

Posttraumatic Stress Symptoms in Children After Hurricane Katrina: Predicting the Need for Mental Health Services

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The purpose of this study was to examine factors related to the development of posttraumatic stress symptoms in children and adolescents after Hurricane Katrina. It was hypothesized that a positive correlation would exist between trauma exposure variables and symptoms indicating need for mental health services experienced 2 years after Hurricane Katrina. Specifically, the authors hypothesized that experiences associated with natural disaster including personal loss, separation from family and/or community, and lack of community support as well as previous loss or trauma would be related to increased symptomatology in both children and adolescents. This study included 7,258 children and adolescents from heavily affected Louisiana parishes. Measures included the Hurricane Assessment and Referral Tool for Children and Adolescents developed by the National Child Traumatic Stress Network (NCTSN, 2005). Results were generally supportive of our hypotheses, and specific exposure and demographic variables were found to be strongly related to posttraumatic stress symptoms in children and adolescents.

Keywords: disasters, mental health, children, trauma, posttraumatic stress

Hurricane Katrina caused unprecedented community devastation, including displacement, property destruction, and financial loss, to those living along the Central Gulf Coast (Knabb, Rhome, & Brown, 2006). The winds and heavy rains resulted in the flooding of 80% of New Orleans (Knabb et al., 2006) and destruction or damage to all of the 26,000 homes in St. Bernard Parish (St. Bernard Parish Government, 2008). In the state of Louisiana, over 1,500 deaths were linked to Hurricane Katrina (Knabb et al., 2006), and the hurricane caused damage to over 875 schools in Louisiana and over 40 were totally destroyed (U.S. Army Corps of Engineers, 2006).

While literature on natural disasters has shown that the majority of children and adolescents exposed will eventually cope successfully and demonstrate adaptive skills after a trauma (Benight & Bandura, 2004), the literature has suggested that for some children exposed to natural disaster, there is an increased risk for higher levels of anxiety and depression compared to children who have not experienced a disaster. Over the past decades, researchers have found several trauma-specific exposure variables to be associated

with the development of psychological symptomatology after natural disasters; these variables include personal loss (Vernberg, LA Greca, Silverman, & Prinstein, 1996; Lonigan, Shannon, Taylor, Finch, & Sallee, 1994; Russoniello et al., 2002), separation from family and/or community (Brown & Perkins, 1992; McFarlane, 1987), and level of community support (Pynoos & Nader, 1988; Vernberg et al., 1996). Importantly, many of these factors were experienced by children and adolescents during and after Hurricane Katrina.

Personal Loss

Personal loss can occur in a number of different ways during a disaster. During and after Hurricane Katrina, many children experienced personal losses including destruction of their home or neighborhood, death of family members or friends during or shortly after the storm, having their personal belongings such as toys or clothes destroyed, and loss of family finances because of parental unemployment (Osofsky, Osofsky, & Harris, 2007). Research after Hurricanes Andrew (Vernberg et al., 1996), Hugo (Lonigan et al., 1994), and Floyd (Russoniello et al., 2002) have highlighted the significant association between personal loss and PTSD symptomatology in children. After Hurricane Andrew, Vernberg et al. (1996) utilized previous research, theory, and personal experience to create a conceptual framework to foster understanding of factors associated with posttraumatic stress symptoms in elementary school-age children after a natural disaster. This research found that individual child characteristics, specifically gender, exposure to traumatic events, including perceived life threat, life-threatening experiences, and experiences of loss and disruption, efforts to cope with the hurricane, and access to social support accounted for approximately 62% of the variance in children's posttraumatic stress disorder (PTSD) symptoms 3 months after a

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hurricane. Exposure to traumatic events predicted 35% of the variance in children's PTSD scores; thus, experiences such as damage to home, loss of clothes and toys, parental unemployment, moving to a new place, going to a new school, living away from parents, and moving away from friends were strongly related to degree of PTSD symptoms. Similarly, in a study of over 5,000 school-age children after Hurricane Hugo, Lonigan and colleagues (1994) found that displacement, damage to home, and parental unemployment were associated with PTSD, specifically symptoms of reexperiencing and hyperarousal. In a 2002 study of 218 9 to 12-year-old children after Hurricane Floyd, Russoniello et al. (2002) found that children whose homes flooded were three times more likely to have symptoms of PTSD than children who did not have flooded homes.

Separation

Attachment theory supports the assumption that separation from a parent is a significant stressor that can lead to psychological distress, especially in children in times of crisis (Bowlby, 1969). Given the importance of the attachment relationship, the psychological sequelae of children's being separated from their parents during a natural disaster is an important factor. One study conducted after a bushfire in Australia hypothesized that children who were separated from their parents because of the fire would be at increased risk for long-term preoccupation with the disaster (McFarlane, 1987). This hypothesis was confirmed; McFarlane (1987) found that separation from parents, as well as parental preoccupation with disaster and changes in family functioning, was associated with posttraumatic stress. Findings indicated that separation from parents was a stronger predictor of psychological distress 26 months after the bushfire than exposure to the fire or other trauma related losses.

