Social and Mental Health Needs Assessment of Katrina Evacuees

Ann L. Coker, PhD, Jeanne S. Hanks, MSW, Katherine S. Eggleston, MSPH, Jan Risser, PhD, P. Grace Tee, MS, Karen J. Chronister, MSPH, Catherine L. Troisi, PhD, Raouf Arafat, MPH, MD, and Luisa Franzini, PhD

Hurricane Katrina made landfall along the Gulf Coast as a Category 3 storm on August 29, 2005. Many residents were evacuated to neighboring cities owing to massive destruction. Working with the City of Houston Health Department, researchers conducted a medical and psychological needs assessment of 124 Hurricane Katrina evacuees in Houston shelters from September 4–12, 2005. Among those willing to talk about their experiences, 41% were afraid they would die, 16% saw someone close to them injured or die, 17% saw violence, and 6% directly experienced physical violence. When using a version of the Impact of Stress Experiences scale, the majority of evacuees scored as experiencing moderate (38.6%) to severe (23.9%) post-traumatic stress disorder (PTSD) symptoms. These data suggest that in addition to challenges in finding loved ones, housing, and jobs, many Katrina survivors have experienced significant psychological trauma that may lead to future PTSD.

Hurricane Katrina was the first Category 5 hurricane of the 2005 Atlantic hurricane season. The storm weakened in intensity, but nearly doubled in size before making landfall as a large Category 3 storm on August 29 along the Central Gulf Coast near Buras-Triumph, Louisiana. Because of the breech of several levees and floodwalls, about 80% of the city of New Orleans flooded within hours after landfall, with reported depths as great as 20 feet.[1] Although more than 1 million people were under an evacuation order,[1] it is unclear how many people were evacuated to various cities nationwide. The National Hurricane Center called the scope of human suffering inflicted by Hurricane Katrina in the United States "greater than that of any hurricane to strike this country in several generations."[1]

In the 3-week period following Hurricane Katrina (August 29, 2005), Houston, Texas was host to more than 200,000 survivors. The majority were evacuees temporarily housed in the George R. Brown (GRB) Convention Center managed by the City of Houston or the Astrodome Complex managed by Harris County. Hurricane survivors began to arrive at the convention center on Friday, September 2, 2005 and the shelters

Ann L. Coker is Associate Professor of Epidemiology, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Jeanne S. Hanks is Doctoral Student, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Katherine S. Eggleston is Research Coordinator, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Jan Risser is Assistant Professor of Epidemiology, School of Public Health, University of Texas Health Science Center, Houston, Texas.

P. Grace Tee is Doctoral Candidate, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Karen J. Chronister is Doctoral Candidate, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Catherine L. Troisi is Assistant Director, Disease Prevention and Control, Office of Surveillance and Public Health Preparedness, Houston Department of Health and Human Services, Houston, Texas.

Raouf Arafat is Chief of the Bureau of Epidemiology, Office of Surveillance and Public Health Preparedness, Houston Department of Health and Human Services, Houston, Texas.

Luisa Franzini is Management, Policy and Community Health Associate Professor, School of Public Health, University of Texas Health Science Center, Houston, Texas.

Reprint requests: Ann L. Coker, University of Texas School of Public Health, Discipline of Epidemiology, Houston, TX 77030. E-mail: Ann.L.Coker@uth.tmc.edu

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closed September 23, 2005 in preparation for Hurricane Rita. Owing to the vast area of destruction and dislocation of thousands of people, the experiences of Hurricane Katrina evacuees from New Orleans are unique relative to those who experienced other natural disasters, including hurricanes.

