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Mental Health Symptoms in Youth Affected by Hurricane Katrina

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Natural disasters, such as hurricanes, may cause severe psychological impairment in children and adolescents, which may persist in youth who have survived hurricanes, their effects, or both. To better understand the needs of youth in the community after Hurricane Katrina, officials in St. Bernard Parish, LA, commissioned a youth needs assessment survey. The survey assessed how youth were coping approximately 2 years after Hurricane Katrina. The goal was to explore the prevalence and severity of depressive, anxious, and posttraumatic symptoms reported by youth. Based on retrospective reports from 43 youth, the prevalence of children's mental health symptoms was 44–104% higher in the 2 years after Hurricane Katrina compared to pre-Katrina. The majority of mental health symptoms reported by youth had an onset after the hurricane, for example, 79% reported new onset of mental heath symptoms in the year after Katrina. The vast majority of these children (56%) continued to experience mental health difficulties 2 years after the disaster. Implications regarding post-Katrina mental health needs, service delivery, public response, and collaboration efforts are summarized and directions for future research are proposed.

Keywords: Hurricane Katrina, youth, mental health, disasters, mixed-methods

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Research suggests that a significant proportion of children and adolescents who have experienced a natural disaster exhibit significant mental health symptoms that interfere with daily functioning (Garrison, Bryant, Addy, Spurrier, Freedy, & Kilpatrick, 1995; Goenjian, Steinberg, Najarian, Fairbanks, Tashjian, & Pynoos, 2000; La Greca, Silverman, Vernberg, & Prinstein, 1996; Lonigan, Shannon, Finch, Daugherty, & Taylor, 1991; Vogel & Vernberg, 1993). Symptoms may persist well beyond the initial stressor, as children who survive natural disasters often experience long-term emotional, behavioral, and academic difficulties (Burke, Moccia, Borus, & Burns, 1986; McFarlane, Policansky, & Irwin, 1987; Shaw, Applegate, & Schorr, 1996; Weisler, Barbee, & Townsend, 2006).

Posttraumatic responses of children and adolescents were studied extensively in the aftermath of Hurricane Andrew, which severely damaged the northwestern Bahamas, southern Florida, and southwest Louisiana in August 1992. When examining children (ages 8–12) at several time points post-hurricane, researchers found that 30% of children reported severe or very severe posttraumatic stress disorder (PTSD) symptoms 3 months after the disaster (LaGreca et al., 1996). According to the American Psychological Association (APA, 2000), PTSD symptoms include intrusive recollection of the event, including distressing dreams or re-experiencing the trauma; persistent avoidance or numbing, for example, feeling detached or inability to recall important aspects of the event; and hyperarousal, including difficulty falling or staying asleep and exaggerated startle response. Thirteen percent of children reported suffering from continued high levels of posttraumatic symptoms at 10 months poststorm (LaGreca et al., 1996). Similarly, 32 weeks after the storm, Shaw, Applegate, and Schorr (1995) reported that 51% of the children in high-impact areas had moderate levels of posttraumatic symptoms, and 38% had severe to very severe levels. In a follow-up study, 70% of the children in high-impact areas continued to score in the moderate to severe range on a measure of posttraumatic symptoms 21 months after Hurricane Andrew (Shaw et al., 1996).

Although less prevalent in the literature, a substantial overlap has been found between posttraumatic symptoms and symptoms of

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other anxiety disorders and depression (Davidson & Foa, 1991). Within the disaster literature, depression has been described as a notable aspect of some youth's postdisaster responses (e.g., Hardin, Weinrich, Weinrich, Hardin, & Garrison, 1994), and traumatized children and adolescents often display symptoms of depression (e.g., depressed mood, significant weight loss or weight gain, sleep disturbance, fatigue or loss of energy, and feelings of worthlessness or excessive guilt; APA, 2000) and/or anxiety (e.g., excessive anxiety or worry, difficulty controlling the worry, restlessness, muscle tension, and difficulty concentrating or mind going blank; APA, 2000) in addition to symptoms of PTSD (Vernberg & Varela, 2001). For example, 14 months after a super-cyclone hit India, Kar and Bastia (2006) found that 27% of adolescents surveyed reported significant levels of posttraumatic symptoms, 18% reported significant levels of depression, and 12% reported significant levels of generalized anxiety. Of these adolescents, 39% exhibited comorbidity, indicating that high rates of depression and anxiety were found in conjunction with posttraumatic symptoms in child and adolescent populations after a natural disaster. Although the literature has documented the coexistence of depressive and posttraumatic (e.g., Vernberg & Varela, 2001) or anxious and posttraumatic symptoms in youth after natural disasters (e.g., Lonigan et al., 1991; Vogel & Vernberg, 1993), few studies have assessed the co-occurrence of all three symptom groups within a population after a disaster (e.g., Goenjian et al., 1995; Green, Grace, Vary, Kramer, Gleser, & Leonard, 1994; Kar & Bastia, 2006). The August 2007 needs assessment conducted in St. Bernard Parish, LA, described in this paper addressed a gap in the literature by simultaneously examining posttraumatic, anxious, and depressive symptoms in children and adolescents after a natural disaster.

One of the most destructive hurricanes ever to strike the United States, Hurricane Katrina made landfall along the Central Gulf Coast region on August 29, 2005. The hurricane flooded the entirety of St. Bernard Parish, a community located southeast of the city of New Orleans, destroying virtually every home, business, office, and green space. After the flood waters receded, residents had to contend with corpses, mold, snakes, alligators, flies and mosquitoes, piles of trash and debris, and venomous spiders as they began to rebuild their lives. A survey conducted in St. Bernard Parish by the authors in August 2006 found high comorbidity rates of depressive, posttraumatic, and anxious symptoms among adults of the parish (Mitchell, Witman, & Taffaro, 2008). Similar results have been noted in the literature (e.g., Coker et al., 2006; Weems et al., 2007). By August 2006 over 70% of the adult participants reported experiencing new onset of mental health symptoms after Katrina. Furthermore, 20% of participants described taking medications for anxiety or depression, compared with 10% who reported taking medications before the storm (Mitchell et al., 2008).

