The population burden of posttraumatic stress disorder in Mississippi during the first two years after Hurricane Katrina

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Abstract

Hurricane Katrina was, in death toll and economic impact, the most devastating natural disaster to hit the United States in the past 75 years. Extant estimates of psychopathology after this event may underestimate the true population burden of disease. Between February and July 2007, we conducted interviews of 810 persons who were representative of adults living in the 23 southernmost counties of Mississippi before Hurricane Katrina to assess the prevalence of posttraumatic stress disorder (PTSD), its correlates, and course during the first two years after Hurricane Katrina. The prevalence of PTSD after Hurricane Katrina was high (24.3% using symptom and duration criteria; 17.0% using all criteria, including functional impairment) and associated principally with hurricane-related stressful events. Absent effective measures to prevent natural disasters affecting populations, postdisaster interventions that aim to improve manipulable stressors after these events may influence the onset and course of PTSD.

Introduction

Hurricane Katrina made landfall on the Mississippi-Louisiana border on August 29, 2005. Hurricane Katrina was the deadliest hurricane in the US during the last 75 years, with at least 1,604 deaths in its aftermath, and by far the most expensive natural disaster in US history, with costs estimated at $100 billion.[1,2] More than two years after the hurricane substantial parts of New Orleans remained uninhabitable and the population in many other parts of Southern Louisiana and Mississippi was a small fraction of what it was before the hurricane.

The mental health and behavioral consequences of natural disasters in previous studies have ranged from mild to very severe.[3] There is, however, every reason to believe that the effects of Hurricane Katrina would be substantial. Survivors of Hurricane Katrina experienced an extraordinary array of known risk factors for heightened pathology after disasters including threat to life, bereavement, exposure to the dead and dying, and lingering social and community disruption.[4-8] Reports that have been published about the aftermath of Hurricane Katrina thus far all have suggested that the scope of traumatic events experienced by residents of the Gulf Coast after the hurricane was substantial.[9-11]

The existing assessments about the consequences of Hurricane Katrina, while important, have been limited in three important ways. First, most have focused on the assessment of specific risk groups, like evacuees,[12-15] each of which represented a very small proportion of the pre-hurricane residents of the affected areas. Second, the only population-based study that has been published thus far of which we are aware[10,11] primarily drew participants from volunteer list-based samples compiled from agencies concerned with post-hurricane relief and from local random telephone dialing. Third, no extant study has considered the burden of psychopathology in the longer-term, over several years and how the course of this psychopathology changed over time.

It is the purpose of this paper to document posttraumatic stress disorder (PTSD), the sentinel psychopathology associated with traumatic event experiences, after Hurricane Katrina

among a population-based sample of persons who were living in the areas affected by Hurricane Katrina before the hurricane hit and the factors that were associated with PTSD onset and progression after this event.

Methods

Sample

Our sampling frame of interest was adults (18 years or older) who were living in the 23 southernmost counties of Mississippi prior to Hurricane Katrina. The study area was divided into three strata, representing different levels of damage inflicted by Hurricane Katrina (Figure 1).

Due to the severe damage inflicted by Hurricane Katrina in the 6 counties included in strata A and B, substantial efforts were undertaken to account for and identify all housing units that existed prior to the Hurricane. An area probability sampling frame was created through systematic enumeration of all addresses in 32 randomly selected segments (consisting of aggregations of 2000 Census blocks) in each of the two strata by trained listers. A random selection of addresses was then sampled within each segment. Extensive tracking was conducted by trained interviewers to locate persons (wherever they were in the country at the time of the study) who had resided at the selected addresses prior to Hurricane Katrina, including a combination of internet, telephone, archival (including post office and Department of Motor Vehicle records), and in-person research.

Because the counties included in stratum C experienced less severe damage as a result of Hurricane Katrina, a random digit dial sampling frame was used to sample potential respondents in this stratum, which was covered by one telephone area code.

Interviews were conducted using a computer-assisted interview system (32% of interviews in strata A and B were conducted in-person, with the remaining 68% conducted via telephone). A complete enumeration of all adult household members was solicited and the

respondent was randomly selected from all eligible household members. Interviews took place between February 24, 2007 and July 31, 2007 and lasted 37 minutes on average. This study was approved by the Institutional Review Board of the University of Michigan.

Measures

We collected information on sociodemographic characteristics (gender, age, race/ethnicity, educational attainment, household income, and marital status) from each respondent. We also assessed experiences during Hurricane Katrina, including whether the respondent was exposed to any traumatic events during the hurricane (being physically injured, knowing someone who was injured or killed, seeing dead bodies) or experienced financial loss as a result of the hurricane (reporting "a lot" of damage to property or possessions, losing a job, experiencing a decline in household income as a result of the hurricane). Other stressors related to Hurricane Katrina were also assessed, including being displaced from home, losing sentimental possessions like photographs, and experiencing any of six stressors in the six months after the hurricane (e.g., shortage of food or water, difficulty finding sufficient housing). These items were modified from scales that have been used after other natural disasters, including Hurricane Andrew. The number of post-hurricane stressors was calculated (ranging from 0 to 8; Cronbach's alpha = 0.72) and categorized into low (0-2 stressors) and high (3 or more stressors) exposure to post-hurricane stressors.

The Crisis Support Scale[16] was used to measure social support in the two months after Hurricane Katrina; items were summed for a total social support score ranging from 6 to 42 (Cronbach's alpha = 0.77), which was categorized into tertiles.

Information about lifetime traumatic events experienced by respondents was collected using a modified version of Criterion A traumatic events from the Composite International Diagnostic Interview (CIDI).[17] For each event reported, respondents were asked whether the event occurred before or after Hurricane Katrina. The number of traumatic events experienced prior to Hurricane Katrina was categorized into low (0-1), medium (2-3), and high (4 or more),

whereas the number of events experienced after Hurricane Katrina was categorized into low (0-1) and high (2 or more).