Post-traumatic stress disorder (PTSD) is among the most common psychological disorder that occurs after traumatic events and disasters.[2] Correlates of PTSD include age, socioeconomic status, race/ethnicity, female gender, and co-morbid psychiatric conditions.[3] The majority of people who were evacuated to Houston as a result of hurricane Katrina were low-income and minority populations who are known to be at increased risk of psychological consequences of disasters.[3-5] Evacuees experienced not only the hurricane and subsequent flooding but in some cases threat or actual physical harm from other evacuees or authorities. Social disintegration due to lack of local, state, and federal emergency planning and relief efforts left many evacuees stranded. Anthony Eng, chair of the American Psychiatric Association's committee on Psychiatric Dimension of Disasters, noted that the public disorder after the slow emergency response could increase the mental health strain on some individuals.[6]

The conditions resulting from Hurricane Katrina combined with limited resources among the low-income minority populations may cause some individuals to be at extremely high risk for PTSD, as well as other mental and physical health disorders. Furthermore, these individuals may have greater difficulty returning to their usual quality of life after this major natural disaster. The purpose of this report is to summarize a medical, social, and psychological needs assessment of Katrina evacuees staying in large shelters in Houston, Texas immediately after being evacuated and to qualitatively describe their experiences during and after the hurricane as they began to put their lives together again.

Methods

Colleagues from the City of Houston Department of Health and Human Services, Harris County Health Department and the University of Texas (UT) Health Science Center School of Public Health worked together to assess the needs of guests who evacuated from New Orleans after Hurricane Katrina. A brief survey was developed to assess the medical, social, and psychological needs of guests, including an reduced (8 items) version of the Impact of Event scale (15 items) used to assess PTSD.[7] Items 1-3, 5, 6, 8, 13 and 15 of this scale were retained; the Cronbach's alpha of 0.80 indicated good internal consistency. We eliminated questions regarding sleep disturbance given the nature of their current housing (item 4); other items (7, 9-12 and 14) were also excluded owing to the presence of similar items in the revised scale. A shorter instrument was preferred in the busy and stressful setting.

The survey was also used to encourage those willing to talk about their experiences during and after Hurricane Katrina. Trained volunteers working with the City and County Health Departments conducted interviews with evacuees at the George R. Brown Convention Center and the Astrodome Complex. Interviewers explained that this information was to be used by the health department to assist in meeting the needs of evacuees. Individuals were informed that they could refuse to answer any or all questions. Those included were a convenience sample of guests remaining near their cot space or in common areas between the hours of 10:00 AM and 9:00 PM during the study period. The majority of interviews were conducted during the two weekends following Hurricane Katrina. The University of Texas Health Science Center Institutional Review Board (IRB) approved the study protocol in which the Houston Health Department provided UT investigators access to de-identified questionnaires for analysis. Additionally, IRB approval was granted for follow-up interviews with consenting subjects to determine how needs may change over time.

Findings were analyzed using Intercooled Stata version 8.0. Descriptive statistics such as means, standard deviations (STD), and percentages were used to characterize the population of evacuees surveyed. Odds ratios and 95% confidence intervals (CI) were used to measure associations between hurricane-related experiences and current moderate to severe PTSD symptom scores. Finally, correlation coefficients and associated P values were calculated using linear regression to determine whether PTSD symptoms scores (dependent variable) were associated with demographic attributes of the evacuees or hurricane experiences (independent variables).

Results

The research team conducted 124 interviews with evacuees at the George R. Brown Convention Center and the Astrodome Complex between September 4, 2005 and September 12, 2005. The age range of the 124 guests who were interviewed was 18-92 years, with a median age of 46.4 (STD = 15.1 years). Table 1 provides the self-reported demographics of those interviewed. The overwhelming majority of those interviewed were African-American (88.4%) and two thirds were women (Table 1). Most guests had not evacuated prior to Katrina (84.9%) because of lack of transportation and arrived in Houston either by bus (71.7%) or cars of family or friends (25.8%) (Table 1). Evacuees arrived in Houston in waves; among the first to arrive were those without means to leave New Orleans prior to the hurricane who were housed at the

Table 1. Demographics of Katrina Evacuees Population Survey in Houston, Texas, 2006

