



Life after Hurricane Katrina: The Resilience in Survivors of Katrina (RISK) Project¹

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This article presents an overview of the findings to date of the Resilience in Survivors of Katrina (RISK) Project, a longitudinal study of 1,019 young, predominantly female and African American community college students who were surveyed a year before Hurricane Katrina in New Orleans and then two to three times afterward. This study combines a multidisciplinary, multimethod approach to understanding the immediate and long-term effects of the Katrina disaster on physical and mental health, economic and social functioning, and neighborhood attainment. I discuss what we can learn from the rare inclusion of predisaster data and our unusual ability to follow participants for years after the disaster. I argue that it is important to follow the recovery of individuals and communities as well as the recovery of the city, as these are often not the same, especially in Katrina where a large proportion of the city never returned.

KEY WORDS: displacement; Hurricane Katrina; natural disaster; poverty; residential mobility; resilience.

INTRODUCTION

Deadly tornadoes, earthquakes, hurricanes, and other large-scale natural disasters are becoming regular occurrences in our lives, and climate change is likely to increase their severity and unpredictability (Van Aalst 2006). These disasters pose many questions and opportunities for social scientists. Policymakers at the local, state, and federal levels must prepare for the challenge of responding to communities devastated by disaster-related trauma and loss; widespread displacement and relocation; and disruptions to social, economic, and other systems that support survivors' physical, mental, and economic well-being. Poor and marginalized populations are especially vulnerable to such threats, and evidence-based policies for disaster preparation and recovery are crucial to reducing disparities in postdisaster outcomes (Fothergill and Peek 2004).

Although it may sound heartless, disasters are also opportunities for social scientists, just as they are for other industries such as construction and the building trades. This is because disasters are often an exogenous shock that lays bare how

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society functions and what promotes or destroys community, democracy, economic development, and health and well-being among the affected population. Disasters often lay bare strengths and weaknesses in a society and allow the astute social scientist to discover truths about a wide variety of issues that are important in everyday life, not just at times of crisis and recovery (Erikson 1976, 1994; Quarantelli 2005). Disasters may be rare in any one individual life, but they are actually common occurrences across the globe and thus are also important to understand as a part of the structure of everyday life. Each year, excluding droughts and war, nearly 500 incidents around the world meet the Red Cross's definition of a disaster (Norris et al. 2005).

In this article, I review findings from one study of a major American disaster—Hurricane Katrina—which struck the Gulf Coast and the city of New Orleans in September 2005. Together with my colleagues,³ I have been studying the long-term impact of Katrina on a sample of poor young women who were living in the New Orleans area and attending community college before the storm. This project—RISK: Resilience in Survivors of Katrina—is a longitudinal study that takes advantage of rare pre-Katrina data to assess the impact of the disaster on people over time and follows them wherever they have relocated. RISK is still an ongoing study, but at this point, approximately 10 years after Katrina, I take stock of some of the lessons we have learned about this disaster and its implications for two types of knowledge: how to conduct disaster studies and public policies to respond to disasters, and the study of mobility and inequality in American society. I identify themes that have emerged from our research, many of which affirm earlier studies of the causes and consequences of disasters, and some of which suggest important new areas of focus for this field.

The RISK Study

When Hurricane Katrina hit in August 2005, I was part of a group of academics overseeing a study of community college students in 10 different sites around the country. The study was called Opening Doors, and it was designed to evaluate ways of increasing the abysmally low graduation rate of community college students (Richburg-Hayes et al. 2009). One of the 10 colleges happened to be in New Orleans where the researchers had signed up 1,019 students who were registering for Delgado Community College and Louisiana Technical College during summer and fall 2004, a year before Katrina struck. Half the students were randomly assigned to an intervention, receiving a scholarship of about \$1,000 for maintaining passing grades. The other half were assigned to a control group who filled out the questionnaires and agreed to be recontacted in the future but who did not receive the scholarship. The plan was to follow both groups of students over the next four years to see if the scholarships helped increase the graduation rate at the colleges.

³ The RISK Project began under the leadership of economist Christina Paxson, who became president of Brown University in 2012. The other principal investigators of the project include psychologist Jean Rhodes, economist Cecilia Rouse, sociologist Elizabeth Fussell, and myself. Other key personnel include urban planner and public health specialist Mariana Arcaya, geographer S. V. Subramanian, and psychologist Sarah Lowe.

To be eligible for the study, partly funded by the state of Louisiana, the students had to be single parents between the ages of 18 and 34 and had to earn less than 200% of the poverty level. These criteria produced a sample of mostly poor, African American, single mothers. The baseline survey, given to all the participants in 2004, asked a lot of questions about physical and mental health, social support (e.g., who would you turn to in times of trouble?), trust in the government, and personality variables such as optimism and planfulness. We had even asked whether the respondent had access to a car—a variable that would be incredibly important a year later when Katrina struck. The questionnaire created a remarkably full portrait of each person participating in the study.

In August 2005, the survey research firm was conducting a one-year follow-up telephone survey with the 1,019 people in the study. Researchers had succeeded in contacting and interviewing about half (492) of the original participants when they had to stop calling on August 25 because a hurricane, named Katrina, was bearing down on the Gulf Coast.

