

*Hurricane Katrina and Mental Health: A Research Note on Mississippi Gulf Coast Residents**

J. Steven Picou, *University of South Alabama*

Kenneth Hudson, *University of South Alabama*

Katrina was the most devastating and deadliest hurricane in recent U.S. history. The storm was particularly destructive for residents of the Mississippi Gulf Coast where sustained winds of 135 mph and a storm surge of 32 feet literally obliterated the built and modified environments. Limited research exists on the chronic (32 months) mental health impacts of survivors in this geographical area. Random-digit dialing telephone surveys were administered in Harrison and Hancock counties (Mississippi) in April and May 2008 and data were collected on a number of mental health outcomes. The results of the calculation of Ordinary Least Squares (OLS) regression models revealed that females, African Americans, and less-educated residents manifested the most severe mental health impacts. Most important, consistent findings for depression and Katrina-related psychological stress indicate that residents who were separated from family members, had maximum residential damage, and suffered severe financial problems remained significantly impacted 32 months after Katrina's landfall. A secondary stressor, in the form of having applications to the Mississippi State Grant Program denied or not processed also predicted personal depression. The implications of these findings are discussed.

The emergence of catastrophic disasters in the twenty-first century poses important problems for both collective and individual recovery. The death and destruction caused by Hurricane Katrina revealed numerous social, economic, political, and geographic vulnerabilities along the central Gulf Coast region of the United States (Laska and Morrow 2006; Wisner et al. 2004). Katrina was a deadly meteorological event with sustained winds of 135 mph and a storm surge that approached 32 feet along the Mississippi Gulf Coast. The damage to residential and commercial building structures across the Mississippi coastal area was without precedent. Katrina's second landfall occurred near the Louisiana/Mississippi border and, as the storm moved in a northeasterly direction, it maintained hurricane force winds for over 100 miles across inland Mississippi.

A dismal response failure characterized the weeks and months following Katrina's destructive landfall. American social institutions failed the coastal communities destroyed by Katrina in three important ways. First, there was

the failure for preparation and evacuation; second, there was the failed response to survivors; third, there continues to be the ongoing failure to rebuild and provide efficient access to resources to facilitate timely community restoration and recovery (Lotke and Bosarge 2006; Picou and Marshall 2007). This pattern of slow recovery suggests that psychosocial impacts will linger and survivors of the storm will continue to be vulnerable to a variety of persistent stressors in the post-Katrina environment.

The present research provides an evaluation of the psychosocial impacts of Hurricane Katrina in terms of social structural vulnerability, residential damage, evacuation behavior, and institutional support from insurance companies and federal grant programs for repairing homes. The logic of our analysis initially views demographic characteristics as an index of social vulnerability for disaster impacts (Blaikie et al. 1994; Bolin 2006; Cutter, Voruff Bryan, and Lynn Shirley 2003; Donner and Rodriguez 2008; Peacock, Morrow, and Gladwin 1997). Social and economic conditions such as gender, age, race, and socioeconomic status have traditionally identified differential social vulnerability to disasters due to the lack of economic and social resources (Adeola 2009; Cutter, Voruff Bryan, and Lynn Shirley 2003; Fothergill and Peek 2004; Laska and Morrow 2006). Second, impact characteristics of the storm, including the amount of residential damage as well as various post-storm behaviors, that is, having to move, being separated from family members, and living in a FEMA trailer are significant post-disaster stressors for survivors. Third, the timeliness of institutional support from insurance companies and federal government-funded programs for rebuilding homes provides another potential emergent stressor that has not been addressed in previous Katrina studies.

The lack of timely resources for rebuilding can be viewed as a potential anthropogenic source of stress (insurance companies and government agencies) that is critical for understanding the chronic mental health impacts of Hurricane Katrina. Without financial payments for rebuilding homes, residents of the Mississippi Gulf Coast will continue to struggle to reestablish social relations that promote community recovery. Previous research on short-term impacts of Hurricane Katrina has revealed differential economic, social, and psychological consequences for survivors.

From data collected 1 month after the storm, Elliott and Pais (2006) found that African Americans were less inclined to evacuate, less likely to have social support networks, and more likely to have high levels of stress, when compared to white survivors. African Americans also anticipated more stress in the future from the consequences of Katrina. A second survey of 1,043 adults found that post-Katrina respondents were twice as likely as respondents from a pre-Katrina survey to have serious mental health problems (Kessler et al. 2006).