Lifetime PTSD was assessed using the Primary Care – PTSD (PC-PTSD) screen,[18] which consists of four items measuring re-experiencing trauma, numbing, avoidance, and hyperarousal associated with an experience “other than Hurricane Katrina”. Responses to the four items were summed and a conservative cut-off score of 4 (indicating positive response to all 4 items) was used in this study to determine presence of lifetime PTSD.

PTSD related to Hurricane Katrina was measured using the PTSD module of the CIDI for DSM-IV;[17] we used Hoge et al.'s convention of presenting both "broad" and "strict" definitions of PTSD in this analysis.[19] Respondents met "broad" criteria for PTSD if they reported one or more re-experiencing symptom (e.g., kept “remembering Katrina even when didn’t want to”), three or more avoidance symptoms (e.g., “avoided places or people or activities that might have reminded you of Katrina”), two or more arousal symptoms (e.g., “trouble sleeping”), and symptoms lasted at least one month.[20] Respondents met "strict" criteria for PTSD if, in addition to the above, they reported that symptoms interfered with their life or activities a lot. Information on recency of symptoms was used to determine whether respondents still met criteria for PTSD in the month prior to the interview.

Analysis

We described the sociodemographic characteristics, hurricane-related experiences, PTSD prevalence (since Hurricane Katrina, past month, and lifetime), and lifetime traumatic event experiences of respondents, overall and within the three sampling strata. We conducted bivariate analyses of the relation between covariates and PTSD since Hurricane Katrina. We fit a logistic regression model predicting PTSD since Hurricane Katrina including all covariates theorized to be related to PTSD. The results were very similar when using the "broad" versus "strict" PTSD criteria; we focus on results using the "broad" criteria. We assessed interactions between severity of exposure to hurricane-related events and stressors and social support after

Hurricane Katrina, as well as lifetime PTSD history. Finally, we created Kaplan-Meier curves demonstrating time from Hurricane Katrina to remission of PTSD symptoms among respondents who met "broad" criteria for PTSD and who reported onset of symptoms within one month of Hurricane Katrina, by variables reflecting severity of exposure to hurricane-related events and stressors. All analyses were conducted using SUDAAN (RTI International, Research Triangle Park, NC) or Stata (Stata Corporation, College Station, TX). Analyses were weighted to account for differential probability of selection within households (incorporating number of eligible household members for all study strata, as well as number of telephone numbers in the household for stratum C), sampling probabilities in the three study strata, and to account for differences with age, race/ethnicity, gender, and educational attainment reported by the 2000 U.S. Census.[21]

Results

The sociodemographic characteristics of the 810 respondents are presented in Table 1, within study strata and overall. Overall, 50.3% of eligible sampled households completed interviews; only 9.4% of contacted households refused to participate; these participation rates are consistent with, and better than, those documented in most population-based studies conducted under comparably difficult conditions.[22] The respondents were representative of the 2000 U.S. Census population in the study area after application of weights. A large proportion of respondents reported Katrina-related traumatic events or financial loss (Table 2); as expected, respondents in strata A and B were more likely to report hurricane-related traumatic events than those in stratum C (40.7% and 31.5%, respectively, versus 19.2% in stratum C). Respondents in strata A and B were also more likely to report a high level of exposure to post-hurricane stressors than those in stratum C (56.9% and 46.0%, respectively, versus 27.0% in stratum C). The overall prevalence of PTSD related to Hurricane Katrina was 24.3% using broad criteria, and 17.0% using strict criteria (Table 3). The prevalence of PTSD was higher in

the study strata closer to the Gulf Coast (broad criteria: 29.1% in stratum A, 27.7% in stratum B, 19.4% in stratum C; strict criteria: 23.4% in stratum A, 21.4% in stratum B, 10.6% in stratum C). 16.2% of respondents met broad criteria for PTSD related to Hurricane Katrina in the month prior to the interview, while 13.0% met strict criteria. The prevalence of lifetime PTSD not related to Hurricane Katrina was 12.7%.

Bivariate associations between covariates of interest and PTSD since Hurricane Katrina (using broad criteria) are presented in Table 4. In a multivariable logistic regression model (Table 4), determinants of PTSD related to Hurricane Katrina were: exposure to hurricane-related traumatic events (OR = 1.81, 95% CI = 1.04-3.16), financial loss as a result of Hurricane Katrina (OR = 2.52, 95% CI = 1.48-4.28), high level of stressors after the hurricane (OR = 2.74, 95% CI = 1.58-4.77), low social support after the hurricane (OR = 2.76, 95% CI 1.43-5.33, compared to high social support), high level of traumatic events after the hurricane (OR = 2.20, 95% CI 1.14-4.27), and a lifetime history of PTSD (OR = 10.81, 95% CI 5.30-22.05).

We found a significant interaction between level of post-hurricane stressors and lifetime PTSD (data not shown), such that post-hurricane stressors were strongly related to PTSD after Hurricane Katrina among those with no history of lifetime PTSD, while they had no effect among those with a prior history of PTSD.

Figure 2 presents Kaplan Meier survival curves of time from Hurricane Katrina (here defined as August 29, 2005, when the hurricane first made landfall in Mississippi) to remission of PTSD symptoms, among the 168 respondents who met broad criteria for PTSD and who reported onset of symptoms within one month of Hurricane Katrina, stratified by exposure to hurricane-related traumatic events, financial loss, post-hurricane stressors, and post-hurricane traumatic events. Respondents with greater exposure to hurricane-related events and stressors demonstrated longer duration of PTSD symptoms, although level of exposure to traumatic events after Hurricane Katrina did not distinguish duration of PTSD symptoms in respondents.