The concept of attachment has been expanded to include place attachment (e.g., Brown & Perkins, 1992) that may be defined to include the emotional bond individuals form with their homes and communities so that the home and/or community becomes part of an individual's identity. When displacement occurs, individuals experience disruption and stress (Brown & Perkins, 1992). The previous research cited, regarding children's posttraumatic stress responses upon being displaced after Hurricanes Andrew (Vernberg et al., 1996), Hugo (Lonigan et al., 1994), and Floyd (Russoniello et al., 2002) provides further support for the concept of place attachment.

Family and Community Support

Literature on resiliency has highlighted the importance of parental and community support as protective factors that are associated with decreased risk of psychopathology (e.g., Masten, 2001). Pynoos and Nader (1988) describe parents as the primary support system for children after disasters. This was highlighted in a study of 9 to 18-year-old children after a 1999 earthquake in Ano Liosia, Greece, which found that difficulties at home including conflict with family members were associated with increased symptoms of PTSD and depression (Roussos et al., 2005).

Though connectedness to family is clearly associated with resiliency in children, connectedness with school has also been found to be associated with positive outcomes after traumatic

events. Vernberg and colleagues (1996) found that social support from teachers and classmates was associated with decreased risk for PTSD in a group of 1,086 elementary school-age children who experienced Hurricane Andrew. Other researchers have highlighted the importance of schools as a place of stability and support for children after natural disasters given the general instability in a community after the disaster (Wolmer, Laor, Dedeoglu, Siev, & Yazgan, 2005).

Preexisting Factors

Results from the majority of research on children and adolescents who have experienced a natural disaster suggests that preexisting factors, such as previous exposure to trauma (Neuner, Schauer, Catani, Ruf, & Elbert, 2006) and factors related to age, race, and gender (Bokszczanin, 2007; Shannon, Lonigan, Finch, & Taylor, 1994) are important variables associated with postdisaster traumatic stress. For example, research on 264 8 to 14-year-old tsunami survivors in Sri Lanka found that previous traumas, including war, domestic violence, community violence, medical treatment, physical abuse, and natural disaster, were positively associated with increased posttraumatic stress symptoms (Neuner et al., 2006). Similarly, Garrison and colleagues assessed 1,264 11 to 17-year-old children after Hurricane Hugo and found that experiencing previous violent, traumatic events was associated with increased likelihood of PTSD (Garrison, Weinrich, Hardin, Weinrich, & Wang, 1993).

Related to demographic variables, research has demonstrated a clear association between female gender and reports of anxiety and depression after a trauma. For example, Bokszczanin (2007) found that after a 1997 flood in Poland, girls were more likely to have symptoms of PTSD than boys. Similarly, Vernberg et al. (1996) found that after Hurricane Andrew, girls reported more symptoms of PTSD than boys, and Giannopoulou et al. (2006) found that after the 1999 Athens earthquake girls were more likely to report symptoms of both anxiety and depression than boys. Roussoniello and colleagues (2002) found that after Hurricane Floyd school-aged girls were twice as likely to report symptoms of posttraumatic stress as school-aged boys.

A second demographic variable, age, has been found to be a predictor of psychological symptomatology after natural disaster. In general, when elementary and high school-age children are assessed, younger children fare worse after a natural disaster. For example, in the previously reported study by Bokszczanin (2007) of students between the ages of 11 and 21, younger students were more likely to have symptoms of PTSD than older students. Giannopoulou et al. (2006) found that after the 1999 Athens earthquake, among 9 to 17-year-old children, younger children were more likely to report symptoms of PTSD than older children. Similarly, Shannon et al. (1994) found that after Hurricane Hugo, among 5th through 11th grade students, younger children were more likely to report symptoms of PTSD than older children.

A third demographic variable, ethnicity, has been posited to play a role in psychological outcomes after disasters though research has been inconsistent in this finding. For example, studies of Hurricane Floyd (Russoniello et al., 2002) and Hurricane Andrew (Vernberg et al., 1996) found no significant associations between ethnicity and PTSD symptoms. However, after Hurricane Hugo (Shannon et al., 1994) researchers found that African American

children were more likely than White or other minority students to report symptoms of anhedonia, attention problems, and risk-taking behaviors.

Method

Research Participants

Participants included children in Grades 4 through 12 attending school in Orleans, Plaquemines, St. Bernard, and St. John the Baptist parishes. All school board systems in the four-parish area were approached for participation and all were eager to participate; however, given the number of difficulties fulfilling basic scholastic functions, many schools in Orleans and Plaquemines were delayed in their participation with the study. St. Bernard Parish combined all schools into one unified school for the 2005–2006 school year, and into two schools for the 2006–2007 school year; all students in the school system were assessed. Ten schools were assessed in Orleans Parish, including six public schools and four Catholic schools. One large high school in St. John the Baptist Parish was assessed in the 2005 through 2006 school year; this school was a heavily receiving school for children displaced by the hurricane. Children in all public schools in Plaquemines Parish were assessed in the 2006 through 2007 school year, for a total of seven schools.