As of the summer of 2007, only about 10% of homes in the parish had been fully restored. Families that were in the slow process of reconstruction often used FEMA trailers as living quarters as well as storage for tools and supplies. Many families were rebuilding their homes themselves because of limited economic resources. There continued to be a lack of shopping venues, movie theatres, or public facilities in the parish where youth could socialize.

Because of the data compiled and analyzed in the 2006 survey, and in discussion with parish leaders, the authors returned in August 2007 to conduct a survey focusing on the youth of the parish (Mitchell et al., 2008). Given the vulnerability of the community, a community-based participatory research (CBPR) approach was used for the August 2007 project to engage partners from the St. Bernard Parish community in all phases of the research process with a shared goal of producing knowledge that would translate into action or positive social change for the community (Boothroyd, Fawcett, & Foster-Fishman, 2004; Green et al., 1997). Discussions with community leaders generated community support, as well as program input into research questions and design, and helped to establish the needs assessment within the appropriate community contexts. Thus, it was hoped that community empowerment and participation would increase the potential that the study findings would be accepted and used to improve practices and policies.

The primary purpose of this project was to inform the Parish government and St. Bernard Health Center about the mental health symptoms of children and adolescents affected by Hurricane Katrina. The intent was to assess how youth were coping ~2 years after Hurricane Katrina. The data were summarized and given to St. Bernard Parish officials to prioritize the extremely limited parish resources. The data may also be used to leverage local and federal funding resources and grants.

The aim of this project was to explore the prevalence and severity of depressive, anxious, and posttraumatic symptoms, as reported by children and adolescents, for three time points: the summer before the storm (2005; Time 1), 1 year after Hurricane Katrina (Time 2), and "currently" (ratings for symptoms within the 2 weeks before their clinic visit corresponding to ~2 years postdisaster; Time 3). The authors hypothesized that the reported number of depressive, anxious, and posttraumatic symptoms in the year after Katrina and at 2 years after the storm would be high relative to reported pre-Katrina symptoms.

The Survey

Participants and Procedures

Participants were recruited through the St. Bernard Health Center, a 22,000-square foot modular building located in the parking lot of an abandoned Super Wal-Mart. All eligible children and adolescents (ages 11–18 years) who were being treated for routine or follow-up (nonurgent) medical care at the clinic during a 5-day period in August 2007 were approached to complete the survey. Adult clients with children in this age range were also approached to participate.

To be included in the project, participants were required (a) to have sought care at St. Bernard Health Center during the data collection period; (b) to be between the ages of 11 and 18 years of age (or have a child in this age range); and (c) to be able to understand project procedures and complete project measures independently. Individuals who were visibly upset or in pain (e.g., crying, complaining of nausea or any discomfort) were not approached to participate. Of note, youth in this age range were developmentally at a level at which they could report on their own experiences (Achenbach, 1991a). In cases where both a child and his or her parent were at the Health Center, both individuals were

approached to participate in the assessment ($n = 33$). Informed parental consent and child assent were obtained for all participants before involvement in the needs assessment.

Participants were asked to complete questions on mental health symptoms for each of three time periods: the summer before Hurricane Katrina (June 2005 through August 2005), the summer after Hurricane Katrina (June 2006 through August 2006), and at the time of assessment (August 2007). Participants were given one of two forms with the questions listed in either ascending order (least to most recent date; Form A) or descending order (most to least recent date; Form B). The order of the questionnaire sections (i.e., demographic and qualitative data, and report on the three different time points) was counter-balanced across participants, in an attempt to control for order effects. To ensure that participants understood the layout and response options on the three-page survey, study staff aided participants, reading questions and eliciting answers, for at least the first two questions. Each participant was provided with dates serving as secondary prompts, as well as with verbal prompts, such as "last summer" or "before the storm," to aid in his or her recall of symptoms. Participation by each child took ~20 min. Each participant was given a $10 gift card to the parishes' local drug store as compensation for their time and participation in the needs assessment. The study protocol was approved by the Institutional Review Boards at both Cincinnati Children's Hospital Medical Center and the University of Cincinnati.

Measures

Self-report inventories were selected through a collaborative effort with parish partners to better understand the most pertinent mental and physical health issues facing the youth of St. Bernard Parish. Specific items were chosen by the research staff and community partners based upon (a) their ability to collectively capture and measure depressive, anxious, and posttraumatic criteria as specified by the DSM-IV-TR; and (b) their ability to capture physical health disparities. To account for the discrepancy in measurement, as well as to ensure face validity with participants, the current study utilized questions from the Achenbach Child Behavior Checklist (CBCL; Archenbach, 1991a) and Youth Self Report (YSR; Archenbach, 1991b). The full CBCL and YSR were not recommended by community residents at the time of the needs assessment given the time and burden that these instruments would have posed on this vulnerable population, particularly in light of the fact that mental health resources were limited relative to the high need for mental health services.