Discussion

The high burden of PTSD in Mississippi documented here is consistent with a large body of evidence that shows substantial psychological impact of disasters and mass trauma, particularly disasters that are accompanied by substantial population exposure to traumatic events and stressors.[3,23] However, most general population studies after natural disasters have reported a prevalence of PTSD that is approximately half the prevalence in this study.[24-27] What is perhaps remarkable in this study is that this high a prevalence of PTSD was documented among a population-representative sample of a very large geographic area. The area sampled is about 13,000 square miles in area and had, before Hurricane Katrina, a population of approximately 655,642 adults. The documented prevalence of PTSD in this study then suggests that about 160,000 adults who were residents of Mississippi before Hurricane Katrina had PTSD at some point in the 2 years after the hurricane. We note that although higher prevalence of PTSD has been reported among specific groups after disasters, this is almost invariably among special groups including clinical samples[28] and among persons in areas that were heavily affected by a natural disaster.[29-31]

Traumatic event and stressor exposure during and after the hurricane was centrally associated with the risk and rate of resolution of PTSD. Interestingly, the hurricane-related events and stressors reported here were not necessarily those that were burned into the national consciousness through repeated broadcasting of television images. For example, only about 8% of respondents reported seeing dead bodies. However, 32% of respondents reported a lot of damage to their property or possessions as a result of the hurricane; the vast majority of the sample (81%) reported at least one other substantial stressor. We note that postdisaster financial stressors, which are neither easily visible, nor in many respects television-worthy, were independently associated with risk of PTSD.

Therefore, the findings documented here reinforce the notion that greater exposure to traumatic events and stressors during and after a disaster are the key determinants of PTSD

risk and resolution after these events. While the event experiences associated with a hurricane hitting land may, to some extent, be unavoidable (barring timely pre-hurricane evacuation), it is reasonable to suggest that a proportion of the stressors incurred after the hurricane had hit, including for example, adversity with housing reconstruction, are avoidable and suggest points for intervention after these events. This is a strong argument for efficient practical and logistical assistance to persons who are in disaster-affected areas. Such assistance may both influence the return of disaster-affected areas to economic viability and productivity, but also have a substantial impact on the burden of psychopathology after such events.

Low social support and prior history of PTSD also were associated with the risk of PTSD in this study. This is consistent with several other postdisaster studies.[32,33] Two central points emerge here that are relevant to our understanding of the consequences of disasters. First, low social support may further exacerbate the contribution of traumatic event exposure during and after disasters to the burden of psychopathology. Second, it is persons who have had a prior history of PTSD who are at overwhelmingly high risk of PTSD after disasters. This is consistent with prior work that has demonstrated the importance of history of psychopathology in influencing future risk[34-36] and may be useful in terms of targeting clinical screening resources. In particular, we found that the relation between post-hurricane stressors and risk of PTSD was modified by the presence or absence of lifetime history of PTSD; post-hurricane stressors were only associated with PTSD among persons with no previous PTSD history. It is plausible that prior experience of PTSD represents a greater vulnerability to subsequent post-hurricane PTSD risk that is high enough to obscure any variability in risk of PTSD associated with differential exposure to postdisaster stressors.

There were few associations documented between sociodemographic variables and the likelihood of PTSD or other mental illness in models that took into account both sociodemographics and exposure to traumatic events and stressors. Although the role of poverty in shaping the aftermath of Hurricane Katrina has received substantial public attention,

this work suggests that in the context of a mass disaster where traumatic events were near ubiquitous, sociodemographic characteristics may play less of a role than in circumstances where there is more heterogeneity of population exposure.

There are three central limitations to the results reported here. First, as with all other population-based surveying, it is possible that there is mismeasurement of the constructs of interest. PTSD was assessed by the CIDI, a structured interview designed for lay interviewers, rather than by clinician-administered diagnostic instruments. The CIDI, however, has been widely used (for example in the National Comorbidity Survey and Replication) and validated.[37-40] Second, because the study occurred between a year and a half and two years after Hurricane Katrina, it is possible that there was imperfect recall about the events that transpired around the Hurricane and that acute cases of PTSD were missed. However, the centrality of this event to the lives of persons in Mississippi somewhat mitigates this concern. Furthermore, the timing of the study allowed us to examine the longer-term consequences of Hurricane Katrina. Third, the small sample size of PTSD cases limited our ability to assess the relation between covariates and duration of PTSD symptoms in multivariable models.

In conclusion, we found that there was a high prevalence of stressors and traumatic events experienced by residents of Mississippi and that these experiences were associated with a substantial burden of PTSD after the hurricane. There was little variability in the risk of PTSD across sociodemographic characteristics, perhaps reflecting the pervasive nature of the traumatic events and stressors experienced during this event that were centrally associated with a high burden of PTSD across sociodemographic groups. Both direct experience of traumatic events during and after the hurricane and hurricane-related financial adversity and other post-hurricane stressors were key determinants of PTSD. Postdisaster management plans that mitigate the stressful practical challenges faced by postdisaster survivors may contribute to a reduction in the burden of mental illness after these events.