Galea et al. (2007), using the sample analyzed by Kessler et al. (2006), investigated the relationship between demographic characteristics, hurricane-related stressors and prevalence of anxiety-mood disorders among Katrina survivors. Mental health problems were found to be most prevalent among females, individuals with lower socioeconomic status, and younger respondents. This research also reported that non-Hispanic white respondents were more likely to have high-level anxiety-mood disorders when contrasted to other racial-ethnic categories. This finding is very different from those of Elliott and Pais (2006), as well as the general research literature on risk and disasters, which suggests that minorities are more risk adverse and negatively impacted by disasters more than their white counterparts (Bolin 2006; Fothergill and Peek 2004).

Three specific hurricane stressors, physical illness/injury, physical adversity, and property loss outside of the New Orleans metropolitan area, were also found to be associated with high anxiety-mood disorders (Galea et al. 2007). Research on Katrina survivors approximately 20 months after the storm found that mental disorders (DSM-IV prevalence estimates) increased significantly for PTSD, serious mental illness, and suicide ideation (Kessler et al. 2008). These increased mental health problems characterized respondents who resided outside the New Orleans Metropolitan area and suggest that hurricane-related psychological impacts may be more widely distributed throughout the impact region than previously documented (Kessler et al. 2008). Despite a number of sample limitations, Galea et al. (2007) conclude “that the proportion of people experiencing hurricane-related stressors after Katrina was substantially higher than after other recent hurricanes” (p. 1432).

Most recently, Adeola’s (2009) analysis of data collected a year after the storm also confirmed that African Americans and women suffered more psychosocial distress than whites and males. This research also found that extensive property damage and severe financial losses were significant predictors of psychosocial distress. These studies provide convergent evidence that severe mental health impacts were initially produced by Hurricane Katrina and persisted for at least 20 months after the storm.

Area of Survey

Harrison and Hancock counties are the two most western coastal counties in the state of Mississippi. Katrina’s destructive eastern eye-wall passed through both counties and damage from winds and storm surge resulted in massive destruction of both the built and modified environments in this area. An estimated 152 deaths were recorded, 83 of those occurring in Harrison County and 52 in Hancock County. In the small coastal communities of Bay

St. Louis, Pass Christian, D'Iberville, Pearlington, and Waveland, entire neighborhoods were literally washed away. In addition, U.S. Highway 90 was destroyed and bridges connecting these coastal communities to the north, east, and west were demolished. Casinos along the Mississippi Gulf Coast were heavily damaged with several being moved extreme distances from their original sites. The destruction to the economic resources along the Mississippi Gulf Coast was absolute.

For impacted residents, approximately 69,000 homes were totally destroyed and an additional 65,000 homes were characterized by significant structural damage throughout the state of Mississippi (Louisiana Recovery Authority 2005: 9). In Hancock County, over 90 percent of the occupied housing units suffered severe damage. Unbelievably, all rental units in Hancock County and 43 percent of the rental units in Harrison County were damaged to the point of being uninhabitable. In December 2005, approximately 38,000 families in South Mississippi were living in FEMA trailers. Over 2 years later (January 2007), this number had been reduced to approximately 14,000. As of January 2008, Mississippi residents still occupied 9,137 FEMA trailers (<http://www.governorbarbour.co/news/2008/Jul/FEMATrailer.html>).

Nonetheless, because the overwhelming majority of Mississippi residents in areas devastated by Katrina (almost 75%) were not covered by flood insurance, residential recovery along the Mississippi Gulf Coast has proceeded at an extremely slow rate. The resolution of insurance claims and the payments of federal home owner grants to returning residents have also progressed at a painstakingly slow pace, reducing the potential for community recovery for all incorporated and unincorporated areas in both counties.