The NCTSN Hurricane Assessment and Referral Tool for Children and Adolescents (NCTSN, 2005) was modified for cultural sensitivity and adapted by the school districts. The students completed the assessment during class, and faculty members from Louisiana State University (LSU) Health Sciences Center, Department of Psychiatry were available to answer questions or provide support. The assessment was administered confidentially, but not anonymously, so that it was possible to report back to the schools and follow-up students who scored above the cut-off for mental health symptoms as well as those students who requested a meeting with a counselor. School administration provided permission for the screens per IRB approval and parental permission was secured for follow-up services if needed. The results from the assessment were used to help identify students who were having difficulties and required evaluation for mental health services as well as to provide culturally sensitive trauma informed services.

A total of 7,258 students completed the referral tool between 2005 and 2007; 2,362 students in 2005 through 2006 and 4,896 students in 2006 through 2007. Because of the transient populations and restructuring of schools, the two school years remained separate for analyses. Students ranged in age from 7 to 19 years, with a mean of age 14 for both years. Table 1 presents the demographic information. As can be seen, the majority of students were in high school, and they were almost equally divided by sex and ethnic group.

Assessment

The NCTSN Hurricane Assessment and Referral Tool for Children and Adolescents (NCTSN, 2005) consists of demographic questions, an assessment of hurricane-related experiences, and queries about the children's feelings of well-being. It further assesses mental health symptoms of posttraumatic stress. The survey was created for use after Hurricane Katrina with input from local school administrators, parents, and students. Their input was

Table 1
Frequency and Percentages of Demographic Variables

| Variable | Category | 2005–2006 (N = 2,362) | | 2006–2007 (N = 4,896) | |
|-----------|------------------|--------------------------|------|--------------------------|------|
| | | n | % | n | % |
| Parish | Orleans | 1,086 | 46.0 | 1,723 | 35.2 |
| | St. Bernard | 864 | 36.6 | 1,507 | 30.8 |
| | Plaquemines | — | — | 1,666 | 34.0 |
| | St. John | 412 | 17.4 | — | — |
| Ethnicity | White | 1,044 | 44.2 | 2,225 | 45.4 |
| | African-American | 1,070 | 45.3 | 2,147 | 43.9 |
| | Other | 248 | 10.5 | 524 | 10.7 |
| Grade | 4th–6th | 445 | 18.8 | 728 | 14.9 |
| | 7th–8th | 162 | 6.9 | 1,185 | 24.2 |
| | 9th–12th | 1,755 | 74.3 | 2,983 | 60.9 |
| Gender | Male | — | — | 2,654 | 54.2 |
| | Female | — | — | 2,242 | 45.8 |

Note. (—) = data not collected.

vital to make it “user-friendly” for students to complete as well as for cultural sensitivity including language and readability. The NCTSN assessment scale of posttraumatic symptoms was based on the UCLA PTSD Reaction Index (Steinberg, Brymer, Decker, & Pynoos, 2004) and includes a number of questions regarding depressive symptoms, such as; do you often feel sad, down or depressed, and are you finding it harder to do or enjoy activities. The 22 item scale is currently being standardized, and for our sample achieved a reliability of $\alpha = .91$ for both the 2005 through 2006 and 2006 through 2007 samples. Students respond to each question assessing mental health symptoms on a scale of 1 to 4, with 1 = *not at all*, 2 = *a little bit*, 3 = *quite a bit*, and 4 = *very much*. To score the screener, 1 point is given for each question rated 3 or 4. The total scores for each student can range from a minimum of 0 to a maximum of 22 with a score of 4 or more (3s and 4s) meeting the NCTSN cut-off for mental health referral.

Analyses

Students were included in the analyses if they met the following criteria; were in the 4th through 12th grades, were between the ages of 7 to 19 and reported valid responses for demographic variables (grade, parish, ethnicity, and gender). Gender and Previous Loss/Trauma were inadvertently omitted during the 2005 through 2006 assessment so could not be included in the first year analysis.

Two binomial logistic regressions, one for each school year, were conducted to assess if trauma exposure variables—separation, personal and adapted loss, support/community—and preexisting factors corresponding to the theoretical constructs previously presented in the literature review could correctly classify whether students met criteria for mental health referral (referral vs. nonreferral). The following trauma exposure and preexisting variables were included in the analyses: grade; gender; ethnicity; previous loss or trauma; family members/friends killed; neighborhood destroyed/damaged; personal belongings destroyed/damaged; parental unemployment because of hurricane; child displaced; child separated from caregiver; child cur-

rently separated from caregiver; child separated from pet; living arrangement; evacuation place; family connectedness; number of schools since the storm (2006–2007 only); and transferred to a new school (2006–2007 only). The outcome variable assessing mental health and well-being was operationalized as Need for Mental Health Services (referral vs. nonreferral). The enter method, where all variables are entered simultaneously into the regression equation, was used for the two logistic regressions (Tabachnick & Fidell, 1996); thus, the theoretical construct groupings did not influence statistical results.