Hurricane Katrina hit New Orleans on August 29, 2005, flooding the city and disrupting the original study. The hurricane's storm surge caused the levees to fail, inundating the below-sea-level city. Floodwater covered 80% of the city's land and damaged about 75% of the residents' homes (Kates et al. 2006). The water was not completely pumped out of the city for six weeks. Slowly, neighborhoods were reopened to residents to return, beginning with the least damaged at the end of September and ending with the most damaged as late as May 2006 (Fussell and Lowe 2014:138). Katrina affected a large area of the Gulf Coast causing 1,833 deaths and resulting in the largest abrupt displacement of population in the United States since the Dust Bowl migration of the 1930s (Picou and Marshall 2007). Based on Federal Emergency Management Agency (FEMA) applications for assistance in 2007, about 1.7 million people were scattered across all 50 states (Graif 2016). While the death toll for Katrina was low compared to other disasters in American history, it remains the costliest natural disaster the country has experienced with damage estimated at \$125 billion (Frankenberg, Lauritor, and Thomas 2015).

After the storm, Delgado Community College lay under nine feet of water and could not reopen for a year. Our New Orleans study participants were all affected by Katrina; nearly half of them lived in the Ninth Ward, where some of the worst destruction and a large proportion of the New Orleans fatalities occurred. Overall, 80% experienced severe home damage and a third experienced the death of a friend or relative. While 85% of our respondents evacuated before the storm to communities across Texas, Georgia, and beyond, many of those who remained were trapped in their homes awaiting rescue by boat or helicopter or stuck in the hellish environments of the Superdome or the Convention Center. Recognizing that we had unusual data on physical and mental health, social support, and socioeconomic status from baseline surveys that would prove important in assessing the impact of the storm, in that first week after the hurricane, a group of researchers came together, including psychologists, sociologists, and economists, to repurpose the New Orleans study to follow the hurricane survivors.

With expedited funding from the National Science Foundation and the MacArthur Foundation, later supplemented by several additional grants from the

National Institutes of Child Health and Development of the National Institutes of Health (NIH), we set out to find the original participants in the Opening Doors Study wherever they were and to follow them longitudinally. Because we had the original participants' social security numbers and extensive contact information and they had agreed to be part of a longitudinal study, we were able to track down and interview 86% of the original sample, many of whom were scattered to 35 different states (see Fig. 1).

From the beginning, we had two goals: to scientifically study the impact of the hurricane, the trauma that the mothers and their children experienced, and the effect of their relocation on their long-term well-being and recovery; and to tell the stories of these survivors.

To date, we have collected and analyzed pre-Katrina baseline data—collected in 2004, and for half the sample again in 2005 (before the storm) (Wave 1), two post-Katrina follow-up surveys, Wave 2 collected in 2005–2006, and Wave 3 collected in 2010. Each survey included questions pertaining to health resources and outcomes; social resources and outcomes; and child well-being. Respondents' residential locations before and after the hurricane were recorded and geocoded at each wave, merging our survey data with information on neighborhood characteristics to examine neighborhood change and its role in recovery; as well as allowing us to pinpoint the exact flooding level at each participant's home address. We also expanded our initial study to explore how genetic variants interact with environmental factors

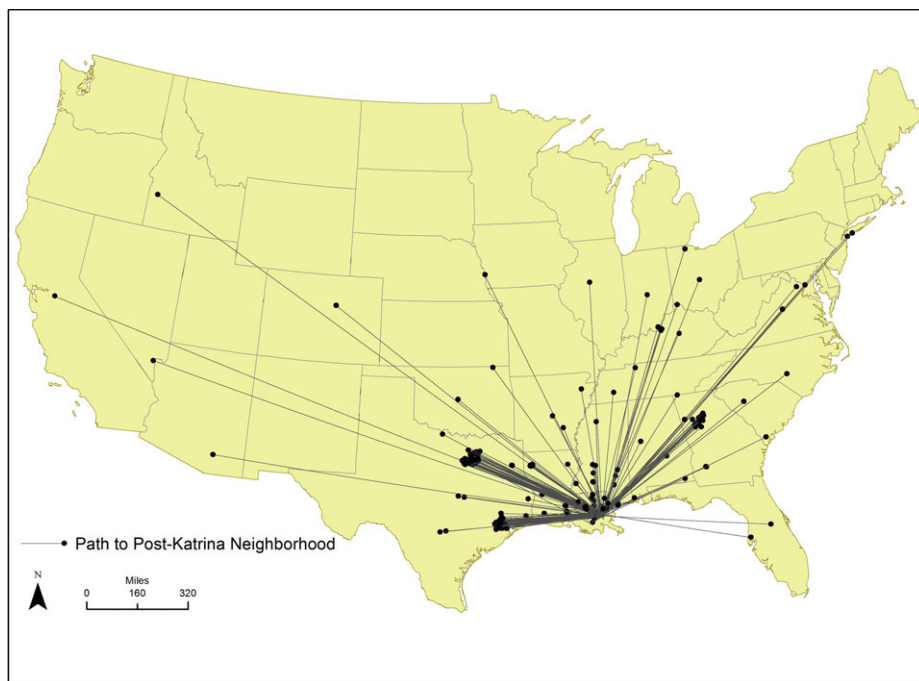


Fig. 1. Location of RISK Respondents 2004–2006

to predict outcomes (Dunn et al. 2014), and we conducted 125 in-depth qualitative interviews in 2006 and in 2010 with survivors living in New Orleans, Baton Rouge, and Dallas and Houston, Texas. The purpose of the interviews was (1) to provide an in-depth understanding of the participants’ experiences during the hurricane and its aftermath and (2) to ascertain participants’ perspectives on how the hurricane led to changes in their functioning, relationships, and goals. The interview protocol covered a range of topics that were informed by previous research on postdisaster adversity and resilience. Examples of topics included childhood family life; predisaster employment and education; experiences in the immediate aftermath of the hurricane; postdisaster decisions about employment, education, and housing; postdisaster physical and mental health; and changes in relationships with family members, intimate partners, and friends since the hurricane. Figure 2 provides the structure of the data collected to date. (A new round of survey and qualitative data will be collected in 2016–2017).

