened morale among staff overall for the remainder of the school year. Being better prepared for Hurricane Florence likely reduced these losses and subsequently, reduced emotional distress. Second, principals talked about putting support and training in place to prepare teachers for natural hazard exposure. It is likely that providing teachers with the skills and tools to address natural hazard exposure helped decrease the overall emotional toll of Hurricane Florence exposure. As noted previously, the impact of training and support for teachers in schools with outcome-oriented principals may have been lower following natural hazard exposure because teachers were better equipped to navigate the impacts of Hurricane Florence and were then oriented around the common goals of student performance and a return to normalcy.

Summary

The analyses discussed here illuminate the benefits of a sequential mixed methods design because the qualitative data provides supporting evidence for what is observed in the quantitative results. Specifically, the qualitative analyses showed that teachers experienced both professional and personal challenges following natural hazard exposure, which helps explain why teacher turnover increased. Turnover in high poverty schools was likely higher because natural hazard exposure added to already stressful working conditions for teachers in that subgroup of schools. Exposure to Hurricane Matthew was significantly and positively associated with teacher turnover, but no effect was found for schools exposed to Hurricane Florence and schools exposed to both natural hazards. Qualitative evidence showed that principals made efforts following exposure to Hurricane Matthew to improve their management of Hurricane Florence.

CHAPTER 6: DISCUSSION

The purpose of this study was to investigate if natural hazard exposure affected teacher turnover and how principal leadership was able to moderate this relationship. The study intersects three discrete literatures—natural hazard exposure, teacher turnover, and principal leadership. Prior research has documented how natural hazard exposure negatively affects student performance and interferes with teachers' ability to deliver high-quality instruction to students (Fothergill & Peek, 2015; Lamb et al., 2013). Negative outcomes following natural hazard exposure is worse for students of color and low-income students (Fuller, 2014; Ward et al., 2013; Schorr, 2006). The extant literature on teacher turnover has shown that teachers' working conditions and the perceptions of principal leadership quality induces turnover (Johnson, 2006; Kraft et al., 2016). Turnover is often greater in schools with high proportions of students of color and low-income students (Boe et al., 2002; Carver-Thomas and Darling-Hammond, 2017; Guin, 2004; Kraft et al., Ronfeldt et al., 2013). Principals have the strongest influence of any school-based factor in reducing turnover because of their influence on teacher working conditions (TWCs) (Johnson, 2006; Ladd, 2011; Grissom et al. 2021). Teachers who have positive perceptions of their principal's leadership and TWCs are less likely to leave their schools (Burkhauser, 2017; Johnson et al., 2012; Kraft et al., 2016). This study extends these prior findings by looking at teacher turnover and the influence of principal leadership in the context of natural hazard exposure.

This chapter has three parts. First, I discuss the findings from each of the six research questions within the context of extant literature. Second, I summarize how the overall results fit

together and their implications for policy and practice. Last, I conclude with a discussion of the limitations of the study and directions for future research.

Discussion of Findings

In this section, I contextualize my findings for each research question within existing research.

Research Question 1: Does Natural Hazard Exposure Predict Teacher Turnover?

The results for my first quantitative research question showed that, yes, natural hazard exposure does predict teacher turnover. In the sample of North Carolina schools from 2016 to 2019, schools that were exposed to any natural hazard between 2017 and 2019 had an average increase in teacher turnover of 0.74 percentage points ($p < 0.10$). Across the entire panel of schools, the average turnover rate was 19.16%. Nearly 5% of the average teacher turnover rate in exposed schools can be explained by natural hazard exposure alone. In the subgroup analyses, teacher turnover increased by 1.49 percentage point ($p < 0.05$) in high poverty schools.

My findings add another negative outcome in schools due to natural hazard exposure. Prior research has found that natural hazard exposure hampers student achievement ((Fothergill & Peek, 2015; Fuller, 2014; Lamb et al., 2013; Ward et. al, 2013). Other research has shown that natural hazard exposure harms non-cognitive outcomes, such as discipline and attendance (Tian and Guan, 2015). Qualitative research has explored how natural hazard exposure negatively influences teacher's stress and emotions (O'Toole, 2018). Kuntz et al. (2013) used quantitative analyses to show that teacher turnover intentions following a natural hazard exposure was associated with increased turnover intentions. My study extends this work by looking at actual turnover in schools exposed to natural hazards. It provides a causal link between exposure and turnover.

The findings for Research Question 1 are important because they demonstrate that natural

hazard exposure does indeed affect turnover. It suggests that something about the way that

natural hazards affect teachers' experiences in schools in the year of and following a natural

hazard exposure induces turnover. It motivates the remainder of the study, particularly the

qualitative research, to determine what can be done to moderate this relationship. Given the prior

literature on the association between leadership and turnover, the qualitative results logically

investigated how principals can potentially disrupt or mitigate the negative consequences of

turnover.

Research Question 2: Do Different Natural Hazard Exposure Events Affect Teacher Turnover Differently?

The second research question offers a more in-depth quantitative exploration of how

natural hazard exposure is associated with teacher turnover by parsing out how different

exposure events are related to turnover. The three types of exposure events investigated were

exposure to Hurricane Matthew, exposure to Hurricane Florence, and exposure to both events.

The results showed that Hurricane Matthew exposure was associated with an average increase in

turnover of 1.26 percentage points. The other two exposure events were not found to have an

effect on turnover.

Both the description of Hurricane Matthew in Chapter 4 and the qualitative evidence in

the study correlate with these results. Hurricane Matthew was categorized as an acute,

unexpected event that overwhelmed exposed schools and communities, which were unprepared

for the natural hazard. The event served as a wake-up call for school leaders, both those exposed

to Hurricane Matthew and those in nearby districts that would later be exposed to Hurricane

Florence, to improve their management of natural hazard exposure. These improvements may

help explain why no effect was found for Hurricane Florence and both exposures.

Potter et al. (2021) described how trust was an important factor in a school leader's relationship with teachers. It is possible that my results can be explained by a loss of trust and confidence in leadership following exposure to Hurricane Matthew. Similarly, a respondent in O'Connor and colleagues' (2013) qualitative study on principal leadership compared being a principal during a natural hazard event to being "the captain of a ship," whom others are looking to for support, guidance, and leadership. Given the crippling impact of Hurricane Matthew, principals of exposed schools may not have been able to assume this position. However, as Grissom and Condon's (2021) crisis management framework explained, crises, such as natural hazards, present an opportunity for learning and analysis. Principals in schools that were exposed to both natural hazards may have leveraged their experiences from Hurricane Matthew to prepare, respond, and recover more effectively from Hurricane Florence. Likewise, as the qualitative data revealed, principals in neighboring districts also borrowed knowledge and insights from their colleagues' experiences to mitigate the impacts of exposure to Hurricane Florence.

Research Question 3: What Strategies Did School Principals Employ to Support Teachers Following a Natural Hazard Exposure?

The third research question moved into the qualitative portion of the study. The qualitative data came from interviews with 38 school principals in Eastern North Carolina whose schools had been exposed to Hurricane Matthew, Hurricane Florence, or both. Using Grissom and Condon's (2021) framework on crisis management, I analyzed how principals supported teachers following a natural hazard exposure. This framework outlines temporally what effective leaders should be doing through each phase of a crisis: mitigation and prevention, preparation, response, recovery, and learning. Embedded in each phase are three core competencies for

school leaders: emotional intelligence, communication, and analysis, judgement, and sensemaking.

Five themes emerged from the analysis of principals' mitigation and prevention efforts. In the first theme principals shared was that efforts for mitigation were not perceived to be something they could control. Rather, school districts and other agencies were responsible for mitigation, especially with formal disaster planning. In the second theme, it was revealed that principals felt some uncertainty and confusion about whether their school districts even had formal disaster plans in place or what those plans entailed, if they did exist. The third and fourth themes indicated that because of unpredictability of natural hazards and the frequency with which they impact the region, principals felt like they had very little control over natural hazard exposure, before even considering how their school districts managed mitigation and prevention. With the fifth theme, I observed that principals did aim to manage natural hazard-related preparedness within their locus of control, which was contained to school level preparedness. Participants shared that they supported and guided teachers through the building preparations, such as securing equipment and using sandbags to reduce the impact of flood damage.

Prior research on the role of principals in natural hazard events has shown that principals are called upon to be leaders within their school communities by overseeing what happens at the building-level. Case studies from Lee, et al. (2008), Potter, et. al (2021), and Shelly (2008) detailed some of the other very practical tasks principals were responsible for, such as organizing and distributing clothing and supplies to families in need. Goswick et al. (2018) and Kanter and Abramson (2014) explained that principals are particularly well suited for these tasks because they have intimate knowledge of their schools communities. Likewise, principals in my study,

who arguably have the most firsthand knowledge of their schools, believed that their efforts helped to reduce the damage and losses in their building.

The second set of themes showed how principals described supporting teachers during response and recovery. As a whole, the themes reveal the various aspects of teachers' working conditions that were negatively impacted by natural hazard exposure. In the first theme, principals recalled some instances of immediate teacher turnover, mostly due to loss of local housing options. Two consequences likely resulted from immediate turnover. First, the loss of colleagues may have reduced morale for remaining teachers. Second, filling these mid-year vacancies may have created additional stress for school principals, and may have negatively influenced their relationships and support of the remaining teachers.

The next four themes detailed the negative impacts of natural hazard exposure on teachers' day-to-day workplace experiences. Many principals recalled that teachers were quite distressed about being held accountable for student performance on statewide standardized assessments despite a considerable loss of instruction time due to school closures. Principals also shared that students sometimes returned to school with substantial emotional trauma due to the natural hazard exposure. Teachers served on the frontlines when it came to meeting students' emotional needs and helping them process the event. Unfortunately, in many cases, principals acknowledged that the emotional toll that natural hazard exposure had on teachers went unrecognized until the end of the school year. Principals also shared that teachers were upset by the loss of materials and the loss of routine due to the natural hazard exposure.

The final theme explored how principals attempted to mitigate some of the negative consequences that teachers experienced following a natural hazard exposure. In many cases, this meant that principals gave teachers the flexibility to deal with personal issues, such as home

repairs, during regular school hours. In other instances, principals created opportunities for teachers to talk openly and receive support about how the natural hazard affected them emotionally. Recognizing that teachers' emotional needs had gone unmet for a long time, some principals also talked about implementing clinical mental health supports and professional development trainings to provide teachers with the skills and tools to better navigate future exposure events.

Being better prepared to respond to future natural hazard events was also the focus of the learning themes. Principals shared how Hurricane Matthew, as an acute, unexpected exposure event, induced them to be more diligent and thoughtful in preparing for Hurricane Florence. One respondent posited that because Hurricane Matthew was so surprising, the impact it had on schools, students, and teachers was actually much worse. Similarly, many principals believe the thoroughness with which they prepared for Hurricane Florence reduced its impact, even in places where flooding was worse than it had been for Hurricane Matthew. Principals also reiterated how they planned to do better to support teachers emotionally.

A series of research articles on the Christchurch earthquakes in New Zealand also showed that teachers face a number of negative outcomes due to natural hazard exposure, such as diminished working conditions, emotional exhausting, and burnout (Kuntz et al., 2013; Le Brocuqe et al., 2016; O'Toole, 2017 & 2018). These findings extend that work by exploring how principals can help mitigate the personal and professional challenges that teachers experience due to an exposure event.

Research Question 4: Did School Principals Use Caring Leadership Behaviors to Support Teachers Following Natural Hazard Exposure?

The findings from the fourth research question have both policy and methodological implications. The analysis was guided by a conceptual framework that used both caring

leadership behaviors (Steinbinder & Sisneros, 2020), as well as process and outcome orientations. The conceptual framework, which was revised as the result of member checking, helps us understand more specifically the behavior principals employed following natural hazard exposure, as well as the orientation that informed their behaviors.

Given the nature of education work, it is highly unlikely that principals would be high or low caring. This dichotomy was the categorization of their caring behaviors during my initial analysis. Rather, after checking with a school principal, I came to understand that principals care about their teachers, in varying ways. It is the underlying orientation that guides their behaviors. The two orientations that I used in my final analyses were process- and outcome-orientations. Principals who were process-oriented tended to give responses that had a lot of empathy for students and teachers. They seemed to be more supportive of the daily ins and outs of natural hazard exposure. On the other hand, outcome-oriented principals gave responses that were more focused on the long-term goals for a school. Specifically, their focus was on student performance and a return to normalcy. Their care for teachers was about setting them up to be successful in delivering of academic content and preparing their students for statewide standardized assessments. Evidence of both orientations was found across the six caring sub-behaviors that were used in the analysis.

My findings, which showed how principals cared for their teachers, are supported by an abundance of prior research on teacher turnover, working conditions, and principal leadership (e.g., Boe et al., 2002; Carver-Thomas and Darling-Hammond, 2017; Grissom et al., 2021; Guin, 2004; Kraft et al., Ronfeldt et al., 2013). This prior work has shown that principals have a powerful influence on teachers' workplace experiences. Research Question 4 extends this line of inquiry by identifying some of the specific behaviors that principals can employ to support

teachers in the context of natural hazard exposure. Moreover, my findings provide evidence of the importance of caring leadership in schools, which scholars, such as Smylie et al. (2020) and Louis et al. (2016) have theorized is a critical component in fostering a positive school environment.