Acknowledgements

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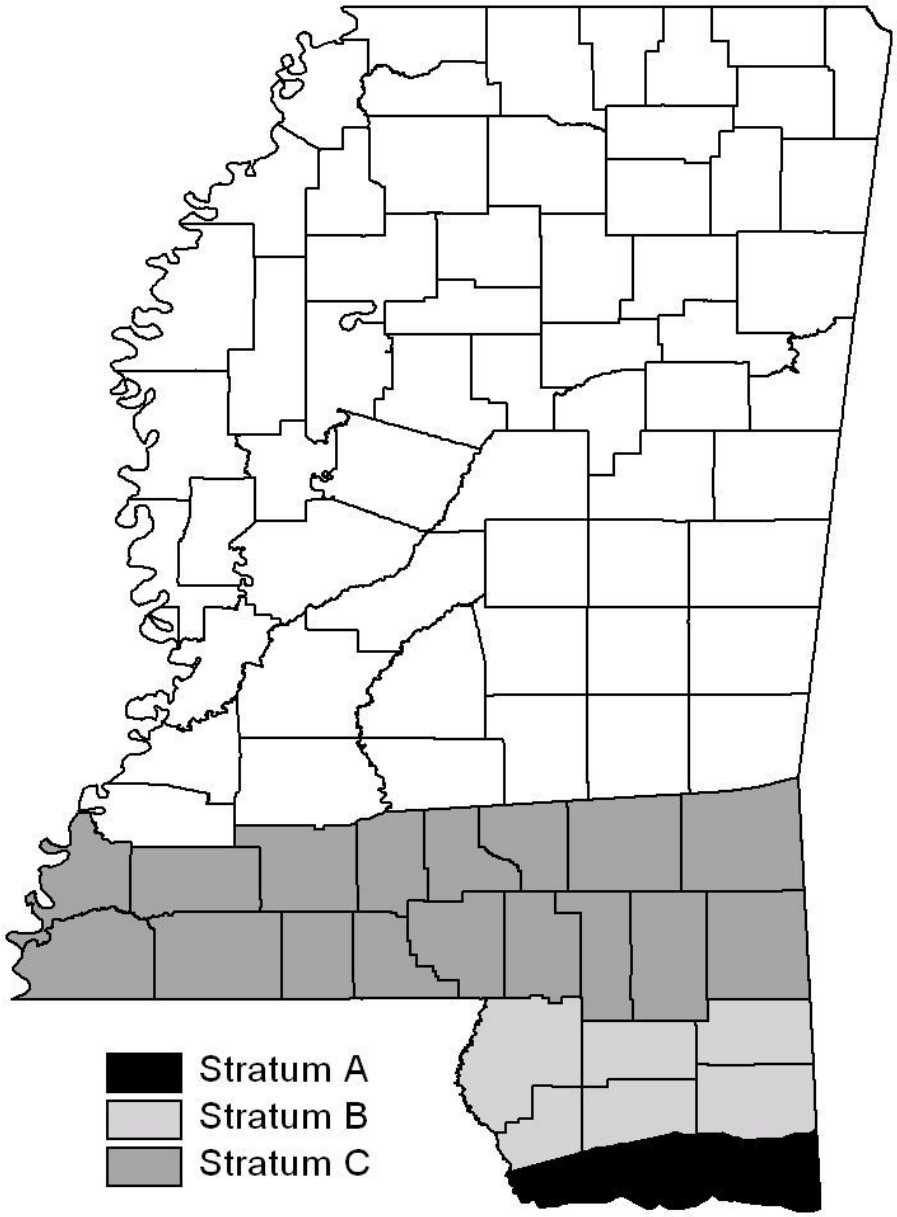
Figure 1. Map of sampling strata used in Mississippi Community Study*



* Stratum A was directly along the Gulf Coast and consisted of the portions of Hancock, Harrison, and Jackson counties south of Interstate-10; stratum B consisted of the portions of Hancock, Harrison, and Jackson counties north of Interstate-10, as well as George, Pearl River, and Stone counties; and stratum C consisted of the 17 counties north of stratum B (Adams, Amite, Covington, Forrest, Franklin, Greene, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Marion, Perry, Pike, Walthall, Wayne, and Wilkinson)

Table 1. Sociodemographic characteristics of respondents, compared with 2000 U.S. Census population[*]

Characteristic	Stratum A[a] N = 272		Stratum B[b] N = 267		Stratum C[c] N = 271		Total N = 810		U.S. Census 2000 N = 655642	
	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]	N	%
Gender										
Male	94	47.1	120	53.7	88	45.0	302	47.8	314869	48.0
Female	178	52.9	147	46.3	183	55.0	508	52.2	340773	52.0
Age										
≥ 65 yrs	73	17.9	52	13.3	81	20.8	206	18.1	109031	16.6
55-64 yrs	57	13.7	60	12.9	61	17.8	178	15.4	80989	12.4
45-54 yrs	53	12.9	55	13.4	51	13.8	159	13.4	115729	17.7
35-44 yrs	52	30.3	43	24.6	42	21.6	137	24.8	136026	20.7
25-34 yrs	25	12.6	36	20.7	22	10.2	83	13.6	118667	18.1
18-24 yrs	12	12.5	21	15.2	14	15.9	47	14.8	95200	14.5
Race/ethnicity										
White non-Hispanic	190	76.2	228	90.2	177	61.6	595	73.1	475413	72.5
Black non-Hispanic	55	19.4	26	8.5	78	35.4	159	24.0	157190	24.0
Hispanic	6	1.8	7	0.7	3	1.1	16	1.2	10010	1.5
Asian/PI non-Hispanic	5	0.7	1	0.1	1	0.1	7	0.2	6484	1.0
Other non-Hispanic	14	1.8	4	0.5	6	0.7	24	1.0	2213	0.3
Mixed race non-Hispanic	2	0.1	1	0.1	4	1.1	7	0.6	4332	0.7
Educational attainment										
Bachelor's degree or higher	82	18.6	50	9.5	71	13.9	203	14.1	92187	14.1
Some college	74	33.1	80	32.9	63	27.0	217	30.2	197572	30.1
High school or equivalent	81	26.0	92	33.5	93	33.3	266	31.3	203879	31.1
< High school	35	22.4	45	24.1	41	25.9	121	24.4	162324	24.7
Household income										
≥ $100,000	17	8.1	16	5.5	25	11.9	58	9.1	18853	5.7
$60,000-$99,999	47	20.5	38	12.1	44	18.2	129	17.3	48826	14.6
$40,000-$59,999	57	17.5	46	23.0	30	11.6	133	16.2	61651	18.5
$20,000-$39,999	73	31.1	82	32.4	60	25.0	215	28.8	97306	29.2
<$20,000	58	23.2	58	27.0	68	33.3	184	28.7	106980	32.1
Marital status										
Married	131	49.1	146	59.4	139	52.6	416	53.4	373266	56.9
Divorced	51	12.5	39	11.3	37	9.1	127	10.6	76511	11.7