The original Opening Doors experiment was partly paid for with money from the state and one of the requirements for participation was that the students were parents, and had household incomes less than 200% of the poverty line. The original sample of 1,019 students included 77 men, and because of that small number in most of our analyses, we focus only on the women (N = 942). The sample was *young*; average age at time of Katrina was 25.2; *poor*, monthly earnings at baseline (\$957.00); *African American* (85%); and on some form of *public assistance* (71%). All were *mothers* with an average of 1.92 children. Sixty-four percent were *single mothers*, neither married nor cohabitating. As would be expected for young adults, the majority of participants reported that they were in excellent or very good health, though problems such as asthma, high blood

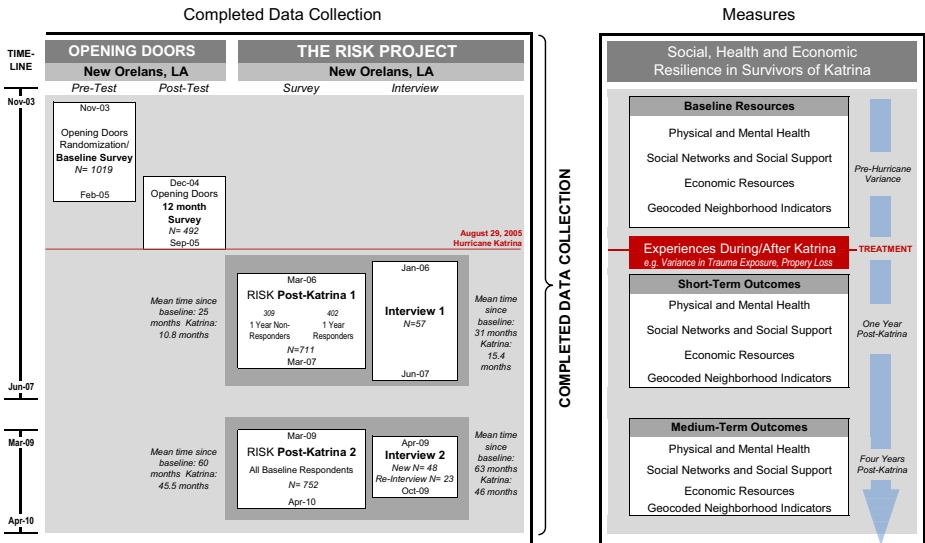


Fig. 2. Structure of the Data Collected.

pressure, back problems, and frequent headaches were not uncommon. Roughly one third of the sample was overweight and one third was obese. Further, 8.1% had been diagnosed with or treated for depression in the past year, measured at baseline before the storm.

While this was a disadvantaged group, they were by far not the most disadvantaged group in New Orleans; in order to qualify for the initial study, they had to have a high school degree or general equivalency diploma (GED) and had to show up to register for community college classes. This population is not a representative sample, but instead is a sample of people we know are more likely to be vulnerable to the effects of disasters—poor, African American, single mothers. Their communities sustained relatively more damage, and the stress of the disaster amplified ongoing struggles with substandard childcare and educational options, racial discrimination, and economic hardship (Spence, Lachlan, and Griffin 2007).

To date, the research team has published more than 30 research papers, three doctoral dissertations, and three master's theses covering a wide variety of topics. The papers are all available on our website (www.riskproject.org). In this article, I outline the wider lessons we can draw from this study for three areas: lessons on how to study disasters and their aftermath, findings on the impact of this disaster and the suggestions that follow for policies to improve responses to future disasters, and our findings that use the disaster to understand social phenomena more generally.

STUDYING DISASTERS AND THEIR AFTERMATH

Three unique features of our study have proved invaluable in studying the effects of Hurricane Katrina. These are the inclusion of baseline predisaster data; the multidisciplinary, multimethod approach; and the longitudinal follow-up five to six years after the storm.

Inclusion of Predisaster Data

Few studies of any disasters have baseline data and, among those that do, few have been on the catastrophic scale of Hurricane Katrina. In the extensive review by Norris and colleagues (2002), only 7 (5%) of the 160 studies reviewed had predisaster data on the individuals examined. (In addition, the samples used in these studies were generally small, with a median sample size of 149 across the 160 studies.) Many studies rely on retrospective information, or are confined to the study of postdisaster adjustment that is uninformed by what came prior to the disaster. The lack of baseline data poses several difficulties. First, without baseline data, it is not possible to obtain accurate measures of how disasters change mental health, social networks, and economic status. Second, retrospective information is likely to be measured with error, leading to biased estimates of the effects of predisaster characteristics on postdisaster outcomes. For example, responses to retrospective questions about predisaster social support, living circumstances, or health status could be colored by postdisaster experiences.

We used the predisaster baseline data to investigate two important questions. First, how much does predisaster mental health account for the mental health problems that are often detected after a disaster? Are people who suffer depression or posttraumatic stress disorder (PTSD) after a disaster suffering from the effects of the disaster or are we just finding people with underlying mental health issues who are very sensitive to the effects of the disaster? The answer is that when we controlled for pre-Katrina mental health, the effect of Katrina on poststorm mental health was reduced by about 20%, but the effect of trauma on possible PTSD was not affected by pre-Katrina mental health.