The large sample size suggests that even small differences would be detected increasing the potential of a Type II error. Effect sizes, or measures of association, were used to determine substantive significance instead of statistical significance. Statistical significance is based on alpha levels and substantive significance is based on moderate to large measures of association. The absolute value of the unstandardized logit coefficients (B) were used to assess the strength of the relationships; where Cohen's standard suggests that .2 = weak, .5 = moderate and .8 = high association (25, 26).

Results

Evacuation and Storm Experience

The evaluation conducted in 2005 to 2006 showed that 863 children and adolescents (37.2%) went to a relative's house; 879 (37.2%) went to a hotel; 169 (7.2%) went to a friend's house; and 134 (5.7%) went to a shelter. Evacuation site was missing or reported unknown for 317 (13.4%) of the sample. The evaluation conducted in 2006 to 2007 showed that after the evacuation 1,902 children and adolescents (43.2%) went to a relative's house; 1,848 (42.0%) went to a hotel; 311 (7.1%) went to a friend's house; and 339 (7.7%) went to a shelter. Data was missing or reported unknown for 496 (10.1%) of the sample. Table 2 presents the frequencies and percentages of additional evacuation and storm variables. As can be seen, the majority of students not only reported that they saw their neighborhood destroyed or damaged but also that their personal belongings were destroyed/damaged.

Poststorm and Well-Being Variables

Table 3 presents the frequency and percentages for the post-storm and well-being variables. The majority of students had to

Table 3
Frequency and Percentages of Poststorm and Well-Being Variables

| Variables | 2005–2006 ($N = 2,362$) | | 2006–2007 ($N = 4,896$) | |
|--|------------------------------|------|------------------------------|------|
| | n | % | n | % |
| Child was displaced | 2,055 | 87.0 | — | — |
| Child transferred to a new school | — | — | 4,077 | 84.5 |
| Parent unemployed resulting from hurricane | 979 | 41.7 | 1,849 | 38.1 |
| Parent helped in recovery efforts | 914 | 39.2 | 1,763 | 36.4 |
| Previous loss or trauma | — | — | 1,016 | 21.2 |
| Child experienced other hurricane/flooding | 310 | 13.2 | 620 | 12.8 |
| Wants to speak with counselor | 252 | 11.1 | 625 | 12.9 |
| Child currently separated from caregiver | 189 | 8.3 | 267 | 6.5 |

Note. (—) = data not collected.

transfer to a new school, over 35% had a parent unemployed because of the hurricane, and over 20% had experienced a previous loss or trauma.

The survey conducted in 2005 through 2006 indicated that the number of different places students lived since the hurricane ranged from 1 to 10 with a mean of 3 ($N = 2,106$, $SD = 1.64$). Children attended an average of two schools while displaced ($N = 2,026$, $M = 2.19$, $SD = 0.85$) with a range from 1 to 5 schools. Less than half of the participants (901, 40.1%) had returned to their homes; 192 (8.5%) were living in a trailer in the community, 346 (15.4%) were living in a trailer at their house, 255 (11.4%) were in a new home, 217 (9.2%) were living in an apartment and 335 (14.9%) were living in other forms of housing.

The following year, in 2006 through 2007, the number of different places students lived since the hurricane ranged from 1 to 10 with a mean of 3.05 ($N = 4,336$, $SD = 1.57$). Over 1 year after the storm, less than half of the participants (2,094, 44.3%) had returned to their homes. Nine percent (436) were living in a trailer in the community, 18% (847) were living in a trailer at their house, 16% (749) were in a new home, and 7% (306) were living in other forms of housing. For this survey, students were asked how they felt compared to last year. There were 2,281 (47.4%) who reported feeling better, 605 (12.6%) reported feeling worse, and 1,923

Table 2
Frequency and Percentages of Evacuation and Storm Variables

| Variable | 2005–2006 ($N = 2,362$) | | 2006–2007 ($N = 4,896$) | |
|--|------------------------------|------|------------------------------|------|
| | n | % | n | % |
| Child saw neighborhood destroyed/damaged | 2,173 | 94.1 | 4,259 | 88.7 |
| Personal belongings destroyed/damaged | 1,572 | 67.0 | 3,599 | 74.1 |
| Child separated from pet | 764 | 33.3 | 1,644 | 34.3 |
| Child separated from caregiver | 732 | 31.2 | 1,274 | 26.2 |
| Family members/friends injured | 473 | 20.5 | 787 | 16.3 |
| Child witnessed injury | 331 | 14.1 | 827 | 17.0 |
| Family members/friends killed | 309 | 13.3 | 610 | 12.6 |
| Rescued | 116 | 5.3 | 241 | 5.2 |
| Child injured | 115 | 4.9 | 188 | 3.8 |

(40.0%) reported feeling the same ($N = 4,809$). Students were also asked to rate on a scale of 1 to 10 how connected they felt to their family; the mean response was 7.91 ($N = 4,712$, $SD = 2.39$).