	Number	Percentage
Respondent's gender		
Male	40	32.3
Female	84	67.7
Respondent's race/ethnicity		
African American	107	88.4
White	6	5.0
Hispanic	8	6.6
Missing	3	—
Respondent's current marital status		
Married/living together	27	23.1
Single	64	54.7
Divorced/separated	15	12.8
Widowed	11	9.4
Missing	7	—
How did respondent get to Houston?		
Bus	86	71.7
Car (family/friend)	31	25.8
Hitch hiked	3	2.5
Missing	4	—
Where was respondent before coming to Houston?		
Conference center/Superdome	23	19.3
Home	74	62.2
Left New Orleans before Katrina	18	15.1
Other location	4	3.4
Missing	5	—
Respondent's employment status prior to Katrina.		
Employed	74	64.9
Unemployed	10	8.8
Disabled	18	15.8
Retired	12	10.5
Missing	10	—
Did respondent report any chronic disease(s)?		
No	57	47.1
Yes	64	52.9
Missing	3	—
Type of chronic disease among those reporting a chronic disease or condition.*		
Hypertension	40	31.5
Diabetes	20	15.7
Asthma	14	11.0
CVD (stroke, heart condition, congestive heart failure)	13	10.2
Mental illness (anxiety, depression, schizophrenia, other stress disorders)	9	7.1
Arthritis	9	7.1
Respiratory condition	6	4.7
Muscular skeletal disorders	6	4.7
GI disorders (ulcers, GERD, reflux)	4	3.1
Thyroid condition	3	2.4
Kidney disease	2	1.6
Blindness	1	0.8
Total number of chronic diseases reported	127	—

*Subject may report more than one chronic disease.

Superdome or New Orleans Convention Center. In the subsequent weeks, those who were able to evacuate before the hurricane (usually by private car of family or friends) or who had run out of resources to stay in hotels began seeking shelter in the GRB. Before the Hurricane, many evacuees were housed in the New Orleans Superdome (19.3%), yet more remained in their homes (62.2%) and were subsequently rescued (Table 1).

Many guests had difficulty evacuating in buses from New Orleans because they preferred to stay with their family or community group. One evacuee noted "we all wanted to get on the bus with our group; we didn't want to be separated. Some of the difficulties getting folks on the buses was because they didn't keep the groups together." The average group size of those interviewed was 6.5 (STD = 6.6) with a range of 1-30. The average number of children in these groups was 2.5 (STD = 3.1). Almost half of those interviewed had a cellular phone or a family member with a cellular phone; however, many phones were temporarily disabled.

Prior to the hurricane, the majority were employed (65%), while 10.5% were retired and 15.8% were disabled (Table 1). A large percentage of those who remained in New Orleans during Katrina and were evacuated to Houston had a chronic disease (53%); hypertension was reported by 26.2%, followed by diabetes (13.8%), asthma (9.7%), and arthritis (5.5%) (Table 1).

Many survivors experienced not only the trauma of the natural disaster but also loss of family members and human violence after the hurricane as well. Over the 2-week period, the proportion reporting a missing family member was 32.5% (n = 117). Among those willing to talk about their experiences during or after the hurricane, 11% (n = 120) were injured during or after the hurricane, 41% (n = 113) were afraid they would die, 16% (n = 114) saw someone close to them injured or die, 17% saw violence directed toward another, and 6% directly experienced physical violence. One interviewee reported "police and national guard were no help. They held their guns on people like they were criminals." Another described conditions at the Superdome as being "worse than a jail." Many evacuees were stranded in their homes (62.2%) (Table 1) and were forced to wade through water, some guiding floating mattresses filled with infants and young children. Several reported seeing "bodies floating" as they waded through water in search of safety. After the hurricane, survivors also reported making their way to roads and bridges along evacuation routes but were unable to get onto buses leaving New Orleans.

Although symptoms of PTSD typically occur within weeks of a traumatic event[8] (here Katrina and its aftermath), the team explored PTSD symptoms among those willing to discuss their experiences (71% of the 124 interviewed). We used a reduced version of the Impact of Event scale[6] to assess symptoms of PTSD; scores ranged from 0 to 38, with moderate PTSD defined as a score between 13 and 23 and severe PTSD defined as scores 24 and greater. We found that the majority of guests scored as experiencing moderate (38.6%) to severe (23.9%) PTSD symptoms (n = 88). To illustrate

Table 2. Correlation between Hurricane Katrina experiences, demographic attributes, and PTSD symptom scores among 88 people willing to complete the impact of stress experiences scale