The youth mental health checklist (youth and parent forms). Items from the Achenbach syndrome scales, which have been used in previous research (Alati, O'Callaghan, Najman, Williams, Bor, & Lawlor, 2005; Glover, Pumariega, Holzer, Wise, & Rodriguez, 1999; MacGowan, Nash, & Fraser, 2002; Saylor & DeRoma, 2002), were used to examine posttraumatic, anxious, and depressive symptoms. Surveys consisted of items selected from the anxious/depressed, withdrawn/depressed, and somatic complaints subscales of the YSR (Achenbach, 1991b) and CBCL (Achenbach, 1991a). Items from the CBCL identified in a post hoc PTSD scale (for which Wolfe and colleagues found a Cronbach's alpha of .89 based on a sample of 68 sexually abused children; Wolfe, 1989) comprised the posttraumatic symptoms utilized in this survey. The response format for the items is (0) *not true*; (1) *somewhat or sometimes true*; and (2) *very true or often true* (see Table 1). A parallel survey, using items from the CBCL, was constructed for parental report of youth symptoms. While the CBCL (Achenbach, 1991a) and the YSR (Achenbach, 1991b) in their complete forms have been shown to be reliable and valid (e.g., Achenbach, 1991a, 1991b; Saylor & DeRoma, 2002; Wolfe et al., 1989), it is not known if the items of posttraumatic, depressive, and anxious symptoms utilized in this study have similar properties. Despite the fact that only a subset of items were used for this needs assessment project, all measures were purchased from the company.

With respect to reliability of the current measure, Cronbach's alpha for posttraumatic symptoms ranged from .81 to .92 across

Table 1
CBCL Items Used To Create Symptom Subscales

Mental health symptoms			Physical health symptoms
Posttraumatic	Depressive	Anxious	
1. Rather be alone[b,d]	1. Rather be alone[b,d]	3. Can't get mind off thoughts[d]	17a. Aches, pains[c]
2. Trouble sleeping[d]	2. Trouble sleeping[d]	4. Too dependent	17b. Headaches[c]
3. Can't get mind off thoughts[d]	5. Lonely[d]	7. Fears[a,d]	17c. Nausea[c]
5. Lonely[d]	6. Cries a lot[a]	13. Nervous, tense[a,d]	17d. Eye problems[c]
7. Fears[a,d]	8. Fears doing bad[a]	14. Nightmares[d]	17e. Skin problems[c]
11. Persecuted[d]	9. Must be perfect[a]	15. Fearful, anxious[a,d]	17f. Stomachaches[c]
13. Nervous, tense[a,d]	10. Feels unloved[a]	19. Self-conscious[a]	17g. Vomiting[c]
14. Nightmares[d]	12. Feels worthless[a]	22. Suspicious[d]	
15. Fearful, anxious[a,d]	16. Feels guilty[a,d]	23. Argues a lot[d]	
16. Feels guilty[a,d]	18. Secretive[b,d]	26. Worries[a]	
18. Secretive[b,d]	21. Trouble concentrating[d]		
21. Trouble concentrating[d]	24. Sad[b,d]		
22. Suspicious[d]			
23. Argues a lot[d]			
24. Sad[b,d]			
25. Mood changes[d]			

[a] CBCL Anxious/Depressed subscale. [b] CBCL Withdrawn/Depressed subscale. [c] CBCL Somatic Complaints subscale. [d] Wolfe et al. (1989) PTSD scale.

the three time points, indicating good internal consistency for each of the youth and parent measures. Cronbach's alpha values ranged from .83 to .90 for depressive symptoms, .75 to .87 for anxious symptoms, and .76 to .85 for physical health symptoms for the two time points after the hurricane. Lower alphas were obtained for depressive, anxious, and physical health symptoms during the pre-Katrina time interval in the youth dataset (.71, .65, and .54, respectively). Because many of the youth reported experiencing few symptoms during the months before the storm, the lower endorsement rate at this time period may have resulted in lower reliability statistics.

Summary scores for posttraumatic, depressive, and anxious symptoms used in survey analyses were calculated for each time point based on participant endorsement. Using the response format of the YSR and CBCL (0–2; Achenbach, 1991a, 1991b), parameters of participant scores for posttraumatic, depressive, and anxious symptoms could range from 0–32, 0–24, and 0–20, respectively. Items from the YSR and CBCL were also summarized descriptively.

Demographic information and qualitative items questionnaire. Qualitative items included in the survey were chosen based on previous research looking at the effects of natural disasters on children and adolescents (Davidson & Foa, 1991; Galante & Foa, 1986; Garrison et al., 1995; Goenjian et al., 1995; Hardin, Carbaugh, Weinrich, Pesut, & Carbaugh, 1992; La Greca, Silverman, & Wasserstein, 1998; Lonigan et al., 1991). These items asked participants to comment on their hurricane experience (e.g., "How many homes/residences have you lived in since Hurricane Katrina?", "How many schools have you attended since Hurricane Katrina?", "Did you lose any family members or friends during Hurricane Katrina?", "Were you in St. Bernard Parish or New Orleans when Hurricane Katrina hit?"). A parallel questionnaire was administered to parents. Disaster-related variables (e.g., factors associated with the storm and its aftermath, e.g., parental job loss as a result of the hurricane, property damage, or loss of a loved one as a result of Katrina) and youth demographic information were also collected.

Analyses

Descriptive statistics including means, standard deviations, and frequencies were tabulated. Mixed effect modeling assuming a normal distribution was used to assess for test effects between the two versions of forms administered (chronological order and reverse chronological order; see description of Form A and B in Methods). To determine whether mental health symptoms (e.g., posttraumatic, depressive, and anxious) at the two time points post-hurricane (1 year after the storm and 2 years post-Katrina) were higher relative to the reported pre-Katrina symptoms, generalized linear model (GLM) analyses were conducted using SAS PROC GENMOD. Given the non-normality of the Time 1 distribution (low frequency rating of mental health symptoms pre-Katrina), parameter estimates were adjusted using the generalized estimating equation (GEE) method developed by Liang and Zeger (1986). Three variables were included in the general linear model: depressive symptoms, anxious symptoms, and PTSD symptoms. In the first step, Time 1 data was compared to the average of Times 2 and 3 data. Secondly, Time 2 data was compared to Time 3 data. Alpha was set to .05 for all significance testing.