We measured pre-Katrina mental health using the K6 scale of nonspecific psychological distress (Kessler et al. 2002) which includes items such as “During the past 30 days, about how often did you feel so depressed that nothing could cheer you up?” Respondents answered on a 5-point Likert-type scale ranging from 0 (*none of the time*) to 4 (*all the time*). Scale scores range from 0 to 24. A previous validation study (Kessler et al. 2003) suggests that a scale score of 0 to 7 can be considered as probable absence of mental illness, a score of 8 to 12 can be considered as probable mild or moderate mental illness (MMI), and a score of 13 or greater can be considered as probable serious mental illness (SMI). The Impact of Event Scale-Revised, a 22-item self-report inventory of symptoms of PTSD (Weiss and Marmar 1997) was used to measure PTSD symptoms as a result of hurricane experiences. The total score for this scale ranges from 0 to 88. This measure was specific to the respondent’s hurricane experiences and was included only in the post-Katrina survey. Participants were asked how often, over the prior week, they were distressed or bothered by experiences related to the hurricane, with sample items including “Any reminders brought back feelings about it,” “Pictures about it popped into my mind,” and “I was jumpy and easily startled.” The scale includes 22 questions rated in a 5-point scale, with the following response options: “Not at all” (1), “A little” (2), “Moderately” (3), “Quite a bit” (4), and “Extremely” (5).

Without any controls, the prevalence of mild-moderate or serious mental illness (MMI/SMI) rose from 23.3% to 37.2% ($p < .001$), and that of probable serious mental illness (SMI) doubled (6.9% to 13.8%, $p < .001$). At the time of the post-Katrina survey, 47.9% of the sample were classified as having probable PTSD (IES-R >1.5). When we controlled for pre-Katrina health status in addition to sociodemographic characteristics, this reduced the odds ratios for trauma and loss relative to the estimates without controls. The declines were largest for SMI. The odds ratios for loss and trauma for PTSD and stress declined by only small amounts. Notably, even controlling for predisaster health information, there were large and usually statistically significant adverse effects of loss and trauma on mental health. Our results indicate that controlling for baseline sociodemographic measures and mental health results in a modest reduction in estimates of the effects of trauma and loss. This suggests that studies that fail to incorporate baseline data may overestimate the influence of trauma and loss on postdisaster health. Overall, however, our broad conclusion is consistent with previous research demonstrating that disaster-related trauma and loss produce significant adverse health effects. Moreover, our respondents who had significant mental health problems stemming from the disaster were very unlikely to get any care for these problems. Only 9.2%

reported having visited a psychiatrist, psychologist, or other mental health professional in the year after the hurricane, including 15% of those with MMI and 16% of those with SMI (Rhodes et al. 2010).

The second question we investigated with predisaster data was “How much do baseline economic and social resources protect individuals against harm from disasters?” For example, researchers have noted that differential access to resources, such as reliable information, transportation, and more geographically extended social networks can affect variations in exposure to trauma (Kaniasty and Norris 2009) and affect individuals’ ability to respond to trauma. Moreover, those who are poor tend to receive and heed fewer evacuation warnings, heightening their risk for exposure (Lieberman 2006; Stephens et al. 2009).

Even among the vulnerable group in the RISK study, there was considerable variation in adaptive resources and psychological responses. We found that perceived social support predisaster protected victims from exposure to disaster-related stressors and loss (Lowe, Chan, and Rhodes 2010) as did specific support providers, including intimate partners (Lowe, Rhodes, and Scoglio 2012). Consistent with the family stress model (Conger et al. 1992), the hurricane produced external stressors, such as unemployment and prolonged separations, which undermined both individual functioning and intimate relationship processes. Consistent with psychological theories of stress (Hobfoll 1989) and our mental health findings (Paxson et al. 2012; Rhodes et al. 2010), losses of social and other resources (i.e., personal property, physical health) were significantly associated with postdisaster psychological stress (Zwiebach, Rhodes, and Roemer 2010).

Overall, we found that higher baseline resources (higher personal income, more perceived social support, and ownership of a car) predicted fewer hurricane-associated stressors, but the consequences of stressors and loss were similar regardless of baseline resources (Rhodes et al. 2010). In other words, people with cars, higher incomes, and more friends and family in their support networks were better able to evacuate before the storm hit and to avoid experiencing the worst aspects of the evacuation process itself. But if you were unlucky enough to experience many hurricane traumas, your risk of developing serious mental illness or probable PTSD was markedly increased, regardless of your prehurricane resources.

Multidisciplinary, Multimethod Approaches

Our approach has combined researchers from across the social and medical sciences, as well as combining quantitative and qualitative data. Disciplinary approaches to the study of disasters have focused on different outcome variables and have developed different theoretical models to explain those outcomes. Psychological approaches to the study of disaster have tended to focus on individual differences in coping and responses, rather than on how individuals manage to restore their economic, educational, and social equilibrium over time. Sociological approaches, however, have tended to minimize the psychological aspects of the events (Hutton 2001). Economists have tended to examine disasters as one example of a wider class of “shocks” or unexpected events with potential adverse impacts

(Frankenberg et al. 2015). Medical and epidemiological studies have stressed the immediate tolls of disasters on physical and mental health but rarely looked at long-term effects.