Mental Health Referral

Of the 2,362 students surveyed in the 2005 through 2006 school year, 1,158 (49.1%) met the cut-off score for mental health referral. Of the 4,896 students in the 2006 through 2007 school year, 2,038 (41.6%) of the students met the cut-off score for mental health referral. Table 4 presents symptoms commonly reported in 2006 through 2007 and students meeting cut-off scores for mental health referral by grade level.

Logistic Regression

Two binomial logistic regressions were conducted to assess if the abovementioned trauma exposure and preexisting variables would be helpful to classify whether students were in the referral or nonreferral group. The outcome variable assessing mental health and well-being was operationalized as Need for Mental

Health Services (referral vs. nonreferral). Results of the analyses are presented below.

Logistic regression for 2005 through 2006. For the 2005 through 2006 analysis, the abovementioned trauma exposure and preexisting variables correctly classified 62.6% of the students falling in the referral or nonreferral group, $\chi^2(23) = 198.52$, $p < .001$. Table 4 presents the individual contribution of each variable (beta coefficients). Students who were displaced were 1.8 times more likely to be in the referral group than students who were not displaced. Students who were separated from a parent were 1.6 times more likely to be in the referral group. Students who were living in a trailer in the community were 1.5 times more likely to be in the referral group than students that had returned to their house. Results also suggest that students who evacuated to a shelter were 1.8 times more likely to be in the referral group as compared with students who evacuated to a hotel. The analysis revealed no age or ethnic differences in the 2005 through 2006 referral status.

Logistic regression for 2006 through 2007. For the 2006 through 2007 analysis, the abovementioned trauma exposure and

Table 4
Logistic Regressions On 2005–2006 Trauma Exposure, Well-Being and Preexisting Variables
Classifying the Need for Mental Health Services (Referral vs. Nonreferral)

| Variable | χ^2 | Sig. | Odds Ratio | 95.0% CI | |
|--|-------------|-------------|-------------|-------------|-------------|
| | | | | Lower | Upper |
| Parish | 0.91 | .636 | | | |
| St. Bernard | 0.03 | .901 | 1.02 | 0.74 | 1.40 |
| St. John | 0.84 | .355 | 0.80 | 0.51 | 1.28 |
| Grade | 12.40 | .002 | | | |
| 4th–6th | 7.37 | .006 | 1.43 | 1.11 | 1.85 |
| 7th–8th | 2.73 | .098 | 0.73 | 0.51 | 1.06 |
| Ethnicity | 5.51 | .063 | | | |
| African American | 5.49 | .019 | 1.38 | 1.06 | 1.81 |
| Other | 1.17 | .279 | 1.21 | 0.86 | 1.69 |
| Family members/friends killed | 7.46 | .007 | 1.47 | 1.11 | 1.93 |
| Neighborhood destroyed/damaged | 0.64 | .431 | 0.85 | 0.56 | 1.28 |
| Toys destroyed/damaged | 5.80 | .015 | 1.40 | 1.07 | 1.85 |
| Parent unemployed resulting from hurricane | 9.45 | .002 | 1.35 | 1.12 | 1.63 |
| Displaced | 4.73 | .030 | 1.84 | 1.06 | 3.19 |
| Separated from caregiver | 6.45 | .011 | 1.31 | 1.06 | 1.60 |
| Currently separated | 6.31 | .012 | 1.62 | 1.11 | 2.37 |
| Separated from pet | 3.67 | .058 | 1.21 | 0.99 | 1.47 |
| Residence | 20.40 | .001 | | | |
| A new house | 0.77 | .381 | 0.86 | 0.61 | 1.21 |
| Trailer in the community | 3.89 | .047 | 1.54 | 1.01 | 2.36 |
| Trailer at my house | 2.40 | .134 | 0.76 | 0.53 | 1.09 |
| Apartment | 1.12 | .289 | 1.22 | 0.84 | 1.78 |
| Other | 2.46 | .115 | 1.32 | 0.94 | 1.85 |
| Evacuation place | 13.46 | .010 | | | |
| Relative's house | 1.45 | .237 | 0.88 | 0.71 | 1.09 |
| Friend's house | 0.79 | .378 | 0.85 | 0.59 | 1.22 |
| Shelter | 6.22 | .013 | 1.78 | 1.13 | 2.81 |
| Missing/unknown | 2.08 | .150 | 1.27 | 0.92 | 1.74 |

Note. The outcome variable = met criteria for mental health referral (referral vs. nonreferral). The reference variable for: Ethnicity = White, Parish = Orleans, Evacuation place = hotel, and Residence = my house. To reduce the potential of a Type I error, because of the large sample size, effect sizes (unstandardized logit coefficients), were used to determine substantive significance (based on moderate to large measures of association) instead of statistical significance (alpha levels). Differences with substantive significance are bolded.