Survey Results

Sample Characteristics

All of the youth asked to participate in this assessment completed the survey. Three participants failed to answer more than 10 of the 26 items and were therefore excluded in study analyses. Three parents (two mothers and one father) declined participation in this needs assessment, reporting either being overwhelmed or that their child was "doing just fine" since the storm. In all, information on a total of 81 youth of the parish was obtained from 43 youth and 71 adults (including 33 who had children with them). Demographic characteristics of the sample are available as online supplemental material. Our primary analyses focused on data from 43 youth; however post hoc analyses were conducted with parent data. Qualitative data are presented below and in tables.

Families (both youth and parent participants) reported significant losses, with 78 (96%) reporting having had their homes partly or completely destroyed by the storm and ensuing flood waters. Of the three families that reported that they did not have property damage from the storm, two were from military families that moved to St. Bernard Parish after the storm. Forty-eight percent of the children per parental report, and 35% of the youth per self report, were located in areas directly impacted by the storm when Katrina made landfall. Many of the children, 31 (44%) according to parents, and 12 (28%) according to youth, reported losing either a family member or a friend as a result of the hurricane. Families reported having lived in as many as 10 homes or residences since the storm ($Mdn = 3$, inter-quartile range: $IQR = 1$). Reported homes or residences include apartment, garage, hotel or motel, trailer or RV, shed, house, car, with family, campground, nursing home, shelter, ship, townhouse, and ferry. Sixty-one percent of the youth or families reported living in another state since the storm. School attendance was also varied, with youth attending classes in as many as six schools since Katrina ($Mdn = 2$, $IQR = 1$). The highest total number of people living in a home at one time before the storm was seven ($Mdn = 4$, $IQR = 2$); that increased to as many as 18 people living in one home or residence as a result of the storm ($Mdn = 5$, $IQR = 2$).

Test Effects Between Forms

Mixed effect models were constructed for the youth dataset across the three time points to assess for test effects between the two form types (chronological order and reverse chronological order). Model specifications assumed normally distributed residuals, an autoregressive covariance structure, and correlated errors associated with subjects being measured at multiple time points. There were no significant relationships found between (a) the type of form given or (b) the interaction of type of form given by time; demonstrating the counter-balanced nature of assessment measures.

Rate of Mental Health Symptoms in Youth of St. Bernard Parish, LA

Data presented in Table 2 show that the prevalence of mental health symptoms was 44–104% higher post-Katrina when com-

Table 2
Means and Standard Deviations of Youth Symptom Endorsement by Time (n = 43)

Symptoms	Time period		
	Before Hurricane Katrina[a]	Year following Katrina[b]	In the past 2 weeks[c]
Posttraumatic	7.14 (4.98)	12.44 (7.62)	10.72 (7.01)
Depressive	3.93 (3.23)	8.02 (6.12)	6.21 (5.53)
Anxious	5.70 (3.28)	8.23 (4.12)	7.65 (4.45)

[a] June through August, 2005. [b] June 2006 through August 2006. [c] August 2007.

pared to pre-Katrina symptoms (per youth retrospective report). More specifically, youth endorsement of posttraumatic symptoms increased 75% in the year after the storm, and remained 50% higher than prestorm levels 2 years post-Katrina. A similar pattern was found for depressive and anxious symptoms, which saw an endorsement increase of 104 and 44%, respectively, in the year after the storm, and a 58 and 34% increase from pre-Katrina levels 2 years later. Seventy-nine percent of youth respondents reported new onset of mental health symptoms in the year after Katrina, and the vast majority (56%) reported continued mental health difficulties 2 years after the storm.

GLM revealed that there were significant differences in endorsement of mental health symptom scores across the three time periods per youth report. A statistical table summarizing our results is available as online supplemental material. GLM modeling revealed that posttraumatic and anxious symptoms in youth were significantly higher in the year after Hurricane Katrina (1.7 and 1.4 times higher, respectively), and remained significantly higher than pre-Katrina levels 2 years after the storm (1.5 and 1.3 times higher, respectively). A third GLM model revealed a significant increase in youth endorsement of depressive symptoms from Time 1 to Times 2 and 3, and a significant decrease from Time 2 to Time 3. The results indicate that depressive symptoms in youth were significantly higher in the year after Hurricane Katrina (2.0 times higher), and although significantly less than reported at Time 2, they remained salient 2 years after the storm (1.6 times higher than pre-Katrina levels).

While the focus of this paper is to describe youth self-report of symptoms, a comparison of parent and youth report of symptoms across the 33 matched youth-parent dyads yielded nonsignificant differences between youth and parent report. Of note, however, youth did report a higher number of mental health symptoms in their parent's report of their symptoms for the two time periods after the hurricane. A statistical table summarizing the results is available as online supplemental material.

Qualitative Data

During visits in the Health Center and within the context of brief survey interactions with clinic patients, the stories shared were compelling. Many clinic patients, whether able to participate in the needs assessment or not, took the time to describe the impact of Katrina on their lives. For example, one elderly gentleman shared with the authors that he never returns to the side of town where his old house once stood. He specifically stated that he stopped visiting his old homestead because it became "too difficult to go back there" because there was "nothing left."