Data, Methods and Analysis

Between April 16 and May 28 in 2008, the University of South Alabama Polling Group conducted telephone surveys of residents in Harrison County and Hancock County, Mississippi. The target population of the survey consisted of adults living in these two counties during the time in which the interviews were conducted. The sampling frame consisted of 30,000 random-digit-dialed numbers targeting this geographic area. These numbers were also supplemented with a list of cell phone numbers. Altogether, a total of 2,022 households were contacted, with one adult in each of the 810 of the households completing interviews. Individuals with cell phone numbers comprised approximately 10 percent of this sample. To ensure random selection of respondents within households, the adult with the most recent birthday was interviewed. Since Hurricane Katrina, an unknown number of residents have permanently migrated to other locations. Thus, the extent to which this Katrina out-migration has affected the composition of our sample is unknown. The

present study focuses on Katrina survivors along the Mississippi Gulf Coast who have returned to rebuild their homes and communities.

Two variables were used to evaluate the mental health status of the respondents. A multiple indicator scale of personal depression was administered to respondents. This measure utilized items included in the Center for Epidemiological Studies Depression Scale (CES-D) (Mirowsky and Ross 1989). The CES-D scale measures an individual's experiences and feelings over the last seven days. The CES-D is not event-related, but provides a more general measure of feeling sad, lonely, having trouble concentrating, loss of appetite, etc. Items from the Impact of Events Scale (IES) were utilized as the primary indicator of Katrina-related psychological stress and PTSD symptoms (Horowitz 1976). This standardized scale measures event-related cognitive and behavioral responses that have occurred over the last week at the time of the interview and is a survey proxy for PTSD. The contents of this scale were originally established from statements taken from individuals who had experienced a variety of stressful events (Horowitz 1974, 1976, 1986). The more stressful an event to the respondent, in this case Hurricane Katrina, the greater the incidence of distressing ideas, thoughts, feelings, and irritability (Horowitz, Milner, and Alvarez 1979). The IES and CES-D items used to construct the depression and stress measures used in this analysis are available upon request.¹

Separate confirmatory factor analysis models and factor scores for each respondent were estimated for both the depression and psychological stress measures (see Bollen 1989). Factor loadings and fit statistics for both factor models were quite good and are available upon request. The estimated factor scores for the depression and stress variables comprise the dependent variables used in the subsequent multivariate analysis. Independent variables include demographic characteristics, information regarding separation from family, residential damage, financial problems resulting from Hurricane Katrina, and information regarding claims filed to insurance companies. Our analysis also examined the bivariate relationship for a small subsample of residents who had applied for funds with the Mississippi Grant program.

The data in Table 1 reveals that, among those living in Harrison and Hancock counties at the time of the survey, a substantial portion were severely impacted by Hurricane Katrina. For example, 14 percent reported that their homes were totally destroyed by the storm, 41 percent had to move out of their homes, and nearly one out of every five of those surveyed (18.3%) were still living in a FEMA trailer at the time of the interview.² Almost 40 percent of the respondents reported they had been separated from family members because of the storm and nearly one out of every four residents suffered severe financial problems. Around 9 percent reported that their Katrina-related insurance claims had been denied. Finally, more than 40 percent of the

Table 1
Descriptive Statistics

	N	Min	Max	Mean	Std. Dev.
Depression Factor Scores	715	0	8.008	1.345	1.963
Stress Factor Scores	730	0.981	3.971	1.931	0.810
Age	713	18	90	55.1	15.0
Female	809	0	1	0.525	
African American	809	0	1	0.105	
Other	809	0	1	0.036	
No Race Indicator	809	0	1	0.087	
Less Than High School	809	0	1	0.056	
Some College or Associate Degree	809	0	1	0.311	
Bachelors or Advanced Degree	809	0	1	0.313	
Married or Living with Partner	809	0	1	0.625	
Home Totally Damaged	801	0	1	0.140	
Had to Move	808	0	1	0.411	
Living in FEMA Trailer	809	0	1	0.183	
Separated from Family	809	0	1	0.393	
Severe Financial Problems	802	0	1	0.239	
Insurance Claim Denied or Pending	592	0	1	0.091	
Mississippi Grant Program Denied or Pending	208	0	1	0.409	

residents who had filed a claim with the federally funded relief program set up to aid Hurricane Katrina victims in Mississippi still had claims that were pending or had claims that were denied at the time of the interviews.