Hurricane Katrina Experience	Number in Strata	PTSD Symptom Score Mean ± STD	Correlation Coefficient (*P* Value)
Was any member of the respondent's family or group missing?			
No	59	14.9 (10.1)	Referent group
Yes	27	19.3 (9.7)	4.4 (0.06)
Missing	2	—	—
Was respondent injured?			
No	76	16.4 (10.1)	Referent group
Yes	10	16.6 (11.4)	0.2 (0.9)
Missing	2	—	—
Was respondent on any "mental health" medication before Katrina?			
No	63	14.6 (9.2)	Referent group
Yes	23	19.7 (11.9)	5.1 (0.04)*
Missing	2	—	—
Was respondent afraid she or he would die during or after Katrina?			
No	49	13.8 (9.3)	Referent group
Yes	34	19.0 (10.4)	5.2 (0.02)*
Missing	5	—	—
Was someone close to the respondent injured or die during or after Katrina?			
No	73	15.5 (10.0)	Referent group
Yes	12	19.0 (9.2)	3.5 (0.3)
Missing	3	—	—
Did the respondent experience violence directed toward him or her during or after Katrina?			
No	80	16.0 (10.1)	Referent group
Yes	5	19.6 (12.5)	3.6 (0.5)
Missing	3	—	—
Did the respondent witness violence towards others during or after Katrina?			
No	70	15.3 (9.7)	Referent group
Yes	15	21.3 (11.4)	6.0 (0.04)*
Missing	3	—	—
How hopeful is the respondent about the future?			
Very hopeful	61	15.5 (10.0)	Referent group
Somewhat hopeful	18	20.7 (9.1)	5.2 (0.05)*
Not hopeful	3	22.0 (7.2)	6.5 (0.3)
Missing	6	—	—
How did the respondent get to Houston?			
Bus	63	15.8 (10.0)	Referent group
Car	23	17.0 (10.4)	1.2 (0.6)
Hitch Hiked	2	20.0 (21.3)	4.2 (0.6)
Missing	4	—	—
Respondent's gender			
Male	27	15.6 (9.8)	Referent group
Female	61	16.4 (10.4)	0.8 (0.7)
Respondent's race/ethnicity			
White	5	9.0 (10.2)	Referent group
African American	77	16.6 (16.4)	7.6 (0.1)
Hispanic	5	16.2 (6.1)	7.2 (0.3)
Missing	1	—	—
Respondent's current marital status			
Married/living together	20	12.8 (9.4)	Referent group
Single	47	16.8 (10.3)	4.0 (0.1)
Divorced/separated	10	17.6 (8.5)	4.8 (0.2)
Widowed	9	19.4 (12.7)	6.6 (0.1)
Missing	2	—	—
Did respondent report any chronic disease(s)?			
No	38	16.2 (11.7)	Referent group
Yes	48	16.4 (8.9)	0.2 (0.9)
Missing	2	—	—

*Statistically significant.

symptoms voiced by evacuees, one interviewee reported "feeling very overwhelmed, not sleeping, and frequently replaying the hurricane in her head."

Table 2 reports correlations between Katrina experiences, demographic attributes, and PTSD symptom scores among 88 people willing to complete the

Impact of Event scale (IES). General linear modeling was used to look at the association between each variable in Table 2 (as dichotomous variables or ordinal variables). The IES score was used as a measure of PTSD symptoms, the dependent variable. Correlation coefficients and *P* values were presented as an indicators of the strength and direction of the associations. The referent group is noted in Table 2 and indicates the comparisons made in estimating PTSD symptoms scores. For example, when comparing PTSD symptoms scores for those reporting that a member of the respondent's family was missing (yes; PTSD mean = 19.3) compared with those reporting that a family member was not missing as the referent group (no; PTSD mean = 14.9), the *P* value for the correlation coefficient of .06 indicates that the difference in mean scores approaches statistical significance, which is typically set at .05 or less.