Table 5

Logistic Regressions On 2006–2007 Trauma Exposure, Well-Being and Preexisting Variables Classifying the Need for Mental Health Services (Referral vs. Nonreferral)

| Variable | Category | χ^2 | Sig. | Odds Ratio | 95.0% CI | | |
|--|-----------------------------|--------------|-------------|-------------|-------------|-------------|------|
| | | | | | Lower | Upper | |
| Parish | | 0.74 | .690 | | | | |
| | St. Bernard | 0.73 | .392 | 0.92 | 0.75 | 1.12 | |
| | Orleans | 0.14 | .708 | 0.96 | 0.76 | 1.21 | |
| Grade | | 87.75 | .001 | | | | |
| | 4th–6th | 86.50 | .001 | 2.74 | 2.21 | 3.38 | |
| | 7th–8th | 13.40 | .001 | 1.35 | 1.15 | 1.59 | |
| Gender | | 85.82 | .001 | 0.53 | 0.46 | 0.61 | |
| Ethnicity | | 6.40 | .041 | | | | |
| | African American | 5.92 | .015 | 1.32 | 1.06 | 1.64 | |
| | Other | 2.55 | .110 | 1.21 | 0.96 | 1.52 | |
| Previous loss or trauma | | 49.09 | .001 | 1.78 | 1.51 | 2.08 | |
| Family members/friends killed | | 23.46 | .001 | 1.64 | 1.34 | 2.01 | |
| Neighborhood destroyed/damaged | | 2.34 | .126 | 0.84 | 0.68 | 1.05 | |
| Personal belongings destroyed/damaged | | 26.82 | .001 | 1.68 | 1.38 | 2.05 | |
| Parent unemployed resulting from hurricane | | 19.04 | .001 | 1.37 | 1.19 | 1.57 | |
| Currently separated | | 2.70 | .100 | 1.14 | 0.98 | 1.32 | |
| Separated from pet | | 5.81 | .016 | 1.19 | 1.03 | 1.37 | |
| Residence | | 3.99 | .408 | | | | |
| | A new house | 1.47 | .226 | 1.14 | 0.93 | 1.39 | |
| | Trailer in the community | 1.86 | .172 | 1.20 | 0.92 | 1.56 | |
| | Trailer at my house | 0.57 | .450 | 1.08 | 0.88 | 1.33 | |
| | Apartment | 2.86 | .091 | 1.21 | 0.97 | 1.51 | |
| | Other | 88.43 | .001 | 0.87 | 0.85 | 0.90 | |
| | Family connectedness | | 23.46 | .001 | 1.64 | 1.34 | 2.01 |
| | Transferred to a new school | | 6.03 | .014 | 1.31 | 1.06 | 1.62 |
| Evacuation place | | 27.30 | .001 | | | | |
| | Relative's house | 7.56 | .006 | 1.24 | 1.06 | 1.44 | |
| | Friend's house | 0.72 | .398 | 1.13 | 0.85 | 1.51 | |
| | Shelter | 24.65 | .001 | 2.02 | 1.53 | 2.66 | |
| Missing/unknown | | 3.49 | .062 | 1.27 | 0.99 | 1.64 | |

Note. The outcome variable = met criteria for mental health referral (referral vs. non-referral). The reference variable for: Parish = Plaquemines, Evacuation place = hotel, and Residence = my house. To reduce the potential of a Type I error, because of the large sample size, effect sizes (unstandardized logit coefficients), were used to determine substantive significance (based on moderate to large measures of association) instead of statistical significance (alpha levels). Differences with substantive significance are bolded.

preexisting trauma exposure and well-being variables correctly classified, $\chi^2(24) = 588.5, p < .001$, 67.5% of students falling in the referral or nonreferral group. Table 5 presents the individual contribution of each variable (beta coefficients). Fifty-two percent of students in 4th to 6th grade and 40.4% of students in 9th to 12th grades met the cut-off score for mental health referral. In the logistic regression, younger students' in 4th to 6th grades were 2.7 times more likely to be in the referral group than were students in the 9th to 12th grades. Females were 1.9 times more likely to be in the referral group than were males. The likelihood of being in the referral group increased by 1.6 times for students who reported a family member or friend was killed and 1.7 times for students reporting that their personal belongings were destroyed or damaged. Results also suggest that students who evacuated to a shelter were 2.0 times more likely to be in a referral group compared to students that evacuated to a hotel. Students who reported previous loss or trauma were 1.8 times more likely to meet the cut-off for mental health referral. The analysis revealed no ethnic differences in the 2006 through 2007 referral status.

Figure 1 presents a histogram comparing the percentages of significant predictors for the 2005 through 2006 data by referral

status (referral vs. nonreferral) and Figure 2 presents a histogram comparing significant predictors for the 2006 through 2007 data by referral status (referral vs. nonreferral).