The impact of disasters on individuals are best understood with a perspective that takes into account not only the individual's preexisting functioning and capacity to overcome material and psychological losses but also the underlying social, economic, and political relationships that determine recovery capacities. In the RISK study, we take a multidisciplinary approach that extends across psychological, sociological and economic, epidemiological, demographic, and geographic perspectives. This is sometimes difficult work, but we believe it leads to a much more complex and accurate model of the impact of disasters. At present and in the future, we will be working on developing new theoretical and statistical models that allow us to capture the many variables that affect resilience and recovery for individuals and communities alike.

We also have combined quantitative and qualitative data in our study, supplementing our surveys with embedded qualitative interviews within the study design. The qualitative respondents were purposely chosen to capture the heterogeneity in survivors' mental health outcomes and residential locations post-Katrina that were uncovered in the survey data (see Lowe and Rhodes 2013). We interviewed 57 respondents in 2006 and early 2007, and then an additional 48 respondents after the 2009–2010 survey. Finally, 20 respondents from the first round of qualitative data collection were reinterviewed between August 2011 and 2012. In all, the RISK Project includes 125 interviews with 105 women. The qualitative subsample is representative of the full survey (Asad 2015:288). The semistructured interviews lasted one to two hours and addressed topics similar to the full survey.

The information coming from the qualitative interviews will play two roles in the overall study. First, it complements the quantitative data, permitting a richer understanding of the experiences of these families in the aftermath of the hurricane. The qualitative data allow us to explore some of the processes behind some of the patterns we find in the quantitative data. For instance, we found evidence in the qualitative data that many people were making decisions about where to live based on the religious congregations they belonged to before the hurricane. In the in-depth interviews, we have learned that whole congregations relocated to Houston, thus increasing the desire of some respondents to also relocate. Other congregations were able to repair their churches and reconstitute themselves in New Orleans. The church is a central institution in the lives of many respondents, and collective decisions made by pastors and their congregations can lead to individual decisions about relocating or returning to New Orleans.

The mixed-methods longitudinal study design allows us to develop meaningful survey questions, consider new variables in our analyses, and interpret results. For example, when qualitative data revealed that some women experienced the hurricane as a positive force, leading them to break the hold of friends and family interfering with their education and social mobility (Lowe et al. 2012), we added measures of posttraumatic growth (PTG) and social networks to the subsequent survey (Lowe, Manove, and Rhodes 2013). We realized we had been framing all of our survey questions around the negative consequences of the disaster. It had not

even occurred to us that people would consider the storm a “blessing in disguise.” It turned out that there is a blossoming research literature developing on PTG and so we have now been investigating this with the survey questions we added to the 2009–2010 wave.

The themes emerging from the interviews in 2010 showed that the majority of respondents did not have their lives entirely “back on track,” although the specific domains in which respondents felt dissatisfied varied. Many displaced respondents felt conflicted about returning to New Orleans and did not settle into their new homes. For example, some who had bought homes in Houston had not found steady work, or had partners who commuted to jobs in New Orleans. Even those who had returned to New Orleans felt conflicted about their long-term residence in the city because they often lived in high-priced rental housing, FEMA trailers, the homes of relatives, or other temporary situations. The massive displacement of residents geographically stretched and strained many extended family networks, which are of great importance among low-income black families in New Orleans, creating financial and emotional difficulties for many respondents.

Longitudinal Study of Disaster

The few existing longitudinal disaster studies typically follow individuals for relatively short periods. A 2005 review of the epidemiology of PTSD following disaster concludes that “the course of PTSD in the intermediate and long term after disasters remains largely unexplored” (Galea, Nandi, and Vlahov 2005). This review enumerated 28 studies that collected information from disaster survivors at two or more time points. Only eight collected data at three time points after the disaster. The longest-running study followed survivors for three years. As a result, little is currently known about the long-term course of PTSD and other mental health problems that specifically result from disasters. However, research has shown that the chaos and disruptions in the aftermath of natural disasters may be more significant over time than the exposure to the disaster itself (Cronkite and Moos 1984; Flynn 1999; Harvey 2016; Hutton 2001). Over time, many Katrina survivors have continued to struggle with the stressors associated with massive community dislocation; insufficient relief responses; uncertain housing; family and social network separation; crime; and a wholesale loss of the economic and healthcare institutions on which they relied (Abramson and Garfield 2006; Chan and Rhodes 2013; Harvey 2016).

By the second wave follow-up in 2009–2010, nearly 30% of our sample reported enough psychological distress to indicate probable mental illness (Paxson et al. 2012). Although this represents a decline from the rate of 36% that was observed one year after the hurricane, it is still substantially higher than the pre-Katrina rate of 24%. Symptoms of PTSD also declined, but one third of respondents still met criteria for probable PTSD. Housing loss, hurricane trauma, and death of a family member or friend were all associated with high levels of continuing PTSD symptoms, especially in combination with psychological distress.

Hurricane stressors were associated with increases in a range of survivors' postdisaster health symptoms in both the immediate (Rhodes et al. 2010) and longer-term aftermath (Arcaya, Lowe, et al. 2014). The proportion of respondents experiencing frequent headaches or migraines tripled over the four waves of data collection, while the percentage with digestive problems increased sevenfold and proportion with back problems doubled. Women who experienced increases in distress and the loss of a family member or a friend during Katrina were significantly more likely to have persistent health problems, and posttraumatic stress symptoms were associated with poor physical health outcomes, including asthma attacks (Arcaya, Lowe, et al. 2014) and frequent headaches or migraines. Participants who were still displaced after four years were also more likely to experience physical health symptoms than those who had returned to their original communities (Fussell and Lowe 2014). Among displaced respondents, relocation to more sprawling, less walkable communities was associated with weight gain (Arcaya, James, et al. 2014). By taking into account prehurricane assessments of physical health, our findings provide more definitive evidence of the physical health declines coincident with disasters. They also underscore the reciprocal nature of distress and health problems.