From a methodological standpoint, the findings lend support to the use of multiple coders and member checking. Specifically, my coding needed to be changed after a conversation with a school principal, who found my initial characterization of interview participants as either high or low caring to be problematic. Recoding the interviews proved to be a worthy endeavor because it provided more accurate insights into the ways that principals can show care. In addition, the revised analyses insulate principals from being characterized as low caring, when in reality my coding framework was not appropriately suited to capture the underlying intentions of what they shared in the interview. Merrick (1993) used the metaphor of chewing gravel for the process of recoding when the researcher mischaracterizes participants' viewpoints. However, she believed that recoding better captures participants' realities and lived experiences.

Research Question 5: What is the Relationship Between Caring Leadership Orientation and Teacher Turnover in Schools that were Exposed to a Natural Hazard?

The fifth research question leverages the benefits of a mixed methods study to look even further into the relationship between caring principal orientations and teacher turnover following natural hazard exposure. The qualitative sample of principals whose schools were exposed to a natural hazard was narrowed to only principals not in their first year of teaching at the time of the natural hazard exposure (N=31). These principals were then each categorized as process or outcome oriented according to qualitative evidence. Their orientation was then linked to the quantitative panel data to provide descriptive evidence of the difference in turnover rates

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between schools with process (N=17) and outcome (N=14) oriented principals following natural hazard exposure.

The findings showed that schools with outcome-oriented principals generally had lower turnover rates following natural hazard exposure. The gap in turnover rates between schools with process- and outcome-oriented principals narrowed in 2018, one year after schools were exposed to Hurricane Matthew, but then widened again in 2019 when Hurricane Florence occurred. Turnover rates in schools with process-oriented principals in 2019 often exceeded pre-exposure turnover rates.

These findings diverged from what the qualitative results on caring process orientations in Research Question 4 seemed to indicate. Often, outcome-oriented principals seemed to prioritize results and a return to normalcy at the expense of teachers' working conditions, morale, and wellbeing. However, the mixed methods findings suggest that teachers may have responded more positively to the comradery that working toward common goals that outcome-oriented principals created. Furthermore, results on statewide standardized assessments would have been released before Pay Period 3 of the year following an exposure event, which means that teachers in outcome-oriented schools may have felt more inclined to remain at their schools after observing that their students performed well on these assessments, despite the difficulties natural hazard exposure created. It is also possible that turnover increased in schools with process-oriented principals because teachers felt that not enough emphasis was placed on academic performance, which is an important indicator of school and teacher success. The descriptive analyses also showed that schools exposed to both natural hazards had lower turnover rates in 2018 and 2019, which suggests that teachers appreciated a focus on outcomes in the years after an initial exposure.

The narrowed gap in the year following exposure to Hurricane Matthew may be explained by the qualitative findings, which indicated that principals sought to be better prepared for future exposure events by providing professional development training and emotional supports in place for future natural hazard events. These changes likely were implemented in 2018 for schools that were exposed to Hurricane Matthew and schools that were exposed to both events. Schools only exposed to Hurricane Florence may have also implemented similar supports in 2018 after learning from the challenges that schools exposed to Hurricane Matthew experienced.

These descriptive analyses provide an initial insight into the relationship between principal leadership and teacher turnover in the context of natural hazard exposure. However, it is important to note that no causal claims can be made about these analyses. The sample, especially when broken down into exposure event types, was very small. Moreover, as was the case with the high turnover rate observed for schools with outcome-oriented principals that were exposed to both natural hazards, there are likely some unobserved factors occurring at the school level that confounding the observational results. Of course, teachers may be opting into schools with principals whose orientation matches their own preferences. Nevertheless, the findings lend some support to the benefits of an outcome orientation over time in schools exposed to natural hazards. The findings do not entirely discount process-oriented principals either. Schools with process-oriented principals had reduced turnover rates in the year after a natural hazard exposure, which suggests that the focus on process and finding ways to improve teachers experiences at that point in time may also be beneficial.

Research Question 6: What Deeper Insights do the Qualitative Findings Provide to Help Explain the Quantitative Results on Teacher Turnover in Schools Affected by Natural Hazard Exposure?

Whereas the fifth research question focused on a narrow analysis of the relationship between teacher turnover and principal leadership following natural hazard exposure, the final research questions leverages the full power of all the preceding quantitative and qualitative analyses to develop meta-inferences. In these meta-inferences, the qualitative findings are used to provide supportive evidence for the quantitative results. The qualitative results helped explain why a statistically significant increase in teacher turnover following natural hazard exposure occurred, as shown in the analyses related to Research Question 1. Subgroup analyses showed that high poverty schools had an even greater turnover rate following Hurricane Matthew. This finding is supported by the literature on teacher turnover. Prior research (e.g., Carver-Thomas & Darling-Hammond, 2017) has shown that teacher turnover is often a greater challenge in schools with high proportions of low income students.

The qualitative results also revealed that Hurricane Matthew had a more pronounced impact on exposed schools, and this impact likely had worse consequences because schools were not sufficiently prepared for its severity. The findings lend insights into how Hurricane Matthew induced a 1.49 percentage point increase in teacher turnover (p<0.05) in exposed schools. No effect was found for Hurricane Florence or exposure to both natural hazards. These two results are supported by additional qualitative evidence, which revealed that school leaders were generally better prepared and responded better to Hurricane Florence.

As a whole, the integrated results presented in the narrative and joint display show that teacher turnover in schools exposed to natural hazards likely increases when teacher working conditions are diminished, when principals do not offer timely support for the challenges that teachers experience or if their support does not align with teachers' orientation preferences.

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Overall Summary and Implications for Policy and Practice

The final point made about the integrated results is perhaps the biggest key takeaway from this study. The findings indicate that because of their powerful influence on teacher working conditions, principals are likely able to moderate the relationship between natural hazard exposure and increased teacher turnover. Qualitative evidence described the many challenges that teachers experienced following natural hazard exposure.

Professionally, teachers dealt with lost instructional time, student needs, and the overall emotional toll of natural hazard exposure. All of these new stressors likely had a negative impact on teachers' perceptions of their working conditions. Teachers in high poverty schools that were exposed to a natural hazard also has higher turnover rates, which suggests that the exposure exacerbated existing working conditions that were associated with high turnover. Principals could moderate this relationship in two ways. First, they could provide appropriate supports, such as mental health resources and professional development, that could reduce the negative impacts of natural hazard exposure. Second, they could align their behaviors following an exposure with teachers' preferences for outcome or process orientations. This second point may not be practical, given that caring behavior orientation reflects a leader's personality. Teachers may not trust principals who present an inauthentic orientation. Rather, during the hiring process, principals can select teachers whose orientations match their own. Principals may also want to consider ways to increase buy-in to their orientation style for existing teachers.

Personally, many teachers experienced losses and hardships due to natural hazard exposure. As the qualitative data suggested, this suffering negatively influenced teacher morale for the remainder of the year. Teachers may have been induced to turnover due to their personal difficulties or because of low morale. As the qualitative data indicated, principals tried to find ways to be accommodating of teachers' personal needs following natural hazard exposure.

Receiving this support may have improved the relationship and trust between teachers and principals. These findings serve as a reminder that principals should be cognizant of teachers' needs and emotions. This point is emphasized by other qualitative data, which showed that principals often did not recognize the toll of natural hazard exposure on teachers until it was too late for any kind of intervention or support to be provided in the school year when the exposure occurred.

Further evaluation of principals' caring behavior orientations suggests that teachers may value a leader who emphasizes students' academic success and a return to routine operations and sense of normalcy following natural hazard exposure. It is possible that process-oriented principals, in an effort to be empathic and supportive toward students and teachers, lost sight of how schools are measured to be successful. As the literature review in Chapter 2 and the caring leadership literature showed in Chapter 3, principals are responsible for setting the vision, tone, and working environment in schools. Perhaps teachers appreciated outcome oriented principals' long-term vision for their schools' success. By the same token, teachers with process-oriented principals may have felt that the focus on day-to-day experiences clouded their principals' overall visions and weakened the long-term trajectory of their schools' performance. These findings suggest that principals should not lose sight of the overall vision and goals for their schools even in the wake of a particularly difficult event, such as a natural hazard exposure. Teachers may benefit from being united around a common end goal.

The mixed methods results do show that some consideration of processes may be able to reduce teacher turnover in the year after exposure. As Grissom and Condon (2021) explained, after an event has occurred, there is an opportunity for learning and analysis that can improve

leaders' crisis management in the future. It is possible that the efforts to improve that process-oriented principals made after a natural hazard exposure induced fewer teachers to turnover.

The overall findings in the paper suggest that principals play an important role in moderating teacher turnover following natural hazard exposure. In 2020, the year after data collection occurred, the world writ large was exposed to a major natural hazard, the COVID-19 global pandemic. The outcomes in this study, while not a perfect correlation for the pandemic, does provide some recommendations and insights for the ways in which principals can moderate the negative experiences and diminished working conditions that teachers have dealt with over the past two years. Moreover, as natural hazards, such as floods, wildfires, earthquakes, and other hurricanes, continue to disrupt schooling, the outcomes of this paper emphasize how important principals are in managing the consequences of these events.

From a larger policy perspective, just as principals need to support teachers, districts, policymakers, and principal preparation programs should consider ways to support and train principals to be leaders in times of crisis. In doing so, the effect of these events on teacher turnover may be reduced. This goal is especially important considering how teacher turnover is an ongoing issue in many schools. As natural hazards continue to become endemic to school life, the additional stresses they introduce in teachers' lives and working conditions may make the profession of teacher unappealing to future teachers. A small teacher pipeline would likely exacerbate ongoing issues of turnover and understaffing. These problems are already much more prevalent in underserved schools. As a result of a weakened pipeline, the gap between historically marginalized student populations, such as low income students and students of color, would likely only worsen.

Limitations and Directions for Future Research

First and foremost, the conclusions of the mixed methods portion of the study cannot provide causal estimations of the relationship between principal leadership and teacher turnover in the context of natural hazard exposure. The mixed methods results can only provide descriptive evidence of the relationship. In Research Question 5, the descriptive evidence's explanatory ability is further limited by the small sample size, which had considerable noise at the school-level in some instances. In the future, researchers can consider research designs that allow for causal inferences about the extent to which principal leadership can moderate teacher turnover.

The quantitative data and the quantitative research questions also has limitations. The North Carolina Teacher Working Conditions Survey, from which the control variables for turnover intention were derived, is only offered biennially in even years. This meant that turnover intentions in odd years was perhaps not entirely representative to turnover intentions. More importantly, the panel only consisted of four years of data. Prior to 2016, other natural hazards, such as a severe storm in Western North Carolina would have caused disruptions to schooling for exposed schools, confounding the results of the study. The statewide budget crisis in 2014 and 2015 would have also created noise in the pre-exposure estimates because districts responded with different types of fiscal frugality, which may have included lay-offs in some cases. Estimates after the 2019 school year would have been affected by the Covid-19 pandemic, which would have added noise to the post-exposure estimates. This limitation reduces what can be fully determined about the impact of Hurricane Florence on teacher turnover. It also impedes an even longer-term view of the effect of Hurricane Matthew. Future research could look for a longer panel that would not be interrupted by other natural hazards. However, this author does

expect that being able to find such a panel would likely be difficult in the age of climate change and increased natural hazards.

The qualitative results were only self-reports provided by willing participants over the course of a one-hour interview that coved a wide range of topics beyond just the impact of natural hazard exposure on teachers. The analyses relied on principals' memory and willingness to be truthful in sharing their experiences. Principals may not remember completely or may have incorrectly characterized what they and their teachers went through after natural hazard exposure. Although member checks and cross references with district administrator interviews and a researcher-made survey that some teachers in exposed schools completed were used, principal interview data may not be the best way to explore the relationship. Future studies should consider teacher interviews and observations to better understand the role of school principals on teacher turnover following natural hazard exposure. In addition, sampled principals were only located in Eastern North Carolina schools. Chapter 4 discussed how this region is particularly vulnerable to hurricane exposure, although hurricanes have affected much further inland. The qualitative evidence suggested some level of acceptance of natural hazard exposure as a part of life in this region, more so than perhaps the rest of the state. Future research could also look into principal leadership at schools where natural hazards are less frequent.

In addition, the study is limited by only looking into hurricanes as natural hazard events and the resultant teacher turnover in one state. Hurricane season takes place in summer and fall each calendar year, which means exposure can only occur early on in the school year, leaving teachers and school leaders to navigate the impact for many, many months. The length of impact may be associated with teachers' exhaustion and turnover. On the other hand, other types of natural hazard exposure that occur at other periods of the school year may not have as much of

an effect on turnover if they do not correlate with a long recovery period during the school year. Moreover, most North Carolina school principals receive their training in the state, which may influence their crisis management skills in some unobservable way. Furthermore, in Research Question 5, 31 of 38 participants were not in their first year as school principal when a natural hazard exposure occurred. This means that seven principals in the sample were in their first year. Two possible avenues of further exploration are possible. First, researchers could investigate how first-year principals manage natural hazard exposure and other crisis events, as well as the relationship between their leadership and teacher turnover. Second, principal turnover as the result of natural hazard exposure has not yet been explored. Future studies could explore this relationship.