Table 2 presents the Ordinary Least Squares (OLS) estimates of demographic- and hurricane-related variables on the depression and stress factors scores. All of the models reveal that females and African Americans at the time of the survey had higher levels of depression and psychological stress than males and whites, respectively, net of the other variables in the model. Obtaining a college degree appeared to reduce levels of depression, but not Katrina-related stress. As expected, the models also revealed that Katrina-caused family separation, residential damage, and financial problems significantly increased the levels of depression and stress for remaining or returning residents, net of other variables. The analysis also indicated that the effects of moving and residing in a FEMA trailer were redundant with other variables in

Table 2
 OLS Regression of Depression and Stress Factor Scores On Demographic and Katrina Related Variables

<i>Independent Variables</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
	Depression Factor Scores		Stress Factor Scores	
	<i>b</i>	<i>b</i>	<i>b</i>	<i>b</i>
Age	-0.008† (0.005)	-0.004 (0.005)	-0.002 (0.002)	-0.004† (0.002)
Female	0.402 ** (0.136)	0.432 ** (0.144)	0.274 *** (0.056)	0.261 *** (0.063)
Africans American	0.809 *** (0.227)	0.805 ** (0.256)	0.264 ** (0.092)	0.258 * (0.111)
Other	0.269 (0.359)	-0.716 (0.472)	-0.154 (0.148)	-0.231 (0.207)
Less Than High School	0.402 (0.311)	-0.189 (0.393)	0.141 (0.124)	0.153 (0.169)
Some College or Associate Degree	-0.553 ** (0.182)	-0.309 (0.201)	-0.035 (0.074)	0.067 (0.088)
Bachelors or Advanced Degree	-0.623 *** (0.182)	-0.352† (0.198)	-0.114 (0.074)	-0.038 (0.086)
Married or Living with Partner	-0.505 *** (0.151)	-0.305† (0.167)	-0.059 (0.062)	-0.005 (0.074)
Separated from Family	0.540 *** (0.141)	0.491 ** (0.152)	0.228 *** (0.058)	0.216 ** (0.066)
Home Totally Damaged	0.653 ** (0.205)	0.397† (0.237)	0.254 ** (0.084)	0.257 * (0.105)
Severe Financial Problems	1.306 *** (0.169)	1.363 *** (0.191)	0.597 *** (0.068)	0.603 *** (0.082)
Insurance Claim Denied or Pending		0.397 (0.268)		0.079 (0.116)
Constant	1.609 *** (0.346)	1.080 ** (0.415)	1.707 *** (0.140)	1.708 *** (0.182)

(Continued)

Table 2
(Continued)

R ²	0.25	0.23	0.24	0.23
N	674	509	677	508

p-value $f < .10$, $< .05$ *, $< .01$ **, $< .001$ ***. bs represent unstandardized regression coefficients.

Standard errors are in parentheses.

the model. Although an insurance claim pending or denied was significant for bivariate models (not shown), this variable was not significant when controlling for other variables. Bivariate models (not shown) were also estimated for the small subsample of residents who had applied to the Mississippi Grant Program ($N = 184$). Those who had a grant denied or pending had significantly higher levels of depression. The same pattern held for stress, but the effect was only marginally significant (at the .10 level of confidence).

Conclusions

Hurricane Katrina was the most destructive and costliest storm in recent United States history. The mental health consequences of this “storm of the century” continue as the rebuilding of residential structures proceeds at a slow pace and psychosocial impacts persist nearly 3 years after landfall. Previous empirical evaluations of the mental health impacts of Katrina suggest that women and African Americans were initially the most vulnerable populations and that mental health problems are relatively widespread for these groups (Adeola 2009; Elliott and Pais 2006; Galea et al. 2007; Kessler et al. 2006, 2008). The present research has expanded these previous studies in several ways. First, we focused on residents of the two hardest-hit coastal counties in Mississippi. Previous inquiry has focused primarily on the New Orleans area and information is limited on the mental health impacts of survivors along the devastated Mississippi Gulf Coast. Secondly, we employed more robust and valid measures of personal depression and Katrina-related psychological stress than used in previous studies. Thirdly, we evaluated mental health outcomes 32 months after Katrina’s landfall, providing information on relatively long-term mental health impacts. Finally, we estimated the impacts of a variety of post-storm stressors, including the amount of residential damage, evacuation behavior, FEMA trailer residence, degree of financial distress, and outcomes of insurance and grant program claims.