Missing Data Analysis

Missing data analyses were conducted to assess if the logistic regressions were influenced by the number of students who did not complete the NCTSN Hurricane Assessment and Referral Tool. Chi-square analyses were conducted for each of the school years to assess if significant differences existed between students included in the logistic regression versus those that were not related to meeting the NCTSN cut-off for referral for mental health services. For the 2005 through 2006 school year, 2,033 students were included in the analysis and 329 (13.9%) were excluded because of missing data; 4,209 students were included in the 2006 through 2007 analysis and 687 (14.0%) were excluded because of missing data. Results of the chi-square were not significant for either the 2005 through 2006 school year, $\chi^2(1) = 0.84, p = .360$ or the 2006 through 2007 school year, $\chi^2(1) = 0.70, p = .402$. These results suggest that there were no significant differences between partic-

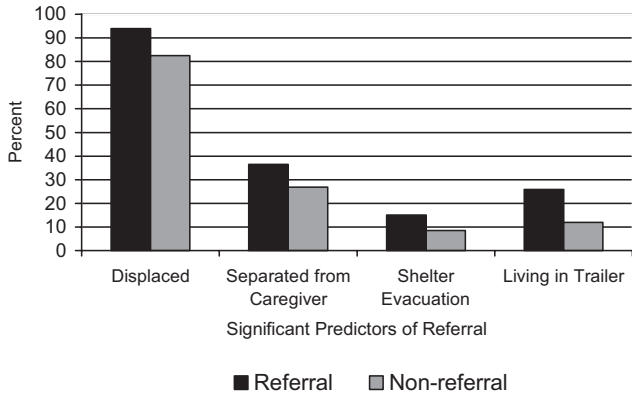


Figure 1. Histogram displaying percentages of significant predictors in the 2005 through 2006 data by need for mental health services (referral vs. nonreferral).

ipants included in the logistic regression and those excluded because of missing data.

Discussion

The devastation to children and families resulting from Hurricane Katrina and the breaching of the levees provides an important perspective related to the effects of a disaster which was both severe and long lasting. This study demonstrates the widespread impact of this disaster that personally affected the majority of children surveyed who returned to the heavily devastated areas. Three quarters of the children in Orleans, Plaquemines, and St. Bernard parishes assessed reported loss of personal belongings. By the 2006 through 2007 school year, well over half of the children assessed had still not returned to their prestorm homes. Half of the children surveyed in 2005 through 2006 met the cut off for referral for mental health services; in the 2006 through 2007 school year, 41% still met the cut-off for referral indicating the chronic effect of this disaster on children and adolescents. In 2005 through 2006,

11% of the children and adolescents expressed interest in receiving mental health services and in 2006 through 2007, 13% showed such interest indicating their recognized need for support themselves after the traumatic experience of the hurricane and displacement.

The results reveal the extent of the trauma and loss experienced by children and adolescents as a result of the devastation created by Hurricane Katrina. While children and families are resilient and committed to returning and living in Metropolitan New Orleans, at the same time, mental health symptoms were present in over 40% of students screened. As a consequence, evidence based clinical services are much needed. The data also provide consistent support for the findings after this disaster in the existing literature. As has been shown previously, experience of prior trauma (Neuner et al., 2006), property loss (Assanangkornchai, Tangboonngam, & Edwards, 2004), separation from caregiver (McFarlane, 1987), significant personal losses (Lonigan et al., 1994; Vernberg et al., 1996), and living in a shelter (Sattler et al., 1995), were predictors of increased symptomatology after a disaster. In addition, consistent with earlier findings, females reported more distress than males (Bokszczanin, 2007; Vernberg et al., 1996).

After the hurricane during the 2005 through 2006 school year, our findings indicated clearly that children experienced increased trauma symptoms if they were currently separated from a parent or caregiver, if they had lived in a shelter, or if they were living in a trailer instead of their house. Separation from a caregiver is particularly traumatic for children in a time of crisis when the children need their parents for emotional support and a sense of security (Bowlby, 1969; McFarlane, 1987). Not being able to return compounds the sense of loss for both the children and families and disrupts normal routines. Travel trailers are small with limited ability for daily routines such as cooking and afford little privacy. Over crowding, and exposure to family and neighborhood conflicts added to problems for the children. Although trailers are temporary solutions to lack of housing, for many families, "temporary" has stretched into years in transitional living communities with very limited community space and child friendly activities. These find-