Other natural hazards may influence teacher turnover differently, as would other contexts, such as leadership preparation. Future research could look beyond hurricanes in North Carolina for an understanding of the consequences of natural hazard exposure and other crises on teacher working conditions and turnover. With challenges like the COVID-19 global pandemic and the continued march of global climate change, without worldwide policy changes, there will sadly be no shortage of opportunities for researchers to take up these investigations.

APPENDIX A. COUNTIES IN NORTH CAROLINA WITH RESIDENTS ELIGIBLE FOR INDIVIDUAL ASSISTANCE FROM FEMA AFTER HURRICANE MATTHEW (2016) AND HURRICANE FLORENCE (2018)

County Name	Hurricane Matthew (2016)	Hurricane Florence (2018)
Anson	1	1
Beaufort*	1	1
Bertie*	1	0
Bladen*	1	1
Brunswick*	1	1
Camden*	1	0
Carteret*	1	1
Chatham	1	1
Chowan*	1	0
Columbus*	1	1
Craven*	1	1
Cumberland*	1	1
Currituck*	1	0
Dare*	1	0
Duplin*	1	1
Durham	0	1

Edgecombe*	1	0
Gates*	1	0
Greene*	1	1
Guilford	0	1
Halifax*	1	0
Hartnett*	1	1
Hertford*	1	0
Hoke*	1	1
Hyde*	1	1
Johnston*	1	1
Jones*	1	1
Lee	1	1
Lenoir*	1	1
Martin*	1	0
Moore	1	1
Nash*	1	0
New Hanover*	0	1
Northampton*	1	0
Onslow*	1	1
Orange	0	1

Pamilco*	0	1
Pasquontank*	1	0
Pender*	1	1
Perquimans*	1	0
Pitt*	1	1
Richmond	1	1
Robeson*	1	1
Sampson*	1	1
Scotland*	1	1
Union	0	1
Tyrrell*	1	0
Wake	1	0
Washington*	1	0
Wayne*	1	1
Wilson*	1	1
	45	34
	(n=45)	(n=34)

1 = meets criterion for column, 0 = does not meet criterion for column
* indicates county is part of Eastern North Carolina
Source: FEMA (2016) and (2018)

APPENDIX B. EXPANDED MATRIX: COUNTIES IN NORTH CAROLINA WITH RESIDENTS ELIGIBLE FOR INDIVIDUAL ASSISTANCE FROM FEMA AFTER HURRICANE MATTHEW (2016) AND HURRICANE FLORENCE (2018)

County Name	Eligible after Hurricane Matthew (2016)	Eligible after Hurricane Florence (2018)	Eligible after Both Storms
Anson	1	1	1
Beaufort	1	1	1
Bertie	1	0	0
Bladen	1	1	1
Brunswick	1	1	1
Camden	1	0	0
Carteret	1	1	1
Chatham	1	1	1
Chowan	1	0	0
Columbus	1	1	1
Craven	1	1	1
Cumberland	1	1	1
Currituck	1	0	0
Dare	1	0	0
Duplin	1	1	1
Durham	0	1	0

Edgecombe	1	0	0
Gates	1	0	0
Greene	1	1	1
Guilford	0	1	0
Halifax	1	0	0
Hartnett	1	1	1
Hertford	1	0	0
Hoke	1	1	1
Hyde	1	1	1
Johnston	1	1	1
Jones	1	1	1
Lee	1	1	1
Lenoir	1	1	1
Martin	1	0	0
Moore	1	1	1
Nash	1	0	0
New Hanover	0	1	0
Northampton	1	0	0
Onslow	1	1	1
Orange	0	1	0

Pamlico	0	1	0
Pasquotank	1	0	0
Pender	1	1	1
Perquimans	1	0	0
Pitt	1	1	1
Richmond	1	1	1
Robeson	1	1	1
Sampson	1	1	1
Scotland	1	1	1
Union	0	1	0
Tyrrell	1	0	0
Wake	1	0	0
Washington	1	0	0
Wayne	1	1	1
Wilson	1	1	1
Total	(n=45)	(n=34)	(n=29)

1 = meets criterion for column, 0 = does not meet criterion for column
Source: FEMA (2016) and (2018)

County Name	County is in Eastern North Carolina	In Eastern NC and Eligible after Both Hurricanes	In Eastern NC and Matthew	In Eastern NC and Florence
Anson	0	0	0	0
Beaufort	1	1	1	1
Bertie	1	0	1	0
Bladen	1	1	1	1
Brunswick	1	1	1	1
Camden	1	0	1	0
Carteret	1	1	1	1
Chatham	0	0	0	0
Chowan	1	0	1	0
Columbus	1	1	1	1
Craven	1	1	1	1
Cumberland	1	1	1	1
Currituck	1	0	1	0
Dare	1	0	1	0
Duplin	1	1	1	0
Durham	0	0	0	0
Edgecombe	1	0	1	0
Gates	1	0	1	0

Greene	1	1	0	0
Guilford	0	0	0	1
Halifax	1	0	1	0
Hartnett	1	1	1	1
Hertford	1	0	1	0
Hoke	1	1	1	1
Hyde	1	1	1	1
Johnston	1	1	1	1
Jones	1	1	1	1
Lee	0	0	0	0
Lenoir	1	1	1	1
Martin	1	0	1	0
Moore	0	0	0	0
Nash	1	0	1	0
New Hanover	1	0	0	1
Northampton	1	0	1	0
Onslow	1	1	1	1
Orange	0	0	0	0
Pamilco	1	0	0	1
Pasquontank	1	0	1	0

Pender	1	1	1	1
Perquimans	1	0	1	0
Pitt	1	1	1	1
Richmond	0	0	0	0
Robeson	1	1	1	1
Sampson	1	1	1	1
Scotland	1	1	1	1
Union	0	0	0	0
Tyrrell	1	0	1	1
Wake	0	0	0	0
Washington	1	0	1	1
Wayne	1	1	1	1
Wilson	1	1	1	1
Total	(n=41)	(n=25)	(n=39)	(n=26)

1 = meets criterion for column, 0 = does not meet criterion for column
Source: FEMA (2016) and (2018)

APPENDIX C. SCHOOL DISTRICTS IN NORTH CAROLINA

School District Name	School District is in Eastern North Carolina
Alamance-Burlington Schools	0
Alexander County Schools	0
Alleghany County Schools	0
Anson County Schools	0
Ashe County Schools	0
Asheboro City Schools	0
Asheville City Schools	0
Avery County Schools	0
Beaufort County Schools	1
Bertie County Schools	1
Bladen County Schools	1
Brunswick County Schools	1
Buncombe County Schools	0
Burke County Schools	0
Cabarrus County Schools	0
Caldwell County Schools	0
Camden County Schools	1
Carteret County Public Schools	1
Caswell County Schools	0
Catawba County Schools	0
Chapel Hill-Carrboro City Schools	0
Charlotte-Mecklenburg Schools	0
Chatham County Schools	0
Cherokee County Schools	0
Clay County Schools	0
Cleveland County Schools	0
Clinton City Schools	1
Columbus County Schools	1
Craven County Schools	1
Cumberland County Schools	1
Currituck County Schools	1
Dare County Schools	1
Davidson County Schools	0
Davie County Schools	0
Duplin County Schools	1

Durham Public Schools	0
Edenton-Chowan Schools	1
Edgecombe County Public Schools	1
Elizabeth City-Pasquotank Public Schools	1
Elkin City Schools	0
Franklin County Schools	0
Gaston County Schools	0
Gates County Schools	1
Graham County Schools	0
Granville County Schools	0
Greene County Schools	1
Guilford County Schools	0
Halifax County Schools	1
Harnett County Schools	1
Haywood County Schools	0
Henderson County Schools	0
Hertford County Schools	1
Hickory City Schools	0
Hoke County Schools	1
Hyde County Schools	1
Iredell-Statesville Schools	0
Jackson County Schools	0
Johnston County Schools	1
Jones County Schools	1
Kannapolis City Schools	0
Lee County Schools	0
Lenoir County Public Schools	1
Lexington City Schools	0
Lincoln County Schools	0
Macon County Schools	0
Madison County Schools	0
Martin County Schools	1
McDowell County Schools	0
Mitchell County Schools	0
Montgomery County Schools	0
Moore County Schools	0
Mooresville Graded School District	0
Mount Airy City Schools	0
Nash-Rocky Mount Schools	1
New Hanover County Schools	1

Newton Conover City Schools	0
Northampton County Schools	1
Onslow County Schools	1
Orange County Schools	0
Pamlico County Schools	1
Pender County Schools	1
Perquimans County Schools	1
Person County Schools	0
Pitt County Schools	1
Polk County Schools	0
Public Schools of Robeson County	1
Randolph County Schools	0
Richmond County Schools	0
Roanoke Rapids City Schools	1
Rockingham County Schools	0
Rowan-Salisbury Schools	0
Rutherford County Schools	0
Sampson County Schools	1
Scotland County Schools	1
Stanly County Schools	0
Stokes County Schools	0
Surry County Schools	0
Swain County Schools	0
Thomasville City Schools	0
Transylvania County Schools	0
Tyrrell County Schools	1
Union County Public Schools	0
Vance County Schools	0
Wake County Schools	0
Warren County Schools	0
Washington County Schools	1
Watauga County Schools	0
Wayne County Public Schools	1
Weldon City Schools	1
Whiteville City Schools	1
Wilkes County Schools	0
Wilson County Schools	1
Winston Salem/Forsyth County Schools	0
Yadkin County Schools	0
Yancey County Schools	0

1 = school district is in Eastern North Carolina, 0 = school district is not in Eastern North Carolina

Source: North Carolina Department of Public Instruction (2020)

APPENDIX D. PARTICIPATING SCHOOL DISTRICTS IN EASTERN NORTH CAROLINA COUNTIES WITH RESIDENTS ELIGIBLE FOR INDIVIDUAL ASSISTANCE FROM FEMA AFTER HURRICANE MATTHEW (2016), HURRICANE FLORENCE (2018), OR BOTH HURRICANES

School District Pseudonym	Hurricane Matthew (2016)	Hurricane Florence (2018)	Both Hurricanes (2016 and 2018)
Red County Schools	1	1	1
Orange County Schools	1	0	0
Yellow County Schools	1	1	1
Green County Schools	1	1	1
Blue County Schools	1	1	1
Indigo County Schools	1	1	1
Violet County Schools	1	1	1
Purple County Schools	1	0	0
Pink County Schools	1	1	1
Silver County Schools	0	1	0
Gold County Schools	1	1	1
Beige County Schools	0	1	0
Brown County Schools	1	1	1
Gray County Schools	1	1	1
Black County Schools	1	1	1

1 = meets column criterion, 0 = does not meet column criterion
Source: FEMA (2016 and 2018); North Carolina Department of Public Instruction (2020)

APPENDIX E. SCHOOL LEADER STUDY PARTICIPANTS BY SCHOOL DISTRICT AND SCHOOL LEVEL

School District Name	Elementary School Principals	Middle School Principals	High School Principals	Total
Red County Schools	1	1	1	3
Magenta County Schools	1	0	0	1
Yellow County Schools	1	1	1	3
Green County Schools	0	1	1	2
Blue County Schools	2	0	1	3
Indigo County Schools	1	1	0	2
Violet County Schools	2	0	1	3
Purple County Schools	1	1	0	2
Pink County Schools	1	1	1	3
Silver County Schools	1	1	1	3
Gold County Schools	1	1	1	3
Beige County Schools	1	1	1	3
Brown County Schools	1	1	1	3
Gray County Schools	1	1	1	3
Black County Schools	1	0	1	2
Total	16	11	12	39

APPENDIX F. INTERVIEW PROTOCOLS

1. Hurricane Matthew ONLY Interview

Background

Let's get started. In the first set of questions, I'd like you to tell me about the general context of your position.

1. Please state your name and district.

2. What is your role in this school district?
   a. How long have you been in this school district? And how long have you worked in this role?

3. What was the first major hurricane in your current role? What, if anything, made Hurricane Matthew unique

Theme: Recovery & Resiliency
In this set of questions, I am going to ask you about how your school (or school district) has changed since <u>Hurricane Matthew</u>.

4. Now that you are two years out from Hurricane Matthew, tell me how your school (or school district) looks different from before the storm?
   a. How is it the same?

5. To what extent has your school (or school district) fully recovered from the impacts of Hurricane Matthew in 2016 in terms of operations and facilities?

6. How did Hurricane Matthew affect students' academic achievement?
   a. How would you describe your students' academic achievement today compared to the time before Hurricane Matthew? And, directly after Hurricane Matthew?

7. How did Hurricane Matthew impact student behavior?
   a. How would you describe your students' behavior before and directly after the storm?
8. How did Hurricane Matthew impact attendance?
   a. How would describe your students' attendance for before and directly after the storm?

9. How, if at all, did you recoup lost instructional time after Hurricane Matthew?
   a. What strategies were most helpful to restore lost time?
   b. And, what were the greatest challenges?