The other advantage of a longitudinal study is that it allows us to examine long-term resilience and posttraumatic growth. Recent research investigates individuals' *resilience* after disasters, defined as the full return to pretrauma levels of functioning (Bonanno et al. 2007). RISK has advanced this line of research by identifying distinct recovery trajectory subgroups along and intervening stressors (e.g., moves, bereavement) that influence trajectory membership. We identified six distinct trajectories of psychological functioning using Latent Class Growth Analysis (LCGA) (Lowe and Rhodes 2013). Over half of the survivors fit into a resilient trajectory characterized by low levels of baseline psychological distress, elevated symptoms at one year after the hurricane, and a return to predisaster levels by 2010. Predisaster functioning, exposure to hurricane-related stressors, social support, and socioeconomic status predicted trajectory groups. Compared to longitudinal analyses, we show that cross-sectional postdisaster associations overestimate the effects of traumatic stress exposure and social support on individuals (Greene, Lowe, and Rhodes 2012).

We also explored PTG, or positive changes experienced as a result of trauma (Tedeschi and Calhoun 1996) among survivors. We have investigated the correlates of PTG, induced by traumatic experience and cognitive processing of trauma, in ways that contribute to a sense of increased strength, spirituality, and appreciation for life (Tedeschi and Calhoun 2004). Consistent with previous research, PTG was found to be strongly positively associated with symptoms of PTSD at the first follow-up wave. Interestingly, however, only those participants with high levels of PTSD at both time points (vs. consistently low or high at only one postdisaster time point) have maintained high levels of PTG over time (Lowe, Manove, and Rhodes 2013). Likewise, we have explored gene-environment interaction (GxE) interactions in these processes. Few studies have GxEs among survivors of disasters and, to our knowledge, our team is the first to identify a GxE in the context of PTG (Dunn

et al. 2014). Evidence of complex interactions between contextual variables, PTSD, PTG, and resilience over time highlights the need for long-term recovery studies.

To our knowledge, ours is the only study to explore the role of predisaster variables, including predisaster psychological symptoms and resources, in predicting PTG. Combining these two research areas will allow us to investigate how PTG and resilience are related and whether individuals who report PTG early after a disaster experience faster recovery on other dimensions such as economic and social recovery.

The persistence of negative mental and physical health symptoms one and five years after the disaster indicates that long-term treatment is needed. Regrettably, however, many of those in need of care in the months after the hurricane do not receive it. This is not unusual—even under normal circumstances, the majority of low-income adults in the United States with health problems and serious mental illness do not receive adequate care (Wang, Demler, and Kessler 2002; Young et al. 2001). Yet, because many survivors of disasters come into contact with service agencies after a disaster, there may be unique opportunities to offer or refer to treatment. The high rates of health and mental health problems among low-income survivors of Hurricane Katrina, coupled with the low rates of care, indicate that this was not successfully accomplished in the case of this natural disaster. This did not have to be the case. An example of an intervention that did make a difference is the “Disaster Relief Medicaid Program” established in New York for all low-income residents to access Medicaid coverage without extensive verification for four months after the 9-11 attacks. Because many people lost employer-sponsored health insurance when they lost their jobs after the disaster and those with Medicaid ended up in another state, this kind of coverage was highly needed. Unfortunately, the same emergency access to health insurance was not agreed to by politicians in the aftermath of Katrina (Rosenbaum 2006).

MOBILITY AND INEQUALITY FOLLOWING KATRINA

Recovery of People vs. Recovery of Place

When Katrina filled American media with pictures of the desperate conditions of the desperately poor people left behind in the Superdome and the Convention Center, some media commentators took the occasion to begin a discussion of long-term poverty in American society. Politicians discussed the problem of poverty and pledged to do better, and then the media moved on to the next big news story. Katrina survivors’ pictures were gone from the newspapers, and television news stations moved on to the next stories and eventually to the next disaster—including the Kashmir earthquake just two months later, which left over 86,000 Pakistanis dead and 2.8 million displaced. With each new disaster, there is another cycle of news, a brief dramatic focus on the victims, and then another story to supplant it.

And it is not just the media that loses sight of the victims of disasters. Most researchers rarely follow survivors beyond the first year or so. Likewise, the field of disaster response is focused on the short term—how do we get people out of danger, how do we keep victims fed and clothed, and how do we supply necessary medicine

and shelter to many victims very quickly? Hurricane Katrina was notable for the breakdown in that immediate response, in part because of the enormity of the storm and the flood, but also because of the failure of local and national governments that made fatal mistakes in the immediate aftermath.

After the initial response, much of the next phase involves rebuilding the homes and businesses that were destroyed. Nearly all of New Orleans was crippled by the storm and had to be pumped out, cleaned up, and rebuilt. But there is a sleight of hand in the transition from the immediate response to the long-term response of experts: the focus in the beginning is on aiding the people who experienced the disaster, while the focus in the long-term is on rebuilding the city, neighborhoods, or towns that were affected. But the recovery of the city is not the same as the recovery of the people.