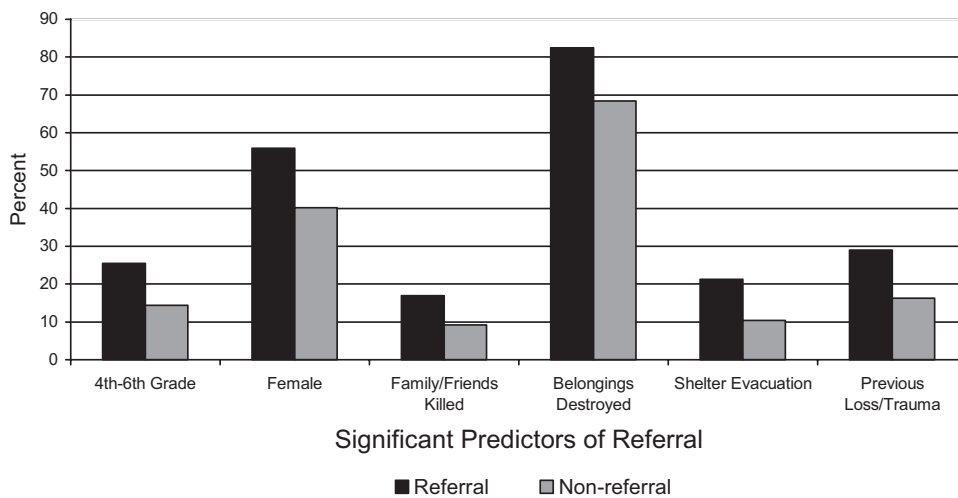


Figure 2. Histogram displaying percentages of significant predictors in the 2006 through 2007 data by need for mental health services (referral vs. nonreferral).

ings highlight the need for rebuilding plans that focus on quickly stabilizing communities, helping families stay together during a crisis, and supporting return to stability and normalcy.

Findings for the 2006 through 2007 school year indicated that children experienced increased trauma symptoms if they were female, had family or friends killed in the storm, had their belongings destroyed, if they had lived in a shelter, or if they experienced a previous loss or trauma. Of particular interest was the finding that, mental health symptoms were significantly related to the age of the child with younger children demonstrating more symptoms in the second school year after Hurricane Katrina; children in 4th through 6th grades were considerably more likely to meet the cut-off for clinical referral than were high school students. This finding may reflect the emotional immaturity of younger children as well as their increased dependence on family and community supports. High school adolescents likely have increased emotional and behavioral regulation because of advanced verbal skills and cognitive processes as well as more highly developed peer support networks.

Limitations

It is rarely known where a disaster will strike and as was the case with Hurricane Katrina, researchers often scramble to obtain solid data in an area devoid of resources. This study was affected by both lack of time in research preparation and lack of resources; however, we as researchers were able to sample the majority of children who had returned to the three parishes after the hurricane. Unlike more programmatic research, disaster research often suffers from lack of experimental control of factors such as maturation, history, and attrition. The extent of devastation in the greater New Orleans area magnified many of these limitations to disaster research; specifically researchers lost work space, equipment, and resources—much of which had to be pulled together in a very short time period. However, it was imperative that researchers familiar with local customs and the culture overcome these adversities and lead much of this research to ensure cultural competence and a better understanding of how this unprecedented natural and human caused disaster affected the communities' younger populations.

Conclusion

In this paper, we have described mental health issues to be considered in helping children, adolescents and families during and after a disaster. The success of a disaster plan for children and families depends on preparation, which includes training at all levels, to build capacity to implement such a plan quickly and efficiently at the time of a disaster. The knowledge alone resulting from the current and existing trauma research showing the negative effects of loss, and displacement are not enough—this knowledge needs to shape political decisions to develop adequate plans to meet the needs of children and families. Decisions are required about how to best allocate scarce federal resources to support the necessary local infrastructure and capacity building involving trauma focused training and efficient development of temporary and longer-term services. Clearly, there is a need for more research related to disasters, displacement, personal losses, and the short and long-term effects on children and families. However, we have learned much in the 2 years since Hurricane Katrina devastated the

Greater New Orleans area about the needs of children, adolescents, and families. The devastation caused by Hurricane Katrina may be over in many people's minds; however, for the hundreds of thousands of children and families that lost homes, loved ones, and communities, the impact will be with them for the rest of their lives and perhaps will continue in generations to follow. As one of our very sensitive school administrators stated, "It is like a little bit of the child has been taken away from our children."

At the same time, the trauma resulting from Hurricane Katrina does not have to preclude resilience and strength. Appropriate supports and services can aid greatly in the psychological rebuilding, while the environmental rebuilding and recovery of the cities and communities occurs. One of the most important contributions of this research is understanding factors that affect the need for mental health services. A better understanding from this research and existing literature can assist in helping identify those that have a greater potential for mental health issues after a disaster. We also have the opportunity to utilize the knowledge that is being gained to recognize the important, and often unmet, needs of children and families at such times of overwhelming difficulty. Research coming out of this disaster is not just academic, but can be used as lessons learned to guide more effective ways to prepare and support children and families when the next disaster occurs. Hopefully, in addition to the increased knowledge gained in responding during and in the aftermath of this devastating hurricane, there is the political will to move the process forward, develop a national disaster plan for children and families, and lessen the posttraumatic stress symptoms and subsequently the need for mental health services and child disaster survivors.

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