10. To what extent are there lingering effects from Hurricane Matthew on students' mental health and stress, if any?
    a. How about for teacher and school staff?
11. Is there anything else that I missed?

NEW THEME: Emergency Preparedness and Resilience

In this section, I'd like you to think about your school's/district's emergency planning and preparedness.

12. If applicable, tell me about your school/district's current natural disaster plan.
    a. How was this plan used in preparing for and responding to the hurricane?
    b. Describe for me the most helpful aspects of the plan.
    c. What, if any, aspect of the plan needs to be adjusted and why?

13. To what extent has this plan altered since Hurricane Matthew?
    a. And how about since Hurricane Florence?

14. In the lead-up to Hurricane Florence in September 2018, how, if at all, did your school/district prepare for the hurricane?
    a. To what extent was this different from how you prepared for Hurricane Matthew?

15. To what extent did your school/district help with the recovery efforts in other districts?
    a. Did your experience with Hurricane Matthew influence your ability to assist nearby districts either after Hurricane Matthew or Florence?

16. What, if anything, has your school/district learned from these hurricanes that will help you better address the needs of students and schools in the future?
    a. What would you recommend schools to put into place as preparation for future disasters?

17. Do you have anything else you would like to share?

Thank you for your thoughts and comments!

2. Hurricane Florence ONLY

Background

Let's get started. In the first set of questions, I'd like you to tell me about yourself.

1. Please state your name and district.

2. What is your role in this school district?
    a. How long have you been in this school district? And how long have you worked in this role?

3. What was the first major hurricane in your current role? What, if anything, made Hurricane Florence unique

Impacts of Hurricane

When answering the next set of questions, I would like you to think about the general impact of <u>Hurricane Florence</u> on school operations and on students.

4. What were the primary challenges Hurricane Florence created for district and school operations?
     a. Did the storm cause any damage to the district offices and/or schools that affected operations? If so, please describe.
     b. Did you experience significant losses of equipment and/or supplies?
     c. And did you experience any significant transportation challenges?

5. What were the effects of Hurricane Florence on students in your district? *(Prompt of needed: For example, personal losses, attendance, and stress.)*

6. Tell me about student mobility within and across neighboring districts after the storm.
     a. How did student mobility impact your schools?
     b. To what extent did you coordinate with other districts to serve your students while your schools were closed?

7. What were the effects of Hurricane Florence on teachers and other staff? (*Prompts if needed: For example, personal losses, attendance, and stress.)*

8. Tell me about teacher and staff mobility within and across neighboring districts after the storm.
     a. What proportion of your teachers and staff were able to return to work immediately following Florence?
     b. To what extent did you coordinate with other districts to have your teachers and staff support instruction in other locations while your schools were closed?

Immediately Following the Storm

When answering the next set of questions, I would like you think back to what occurred immediately after <u>Hurricane Florence</u> struck.

9. Walk me through how you began to address recovery efforts at the schools in your district.

10. What accommodations, if any, were provided to your district by the state or federal government to increase flexibility? (*Prompt if uncertain what accommodations mean: For example, required school days/hours, grant reporting requirements, program eligibility guidelines, and extended deadlines.)*

11. What modifications, if any, did you provide to the schools impacted in your district? (*Prompt if uncertain what modifications mean: For example, academic calendar, school hours, free meals, additional buses, and alternative building locations.*)

12. How, if at all, were school or district facilities used to support broader recovery efforts?

After the Storm

Now when you answer the next questions, I would like you think back to supports and accommodations the district provided or received as recovery progressed.

13. What supports did your district provide to schools and students for hurricane recovery?
    a. Which supports were highest priority long term? And why?

14. In the aftermath of Hurricane Florence, did your district receive any additional funding related to hurricane recovery? If yes, please describe those funds. *(Prompt if uncertain: For example; donations and gifts.)*

Outcomes
In this section of questions, I'd like you to reflect on the success of the recovery process.

15. What would a successful recovery from Hurricane Florence look like for your school/ district?
    a. What metrics would you include in the assessment of recovery efforts?

16. Thinking back to the challenges you identified for students, which challenges did you feel like were successfully addressed?
    a. Describe for me any challenges that **couldn't be** fully addressed.

17. Thinking back to the challenges you identified for staff and school operations, which challenges did you feel like were successfully addressed?
    a. Describe for me any challenges that **couldn't be** fully addressed.

18. Thinking of the logistics of implementing supports, what went well?
    a. What would you like to improve upon in the future?

Emergency Preparedness and Resilience

In this section, I'd like you to think about your school's/district's emergency planning and preparedness.

19. If applicable, tell me about your school/district's current natural disaster plan.
    a. How was this plan used in preparing for and responding to the hurricane?
    b. Describe for me the most helpful aspects of the plan?
    c. What, if any, aspect of the plan needs to be adjusted and why?

20. To what extent has this plan altered since Hurricane Florence?

21. To what extent did Hurricane Matthew in 2016 influence any changes in your disaster planning?

22. What information, if any, did neighboring districts share that was helpful in your recovery process?
    a. What made these resources useful?
    b. Looking back, what information, if any, do you wish had been shared but wasn't?

23. What has your district learned from Hurricane Florence that will help you better address the needs of students and schools in the future?
    a. What would you recommend schools to put into place as preparation for future natural disasters?

Final Thoughts

We're at the last set of questions for today.

24. Are there additional recovery efforts or supports planned?

25. Do you have anything else you would like to share?

Thank you for your thoughts and comments!

3. BOTH Hurricanes

Background

Let's get started. In the first set of questions, I'd like you to tell me about yourself.

1. Please state your name and district.

What is your role in this school district?
    a. How long have you been in this school district? And how long have you worked in this role?

26. What was the first major hurricane in your current role? What, if anything, made Hurricane Matthew/Florence unique

27. Background on storms: Describe to me if your school/district was more severely affected by Hurricane Matthew or Hurricane Florence or equally affected by both?

Impacts of Hurricane Florence

I'd like to focus on <u>Hurricane Florence</u> first. When answering the next set of questions, I would like you to think about the general impact of <u>Hurricane Florence</u> on school operations and on students, teachers and staff.

28. What were the primary challenges Hurricane Florence created for district and school operations?
    a. Did the storm cause any damage to the district offices and/or schools that affected operations? If so, please describe.
    b. Did you experience significant losses of equipment and/or supplies?
    c. And did you experience any significant transportation challenges?
    d. How did these challenges compare to your school's/district's experience after Hurricane Matthew?

29. What were the effects of Hurricane Florence on students in your district? *(Prompt if needed: For example, personal losses, attendance, and stress.)*
    a. How did this compare to the effects on students after Hurricane Matthew? (Prompts: different needs, different intensity, etc)

30. Tell me about student mobility within and across neighboring districts after Hurricane Florence.
    a. How did student mobility impact your schools?
    b. To what extent did you coordinate with other districts to serve your students while your schools were closed?
    c. To what extent was student mobility greater than or less than student mobility after Hurricane Matthew? How, if at all, was student mobility handled differently than after Hurricane Matthew?

31. What were the effects of Hurricane Florence on teachers and other staff? (*Prompts if needed: For example, personal losses, attendance, and stress.)*
    a. How did this compare to the effects on teachers and other staff after Hurricane Matthew?

32. Tell me about teacher and staff mobility within and across neighboring districts after Hurricane Florence.
    a. What proportion of your teachers and staff were able to return to work immediately following Florence?
    b. To what extent did you coordinate with other districts to have your teachers and staff support instruction in other locations while your schools were closed?
    c. How did this compare to teacher and staff mobility after Hurricane Matthew?

Immediately Following the Storm

When answering the next set of questions, I would like you think back to what occurred immediately after <u>Hurricane Florence</u> struck.

33. Walk me through how you began to address recovery efforts at the schools in your district.
    a. To what extent was this process different than the process you followed after Hurricane Matthew?

34. What accommodations, if any, were provided to your district by the state or federal government to increase flexibility? (*Prompt if uncertain what accommodations mean: For example, required school days/hours, grant reporting requirements, program eligibility guidelines, and extended deadlines.*)
    a. To what extent was/were this/these accommodation/accommodations different from the ones used following Hurricane Matthew?

35. What modifications, if any, did you provide to the schools impacted in your district? (*Prompt if uncertain what modifications mean: For example, academic calendar, school hours, free meals, additional buses, and alternative building locations.*)
    a. To what extent was/were this/these modification/modifications different from the ones used following Hurricane Matthew?

36. How, if at all, were school or district facilities used to support broader recovery efforts?

After the Storm

Now when you answer the next questions, I would like you think back to supports and accommodations the district provided or received as recovery from Hurricane Florence progressed.

37. What supports did your district provide to schools and students for hurricane recovery?
    b. Which supports were highest priority long term? And why?
    c. To what extent were supports prioritized differently than after Hurricane Matthew?

38. In the aftermath of Hurricane Florence, did your district receive any additional funding related to hurricane recovery? If yes, please describe those funds. *(Prompt if uncertain: For example; donations and gifts.)*
    a. Was this different from what you received after Hurricane Matthew?

Outcomes
In this section of questions, I'd like you to reflect on the success of the recovery process.

39. What would a successful recovery from Hurricane Florence look like for your school district?
    a. What metrics would you include in the assessment of recovery efforts?

40. Thinking back to the challenges you identified for students, which challenges did you feel like were successfully addressed?
    a. Describe for me any challenges that **couldn't be** fully addressed.

  b. Were these challenges for students the same as those addressed during Hurricane Matthew? If so, were they addressed better than, worse than, or about the same as after Hurricane Matthew?

41. Thinking back to the challenges you identified for staff and school operations, which challenges did you feel like were successfully addressed?
  a. Describe for me any challenges that **couldn't be** fully addressed.
  b. Were these challenges for staff and school operations the same as those addressed during Hurricane Matthew? If so, were they addressed better than, worse than, or about the same as after Hurricane Matthew?

42. Thinking of the logistics of implementing supports, what went well?
  a. What would you like to improve upon in the future?

Emergency Preparedness and Resilience

In this section, I'd like you to think about your school's/district's emergency planning and preparedness.

43. If applicable, tell me about your school/district's current natural disaster plan.
  a. How was this plan used in preparing for and responding to the hurricane?
  b. Describe for me the most helpful aspects of the plan?
  c. What, if any, aspect of the plan needs to be adjusted and why?

44. To what extent has this plan altered since Hurricane Matthew?
  a. And how about since Hurricane Florence?
  b. How did this relate to any differences in planning and recovery between Hurricane Matthew and Hurricane Florence?

45. What has your district learned from Hurricanes Matthew and Florence that will help you better address the needs of students and schools in future disaster?
  a. What would you recommend schools to put into place as preparation for future natural disasters?

Final Thoughts

We're at the last set of questions for today. In this section, I'll ask you about future recovery efforts.

46. Are there additional recovery efforts or supports planned?

47. Do you have anything else you would like to share?

Thank you for your thoughts and comments!

APPENDIX G. POST-INTERVIEW FORM FOR QUALITATIVE ANALYSIS

Participant Information:
- File Name:
- School District Name:
- School Level:

First Impressions:
[Describe any initial thoughts or impressions of the interview.]

Preliminary Connections:
[Note anything from the study or extant literature that come to mind from the interview.]

Key Quotes:
[Add any statements participant made that are particularly noteworthy.]

Other thoughts:
[Record anything else that is noteworthy from the interview.]

Follow-up Items:
[List any lingering questions, concerns, or items to clarify from the interview and to whom the query should be directed (i.e., the participant, dissertation committee member, study principal investigators).]

APPENDIX H. PRELIMINARY CODEBOOK

Major Code	Minor Code Name	Definition
1. Self-awareness		
	1.1 Knows values	Participant describes knowing him/herself and his/her/their values and beliefs well.
	1.2 Understands perceptions	Participant describes understanding how others perceive her/him and how these perceptions are important to leadership.
	1.3 Manages conflict	Participant describes knowing how his/her/their values and beliefs could be challenged and prepares her for managing potential conflict.
	1.4 Maintains respect	Participant describes knowing him/herself and his/her/their values and beliefs well.
2. Deep Listening		
	2.1 Another's perspective	Participant describes understanding that another's perspective is paramount to caring leadership.
	2.2 Limits distractions	Participant describes understanding that another's perspective is paramount to caring leadership.
	2.3 Maintaining eye contact	Participant describes maintaiining eye contact.
	2.4 Larger picture	Participant describes connecting what a person is communicating to the larger picture.
	2.5 Withholding judgment	Participant describes withholding judgment.
	2.6 Others matter	Participant describes making sure others to know that what they have to say matters.
3. Being Curious		
	3.1 Appreciating curiosity	Participant describes appreciating that curiosity and asking questions leads to new, unexpected information and solutions.