Separated	6	1.2	5	1.4	9	4.8	20	2.9	17157	2.6
Widowed	35	7.0	33	6.7	46	8.1	114	7.4	53446	8.1
Never been married	49	30.2	43	21.2	39	25.5	131	25.7	135582	20.7

[*] All data are restricted to the population 18 years and older
[†] Weights account for number of persons (and telephone numbers for stratum C) in the household, probability of household selection within strata, and post-stratification weights to make sample representative of population by age, gender, race/ethnicity, and educational attainment
[a] Stratum A includes Hancock, Harrison, and Jackson counties below Interstate-10
[b] Stratum B includes Hancock, Harrison, and Jackson counties above Interstate-10, and George, Pearl River, and Stone counties
[c] Stratum C includes Adams, Amite, Covington, Forrest, Franklin, Greene, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Marion, Perry, Pike, Walthall, Wayne, and Wilkinson counties

Table 2. Hurricane Katrina experiences reported by respondents, by sampling strata

	Stratum A[a] N = 272		Stratum B[b] N = 267		Stratum C[c] N = 271		Total N = 810	
	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]
Hurricane Katrina event experiences								
Present during hurricane force winds or major flooding	148	54.1	190	71.8	246	93.2	225	76.7
Unsure about the safety or whereabouts of family or friends	178	66.0	181	68.7	165	65.5	524	66.5
Involved in rescue or recovery efforts	77	29.1	77	29.3	56	20.7	210	25.3
Hurricane Katrina-related traumatic events								
Physically injured	24	6.8	10	2.5	9	4.6	43	4.7
Know someone who was injured or killed	93	31.9	69	25.2	37	16.1	199	22.9
Saw dead bodies	26	16.1	20	8.6	5	3.1	51	8.2
Exposure to any hurricane-related traumatic events[d]	114	40.7	84	31.5	45	19.2	243	23.4
Financial loss related to Hurricane Katrina								
A lot of damage to property or possessions	140	52.3	91	33.0	57	19.9	288	32.4
Lost job as a result of Hurricane Katrina	55	24.9	44	22.2	11	7.0	110	16.0
Household income declined as a result of Hurricane Katrina	68	26.1	47	18.2	22	9.8	137	16.5
Any financial loss as a result of Hurricane Katrina[e]	170	66.3	129	49.8	79	29.9	378	45.2
Exposure to stressors after Hurricane Katrina								
Lost sentimental possessions, like photographs	158	59.8	87	35.2	27	14.5	272	32.5
Displaced from home	128	46.6	88	33.4	44	16.9	260	29.6
Number of days displaced from home (Mean, SE)		389.4 (26.5)		163.7 (26.1)		187.0 (93.0)		270.6 (27.0)
Shortage of food or water[f]	77	31.7	78	31.3	95	37.4	250	34.2
Unsanitary conditions[f]	86	31.9	81	33.5	43	16.2	210	25.0
Fear of crime[f]	96	36.6	102	38.3	70	29.6	268	33.8
Difficulty receiving checks from government or insurance agencies[f]	119	40.7	85	32.6	63	21.2	267	29.6
Difficulty finding sufficient housing[f]	77	32.5	37	16.7	24	11.3	138	18.7
Difficulty finding a contractor[f]	96	38.0	81	28.9	69	23.6	246	29.0
Exposure to hurricane-related stressors[g]								
Low (0-2 stressors)	124	43.1	146	54.1	200	73.0	470	59.8
High (3 or more stressors)	148	56.9	121	46.0	71	27.0	340	40.2
Social support received in the 2 months after Hurricane Katrina								
High	114	45.9	100	36.5	102	37.1	316	39.4
Medium	88	28.2	98	36.1	83	32.0	269	32.0
Low	69	26.0	69	27.5	86	30.9	224	28.6

[†] Weights account for number of persons (and telephone numbers for stratum C) in the household, probability of household selection within strata, and post-stratification weights to make sample representative of population by age, gender, race/ethnicity, and educational attainment
[a] Stratum A includes Hancock, Harrison, and Jackson counties below Interstate-10
[b] Stratum B includes Hancock, Harrison, and Jackson counties above Interstate-10, and George, Pearl River, and Stone counties
[c] Stratum C includes Adams, Amite, Covington, Forrest, Franklin, Greene, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Marion, Perry, Pike, Walthall, Wayne, and Wilkinson counties
[d] Exposure to hurricane-related traumatic events includes being physically injured, knowing someone who was injured or killed, and seeing dead bodies during or after Hurricane Katrina
[e] Financial loss includes "a lot" of damage to property or possessions, losing a job, or experiencing decline in household income as a result of Hurricane Katrina
[f] Stressors assessed for the 6 months after Hurricane Katrina; "yes" responses include those who reported experiencing "some" or "a lot" of stress associated with the item
[g] Sum of eight hurricane-related stressors
[h] Social support score was created by summing responses indicating the frequency (ranging from "never" to "always") of six items ("someone willing to listen to you when you need to talk", "contact with people who were in a similar situation", "able to talk about your thoughts and feelings with others", "sympathy and support from others", "practical help from others", "let down by others"; the last item was reverse coded)