Those who were afraid they would die or saw others who were injured, sick, or dying were more than twice as likely to report moderate to severe PTSD symptoms (odds ratio [OR] = 2.4; 95% CI = 1. 0-6.2; *P* = .05). One evacuee noted they would "rather not try to find out where [my relatives are] because if they are gone I don't want to know now." PTSD symptom scores did not vary by gender (*P* = .7) or the presense of a chronic disease (*P* = .9). Higher PTSD symptoms scores were noted for those who thought they would die (*P* = .02), witnessed violence (*P* = .04), reported that a family member or friend was missing (0.06), or reported using mental health medicine in the past (*P* = .04) (Table 2). Being very hopeful about the future was significantly correlated with lower PTSD symptom scores (*P* = .05); those who were very hopeful were 79% less likely to have moderate to severe symptoms (*P* = .02) even when controlling for life threatening experiences (Table 2).

When asked about what helped them stay calm during their hurricane experience, 29% responded that their belief in God and use of prayer helped (n = 111). Others (23%) indicated that their family members and children helped them remain calm. When asked what made them feel welcomed in Houston, the majority (81%) reported that the people and particularly volunteers were important in welcoming them (n = 105). One evacuee stated "all the volunteers helped me more than any money they could have given me." Another noted "people who I did not even know were concerned about me."

Table 3 addresses the future plans and needs for Katrina evacuees in Houston. Many were planning on moving to Houston (42.1%), while others were unsure how long they would stay in the city (36.4%). The majority of those who wished to stay in Houston were also interested in finding a job (46.5%), and just as many needed assistance in locating this employment. The primary issues Katrina survivors felt they needed to address were finding housing (52.7%), finding a job (8.9%), finding missing family members (5.4%), getting clothing or food (4.5%), and transportation (6.3%). One evacuee noted feeling "frustrated by the system" and "lost in the system."

Table 3. Future plans and needs for Katrina Evacuees in Houston (n = 124)

Future Plans	Number	Percentage
Does respondent plan to stay in Houston?		
No	26	21.5
Yes	51	42.1
Unsure	44	36.4
Missing	3	—
Does respondent plan to work in Houston?		
No	32	32.3
Yes	46	46.5
Unsure	21	21.2
Missing	25	—
Does respondent need help finding a job?		
No	40	42.1
Yes	46	48.4
Unsure	9	9.5
Missing	29	—
With what areas does respondent need help?		
Housing	59	52.7
Money	10	8.9
Transportation	7	6.2
Finding Family	6	5.4
Clothes/Food	5	4.5
Other	19	16.9
None	6	5.4
Missing	12	—
How hopeful is the respondent about the future?		
Very hopeful	74	72.5
Somewhat hopeful	25	24.5
Not hopeful	3	3.0
Missing	22	—

Despite those experiences during and after the hurricane, Katrina survivors were in general hopeful about their future; 72.5% were very hopeful and 24. 5% were somewhat hopeful. One evacuee hoped "to go home and have Mardi gras in 2006." Only three guests responded that they were not hopeful about their future.

While the majority of evacuees interviewed were willing to be re-contacted for a follow-up interview (65%), follow back proved difficult owing to the transient nature of a population displaced from their homes by a natural disaster. Six weeks after the disaster, the study team attempted to re-contact all those who were willing and who had a telephone number (n = 50). The initial interviews took place in shelters in early September, but by mid October many individuals were unreachable (n = 15) or had given phone numbers that were no longer valid (n = 14). Among 21 evacuees who were re-contacted, 15 (60%) consented to a follow-up interview; two thirds were women.

Thirteen of the 15 re-contacted guests had PTSD symptom assessment at both time periods. Five of 13

(38.5%) had moderate to severe PTSD scores at baseline and re-contact. Among 8 evacuees without PTSD symptoms at baseline, 3 (37.5%) had symptoms at re-contact indicating moderate to severe PTSD. The incidence and persistence of PTSD symptoms among this selective group of survivors reveals a need for continued services. Future studies to assess the ongoing needs of those affected by disasters should attempt to gather additional contact information for relatives or friends residing in another demographic area.