Many visitors to the clinic, when made aware of the needs assessment, approached the research team and asked how they could help. One family in particular remains salient in the minds of the research staff. On the last day of data collection, a mother and her four children came into the clinic in obvious disarray, all of them still in their pajamas despite it being almost 11 o'clock in the morning. One male child, around 10 years of age, was without a shirt and his shoes. The mother began to explain how happy they were to have finally moved back into their home and out of their FEMA trailer the week before. Like many families in the parish, they had attempted to repair their home without skilled laborers, as they did not have the funds to pay for the appropriate assistance. That morning, they had awoken to their home on fire. The mother was still in obvious shock, saying that "after the water had receded [after Hurricane Katrina], the house dried up like a leaf . . . it went up [in flames] so fast." Even after such a tumultuous morning, this family insisted that they participate in the needs assessment. They wanted to "give back to the clinic, and to the parish, which has meant so much to our family."

As part of this needs assessment, participants were also asked, "What has been the hardest thing about life after Katrina for you?", and "Do you plan to live in the parish after graduation from high school or college?" Many youth reported that loss of friends and loved ones ($n = 18$), living in a FEMA trailer or shelter ($n = 7$), presence of mental health symptoms ($n = 5$), and returning to a destroyed home and community ($n = 8$) were the hardest things about their lives after Hurricane Katrina. Relevant to community planning, 48% of youth intend to live in or return to the parish after graduation from high school or college. Those who reported they wanted to leave the parish after graduation ($n = 18$) gave reasons such as being scared of the increased crime rate ($n = 1$), worried that another hurricane would hit the area ($n = 1$), or attendance at a university out of the area ($n = 7$). Youth also stated lack of appealing things to do in the parish as a reason for wanting to leave ($n = 4$). Of the youth who reported wanting to return to or stay in St. Bernard Parish after high school or college ($n = 14$), many gave reasons such as loving the parish ($n = 5$) and calling the parish the only home they have ever known ($n = 8$).

Implications and Future Directions

The current study examined the mental health status of youth in St. Bernard Parish, Louisiana, ~2 years after Hurricane Katrina. The prevalence of mental health symptoms in youth was high relative to self-reported pre-Katrina rates. Per retrospective report, the prevalence of symptoms was reported to be highest in the year after the hurricane, although at 2 years post-Katrina, many youth continued to report high levels of posttraumatic, depressive, and anxious symptoms. The results of this needs assessment suggest that youth's experiences of Hurricane Katrina, like other natural disasters, appear to be associated with high reports of mental health symptoms. Reports of anger, depression, loss, instability, danger, and boredom were common themes arising from questions about how survivors were feeling and coping.

It has been estimated that lifetime prevalence rates of PTSD is estimated to be 7.8% (Kessler, Sonnega, Bromet, Hughes, &

Nelson, 1995). One longitudinal study by Giacona and colleagues (1995) assessed the lifetime prevalence of PTSD in a nonreferred community sample of adolescents as 6.3%. Although this needs assessment did not assess for clinical PTSD, relative to these rates, it did find high levels of reported posttraumatic symptoms in the youth of St. Bernard Parish at 1 year post-hurricane (16%) and continued elevated symptoms (21%) 2 years after the storm.

One salient finding of this needs assessment is the co-occurrence of posttraumatic symptoms with depressive and anxious symptoms in youth after a major natural disaster. Such knowledge argues for a broader conceptualization and response to traumatic events, going beyond the present emphasis of posttraumatic response as a singular point of emphasis. Rather, future clinical research studies should address the co-occurrence of mood and anxiety disorders, particularly among youth on whom very few clinical studies have been published in the trauma literature. Further, it is important to determine what predicts positive and negative adjustment patterns long term after a natural disaster. For example, developmental, behavioral, transitional, and predisaster family and mental health variables may be important predictors.

Expanding on the previous point, this study highlights the fact that children and adolescents who experience disaster suffer from a myriad of co-occurring symptoms (and perhaps disorders) and that presentation and classification of symptoms into categories may be difficult (e.g., the overlap in symptom presentation between depression and PTSD). Treatment interventions should, therefore, target all prevalent facets of possible youth responses to natural disasters (e.g., PTSD, depression, and anxiety). Future clinical research on survivors of Hurricane Katrina and other natural disasters should further focus on how predisaster and immediate postdisaster psychological symptoms may predict delayed postdisaster risk factors and symptoms. In addition, clinical research studies should look at the effectiveness of interventions that have been implemented thus far to improve postdisaster responses by communities and health professionals.

This needs assessment expanded upon previous literature to assess not only posttraumatic symptoms, but also anxious and depressive symptoms in a population of trauma-exposed youth. To that effect, this survey found that youth of St. Bernard Parish, LA, continue to display high levels of psychological distress 2 years after Hurricane Katrina. Future clinical research and community assessments should continue to examine psychological morbidities as youth and community conditions evolve.

It is important to interpret the results in the context of the limitations of the study, which in turn inform future research studies. First, the data were collected independently on youth; however, many of them were accompanied by parents who were bringing them to a clinic setting. Given the study design, it is important to consider how the dynamic may have influenced results. The literature has noted that youth may downplay their psychological distress to ease some of their parents' burden (Yule & Williams, 1990), and in fact the data from this study showed a discrepancy in youth and parent report (a statistical table summarizing the results is available as online supplemental material), suggesting that youths' true symptoms may in fact be *higher* than those reported. Future clinical research studies will need to reassess the prevalence of symptoms and disorders, as well as the relationship between parent and child postdisaster mental health coping, using a larger sample size, ideally using a multi-informant, multi-modal approach.

Second, the nonsignificant findings based on youth self report from Time 2 to Time 3 may be because of the limited sample size ($n = 43$). As of August 2007, there were ~5,000 school-aged youth under the age of 18 in the 680-square mile area of the parish; thus, in the context of this needs assessment, the sample size is limited, but not insignificant as this was ~1% of the population and a higher percentage given the eligibility characteristics. Further, participant characteristics mirrored pre-Katrina race demographics (e.g., in 2005, 86% of the population was white; 10.5% were African American; and 5.5% were of Hispanic or Latino origin; United States Census Bureau, 2007). Because those who were in visible pain or discomfort were not approached to participate, there is no way to know whether the symptoms endorsed by this clinic sample are representative of the overall youth population in the parish. Again, future clinical research studies should aim to include larger cohorts of both child and parent survivors of natural disasters.