New Orleans was a city experiencing long-term slow-motion population decline before Katrina. The population of the city had declined from its height in 1950 of 628,000 to its prehurricane population of 484,674 in 2000. By 2010, the city had a population of 343,829, and by 2014, the population was estimated at 384,220.

The population decline since the disaster has been uneven and concentrated among African Americans, who have returned to the city at rates much lower than whites. Overall the city is older, richer, and whiter than it was before Katrina. New Orleans has also seen growth in its Latino population, which was very small before Katrina (Fussell 2007). New Orleans's poverty rate of 23% in 2010 was the lowest it had been since 1979. (It has since climbed to 27% in 2013.) In 1999, New Orleans had 130,896 people living below the poverty line. In 2013, it had 97,970 people. Many of the poor did not return to the city, and the poverty rate of the surrounding suburbs increased. Many city neighborhoods have gentrified, attracting new, young white residents with college degrees. The effect of recovery spending to rebuild New Orleans, much of it from the federal government, was a stimulus to the local economy such that New Orleans did not feel the effects of the 2008 recession as much as the rest of the country with its job level declining by only 1% between 2008 and 2010. Rents have tripled in New Orleans since 2005 and the percentage of renters in the city paying more than 35% of their pretax income on housing grew from 43% before the storm to 51% after the storm (Plyer, Shrinath, and Mack 2015). So, while New Orleans shows signs of recovery, it also has lost many of its low-income African American residents.

Because we followed respondents wherever they moved, surveying 86% of the predisaster sample at least once since the storm, we can shed light on the situation of those who left New Orleans and did not return, the decision making of the displaced residents, and the effects that new neighborhoods have had on individuals.

Our respondents were highly mobile. Only 19% of our sample reported no moves between baseline and all waves of the survey; 58% had changed tracts between baseline and 2006, and 63% changed tracts between 2006 and 2009. Even with all these moves, only about one third of our sample was outside of Louisiana in 2006 and again in 2009. Of those in the state, 25% lived in New Orleans, and 75% were elsewhere in Louisiana. Pre-Katrina renters were more likely to lose their pre-Katrina homes, even after taking into account flood damage, evacuation behavior, and access to insurance, suggesting that housing tenure is an important

mechanism creating disaster vulnerability (Fussell and Harris 2014). In 2006, participants who had returned to New Orleans had less psychological distress, perceived stress, and fewer health conditions than those who had resettled elsewhere or were still in interim housing (Fussell and Lowe 2014).

Studying relocation experiences sheds important light on how neighborhoods affect health. We find increases in body mass index (BMI) among those moving to areas characterized by urban sprawl (Arcaya, James, et al. 2014). New Orleans was a walkable city with good public transportation. The largest number of our relocated respondents ended up in Dallas and Houston, cities where people found no sidewalks and where they had to drive to everything. In the in-depth interviews many respondents describe this as a loss in their quality of life. We find objectively that it also makes them less healthy as they have gained weight more than those who relocated to areas that are more walkable. In addition, uncertainty and frequent moves to temporary housing have negative effects on respondents' health. Fussell and Lowe (2014) find housing instability in the five years after the storm is associated with the deterioration of participants' mental and physical health, even controlling for pre-Katrina characteristics and hurricane-related trauma.

While most studies on neighborhoods and health examine the effect of neighborhoods on health, we looked at the effects of baseline health on where our respondents ended up. We found that those who reported poor health at baseline; or if they self-reported a diagnosis of asthma, high blood pressure, diabetes, high cholesterol, heart problems, or any other physical health problems not listed; or complained of back pain, migraines, or digestive problems, they were more likely to end up in higher poverty neighborhoods five years after the storm. Their location one year after the storm showed no relation to health at baseline. Yet by 2010, they were living in neighborhoods with a 3.4% higher neighborhood poverty rate (95% confidence interval: 1.41, 5.47). Differences persisted after adjustment for personal characteristics, baseline neighborhood poverty, hurricane exposure, and residence in the New Orleans metropolitan area (Arcaya, Subramanian, et al. 2014). We have since replicated this finding with data from the Moving to Opportunity Study (MTO) where baseline (1994–1997) physical health of a child (the only measure available for study participants) once again predicted neighborhood quality at follow-up in 2002 (Arcaya et al. 2016).

For our respondents in RISK, a year after Katrina, residential mobility was associated with a significant improvement in neighborhood quality (Graif 2016). Compared to participant's pre-Katrina census tracts, their new tracts had less concentrated poverty (14.5% vs. 11%). The disadvantage index dropped from over 1.0 standard deviation above the average census tract to only about 0.65 above the average. Declines in neighborhood poverty significantly predicted improvements in educational attainment, employment, K6 scale scores of psychological distress, and the number of diagnosed health conditions, controlling for individual and neighborhood baseline characteristics. The largest neighborhood improvements were found among participants whose homes had flooded, prompting moves away from the New Orleans metro area. Graif (2016) found that respondents' immediate and extended neighborhoods and metropolitan areas after Katrina were less

disadvantaged, less organizationally isolated, and more racially and ethnically diverse compared to their prehurricane environments, and to the environments of those staying or returning home. Families who were flooded in New Orleans, received FEMA aid, and moved long distances had the most improvement in their neighborhoods after the move.