Discussion

The findings presented here suggest that in addition to challenges in finding loved ones, housing, jobs, and reestablishing themselves, many Katrina survivors may also be dealing with significant psychological trauma that may lead to future PTSD. Feelings of anger, abandonment, and mistreatment by government authorities were common themes arising from questions about how survivors were feeling. Our finding of PTSD symptoms among 36.8% of those interviewed is slightly lower than the rate reported by the Centers for Disease Control and Prevention of 49.8% among Parish residents.[9] However, this increase would be expected since the CDC assessment took place almost 2 months after the hurricane when residents began returning to the area, seeing first hand the destruction of their homes and city.

The stability of an individual's physical and mental health may become more vulnerable when that person is displaced from their community and social networks.[2] Over 1 million people were displaced in the evacuations of Hurricane Katrina and her aftermath. Those trapped in affected areas were forced to live in unsanitary conditions without food or water for several days. People with chronic diseases, many of whom were suffering from advanced stages of their disease, were no longer able to adhere to recommended treatment. The mental stress due to the lack of access to clean water, food, and sanitary conditions let alone the loss of loved ones and worldly possessions in the midst of a damaged and rioting city is likely to impact people for many years to come. After flooding in Mexico in 1999, PTSD rates persisted in areas of mass casualties and displacement for over 2 years.[10]

The negative impact of disasters is most strongly experienced by disadvantaged populations.[4,7] However, this impact is heightened when a natural disaster directly strikes an area with significant concentrations of underprivileged people such as the city of New Orleans. An estimated 25—30% of individuals living in areas hard hit by Katrina may develop clinically significant mental health needs.[11] Although many will focus on the physical health and financial distress of those displaced by Katrina, the assessment and treatment for resulting mental health disorders is crucial to the recovery process.

One of the primary objectives of the baseline survey was to identify needs of evacuees over time. When asked what evacuees' biggest issue or problem was, respondents generally listed housing during baseline examination. However, in subsequent follow-up interviews, problems shifted from housing to employment, healthcare, and figuring what will become of their homes left behind in New Orleans. For those with chronic diseases, the immediate medications needs were readily addressed. We do not know to what extent changes in health care providers and access to medical records may affect longer term mental and physical health for evacuees. Four out of the 15 respondents had made it back to New Orleans, while the remainder were residing in Texas (n = 10) and Georgia (n = 1). Family and religion continued to help keep these evacuees centered, and as a whole, they were still very hopeful about their future. Future cohort studies are needed to track changes in social, economic, and education needs of evacuees and relocating families over time.

While Katrina is in the nation's past, the consequences continue to have impact for its victims. A recent survey of Louisiana residents states that 39% of people reported feeling angry, and 53% said they were depressed.[12] Future hurricanes are very likely to occur in the Atlantic and Gulf coast regions. These data can be used to better plan for the short- and long-term needs of storm victims and evacuees.

Results of this survey can provide recommendations as to how municipalities can be better prepared for future similar events, both for cities that may need to be evacuated and those hosting evacuees. It is imperative that advanced planning take place to allow mechanisms for evacuation for those unable to leave by themselves.

For cities welcoming those forced to leave their area of residence because of a disaster, it is necessary to provide for psychological as well as physical needs. A large percentage of those surveyed already showed signs of PTSD 2 to 3 weeks after Hurricane Katrina. This percentage would be expected to increase during the 6-month period following the disaster. A behavioral health triage program was started in October in Houston to educate evacuees about depression and PTSD and to identify those at greatest risk of behavioral health problems. Once identified, clients were linked to mental health services that met their specific needs. Specific programs were directed towards students, particularly those in schools where tensions between Louisiana residents and Houston residents were high.

In addition, behavioral health is a complicated issue and can depend on physical and life situation elements. Evacuees were given assistance with housing as soon as possible after the Hurricane, with special

programs and aid for those with unique needs (mainly the elderly and those with physical disabilities). Later programs provided assistance with job training and placement (whether in Houston or Louisiana, if the client wished to return), with transportation (a particular issue in a city without easily accessible mass transit) and set-up case management services for those with more advanced requirements. By addressing these needs early on and by providing mental health triage, it is hoped that cases of PTSD will be minimized in this population.

All of our team who interviewed Katrina Evacuees learned from their experiences and their courage; in this process we were reminded of the interconnectedness of life. What happens to our neighbors in New Orleans directly influences our lives in Houston, Texas.

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