Table 3. PTSD since Hurricane Katrina and in the past month, lifetime PTSD and traumatic event experiences, by sampling strata

	Stratum A[a] N = 272		Stratum B[b] N = 268		Stratum C[c] N = 271		Total N = 810	
	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]	N	Weighted %[†]
PTSD since Hurricane Katrina								
Broad definition[d]	75	29.1	72	27.7	37	19.4	184	24.3
Strict definition[e]	60	23.4	54	21.4	22	10.6	136	17.0
PTSD in past month								
Broad definition[d]	52	22.6	40	14.9	22	13.0	114	16.2
Strict definition[e]	45	20.3	33	12.7	15	8.8	93	13.0
Lifetime PTSD[f]	30	11.6	30	13.5	28	13.0	88	12.7
Exposure to traumatic events prior to Hurricane Katrina[g]								
Low (0-1 traumatic events)	53	24.8	49	22.0	70	25.8	172	24.6
Medium (2-3 traumatic events)	83	27.2	92	33.0	100	40.4	275	34.8
High (4 or more traumatic events)	136	48.0	126	45.0	101	33.8	363	40.6
Exposure to traumatic events after Hurricane Katrina[g]								
Low (0-1 traumatic events)	239	82.9	224	82.8	237	81.8	700	82.4
High (2 or more traumatic events)	33	17.2	43	17.2	34	18.2	110	17.7

[†] Weights account for number of persons (and telephone numbers for stratum C) in the household, probability of household selection within strata, and post-stratification weights to make sample representative of population by age, gender, race/ethnicity, and educational attainment

[a] Stratum A includes Hancock, Harrison, and Jackson counties below Interstate-10

[b] Stratum B includes Hancock, Harrison, and Jackson counties above Interstate-10, and George, Pearl River, and Stone counties

[c] Stratum C includes Adams, Amite, Covington, Forrest, Franklin, Greene, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Marion, Perry, Pike, Walthall, Wayne, and Wilkinson counties

[d] At least one re-experiencing symptom, at least three avoidance symptoms, and at least two arousal symptoms, and symptoms lasting at least one month

[e] Respondents additionally reported that symptoms interfered a lot with life or activities

[f] Primary Care-PTSD (PC-PTSD) screen total score of 4 indicates lifetime PTSD

[g] Traumatic events assessed were: natural disaster other than Hurricane Katrina, serious accident, physical assault with or without a weapon, unwanted sexual contact, physical abuse or serious neglect as a child (for time prior to Hurricane Katrina only), military combat, diagnosis with a life-threatening illness, unexpected death of someone close, traumatic experience of someone close, and any other extraordinarily stressful event

Table 4. Bivariate associations between covariates and PTSD since Hurricane Katrina, and adjusted model predicting PTSD since Hurricane Katrina

	PTSD (Broad definition)[a]			Adjusted model		
	N PTSD	% PTSD	p-value	OR	95% CI	Wald p-value
Total	184	24.3				
Gender						
Male	62	22.7	0.57	1.00	-	0.57
Female	122	25.6		1.17	0.69-1.98	
Age						
≥ 55 yrs	77	17.2	0.03	1.00	-	0.38
35-54 yrs	79	25.5		0.83	0.46-1.52	
18-34 yrs	28	31.0		1.37	0.66-2.86	
Race/ethnicity						
White non-Hispanic	122	21.4	0.18	1.00	-	0.79
Black non-Hispanic	46	32.9		1.21	0.65-2.26	
Hispanic	4	44.1		2.39	0.16-36.04	
Other non-Hispanic	12	17.6		1.39	0.50-3.85	
Educational attainment						
≥ High school or equivalent	145	20.4	0.01	1.00	-	0.37
< High school	39	36.9		1.38	0.68-2.80	
Household income						
≥ $100,000	15	25.3	<0.001	1.00	-	0.20
$60,000-$99,999	19	16.6		0.53	0.18-1.54	
$40,000-$59,999	29	19.4		0.43	0.15-1.29	
$20,000-$39,999	45	23.3		0.74	0.28-1.99	
<$20,000	62	39.8		1.04	0.36-3.01	
Missing	14	8.1		0.39	0.12-1.32	
Marital status						
Married	87	20.9	0.32	1.00	-	0.53
Divorced/Separated/Widowed	61	25.9		0.69	0.35-1.35	
Never been married	36	30.0		0.92	0.42-1.99	
Exposure to Hurricane-Katrina related traumatic events[b]						

No	98	18.9	0.001	1.00	-	0.04
Yes	86	37.8		1.81	1.04-3.16	
Financial loss as a result of Hurricane Katrina[c]						
No	59	15.8	<0.001	1.00	-	0.001
Yes	125	34.6		2.52	1.48-4.28	
Exposure to stressors after Hurricane Katrina[d]						
Low (0-2 stressors)	57	13.1	<0.001	1.00	-	<0.001
High (3 or more stressors)	127	40.8		2.74	1.58-4.77	
Social support received in the 2 months after Hurricane Katrina[e]						
High	46	14.5	<0.001	1.00	-	0.009
Medium	62	23.7		1.59	0.82-3.06	
Low	76	38.4		2.76	1.43-5.33	
Exposure to traumatic events prior to Hurricane Katrina[f]						
Low (0-1 traumatic events)	29	16.7	0.03	1.00	-	0.76
Medium (2-3 traumatic events)	50	20.9		1.30	0.60-2.81	
High (4 or more traumatic events)	105	31.7		1.07	0.53-2.16	
Exposure to traumatic events after Hurricane Katrina[f]						
Low (0-1 traumatic events)	142	18.2	<0.001	1.00	-	0.02
High (2 or more traumatic events)	42	52.7		2.20	1.14-4.27	
Lifetime PTSD[g]						
No	130	17.4	<0.001	1.00	-	<0.001
Yes	54	71.4		10.81	5.30-22.05	