The in-depth interviews provide a rich picture of how individuals responded to their new neighborhoods. Some experienced their new neighborhoods very positively. The hurricane pushed them to leave New Orleans's declining economy and failing schools and empowered them to change their lives for the better. FEMA's housing assistance played an important role in these relocations (Bosick 2015). However, even though most found better schools, employment options, and less crime in neighborhoods outside New Orleans, some returned because they missed New Orleans's distinctive culture and often depended on their family, neighbors, and friends in the city (Asad 2015; Bosick 2015). This may have been due, in part, to the racial diversity in their new neighborhoods, and preferences for majority-black neighborhoods in New Orleans (Rosen 2010; Tollette 2013). Most of our respondents had lived in predominately black neighborhoods, and they described difficulty coming to terms with Latino neighbors in new locations in Dallas and Houston (Tollette 2013). In addition, many described discrimination from their new neighbors who associated Katrina survivors with crime and negative behaviors. This negative reception caused people to want to return to New Orleans, even if they felt their new neighborhoods and the new schools for their children were better than what was left behind (Asad 2015). Decisions to remain or return, which may seem irrational based on objective characteristics, make sense when the qualitative data are used to understand participants' subjective experiences (Asad 2015; Bosick 2011; Rosen 2010; Tollette 2013).

CONCLUSION: LOOKING AHEAD

There is a robust research literature on disasters and their aftermath in all of the social sciences. Hurricane Katrina was the object of study of many of these specialists, and it also attracted the attention of many social scientists who had not studied a disaster before. This is because the disaster was a costly and very visible failure on many levels: from the engineering failure of the levees; our collective failure to halt climate change, which is contributing to greater extreme weather events (see Gotham 2016); our society's failure to ameliorate entrenched poverty among African Americans; the failure of the local, state, and federal government to cope with the people trapped in New Orleans and then relocated around the country, to the failure of politicians, urban planners, and residents to come up with a master plan for rebuilding the city and providing for its residents.

I have stressed in this article that a longitudinal, multimethod, multidisciplinary approach to studying Katrina can contribute to our collective knowledge of the effects of disasters on individuals and families. The focus on the recovery of people, rather than place, is very difficult to maintain unless, like the RISK Project, you have a sampling frame of people from the disaster whom you can follow wherever

they relocate. We have found that by following people, we can begin to shed light on the long and complex decision making that goes into relocation and recovery at the individual level.

In our next round of data collection, we will track the movement of our respondents and the kinds of neighborhoods they are living in. When we last interviewed participants in 2009–2010, many were still unsettled in their current homes and cities. At that time, FEMA trailer housing and rental assistance programs were ending and the recession restricted employment possibilities in some locations. Postdisaster housing instability is one of the most important obstacles to recovery in other life dimensions, like employment, children's education, social support, and mental health. Indicators of neighborhood quality will allow us to examine how study participants used personal resources to greater or lesser effect in different residential contexts.

We will also collect data in the next round of interviews on the children of the mothers we have been following. This will allow us to track how the children are doing in their new locations as well as how concerns about child welfare affect maternal mental health. Lacking knowledge of a child's safety during the hurricane was a significant predictor of heightened psychological distress and PTSD, even after controlling for demographic variables, predisaster psychological distress, evacuation timing, and bereavement. Moreover, interviews with a subset of the participants showed how mothers consistently put their own needs behind those of their children (Lowe, Chan, and Rhodes 2011). We have also uncovered strong associations between child externalizing and internalizing symptoms and maternal psychological functioning ((Lowe et al. 2011). We will investigate whether there are different patterns of adjustment among the children depending on how old they were when the disaster occurred.

We hope to use our next round of data to contribute to life-course studies by focusing on Hurricane Katrina as a turning point, similar to the Great Depression (Elder 1974, 1999) or military service (Sampson and Laub 1993). Many of the people we interviewed divided their lives into pre-Katrina and post-Katrina. While the norm in disaster research is that people are resilient and return to their predisaster psychological functioning, this is not true of all people, and the idea of a return to predisaster functioning has not been explored in depth in terms of social and economic outcomes, which we will examine.

We also will be exploring community-level recovery and resilience. With the failure to reach a master plan for rebuilding New Orleans, individual families made decisions about whether to return and rebuild, based on their access to housing, to insurance money, and to family and friends. Some neighborhoods with high levels of social capital were able to communicate and work together to bring the community back and to bring neighbors together (Wooten 2012). However, many of our respondents were not part of any organized efforts to rebuild community, and they were very much missing the social ties and networks of support they had before the disaster.

Religion, an important resource in urban black communities, was particularly salient in the wake of traumatic events. Predisaster religious involvement and faith predicted better postdisaster social resources, which in turn, were associated with lower levels of psychological distress (Chan, Rhodes, and Perez 2012). Participants

who interpreted the hurricane as God's wrath or punishment, or who questioned their religious beliefs after the disaster were more likely to experience psychological distress four years after Hurricane Katrina. By contrast, positive religious coping was associated with PTG, above and beyond the protective effects of social support and optimism (Chan and Rhodes 2013). As mentioned above, some people made the decision about whether to return to New Orleans based on whether their congregation returned, or whether they could find a new congregation in their new city. Some congregations opened new branches in Houston and that created a sense of community among ex-New Orleanians who were then able to begin to think of Houston as home.

Katrina and its aftermath was a window into some of the best and the worst aspects of our society and government. The failure of the government to protect and to rescue the inhabitants of New Orleans was shameful. The outpouring of help from private citizens, and eventually from the federal government, as well as the hard work of survivors has allowed recovery to proceed. But as C. Wright Mills (1959) taught us, the sociological imagination allows us to see the intersection of biography and history. The biographies of those who were affected by Katrina are still unfolding, and the definitive history of Katrina has yet to be ascertained. In many ways, this disaster is still unfolding.

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