	3.2 Asking questions	Participant describes asking questions in order to gain greater understanding, clarity, and new possibilities.
	3.3 Intellectually humble	Participant describes being intellectually humble and often asks more than speaks.
	3.4 Encourages others	Participant describes encouraging others to use their knowledge and expertise to address the complex issues the organization faces.
4. Demonstrating Empathy		
	4.1 Recognizes emotions	Participant describes hearing another's story or perspective and recognizes the emotions that are being conveyed.
	4.2 Suspends judgment	Participant describes suspending his/her/their own judgement and allows others to feel acceptance for who they are without feeling judged, ashamed, or inadequate.
	4.3 Simply listen	Participant describes ability to be with another and simply listen without trying to make things better.
	4.4 Does not compare	Participant describes not sharing his/her/their own experiences as a comparison or looks for the silver lining in the current situation.
	4.5 Strengthens connections	Participant describes knowing that empathy can strengthen connections with others.
5. Decisiveness		
	5.1 Makes decisions	Participant describes ability to be with another and simply listen without trying to make things better.
	5.2 Adjustments	Participant describes knowing that adjustments may be needed along the way.
	5.3 Trusts self	Participant describes trusting himself/herself/themselves.

| 5.4 Seeks new information | Participant describes seeking new information and acts when needed so that movement forward continues. |
| 5.5 Decisiveness | Participant describes knowing that without decisiveness, others are left waiting and without confidence in their leader. |

APPENDIX I. SOURCES OF DATA USED IN QUANTITATIVE ANALYSES

Unit of Analysis	Data File Name^	Year(s) Used	Description of Data	Rationale for Use	Data File Source
District	District Personnel Demographics	2015, 2016, 2017, 2018, 2019	Data includes race and gender of all employees in the district. Data can be linked to individual teacher-level and principal-level data	Using these data allows me to control for teacher and principal demographics in my analyses.	EPIC
School	School Report Card	2015, 2016, 2017, 2018, 2019	Summary of a school's characteristics, student academic performance, teacher quality, and school safety.	Using this data provides my analyses with variables that offer more specific context about the schools in which teachers are working.	NC DPI
	Public School Universe	2015, 2016, 2017, 2018, 2019	Relevant data includes student-teacher ratio, counts of student free/reduced price lunch eligibility, and counts of students by race, ethnicity, and grade.	By including for these student-level demographics in my analyses, I am able to control for factors that some prior research has suggested is associated with teacher turnover.	NCES

	Teacher Working Conditions Survey (TWCS)^^	2016, 2018, 2020^^^	Survey asks teachers about their perceptions of their working environment, including school leadership.		EPIC
Teacher/ Principal	Personnel Pay History	2015, 2016, 2017, 2018, 2019	File contains information on an employee's position and salary each year. The data allows researchers to follow a teacher's career over time.	This data will allow me to capture whether a teacher is or is not working in the same school as the previous year.	EPIC
	Personnel Education File	2015, 2016, 2017, 2018, 2019	Data includes educational attainment for a school district employee, including year of undergraduate graduation	This data will allow me to control for teacher's experience. Prior research has shown that teachers with less experience have higher turnover rates.	EPIC

^Data File Name is according to source who provides the file (e.g., NCERDC, NCDPI, etc.)

^^Data from the TWCS cannot be linked to individual teacher records.

^^^Survey is conducted biennially.

APPENDIX J. SCHOOL DISTRICTS IN NORTH CAROLINA BY COUNTY AND NATURAL HAZARD EXPOSURE, ADD YEARS OR EVENTS AS APPROPRIATE TO TITLES

School District Name	County Name	Only Hurricane Matthew (2016)	Only Hurricane Florence (2018)	Both Hazards
Beaufort County Schools	Beaufort	0	0	1
Bertie County Schools	Bertie	1	0	0
Bladen County Schools	Bladen	0	0	1
Brunswick County Schools	Brunswick	0	0	1
Camden County Schools	Camden	1	0	0
Carteret County Public Schools	Carteret	0	0	1
Clinton City Schools	Sampson	0	0	1
Columbus County Schools	Columbus	0	0	1
Craven County Schools	Craven	0	0	1
Cumberland County Schools	Cumberland	0	0	1
Currituck County Schools	Currituck	1	0	0
Dare County Schools	Dare	1	0	0
Duplin County Schools	Duplin	0	0	1
Edenton-Chowan Schools	Chowan	1	0	0
Edgecombe County Public Schools	Edgecombe	1	0	0
Elizabeth City-Pasquotank Public Schools	Pasquontank	1	0	0

Gates County Schools	Gates	1	0	0
Greene County Schools	Greene	0	0	1
Halifax County Schools	Halifax	1	0	0
Harnett County Schools	Hartnett	0	0	1
Hertford County Schools	Hertford	1	0	0
Hoke County Schools	Hoke	0	0	1
Hyde County Schools	Hyde	0	0	1
Johnston County Schools	Johnston	0	0	1
Jones County Schools	Jones	0	0	1
Lenoir County Public Schools	Lenoir	0	0	1
Martin County Schools	Martin	1	0	0
Nash-Rocky Mount Schools	Nash	1	0	0
New Hanover County Schools	New Hanover	0	1	0
Northampton County Schools	Northampton	1	0	0
Onslow County Schools	Onslow	0	0	1
Pamlico County Schools	Pamlico	0	1	0
Pender County Schools	Pender	0	0	1
Perquimans County Schools	Perquimans	1	0	0
Pitt County Schools	Pitt	0	0	1

Public Schools of Robeson County	Robeson	0	0	1
Roanoke Rapids City Schools	Halifax	1	0	0
Sampson County Schools	Sampson	0	0	1
Scotland County Schools	Scotland	0	0	1
Tyrrell County Schools	Tyrrell	1	0	0
Washington County Schools	Washington	1	0	0
Wayne County Public Schools	Wayne	0	0	1
Weldon City Schools	Halifax	1	0	0
Whiteville City Schools	Columbus	0	0	1
Wilson County Schools	Wilson	0	0	1
		(n=18)	(n=2)	(n=25)

1 = meets column criterion, 0 = does not meet column criterion
Source: FEMA (2016 and 2018); North Carolina Department of Public Instruction (2020)

APPENDIX K. INTEGRATIVE STUDY PHASE ELIGIBILITY BASED ON SCHOOL LEADER EXPERIENCE IN ROLE

School District Pseudonym Used in Analysis	School Level	Years in Role at Time of Interview	First Year in Role	School Eligible
Beige	ES	4	0	1
Beige	HS	1	1	0
Beige	MS	4	0	1
Black	ES	1	1	0
Black	HS	1	1	0
Blue	ES_1	3	0	1
Blue	ES_2	7	0	1
Blue	HS	10	0	1
Brown	ES	1	1	0
Brown	HS	2	0	1
Brown	MS	11	0	1
Gold	ES	11	0	1
Gold	HS	4	0	1
Gold	MS	5	0	1
Gray	ES	1.5	0	1
Gray	HS	4	0	1

Gray	MS	3	0	1
Green	HS	1	1	0
Green	MS	1	1	0
Indigo	ES	2	0	1
Indigo	MS	2	0	1
Magenta	ES	7	0	1
Pink	ES	4	0	1
Pink	HS	1	0	1
Pink	MS	3	0	1
Purple	ES	6	0	1
Purple	MS	4	0	1
Red	ES	3	0	1
Red	HS	9	0	1
Red	MS	9	0	1
Silver	ES	7	0	1
Silver	HS	3	0	1
Silver	MS	3	0	1
Violet	ES_1	1	1	0
Violet	ES_2	6	0	1

Violet	HS	10	0	1
Yellow	ES	2	0	1
Yellow	HS	3	0	1
Yellow	MS	4	0	1

1 = meets column criterion, 0 = does not meet column criterion

Source: FEMA (2016 and 2018); North Carolina Department of Public Instruction (2020)

APPENDIX L. ESTIMATES OF TEACHER TURNOVER RATES FOR SCHOOL SUBGROUPS FOLLOWING NATURAL HAZARD EXPOSURE

	Subgroup Type							
	Majority Non-white		High Poverty		Low Performing		Eastern North Carolina	
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0059	(0.0063)	0.0149**	(0.0074)	0.0051	(0.0112)	0.0068	(0.0065)
Average Years of Experience	0.0100***	(0.0021)	0.0103***	(0.0023)	0.0138***	(0.0040)	0.0082***	(0.0024)
Percent of Black/AA Teachers	-0.1446***	(0.0505)	-0.1116**	(0.0569)	-0.1602**	(0.0759)	-0.1268**	(0.0552)
Percent of AmIn/ AK Teachers	-0.1257	(0.1920)	0.0519	(0.1824)	-0.027	(0.2677)	0.02537	(0.1728)
Percent of Asian Teachers	0.1035	(0.2551)	0.0959	(0.0350)	0.133	(0.4167)	0.1380	(0.2654)
Percent of Latinx Teacher	-0.1723	(0.1469)	-0.1878	(0.1724)	-0.0889	(0.2100)	-0.2971	(0.2006)
Percent of Other Race Teachers	0.1584	(0.1706)	0.1063	(0.1696)	-0.3558	(0.3329)	-0.1755	(0.1929)
Percent with Master's Degrees	0.0183	(0.0354)	0.0898**	(0.0384)	0.0559	(0.0577)	-0.0233	(0.0396)
Percent with NBC	-0.1478*	(0.0844)	-0.2512**	(0.1095)	-0.1415	(0.1914)	-0.1016	(0.1121)
Remain at Current School	-0.0916***	(0.0388)	-0.0876	(0.0447)	-0.128*	(0.0716)	-0.1385***	(0.0512)
Staying due to School Leaders	-0.0275	(0.0220)	-0.0193	(0.0223)	-0.0864*	(0.0457)	0.01638	(0.0212)
Remain in Current District	0.078	(0.0551)	0.0645	(0.0579)	-0.0375	(0.0954)	-0.0047	(0.0749)
Remain in State	0.0195	(0.0614)	0.0381	(0.0710)	-0.0082	(0.1000)	-0.1018	(0.0749)
Leave Education Entirely	0.0753	(0.0591)	0.1043	(0.0661)	-0.0169	(0.1119)	-0.0118	(0.0695)
Low Performing School	0.011*	(0.0065)	0.0115	(0.0073)	0	#VALUE!	0.0004	(0.0086)
Percent of FRPLE^^ Students	0.0023	(0.0327)	0.0432	(0.0692)	0.1874**	(0.0868)	-0.0328	(0.0338)
Percent of Black/AA Students	0.1397	(0.1238)	0.1923	(0.1456)	0.2814	(0.2358)	0.3251*	"(0.1859)
Percent of AmIn/AK Students	-0.6986	(0.5800)	1.0649*	(0.6027)	0.3014	(0.9371)	-0.4321	(0.6627)
Percent of Asian Students	0.0152	(0.4879)	0.9154*	(0.5567)	-1.3127*	(0.7264)	1.1405	(0.7736)
Percent of Latinx Students	-0.0112	(0.1579)	0.0631	(0.1777)	0.2022	(0.2776)	-0.0067	(0.2084)
Percent of Students of 2+ Races	0.1654	(0.2518)	0.2298	90.2654)	-0.3638	(0.6638)	0.8049**	(0.3383)
Constant	0.1687*	(0.0985)	0.0715	(0.1155)	-0.0498	(0.2030)	0.1278	0.1153
Observations	3,715		3,165		1,268		2,629	

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

APPENDIX M. ESTIMATES OF TEACHER TURNOVER RATES FOLLOWING NATURAL HAZARD EXPOSURE USING AN EXPANDED PANEL, 2014-2019

Independent Variable	(1) Any Exposure	(2) Teacher Characteristics	(3) Turnover Intentions	(4) School Performance	(5) Student Characteristics
Exposure	-0.0042	0.0013	-0.0002	-0.0002	0.0007
	(0.0033)	(0.0023)	(0.0033)	(0.0033)	(0.0033)
Average Years of Experience		-0.0044***	0.0054***	0.0054***	0.0055***
		(0.0004)	(0.0010)	(0.0010)	(0.0009)
Percent of Black Teachers		0.1833***	-0.0334	-0.0337	-0.0496
		(0.0078)	(0.0293)	(0.0294)	(0.0305)
Percent of AmIn/ AK Teachers		-0.0619***	-0.0182	-0.019	0.0248
		(0.0213)	(0.0893)	(0.0896)	(0.0943)
Percent of Asian Teachers		0.2858***	0.2029	0.02041*	0.2127
		(0.0583)	(0.1238)	(0.1237)	(0.1312)
Percent of Latinx Teachers		0.0965***	-0.0162	-0.0189	-0.0185
		(0.0371)	(0.0719)	(0.0719)	(0.0729)
Percent of Other Race Teachers		0.2306***	0.2010*	0.2007*	0.1971*
		(0.0525)	(0.1093)	(0.1092)	(0.1133)
Percent with Master's Degrees		0.0151	0.0220	0.0221	0.0183
		(0.0121)	(0.0188)	(0.0188)	(0.0195)
Percent with NBC		-0.0973	0.0005	0.0005	0.0046
		(0.0141)	(0.0359)	(0.0359)	(0.0379)
Remain at Current School			-0.1428***	-0.1369***	-0.1501***
			(0.01977)	(0.0255)	(0.0260)
Staying due to School Leaders			-0.0123	-0.0122	-0.0114