[a] At least one re-experiencing symptom, at least three avoidance symptoms, and at least two arousal symptoms, and symptoms lasting at least one month

[b] Exposure to hurricane-related traumatic events includes being physically injured, knowing someone who was injured or killed, and seeing dead bodies during or after Hurricane Katrina

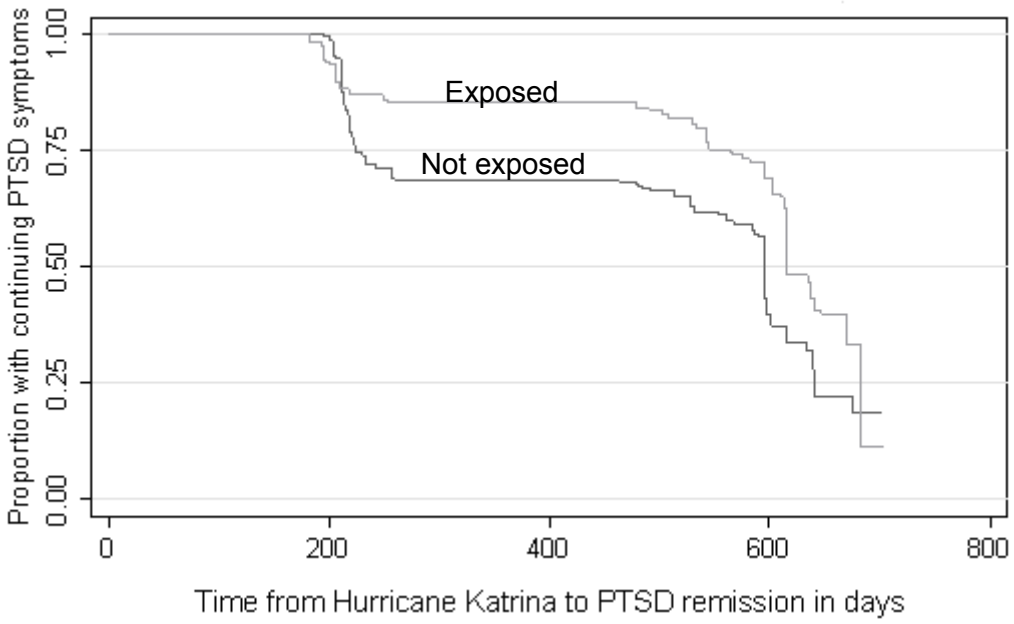
[c] Financial loss includes "a lot" of damage to property or possessions, losing a job, or experiencing decline in household income as a result of Hurricane Katrina

[d] Sum of eight hurricane-related stressors (displaced from home, loss of sentimental possessions, and experiencing "some" or "a lot" of stress from shortage of food or water, unsanitary conditions, fear of crime, difficulty receiving checks from government of insurance agencies, difficulty finding sufficient housing, and difficulty finding a contractor)

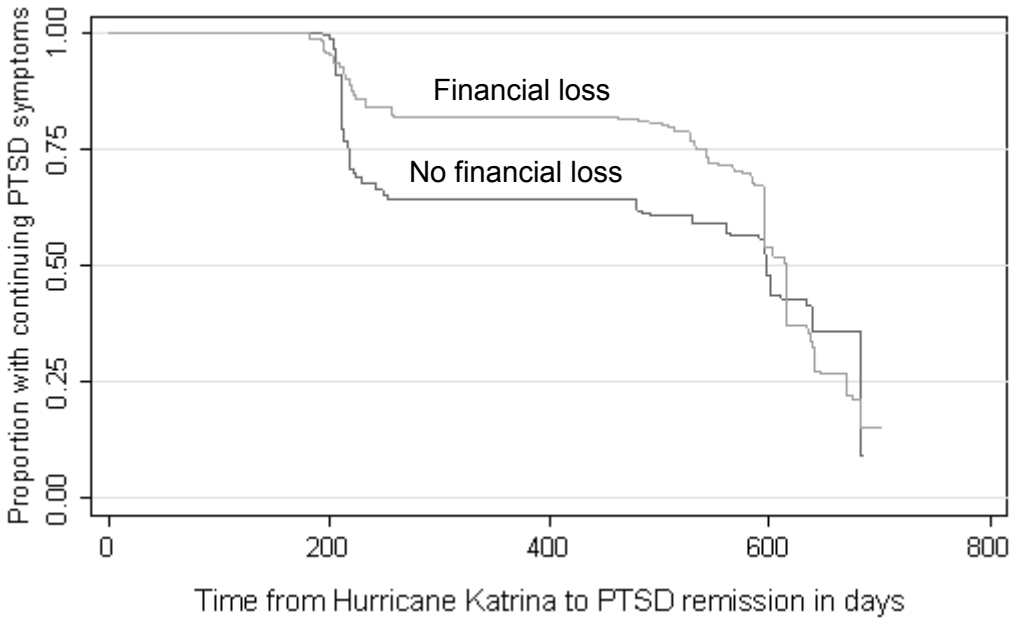
[e] Social support score was created by summing responses indicating the frequency (ranging from "never" to "always") of six items ("someone willing to listen to you when you need to talk", "contact with people who were in a similar situation", "able to talk about your thoughts and feelings with others", "sympathy and support from others", "practical help from others", "let down by others"; the last item was reverse coded)
[f] Traumatic events included natural disaster other than Hurricane Katrina, serious accident, assault with or without a weapon, unwanted sexual contact, physical abuse or serious neglect as a child, military combat, diagnosis with a life-threatening illness, witnessing someone seriously injured or killed, unexpected death of someone close, traumatic experience of someone close, any other extraordinarily stressful situation or event
[g] Primary Care-PTSD (PC-PTSD) screen total score of 4 indicates lifetime PTSD