Third, because Hurricane Katrina was an unexpected phenomenon, predisaster functioning in the youth of St. Bernard Parish was based solely on retrospective report as all pre-Katrina medical records had been destroyed. Thus, the authors did not have information on prehurricane psychiatric morbidity, which is known to influence postdisaster psychiatric morbidity (Nolen-Hoeksema & Morrow, 1991). Advancements in electronic medical and mental health records will facilitate our longitudinal understanding of coping in the future as will our use of standardized assessment tools and interventions in clinics. Even still, we will need to be sensitive to the needs of vulnerable populations after natural disasters and will have to "meet people and communities where they are."

Fourth, and as noted earlier, clear overlap of mental health symptoms and disorders exists. To that effect, future clinical research studies should find ways to better understand how these and other mental health disorders overlap in youth who have experienced natural disasters such as hurricanes. Future studies should aim to better understand the indices and constructs of postdisaster coping and resilience to better tease out relationships among these variables.

Lastly, because posttraumatic symptoms in youth have only recently been a focus in the literature, the assessment of such symptoms in the aftermath of disasters has been varied (e.g., Kar & Bastia, 2006; LaGreca et al., 1996; Lonigan et al., 1994; McDermott & Palmer, 2002; Saylor & DeRoma, 2002; Scheeringa et al, 2006). Because of the vulnerability of the sample, the authors also used a qualitative approach to data analysis and reported CBCL and YSR items as symptoms of anxiety, depression and posttraumatic-stress (Wolfe et al., 1989). The authors acknowledge that this approach is intentionally conservative given the constraints of the study and the retrospective nature of the study. While numerous studies have used item or qualitative analyses using the CBCL or YSR, the authors acknowledge that this approach is not consistent with standard scoring or reporting instructions. Future clinical research studies should determine how to best balance standard measurement with respecting vulnerability. In turn, the literature will need to acknowledge that natural disasters may not allow for "typical" presentations or trajectories of mental health symptoms in youth that are appropriate for the use of

standardized instruments or diagnoses according to *DSM–IV* criteria, particularly in vulnerable populations such as youth.

The results of this study also provide practical advice to clinical practitioners in the wake of disasters. Clinicians working in the field after a natural disaster such as Katrina must continuously adapt their skills with the changing environment. They must be willing to work in unconventional settings (e.g., trailers or other make-shift clinics, as was the case with St. Bernard Parish), and adapt to whatever children, families, and communities may need (Mitchell et al., 2008). Clinicians need to remain cognizant of the fact that, at any given time, and especially over time, there is high comorbidity among mental health symptoms and disorders, including PTSD, depression, and anxiety, as well as other disorders not discussed in this paper (e.g., adjustment disorder, etc.). Youth in St. Bernard and other areas affected by Katrina and other natural disasters also experienced a range of mental health, developmental and medical complications (some related to and some independent of natural disasters) that further complicated assessment and intervention. A thorough assessment that includes a diagnostic interview to best understand the child's history in the context of disaster-related events will help to yield a more accurate diagnosis and plan for the child and family (Osofsky, Osofsky, & Harris, 2007).

A developmental approach is also necessary when working with these traumatized youth who may show signs of regression after the event (Osofsky et al., 2007). Further, clinical interventions and services must address the needs of parents, caregivers, and other family members who may also be suffering from mental health issues (Osofsky et al., 2007; Scheeringa & Zeanah, 2008). Within the context of this needs assessment, participants were recruited from a medical health clinic; thus, comorbid physical health issues should also be evaluated. Overall, clinicians need to recognize that in general, children can be resilient in the face of disasters, particularly when they are able to resume their academic, social, and emotional functioning. Thus, clinical intervention strategies should include a public policy perspective that can address broader systems issues that may improve access to mental health care, as well as assuring that youth have recreational, social and educational activities. Such community-based approaches should strive for a quick return to normalcy and should involve community members, schools, civic organizations, and parents (Fothergill & Peek, 2006). Accordingly, one of the main goals of CBPR is to empower a community, thus involvement of the entire system from the beginning helps a community to take responsibility for rebuilding itself (Boothroyd, Fawcett, & Foster-Fishman, 2004; Green et al., 1997).

It is well documented that youth are resilient, even when confronted with disaster (Masten, 2001). As a result, their psychological and emotional needs may be neglected or overlooked after disasters, especially when the adults in their lives are having trouble coping with the event themselves. The mental health of youth of St. Bernard Parish has been challenged after Hurricane Katrina's landfall in August 2005. Although the framework for mental health services is being reestablished, the ongoing financial, emotional, social, and physical effects of Hurricane Katrina necessitate that additional systems and policies need to be developed and implemented with ongoing evaluation in future disasters. Mental health resources for children and adolescents remain extremely limited relative to the need for these services. Further, resources are needed to establish residential stability and social or recreational facilities for youth within the community. Continued collaboration is warranted with state and national governing agencies, private, nonprofit agencies, and faith-based organizations to intervene and offer services and resources to communities still reeling from the effects of Katrina. Finally, the resiliency of youth, their parents, and the community as a whole should be highlighted. Many youth were transcending the devastating consequences of Katrina by "taking one day at a time," re-establishing their sense of normalcy, and redefining their notions of "home." Although many parents communicated that their children were experiencing mental health difficulties, other parents reported that their children were doing "amazingly well."