	(1)	(2)	(3)	(4)	(5)
			(0.0102)	(0.0101)	(0.0100)
Remain in Current District			0.0555*	0.0601*	0.0423
			(0.0318)	(0.0357)	(0.0357)
Remain in State			0.1247***	0.1321***	0.1156***
			(0.0382)	(0.0409)	(0.0407)
Leave Teaching				0.0136	0.0085
				(0.0332)	(0.0343)
Low Performing School				0.0093*	0.0086*
				(0.0048)	(0.0048)
Percent of FRPLE^^ Students					-0.0071
					(0.0108)
Percent of Black/AA Students					0.1220*
					(0.0630)
Percent of AmIn/AK Students					-0.3494*
					(0.2075)
Percent of Asian Students					-0.2696*
					(0.1472)
Percent of Latinx Students					-0.0483
					(0.0649)
Percent of Students of 2+ Races					0.018
					(0.1177)
Constant	0.1959***	0.2261***	0.2356***	0.2283***	0.2310***
	(0.0018)	(0.0058)	(0.0210)	(0.0265)	(0.0361)
Observations	12,186	12,186	12,186	12,186	12,186

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

APPENDIX N. ESTIMATES OF TEACHER TURNOVER RATES

Estimates of Teacher Turnover Rates in Majority Non-white Schools for Different Natural Hazard Events

| | Natural Hazard Exposure Event | | | | | |
| | Hurricane Matthew | | Hurricane Florence | | Both Exposure Events | |
Idependent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0120*	(0.0070)	0.0044	(0.0078)	-0.0016	(0.0077)
Average Years of Experience	0.0100***	(0.0021)	0.0099***	(0.0021)	0.0100***	(0.0021)
Percent of Black/AA Teachers	-0.1459***	(0.0504)	-0.1441	(0.0504)	-0.1440***	(0.0504)
Percent of AmIn/ AK Teachers	-0.1270	(0.1908)	-0.1257	(0.1915)	-0.1236	(0.1916)
Percent of Asian Teachers	0.1039	(0.2571)	0.1045	(0.2556)	0.1028	(0.2568)
Percent of Latinx Teacher	-0.1749	(0.1470)	-0.1729	(0.1465)	-0.1733	(0.1465)
Percent of Other Race Teachers	0.1533	(0.1709)	0.1529	(0.1703)	0.1556	(0.1712)
Percent with Master's Degrees	0.0183	(0.0355)	0.0182	(0.0354)	0.0193	(0.0354)
Percent with NBC	-0.1502*	(0.0846)	-0.1490**	(0.0389)	-0.1488*	(0.0846)
Remain at Current School	-0.0888**	(0.0389)	-0.0903**	(0.0389)	-0.0900**	(0.0390)
Staying due to School Leaders	-0.0274	(0.0219)	-0.0271	(0.0220)	-0.0272	(0.0220)
Remain in Current District	0.0811	(0.0552)	0.0783	(0.0551)	0.0782	(0.0552)
Remain in State	0.0202	(0.0616)	0.0200	(0.0615)	0.0204	(0.0615)
Leave Education Entirely	0.7903	(0.0592)	0.0754	(0.0591)	0.0759	(0.0592)
Low Performing School	0.0112*	(0.0065)	0.0111*	(0.0064)	0.0111*	(0.0065)
Percent of FRPLE^^ Students	0.0051	(0.0324)	0.0038	(0.0322)	0.0047	(0.0327)
Percent of Black/AA Students	0.1336	(0.1240)	0.1361	(0.1238)	0.1340	(0.1239)
Percent of AmIn/AK Students	-0.7273	(0.5797)	-0.6996	(0.5824)	-0.7086	(0.5832)
Percent of Asian Students	0.0208	(0.4878)	0.0051	(0.4888)	0.0071	(0.4894)
Percent of Latinx Students	-0.0165	(0.1578)	-0.0165	(0.1578)	-0.0169	(0.1578)

Percent of Students of 2+ Races	0.1657	(0.2514)	0.1634	(0.2520)	0.1642	(0.2528)
Constant	0.1680*	(0.0985)	0.1698*	(0.0986)	0.1692*	(0.0988)
Observations	3,715		3,715		3,715	

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

Estimates of Teacher Turnover Rates in High Poverty Schools for Different Natural Hazard Events

| | Natural Hazard Exposure Event | | | | | |
| | Hurricane Matthew | | Hurricane Florence | | Both Exposure Events | |
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0209**	(0.0081)	0.0021	(0.0086)	-0.0036	(0.0087)
Average Years of Experience	0.0102***	(0.0022)	0.0102***	(0.0022)	0.0102***	(0.0022)
Percent of Black/AA Teachers	-0.1083*	(0.0565)	-0.1066*	(0.0566)	-0.1064*	(0.0565)
Percent of AmIn/ AK Teachers	0.0607	(0.1794)	0.0621	(0.1812)	0.0664	(0.1812)
Percent of Asian Teachers	0.1045	(0.3567)	0.1038	(0.3527)	0.1008	(0.3542)
Percent of Latinx Teacher	-0.1893	(0.1725)	-0.1851	(0.1717)	-0.1862	(0.1716)
Percent of Other Race Teachers	0.0962	(0.1704)	0.1001	(0.1708)	0.1038	(0.1712)
Percent with Master's Degrees	0.0881**	(0.0387)	0.0916**	(0.0385)	0.0925**	(0.0384)
Percent with NBC	-0.2551**	(0.1107)	-0.2529**	(0.1099)	-0.2528**	(0.1103)
Remain at Current School	-0.0803*	(0.0447)	-0.0837*	(0.0450)	-0.0831*	(0.0450)
Staying due to School Leaders	-0.0186	(0.0222)	-0.0192	(0.0224)	-0.0193	(0.0223)
Remain in Current District	0.0699	(0.0578)	0.0651	(0.0580)	0.0653	(0.0580)
Remain in State	0.0427	(0.0715)	0.0413	(0.0712)	0.0419	(0.0713)
Leave Education Entirely	0.1128*	(0.0663)	0.1050	(0.0662)	0.1057	(0.0663)
Low Performing School	0.0118	(0.0073)	0.0115	(0.0073)	0.0115	(0.0073)
Percent of FRPLE^^ Students	0.0522	(0.0684)	0.0481	(0.0692)	0.0485	(0.0692)
Percent of Black/AA Students	0.1748	(0.1468)	0.1836	(0.1464)	0.1820	(0.1465)
Percent of AmIn/AK Students	-1.1187*	(0.6026)	-1.0718*	(0.6091)	-1.0777*	(0.6088)
Percent of Asian Students	0.9269*	(0.5514)	0.9019	(0.5587)	0.9059	(0.5577)
Percent of Latinx Students	0.0552	(0.1794)	0.0591	(0.1786)	0.0591	(0.1787)
Percent of Students of 2+ Races	0.2109	(0.2644)	0.2098	(0.2666)	0.2082	(0.2667)
Constant	0.0669	(0.1152)	0.0690	(0.1158)	0.0685	(0.1159)

| Observations | 3165 | 3165 | 3165 |

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*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

Estimates of Teacher Turnover Rates in Low Performing Schools for Different Natural Hazard Events

| Independent Variable | Natural Hazard Exposure Event | | | | | |
| | Hurricane Matthew | | Hurricane Florence | | Both Exposure Events | |
	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0089	(0.0132)	0.0091	(0.0143)	0.0034	(0.0156)
Average Years of Experience	0.0139***	(0.0040)	0.0138***	(0.0040)	0.0139***	(0.0040)
Percent of Black/AA Teachers	-0.16**	(0.0755)	-0.1603**	(0.0762)	-0.1593**	(0.0761)
Percent of AmIn/ AK Teachers	-0.0285	(0.2672)	-0.0291	(0.2658)	-0.0269	(0.2669)
Percent of Asian Teachers	0.1403	(0.4185)	0.1336	(0.4207)	0.1337	(0.4170)
Percent of Latinx Teacher	-0.0945	(0.2101)	-0.0853	(0.2083)	-0.0923	(0.2101)
Percent of Other Race Teachers	-0.3578	(0.3350)	-0.3550	(0.3354)	-0.3570	(0.3353)
Percent with Master's Degrees	0.0551	(0.0579)	0.0541	(0.0575)	0.0559	(0.0573)
Percent with NBC	-0.1478	(0.1923)	-0.1425	(0.1914)	-0.1427	(0.1918)
Remain at Current School	-0.1259*	(0.0709)	-0.1266*	(0.0711)	-0.1253*	(0.0711)
Staying due to School Leaders	-0.0853*	(0.0455)	-0.086*	(0.0460)	-0.0867*	(0.0455)
Remain in Current District	-0.0363	(0.0949)	-0.0356	(0.0953)	-0.0359	(0.0953)
Remain in State	-0.0060	(0.0994)	-0.0063	(0.0999)	-0.0049	(0.0998)
Leave Education Entirely	-0.0110	(0.1124)	-0.0190	(0.1125)	-0.0159	(0.1124)
Percent of FRPLE^^ Students	0.1877**	(0.0863)	0.1855**	(0.0867)	0.1870**	(0.0866)
Percent of Black/AA Students	0.2766	(0.2362)	0.2827	(0.2368)	0.2769	(0.2364)
Percent of AmIn/AK Students	0.3150	(0.9400)	0.2901	(0.9325)	0.2897	(0.9348)
Percent of Asian Students	-1.3106*	(0.7275)	-1.323*	(0.7264)	-1.3114*	(0.7255)
Percent of Latinx Students	0.1974	(0.2800)	0.1969	(0.2800)	0.1955	(0.2801)
Percent of Students of 2+ Races	-0.3664	(0.6647)	-0.3684	(0.6641)	-0.3761	(0.6641)
Constant	-0.0501	''(0.2035)	-0.0474	(0.2036)	-0.0475	(0.2036)
Observations	1268		1268		1268	

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Robust standard errors are in parentheses

Estimates of Teacher Turnover Rates in Eastern North Carolina Schools for Different Natural Hazard Events

Independent Variable	Hurricane Matthew		Hurricane Florence		Both Exposure Events	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0112**	(0.0047)	-0.0045	(0.0052)	-0.0036	(0.0054)
Average Years of Experience	0.0092***	(0.0014)	0.0092***	(0.0014)	0.0092***	(0.0014)
Percent of Black/AA Teachers	-0.0738	(0.0459)	-0.0735	(0.0460)	-0.0733	(0.0460)
Percent of AmIn/ AK Teachers	-0.0535	(0.1713)	-0.0509	(0.1719)	-0.0507	(0.1718)
Percent of Asian Teachers	0.1042	(0.2081)	0.1021	(0.2079)	0.1021	(0.2080)
Percent of Latinx Teacher	-0.1151	(0.1064)	-0.1130	(0.1061)	-0.1129	(0.1062)
Percent of Other Race Teachers	0.1804	(0.1158)	0.1798	(0.1160)	0.1803	(0.1159)
Percent with Master's Degrees	0.0103	(0.0225)	0.0117	(0.0225)	0.0113	(0.0225)
Percent with NBC	-0.0746	(0.0707)	-0.0745	(0.0706)	-0.0743	(0.0706)
Remain at Current School	-0.1062***	(0.0327)	-0.1069***	(0.0326)	-0.107***	(0.0326)
Staying due to School Leaders	-0.0162	(0.0125)	-0.0165	(0.0125)	-0.0165	(0.0125)
Remain in Current District	0.0071	(0.0430)	0.0045	(0.0429)	0.0044	(0.0429)
Remain in State	-0.0144	(0.0499)	-0.0119	(0.0500)	-0.012	(0.0500)
Leave Education Entirely	0.0209	(0.0428)	0.0197	(0.0428)	0.0198	(0.0428)
Low Performing School	0.0125**	(0.0059)	0.0125**	(0.0058)	0.0124**	(0.0059)
Percent of FRPLE^^ Students	-0.0020	(0.0222)	-0.0003	(0.0223)	-0.0006	(0.0223)
Percent of Black/AA Students	0.2304**	(0.1010)	0.2314**	(0.1010)	0.2321**	(0.1009)
Percent of AmIn/AK Students	-0.6019	(0.4708)	-0.5918	(0.4738)	-0.5912	(0.4739)
Percent of Asian Students	-0.1571	(0.3165)	-0.1621	(0.3169)	-0.1635	(0.3163)
Percent of Latinx Students	0.0624	(0.1091)	0.0642	(0.1090)	0.0644	(0.1090)
Percent of Students of 2+ Races	0.1283	(0.1823)	0.1312	(0.1829)	0.1314	(0.1829)
Constant	0.1138**	(0.0546)	0.112**	(0.0546)	0.1121**	(0.0546)

Observations	8,118	8,118	8,118

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Estimates of Teacher Turnover Rates in Majority Non-white Schools in Eastern NC for Different Natural Hazard Events