Figure 2. Kaplan-Meier survival curves showing time from Hurricane Katrina to PTSD remission, among respondents meeting criteria for PTSD who reported onset of symptoms within one month of Hurricane Katrina (N = 168), by exposure to events and stressors during and after Hurricane Katrina*

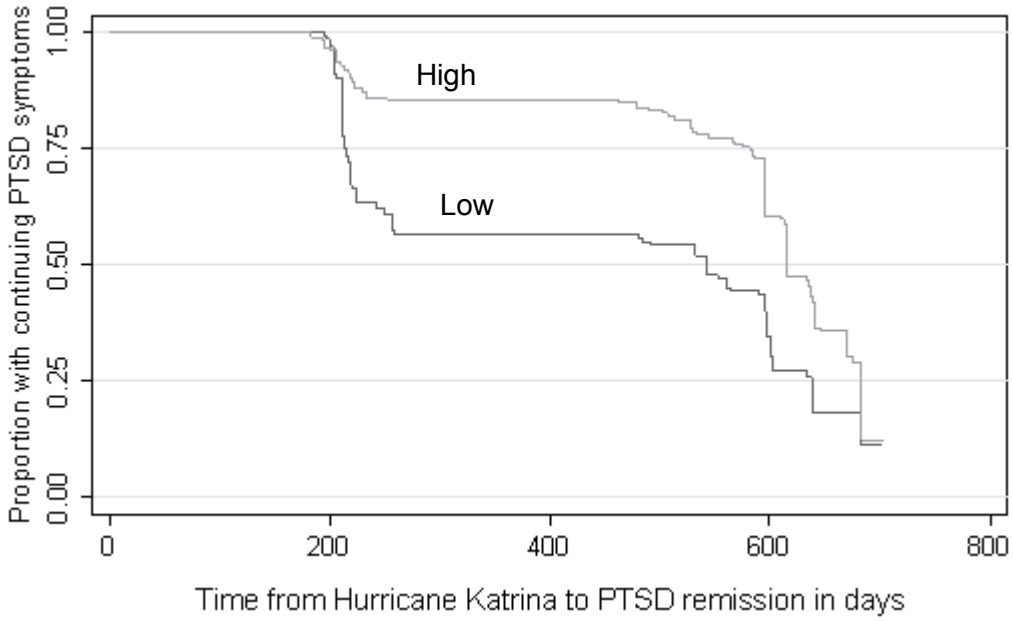
Exposure to Hurricane-related traumatic events



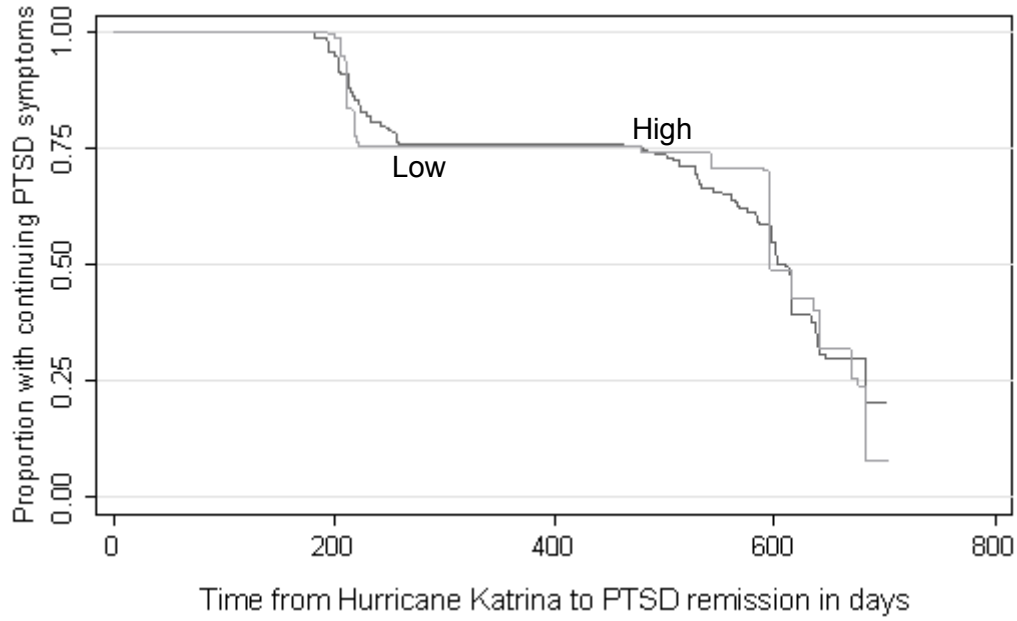
Financial loss as a result of Hurricane Katrina



Exposure to stressors after Hurricane Katrina



Exposure to traumatic events after Hurricane Katrina



* The group experiencing "high" exposure to hurricane-related stressors is comprised of those who reported 3 or more stressors, whereas the "low" exposure group is comprised of those who reported 0-2 stressors; the group experiencing "high" exposure to post-hurricane traumatic events includes those who reported 2 or more traumatic events in the time between Hurricane Katrina and the interview, whereas those with "low" exposure reported 0 or 1 post-hurricane traumatic event