In terms of social structural vulnerability, our findings reveal that African Americans were characterized by high levels of personal depression and PTSD symptoms. This pattern also was observed for females, replicating the observations in the general disaster literature and extending the relatively short-term research on survivors of Hurricane Katrina (Adeola 2009; Galea et al. 2007). Furthermore, less-educated respondents were characterized by higher levels of depression and married respondents were more depressed than their non-married counterparts. Apparently social structural vulnerability continues to maintain negative mental health impacts almost 3 years after Katrina's landfall. These findings identify an intersection of sociodemographic characteristics and mental health outcomes that should be used to continue intervention programs along the Mississippi Gulf Coast.

Most interesting for understanding the lingering mental health impacts of Katrina were findings regarding residential destruction, family separation, financial distress, and state grant program applications. The total destruction of one's residence resulted in increased levels of personal depression and PTSD symptoms. In addition, our analysis revealed that Katrina survivors along the Mississippi Gulf Coast who were separated from family members and suffered severe financial problems also manifested higher levels of depression and psychological stress. Apparently, Katrina's absolute destruction of residences was associated with the separation of family members and coupled with severe financial problems, these factors have resulted in chronic depression and symptoms of PTSD for survivors (Table 2).

Community and family recovery for Katrina survivors along the Mississippi Gulf Coast was not related to the availability and responses of insurance companies, but was found to be related to state-managed agencies that were designed to provide federally allocated funds for rebuilding homes and businesses. This finding is important because one potential anthropogenic stressor, that is, government responses for financial damage claims, is a secondary stressor for mental health problems. Specifically, having a home repair claim denied or pending approval 3 years after Katrina's landfall significantly increased levels of personal depression. This finding identifies an anthropogenic source of mental health pathology that is embedded in the very process of recovery designed to alleviate personal and family distress (Brunsma and Picou 2009).

In summary, the pattern of chronic mental health impacts that has emerged along the Mississippi Gulf Coast will require continued long-term counseling and intervention programs to mitigate these serious psychosocial impacts. Resources should be provided for the application of innovative and continuing programs that respond to chronic depression and PTSD symptoms (Picou 2009). Without such efforts, the long-term mental health problems that currently characterize Mississippi Gulf Coast residents will invariably result in

more serious consequences, such as chemical and drug dependency, family conflict, and suicide.³ The prospect for social and psychological recovery for survivors of Hurricane Katrina is clearly dependent on the successful application of long-term mental health intervention strategies (Halpern and Tramontin 2007: 280–311). Future research should monitor mental health outcomes and community recovery in order to identify vulnerable populations for more effective interventions.

ENDNOTES

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¹The measures of depression and psychological stress used in the present research are valid and reliable scales that have been traditionally used in the mental health and disaster research literatures. The present scales displayed excellent factor loadings and fit statistics and, when contrasted with simple stress questions used in previous Katrina studies are more appropriate indicators of mental health outcomes. The solicitation of mental health information through telephone interviews does not appear to have significant consequences for validity and reliability. For example, see Kessler et al. (2006, 2008).

²It is common practice to report minimum, maximum, and mean values in descriptive tables. The proportion is the mean of a 1.0 dummy variable and should be interpreted as the proportion of people in the sample who have the characteristic that is coded 1. For example, for the variable female, respondents who were coded 1 are those who reported they are female. In Table 1, 52.5 percent of our respondents are female, and so on for all dummy variables in our data. No new information is provided by reporting the standard deviations for dummy variables. Converting the means of the dummy variables by multiplying by 100 would require an additional table. See Neter, Wasserman, and Whitmore (1993).

³Kutner (2007) reports that in Mississippi mental health crisis counselors had more than one million brief contacts (less than 15 minutes) and approximately 150,000 longer contacts following Katrina. Project Helpline calls showed a 61 percent increase from March 1 to May 31, 2006, compared to the last 3 months of 2005. Combined with our findings, it is apparent that Katrina-related mental health problems have persisted well into 2008 and residents of the Mississippi Gulf Coast are at high risk for the negative behavioral and health outcomes that result from chronic symptoms of PTSD and severe depression. Also see: Weisler, Barbee, and Townsend (2006).

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