This needs assessment attempted to map traditional techniques and assessment tools onto a situation that was far from the ordinary. The presentation of symptoms in youth of St. Bernard Parish since Hurricane Katrina is ever-evolving and unfolding because of the layers of concerns affecting every aspect of their lives, including their social, emotional, educational, vocational, and economical well-being. Thus, prolonged, overlapping symptoms demonstrate the limitations of the DSM-IV to adequately assess the mental health functioning of a community after a disaster of such magnitude (Davis & Siegel, 2000; Mitchell et al., 2008; Weisler, Barbee, & Townsend, 2006).

Exposure to Hurricane Katrina and the ensuing flood surge seems to have had serious and long-term physical and mental health effects on the youth of St. Bernard Parish, LA. This needs assessment survey was inspired, in part, by the fact that the parish and its local and federal affiliates prioritized rebuilding the health and mental health infrastructure and securing the educational, social, emotional, and residential resources that are needed to ensure health and achievement in youth, particularly those at highest risk for maladjustment. Hence, completing this study was a necessary step in this process. Following the CBPR model, data were disseminated and compiled and given back to clinic staff, as well as the parish grant manager for use in writing health-related grants. The employment of a community-based and mixed-method approach in this research and evaluation enhanced the design, conduct, and implications of this needs assessment. The results of this study highlight both the opportunities and challenges related to mental health in youth in St. Bernard, as they possess both risk and resiliency factors. As the parish is rebuilt, most youth will inevitably experience increasing residential and school stability. It will be important to provide resources for those youth who will continue to experience emotional, social, academic, and other mental health symptoms as a result of Hurricane Katrina or their long-term displacement from this unprecedented storm. As additional resources are secured, it will continue to be important to identify youth at greatest risk and to ensure that services are provided in a timely and efficient manner given limited resources.

References

Achenbach, T. M. (1991a). *Manual for the Child Behavior Checklist/4*–18 and 1991 profile. Burlington, VT: University of Vermont Department of Psychiatry.

Achenbach, T. M. (1991b). *Manual for the Youth Self-Report and 1991 profile*. Burlington, VT: University of Vermont Department of Psychiatry.

Alati, R., O'Callaghan, M., Najman, J. M., Williams, G. M., Bor, W., & Lawlor, D. A. (2005). Asthma and internalizing behavior problems in adolescence: A longitudinal study. *Psychosomatic Medicine, 67,* 462–470.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revision). Washington, DC: Author.

Boothroyd, R. I., Fawcett, S. B., & Foster-Fishman, P. G. (2004). Community development: Enhancing the knowledge base through participatory research. In L. A. Jason, C. B. Keys, Y. Suarez-Balcazar, R. R. Taylor, & M. I. Davis (Eds.), *Participatory community research: Theories and methods in action* (pp. 37–53). Washington, DC: American Psychological Association.

Burke, J. D., Jr., Moccia, P., Borus, J. F., & Burns, B. J. (1986). Emotional distress in fifth-grade children ten months after a natural disaster. *Journal of the American Academy of Child Psychiatry, 25,* 536–541.

Coker, A., Hanks, J., Eggleston, K., Risser, J., Tee, P., Chronister, K., Arafat, R., & Franzini, L. (2006). Social and mental health needs assessment of Katrina evacuees. *Disaster Management & Response, 4,* 88–94.

Davidson, J. R., & Foa, E. B. (1991). Diagnostic issues in posttraumatic stress disorder: Considerations for the DSM-IV. *Journal of Abnormal Psychology, 100,* 346–355.

Davis, L., & Siegel, L. J. (2000). Post-traumatic stress disorder in children and adolescents: A review and analysis. *Clinical Child and Family Psychology Review, 3,* 135–154.

Fothergill, A., & Peek, L. (2006). Surviving catastrophe: A study of children in Hurricane Katrina. In Natural Hazards Center (Ed.), *Learning from catastrophe: Quick response research in the wake of Hurricane Katrina* (pp. 97–129). Boulder, CO: Institute of Behavioral Science, University of Colorado at Boulder.

Galante, R., & Foa, D. (1986). An epidemiological study of psychic trauma and treatment effectiveness for children after a natural disaster. *Journal of the American Academy of Child Psychiatry, 25,* 357–363.

Garrison, C. Z., Bryant, E. S., Addy, C. L., Spurrier, P. G., Freedy, J. R., & Kilpatrick, D. G. (1995). Posttraumatic stress disorder in adolescents after Hurricane Andrew. *Journal of the American Academy of Child and Adolescent Psychiatry, 34,* 1193–1201.

Giacona, R. M., Reinherz, H. Z., Silverman, A. B., Pakiz, B., Frost, A. K., & Cohen, E. (1995). Trauma and PTSD in a community population of older adolescents. *American Academy of Child and Adolescent Psychiatry, 34,* 1369–1380.

Glover, S. H., Pumariega, A. J., Holzer, C. E., Wise, B. K., & Rodriguez, M. (1999). Anxiety symptomatology in Mexican-American adolescents. *Journal of Child and Family Studies, 81,* 47–57.

Goenjian, A. K., Pynoos, R. S., Steinberg, A. M., Najarian, L. M., Asarnow, J. R., Karayan, I., Ghurabi, M., & Fairbanks, L. A. (1995). Psychiatric comorbidity in children after the 1988 earthquake in Armenia. *Journal of the American Academy of Child and Adolescent Psychiatry, 34,* 1174–1184.

Goenjian, A. K., Steinberg, A. M., Najarian, L. M., Fairbanks, L. A., Tashjian, M., & Pynoos, R. S. (2000). Prospective study of posttraumatic stress, anxiety, and depressive reactions after earthquake and political violence. *American Journal of Psychiatry, 157,* 911–916.