	Natural Hazard Exposure Event					
	Hurricane Matthew		Hurricane Florence		Both Exposure Events	
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0079	(0.0070)	-0.0003	(0.0077)	0.0006	(0.0078)
Average Years of Experience	0.0100***	(0.0021)	0.0100***	(0.0021)	0.0100***	(0.0021)
Percent of Black/AA Teachers	-0.1453***	(0.0505)	-0.144***	(0.0504)	-0.1439***	(0.0504)
Percent of AmIn/ AK Teachers	-0.1274	(0.1911)	-0.1242	(0.1913)	-0.1241	(0.1913)
Percent of Asian Teachers	0.1034	(0.2565)	0.1037	(0.2564)	0.1044	(0.2565)
Percent of Latinx Teacher	-0.1756	(0.1469)	-0.1732	(0.1466)	-0.1731	(0.1466)
Percent of Other Race Teachers	0.1528	(0.1709)	0.1544	(0.1711)	0.1540	(0.1710)
Percent with Master's Degrees	0.0187	(0.0355)	0.0192	(0.0354)	0.0191	(0.0354)
Percent with NBC	-0.1499*	(0.0846)	-0.149*	(0.0845)	-0.1491*	(0.0844)
Remain at Current School	-0.0887**	(0.0390)	-0.0902**	(0.0389)	-0.0903**	(0.0389)
Staying due to School Leaders	-0.0270	(0.0220)	-0.0273	(0.0220)	-0.0273	(0.0220)
Remain in Current District	0.0812	(0.0552)	0.0780	(0.0551)	0.0779	(0.0551)
Remain in State	0.0196	(0.0614)	0.0203	(0.0615)	0.0202	(0.0615)
Leave Education Entirely	0.0774	(0.0592)	0.0757	(0.0592)	0.0756	(0.0591)
Low Performing School	0.0112*	(0.0065)	0.0111*	(0.0065)	0.0111*	(0.0065)
Percent of FRPLE^^ Students	0.0042	(0.0325)	0.0043	(0.0327)	0.0041	(0.0327)
Percent of Black/AA Students	0.1325	(0.1237)	0.1342	(0.1239)	0.1344	(0.1238)
Percent of AmIn/AK Students	-0.7151	(0.5807)	-0.7065	(0.5829)	-0.7056	(0.5830)
Percent of Asian Students	0.0142	(0.4888)	0.0064	(0.4895)	0.0060	(0.4896)
Percent of Latinx Students	-0.0187	(0.1574)	-0.0167	(0.1578)	-0.0165	(0.1578)
Percent of Students of 2+ Races	0.1616	(0.2513)	0.1630	(0.2525)	0.1627	(0.2528)
Constant	0.1701*	(0.0098)	0.1696*	(0.0986)	0.1698*	(0.0987)

Observations	3715	3715	3715

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Robust standard errors are in parentheses

Estimates of Teacher Turnover Rates in High Poverty Schools in Easten NC for Different Natural Hazard Events

| | Natural Hazard Exposure Event | | | | | |
| | Hurricane Matthew | | Hurricane Florence | | Both Exposure Events | |
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0167**	(0.0081)	0.0167	(0.0081)	-0.0038	-0.0088
Average Years of Experience	0.0102***	(0.0022)	0.0102***	(0.0022)	0.0102***	-0.0022
Percent of Black/AA Teachers	-0.1079*	(0.0565)	-0.1079*	(0.0565)	-0.1064*	-0.0565
Percent of AmIn/ AK Teachers	0.0572	(0.1801)	0.0572	(0.1801)	0.0643	-0.1809
Percent of Asian Teachers	0.1031	(0.3551)	0.1031	(0.3551)	0.0998	-0.3539
Percent of Latinx Teacher	-0.1898	(0.1723)	-0.1898	(0.1723)	-0.1860	-0.1717
Percent of Other Race Teachers	0.0963	(0.1706)	0.0963	(0.1706)	0.1029	-0.1711
Percent with Master's Degrees	0.0888**	(0.0387)	0.0888**	(0.0387)	0.0926**	-0.0385
Percent with NBC	-0.2551**	(0.1107)	-0.2551**	(0.1107)	-0.2529**	-0.1103
Remain at Current School	-0.0797*	(0.0448)	-0.0797*	(0.0448)	-0.0829*	-0.0449
Staying due to School Leaders	-0.0182	(0.0223)	-0.0182	(0.0223)	-0.0192	-0.0223
Remain in Current District	0.0717	(0.0580)	0.0717	(0.0580)	0.0656	-0.058
Remain in State	0.0420	(0.0713)	0.0420	(0.0713)	0.0421	-0.0712
Leave Education Entirely	0.1106	(0.0663)	0.1106	(0.0663)	0.1059	-0.0662
Low Performing School	0.0118	(0.0073)	0.0118	(0.0073)	0.0116	-0.0073
Percent of FRPLE^^ Students	0.0528	(0.0686)	0.0528	(0.0686)	0.0491	-0.0692
Percent of Black/AA Students	0.1743	(0.1465)	0.1743	(0.1465)	0.1814	-0.1464
Percent of AmIn/AK Students	-1.106*	(0.6047)	-1.106*	(0.6047)	-1.077*	-0.6088
Percent of Asian Students	0.9137*	(0.5539)	0.9137	(0.5539)	0.9044	-0.5578
Percent of Latinx Students	0.0513	(0.1787)	0.0513	(0.1787)	0.0585	-0.1787
Percent of Students of 2+ Races	0.2030	(0.2643)	0.2030	(0.2643)	0.2079	-0.2665
Constant	0.0675	(0.1150)	0.0675	(0.1150)	0.0681	-0.1158

Observations	3165	3165	3165

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Estimates of Teacher Turnover Rates in Low Performing Schools in Eastern NC for Different Natural Hazard Events

	Natural Hazard Exposure Event					
	Hurricane Matthew		Hurricane Florence		Both Exposure Events	
Independent Variable	Coefficient	Robust S.E.	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Exposure	0.0040	(0.0137)	0.0134	(0.0155)	0.0125	(0.0160)
Average Years of Experience	0.0139***	(0.0040)	0.0137***	(0.0040)	0.0138***	(0.0040)
Percent of Black/AA Teachers	-0.1598**	(0.0759)	-0.1595**	(0.0758)	-0.1598**	(0.0759)
Percent of AmIn/ AK Teachers	-0.0269	(0.2668)	-0.0322	(0.2659)	-0.0319	(0.2660)
Percent of Asian Teachers	0.1365	(0.4172)	0.1360	(0.4179)	0.1347	(0.4176)
Percent of Latinx Teacher	-0.0951	(0.2112)	-0.0862	(0.2106)	-0.0881	(0.2106)
Percent of Other Race Teachers	-0.3539	(0.3348)	-0.3619	(0.3350)	-0.3661	(0.3356)
Percent with Master's Degrees	0.0561	(0.0578)	0.0534	(0.0573)	0.0534	(0.0574)
Percent with NBC	-0.1459	(0.1929)	-0.1441	(0.1919)	-0.1426	(0.1919)
Remain at Current School	-0.125*	(0.0710)	-0.1275*	(0.0713)	-0.1269*	(0.0712)
Staying due to School Leaders	-0.0862*	(0.0458)	-0.0856*	(0.0458)	-0.0860*	(0.0457)
Remain in Current District	-0.0353	(0.0952)	-0.0372	(0.0953)	-0.0373	(0.0952)
Remain in State	-0.0051	(0.0994)	-0.0068	(0.1004)	-0.0061	(0.1002)
Leave Education Entirely	-0.0134	(0.1122)	-0.0190	(0.1126)	-0.0186	(0.1125)
Percent of FRPLE^^ Students	0.1868**	(0.0865)	0.1868**	(0.0868)	0.1866**	(0.0868)
Percent of Black/AA Students	0.2748	(0.2361)	0.2796	(0.2367)	0.2794	(0.2366)
Percent of AmIn/AK Students	0.3099	(0.9376)	0.2511*	(0.9337)	0.2513	(0.9336)
Percent of Asian Students	-1.3152*	(0.7274)	-1.2780	(0.7276)	-1.285*	(0.7269)
Percent of Latinx Students	0.1952	(0.2798)	0.1950	(0.2807)	0.1955	(0.2806)
Percent of Students of 2+ Races	-0.3766	(0.6638)	-0.3771	(0.6635)	-0.3796	(0.6635)
Constant	-0.0474	(0.2032)	-0.0442	(0.2037)	-0.0445	(0.2035)
Observations	1268		1268		1268	

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APPENDIX O. SAMPLED SCHOOL PRINCIPALS BY CARING ORIENTATION WITH SUPPORTING EVIDENCE

School District Name	School Level	Process or Outcome Orientation	Supporting Evidence
Beige	ES	P	"It was not only a matter of 'hey we're going back to school,' but we need you back teaching while your life is completely turned upside down. Just trying to be mindful and respectful of that and of their children and working with staff members to coordinate scheduling. I think about a teacher assistant that I have that came to me in tears. She said 'Miss NAME, I hate to ask for time off when we just got back to school, but I have a guy that can come and give me an estimate on my HVAC that completely has to be redone and ripped out of the bottom of my house, but he can only come during business hours and when we were in school we are business hours.' It was just working to kind of cover and make sure that people could meet with FEMA, and people could work with and meet with insurance adjusters or we even had insurance adjusters come here to meet with our staff so they could kind of go over things, because everybody's got to get things taken care of."
Beige	MS	P	"Then you had teachers who were dealing with damaged houses and personal issues and things like that. So I didn't want to keep them after school for hours on end to meet. I mean, yeah, the classrooms are free after school, but it gets to the point where, you know, they're people and they have their own issues, and there's sort of a breaking point that you can reach. "
Blue	ES_1	P	"Traumatic. Eye-opening. Because to most adults, we had not seen that type of flooding in our area in years. It provided a sense of, I can't think of the word I'm looking for, but a sense of urgency that welfare of children and taking care of them and their emotional needs from the storm had to come first before educating them on the academics came."

Blue ES_2 P "My teachers were equitably going through the same things that their parents who were not teachers, or their grandparents who were not teachers. They were affected in the same manner, you know. Also, the ones who weren't directly affected themselves, they were extremely worried about the displacement of their students — getting materials, supplies out to these students; making sure they were okay, making sure they were safe. Even with our teachers here, we try to talk and discuss and counsel each other and make sure that we knew what to say to students and things like that when they came back and making sure that we knew what the best thing was for our kids, how to get things back to rolling again. I'm sure that took its effect and toll on my teachers as well, even in that manner."

Blue HS P "I think they were compassionate to everybody that was affected. It was challenging trying too, as long as being compassionate and being challenging to try to teach kids under, you know, kids that may be affected. They had to be very mindful of the kids' needs. Naturally, if a kid is being taught with some online assignments and his house is flooded out and he's staying with someone else, naturally that's an accommodation that's got to be made. So they had to be very mindful, maybe get to know kids better than they normally did to know what they're going through."

Brown HS O "I think the students were a little bit more resilient than the staff. When we came back, it was go mode, including [that] we had students that were suffering.'

Brown	MS	P	"I had one teacher who never returned. [Due to] the anxiety and the stress of it, she ended up moving because she didn't have a place to stay. Her building was shut down because the landlord said, 'I can't fix it right now, and you'll have to find another place to live.' She and her son ended up living all the way in [Town], which is another 25 minutes away. She just never came back, and we had to replace her position. She actually took medical leave for anxiety and depression. It was yucky."
Gold	ES	O	"So I had 5 teachers lose their homes. Or, let me put it this way, lose use of their homes. They weren't flattened or anything, but significant damage made it so they could not live in there. They had that stress happening. But luckily, I mean I don't want to say 'luckily' on any of this, but we didn't have school for 7 ½ weeks, so they had an opportunity to take care of their personal stuff and not worry about school. So, now all of them are straightened out but one."
Gold	HS	O	"For the teachers that lost classrooms, I would say that they went through the stages of grief in a manner similar to if they'd lost their homes. They would say, 'Oh the filing cabinets that I had all my tests done over the last 5 years [are gone].' Things that, over the course of time, are recoverable. n some case [it was loss of] memento type things."
Gold	MS	P	"Probably the thing that is most disconcerting is that we lost six weeks of instruction, yet the level of accountability for the school's performance is no different than had it been a regular school year. And that doesn't quite seem fair. "
Gray	ES	P	"Well, you know, it's stressful for them. Just like it would be for kids. 'Cause you're talking about their livelihood, their actual profession being affected. And teachers are ultimately, they care about kids. So you see your kids in trouble, that causes a lot of additional stress on you."

Gray	HS	O	"I think that insuring quality instruction was the first thing, making sure of that. You can do [an] amount of numbers of instruction; however, you can do more impact with the quality of what you're doing, and really focusing on how we're delivering instruction, making sure we're meeting our students' needs, looking at our data."
Gray	MS	P	"I know one teacher, she – her power – for some reason the power took a considerable amount of time before it was [restored]. But she was coming to work, staying with friends; she had a generator. I just made concessions for her to be able to make sure everything was okay at home."
Indigo	ES	P	"One or two of them had some leaks in their roofs, and I said 'Go take care of it; go do what you've got to do; we'll make due.'"
Indigo	MS	P	"I think the biggest challenged was how to best help and support our kids. In many cases, our teachers were so adversely affected by the storm and then having to serve as that support for children, too. The children handled it, just like adults do, in different ways and so really trying to anticipate the needs and we tried to do that in our school, meeting with our staff, being able to assess what the needs of our staff was because we did give a survey to our staff to make sure they could voice to us what their needs were. Some people don't want to share out. Some people want to just handle things themselves. We wanted to make sure everyone knew that we were there to support each other and also anticipate the needs as our children were coming."
Magenta	ES	O	" I don't think there's any [emotional effects of the exposure] at all. I haven't heard anyone even speak of that. Same with teachers and school staff."
Pink	ES	O	"I don't think there are any lingering effects [on staff]."

Pink	HS	O	"I: And what about for teachers and school staff, has there been anything that you've noticed? P: No, no, not to my knowledge, no."
Pink	MS	P	"I think it was so stressful when they went through it. I mean, our community and students affected so much that any time there's a threat of anything similar, it's almost like post-anxiety from it. It's still not... But I think that again, you know, our staff works, our school was a Title I school and very high poverty, so... It's very hard to separate worry about 'em, you know? They worry about them. But I think that most of them have done a healthy balance with it."
Purple	ES	P	"Initially, with my staff, it took me a long time to realize that some of them were having a hard time, just with regrouping and realizing they didn't have their stuff and their things…we're having to try to make sure our staff is equipped to be able to handle that place wherever our students come to them and still be able to provide good solid instruction."
Purple	MS	P	"I feel like a lot of individuals that make decisions like this fail to think about things like the secondary trauma of what it feels like to be an adult helping kids navigate this. And so even if our kids were ready to return back to school, our teachers necessarily weren't mentally prepared. And that's for a variety of reasons. One may be that they themselves were affected in terms of the hurricane, and they're experiencing and grieving their own loss.""
Red	ES	O	"There were teachers that had flood damage that lost hot water heaters, that lost cars. My mom actually personally lost her car in the flood at my house. I think that there were people that did lose cars. I should have said that before with mobility — there were people that their cars were flooded. Teachers, with the first month back, they did have to run home and meet a contractor or meet a utilities person because they had to replace certain things in their homes."
Red	HS	P	"Teachers experienced a lot of the same things that the students did. It was still very difficult."

Red MS O "No. I think that everything they needed was met. For the staff, a big deal is, every time we close school, you've got those that want to come in for an optional workday and don't understand why they can drive from five minutes away and come to school, and then you've got someone like me who lives 25 miles away that, if it flooded in certain areas, I can't get in. That's a challenge every time. Do you make it an optional day or do you make it [so that]nobody comes in? "

Silver ES O "I think because we had to relocate to another school, it was very stressful on the staff. The kids were fine, they didn't care where we were, they were just glad to be back at school, but having to relocate buildings and then return to a building that was not really ready…I mean officially the work was done, but it had not been properly cleaned, that was hard on the staff. But, I would say in general, after we got over that, pretty much everybody rebounded pretty well."

Silver HS P "We did have several staff members who had significant damage to their homes. A couple of them — one had a huge oak tree fall in the middle of it and basically split it in two. So of course that stress level of having to deal with that was significant for them. The one thing I was so proud of was just, other than having to take some time off every once in a while to meet with an adjuster or a contractor, the things they just can't help, I was proud of them. When we came back, for the most part, they rolled up their sleeves and came to work."

Silver MS P "I think it just adds stress. Teaching is stressful as it is. But I think it's just one more layer."

Violet	ES	P	"I would say the emotional impact. Even when everybody's coming back to school, we have to focus on teaching students, but also how to get their life back and fully operational again to some normalcy. I think staff and students are still dealing with that now. I mean, that's definitely a challenge."
Violet	HS	O	"I think the adults handle things worse that the kids do, honestly. It seems like they get thrown out of a routine; I mean the kids don't like being thrown out of a routine either, but they take things in stride. The adults had more questions and 'what are we going to do about this and that?' They tend to be a little less flexible than the kids, but I think our group handled it well. I think the biggest impact that I noticed was just the fact that it threw off the year. The year never felt right; it didn't feel like we were ever in the grove like we normally feel, and I heard that repeated by all staff members throughout the year. Like we had just come back to school and gotten off to a great start; everybody's feeling good, and then, bam. And then you're out for 30 days. You've hired new employees; you've got things that are going on, and everybody's fired up about starting the school year. And then to sit out that long, I think it took that wind out of the staff's sails a little bit. We had to get pumped back up when we got back, and everybody was glad to get back. But we had to get back in the groove, and I don't think it ever felt exactly like most school years do feel. It felt like a very odd and strange year, and I heard that repeated by a lot of people."
Yellow	ES	O	"Just making sure that all of our classrooms were in working order and safe for the students, that was a success."

I think the biggest thing is making sure that as we came back and our priorities got to be on instruction, you also have to realize that you're meeting the needs of the whole child. And so our teachers knew coming back in that they were not only impacted themselves and dealing with their own damages, but knowing that kids were gonna come to school without basic needs being met. And we know that's part of, you know, the hierarchy of needs that you have to address. And so we knew when we came back to school that kids were still going to be dealing with uniform issues, not having everything they needed in terms of clothing, not having everything they needed in terms of food. And so they were prepared to address those needs. But just the social-emotional impact of being displaced from your home, having been in a shelter, and then coming back to school after you've been in that place of the shelter, it's significant on the emotional development of kids. So it really was difficult in terms of an adjustment for them. But the teachers were prepared for that and knew that they were gonna have to help kids get through just one day at a time. And they've done a good job with that.

Yellow   HS   P

"But you know what's crazy is our test scores were higher that year of Matthew. I think the teachers felt so much pressure to compact the curriculum, a lot of the fluff was left out, that we were so focused on getting everything in. Our test scores actually went up that year."

Yellow   MS   O

APPENDIX P. SUPPLEMENTARY QUANTITATIVE ANALYSES

To enhance the quantitative portion of this study, this section describes of two additional quantitative analyses that further queried the effects of Hurricane Matthew and Hurricane Florence on teacher turnover using available data.

Hurricane Matthew Supplementary Analysis

Because Hurricane Matthew occurred in 2017, NCDPI has collected teacher and school level data for the years following the event, 2018 and 2019, as well as for the years prior to the event. The availability of this data allowed me to run a difference-in-difference regression on teacher turnover due to Hurricane Matthew exposure. The theoretical approach and assumptions for this model are discussed in Chapter 4. Table S.1 presents the basic difference-in-difference results of teacher turnover for the intervention group, schools that were exposed to Hurricane Matthew, and the control group, schools that were not exposed, before and after the exposure event occurred. Column 1 shows turnover rates before the exposure. Column 2 shows after the exposure. Column 3 shows the differences. The basic model shows a 0.20 percentage point difference-in-difference, although this finding is not significant. It also shows a 2.83 percentage point difference in post-exposure turnover rates between exposed and unexposed schools. This finding is significant at the 0.01 level.

Table S.2 shows the results of the difference-in-difference regression run estimate the effect of Hurricane Matthew Exposure on teacher turnover. (Table S.3, at the end of this section, shows the full regression output across all covariates. The outcome of interest is the interaction between the exposure and post variables, which shows estimates teacher turnover rates following natural hazard exposure. However, the no effect is shown.

Table S.1

Basic Difference-in-Difference of Teacher Turnover Rates for Hurricane Matthew Exposure

	Pre-Exposure (1)	Post-Exposure (2)	Difference (3)
A. *Treatment Group*			
Hurricane Matthew	0.2046	0.2112	0.0070
	(0.0042)	(0.0025)	(0.0050)
Control Group			
No Exposure to Hurricane Matthew	0.1784	0.1829	0.0046
	(0.0029)	(0.0017)	(0.0035)
Difference	0.0262	0.02827	0.0020
	(0.0050)	(0.0030)	(0.0059)

Table S.2

Results for Preferred Difference-in-Difference Model with School, District, and Year Fixed Effects

	Hurricane Matthew Exposure
Exposure (β1)	-0.0004***
	(0.0051)
Post (β2)	0.0044)
	(0.0044)
*Exposure * Post (β3)*	0.0060
	(0.0052)
Constant (β0)	0.1783
	(0.0031)
Observations	8,118

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

Covariates include teacher characteristics, teacher working conditions, turnover intentions, school performance, and student characteristics.

As discussed in Chapter 4, there are several reasons why the difference-in-difference model is not the preferred model to estimate the impact of hazard exposure on teacher turnover with the available data. First, hazard exposure may have a lingering, non-immediate effect on teacher turnover, which means exposure may impact teacher turnover rates in the years after the event as well as the year of the event. Difference-in-difference models are useful in estimating the immediate effect of an exogenous event; whereas, fixed effects models are better suited for effects that may not be immediate. The fixed effects model employed in Research Question 1 attempts to resolve this issue. For schools that were exposed to Hurricane Matthew in 2017, the outcome variable of interest functions as a lagged variable that is coded as 1 for $Exposure_{2017}$ through $Exposure_{2019}$. Second, because NCDPI data on teachers for the 2021 school year is not yet available, the effect of teacher turnover on for 2020 or later cannot be calculated. (Turnover rates in school year t are calculated using Pay Period 3 from year $t + 1$). Moreover, due to the Covid-19 global pandemic, it is expected that teacher turnover rates in 2020 would be vastly different from prior years. It would not be possible with the available data to attribute which proportions of teacher turnover in 2020 were due to lagging effects from Hurricane Florence and which were due to the pandemic.

Table S.3

Results for Preferred Difference-in-Difference Model with School, District, and Year Fixed Effects

Independent Variable	Coefficient	Robust S.E.
Exposure	-0.0004	(0.0051)
Post	0.0066	(0.0045)
Exposure * Post	0.0063	(0.0052)
Average Years of Experience	0.0092***	(0.0014)
Percent of Black Teachers	-0.0743	(0.0461)
Percent of AmIn/ AK Teachers	-0.0580	(0.1717)
Percent of Asian Teachers	0.1018	(0.2072)
Percent of Latinx Teachers	-0.1120	(0.1068)
Percent of Other Race Teachers	0.1798	(0.1144)
Percent with Master's Degrees	0.0104	(0.0224)
Percent with NBC	-0.0753	(0.0705)
School Leadership Mean	-0.0182	(0.0178)
Mean Leadership Efforts	0.0060	(0.0192)
Remain at Current School	-0.1017***	(0.0331)
Staying due to School Leaders	-0.0094	(0.0130)
Remain in Current District	-0.0111	(0.0440)
Remain in State	-0.0224	(0.0506)
Leave Teaching	0.0171	(0.0428)
Low Performing School	0.0122**	(0.0059)
Percent of FRPLE^^ Students	-0.0064	(0.0226)
Percent of AmIn/AK Students	0.2342**	(0.1009)
Percent of Asian Students	-0.5883	(0.4728)
Percent of Black/AA Students	-0.1574	(0.3177)
Percent of Latinx Students	0.0675	(0.1091)
Percent of Students of 2+ Races	0.1346	(0.1828)
Constant	0.1478**	(0.0594)
Observations	8118	

^N.B.C. stands for National Board Certification

^^FRPLE. stands for Free and Reduced-Price Lunch Eligible

*indicates significant at the 0.10 level, ** indicates significant at the 0.05 level, and *** indicates significant at the 0.01 level

Robust standard errors are in parentheses

Hurricane Florence Supplementary Analysis

Data from NCDPI includes the range of school days lost due to Hurricane Florence by school districts (N=116) with any low performing schools across the state. The availability of this data, which was not tracked for Hurricane Matthew in 2017, affords the opportunity to control school closures as another aspect of natural hazard exposure that may influence teacher turnover. To estimate this effect, I averaged the range of days lost was averaged for each school district in 2019 and coded the number of days lost for other school-year observations as 0. In most cases, the average range of lost days was no more than one or two days between the maximum and minimum number of days lost for that district, but in some of the most severely impacted districts, ranges were as large as two weeks. This averaged variable, therefore, is an imprecise estimate of the true effect of closures on turnover. It does, however, offer an initial first glimpse into the relationship. The average closure days were merged with the existing panel, and all schools in a district were assigned the average number of days lost for that district. Two regressions were then run to estimate the effect of school closures. The first regression estimated the effect of days lost on schools and also controlled for whether schools were exposed to Hurricane Florence only. The second regression estimated the effect of days lost and controlled for whether schools were exposed to both Hurricane Matthew and Hurricane Florence. The model employed was the preferred fixed effect model with teacher, student, and school controls used throughout the quantitative portion of the study.

Table P.4 presents the results. As column 1 shows, a one-day increase in the number of lost school days is associated with an average 0.24 percentage point increase in teacher turnover, significant at the 0.05 level, for schools that were only exposed to Hurricane Florence. Column 2 shows that a one-day increase in the number of lost school days is associated with an average

0.37 percentage point increase in teacher turnover, also significant at the 0.05 level. These results highlight how lost instructional time can be an important factor in teacher turnover.

Moreover, the qualitative findings supported these results. Participants shared that teachers felt increased stress after long periods of school closures due to hazard exposure because they were still held accountable for high-stakes standardized tests that students took during the same school year. These tests are used as measures of school and teacher performance and are tied to school funding and teacher incentives. Therefore, it makes logical sense that turnover rates are higher when lost instructional time is higher because teachers may feel that they are unable to sufficiently prepare students for these tests. From a school leadership perspective, these findings affirm that school leaders should make efforts to reopen schools as soon as it is safe to do after a hazard. When possible, school leaders should provide a buffer between state and local policies and teachers. They should also consider ways to support teachers in making up for lost instructional time.

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