Green, B. L., Grace, M. C., Vary, M. G., Kramer, T. L., Gleser, G. C., & Leonard, A. C. (1994). Children of disaster in the second decade: A 17-year follow-up of Buffalo Creek survivors. *Journal of the American Academy of Child and Adolescent Psychiatry, 33,* 71–79.

Green, L. W., George, M. A., Daniel, M., Frankish, C. J., Herbert, C. P., Bowie, W. R., & O'Neil, M. (1997). Background on participatory research. In M. D. Scammell & R. Sclove (Eds.), *Doing community-based research: A reader* (pp. 53–66). Amherst, MA: The Loka Institute.

Hardin, S. B., Carbaugh, L., Weinrich, S., Pesut, D., & Carbaugh, C. (1992). Stressors and coping in adolescents exposed to Hurricane Hugo. *Issues in Mental Health Nursing, 13,* 191–205.

Hardin, S. B., Weinrich, M., Weinrich, S., Hardin, T. L., & Garrison, C. (1994). Psychological distress of adolescents exposed to Hurricane Hugo. *Journal of Trauma Stress, 7,* 427–440.

Kar, N., & Bastia, B. K. (2006). Post-traumatic stress disorder, depression and generalized anxiety disorder in adolescents after a natural disaster: A study of comorbidity. *Clinical Practice and Epidemiology in Mental Health, 2,* 17.

Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52,* 1048–1060.

La Greca, A. M., Silverman, W. K., Vernberg, E. M., & Prinstein, M. J. (1996). Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. *Journal of Consulting and Clinical Psychology, 64,* 712–723.

La Greca, A. M., Silverman, W. K., & Wasserstein, S. B. (1998). Children's predisaster functioning as a predictor of posttraumatic stress following Hurricane Andrew. *Journal of Consulting and Clinical Psychology, 66,* 883–892.

Liang, K., & Zeger, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika, 73,* 13–22.

Lonigan, C. J., Shannon, M. P., Finch, A. J., Daugherty, T. K., & Taylor, C. M. (1991). Children's reactions to a natural disaster: Symptom severity and degree of exposure. *Advances in Behavior Research and Therapy, 13,* 135–154.

MacGowan, M. J., Nash, J. K., & Fraser, M. W. (2002). The Carolina Child Checklist and protective factors for aggression. *Research on Social Work Practice, 12,* 253–276.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56,* 227–238.

McDermott, B. M., & Palmer, L. J. (2002). Postdisaster emotional distress, depression and eventrelated variables: Findings across child and adolescent developmental stages. *Australian and New Zealand Journal of Psychiatry, 36*(6), 754–761.

McFarlane, A. C., Policansky, S. K., & Irwin, C. (1987). A longitudinal study of the psychological morbidity in children due to a natural disaster. *Psychological Medicine, 17,* 727–738.

Mitchell, M. J., Witman, M., & Taffaro, C. (2008). Reestablishing mental health services in St. Bernard Parish, Louisiana, following Hurricane Katrina. *Professional Psychology: Research and Practice, 39,* 66–76.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology, 61,* 115–121.

Osofsky, J. D., Osofksy, H. J., & Harris, W. W. (2007). Katrina's children: Social policy considerations for children in disasters. *Social Policy Report, 21,* 3–19.

Saylor, C. F., & DeRoma, V. (2002). Assessment of children and adolescents exposed to disaster. In A. M. La Greca, W. K. Silverman, E. M. Vernberg, & M. C. Roberts (Eds.), *Helping children cope with disasters and terrorism* (pp. 35–54). Washington, DC: American Psychological Association.

Scheeringa, M. S., Wright, M. J., Hunt, J. P., & Zeanah, C. H. (2006). Factors affecting the diagnosis and prediction of PTSD symptomatology in children and adolescents. *American Journal of Psychiatry, 163,* 644–651.

Scheeringa, M. S., & Zeanah, C. H. (2008). Reconsideration of harm's way: Onsets and comorbidity patterns of disorders in preschool children and their caregivers following Hurricane Katrina. *Journal of Clinical Child & Adolescent Psychology, 37,* 508–518.

Shaw, J. A., Applegate, B., & Schorr, C. (1996). Twenty-one-month follow-up study of school-age children exposed to Hurricane Andrew.

Journal of the American Academy of Child and Adolescent Psychiatry, 35, 359–364.

United States Census Bureau. (2007). *State and county quickfacts: St. Bernard Parish, Louisiana.* Retrieved from http://quickfacts.census.gov/qfd/states/22/22087.html

Vernberg, E. M., & Varela, R. E. (2001). Posttraumatic stress disorder: A developmental perspective. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety* (pp. 386–406). New York, NY: Oxford University Press.

Vogel, J., & Vernberg, E. (1993). Children's psychological responses to disasters. *Journal of Clinical Child Psychology, 22,* 464–484.

Weems, C. F., Watts, S. E., Marsee, M. A., Taylor, L. K., Costa, N. M., Cannon, M. F., . . . Pina, A. A. (2007). The psychosocial impact of Hurricane Katrina: Contextual differences in psychological symptoms, social support, and discrimination. *Behaviour Research and Therapy, 45,* 2295–2306.

Weisler, R. H., Barbee, J. G. T., & Townsend, M. H. (2006). Mental health and recovery in the Gulf Coast after Hurricanes Katrina and Rita. *Journal of the American Medical Association, 296,* 585–588.

Wolfe, V. V., Gentile, C., & Wolfe, D. A. (1989). The impact of sexual abuse on children: A PTSD formulation. *Behavior Therapy, 20,* 215–228.

Yule, W., & Williams, R. (1990). Posttraumatic stress reactions in children. *Journal of Traumatic Stress, 3,* 279–295.

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