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## The psychosocial impact of Hurricane Katrina: Contextual differences in psychological symptoms, social support, and discrimination

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### Abstract

This study tested a contextual model of disaster reaction by examining regional differences in the psychosocial impact of Hurricane Katrina. A total of 386 individuals participated in this study. All were recruited in the primary areas affected by Hurricane Katrina and included residents of metropolitan New Orleans (Orleans Parish, Louisiana), Greater New Orleans (i.e., Metairie, Kenner, Gretna), and the Mississippi Gulf Coast (i.e., cities along the coast from Waveland to Ocean Springs, Mississippi). Participants were assessed for posttraumatic stress disorder (PTSD) symptoms, other psychological symptoms, perceptions of discrimination, perceptions of social support, evacuation distance, and the extent to which they experienced hurricane-related stressful events. Results were consistent with previous research on the impact of disasters on mental health symptoms. Findings extended research on individual differences in the response to trauma and indicated that regional context predicted unique variance in the experience of discrimination, social support, and emotional symptoms consistent with the theoretical model presented.

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*Keywords:* Traumatic stress; Discrimination; Social support; Emotional symptoms

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Hurricane Katrina devastated the Gulf Coast in August, 2005 and estimates suggest that it was the most costly natural disaster in US history (Bacon, 2005). Along with the physical devastation it became apparent that the traumatic stress wrought by the hurricane could have a deep effect on the mental health of many residents of the area (Weisler, Barbee, & Townsend, 2006). In addition to the physical devastation, financial cost, and mental health impact, it seemed from the many news reports that in areas such as metropolitan New Orleans the social fabric of some communities was also disintegrating in the wake of the storm. This paper

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examines regional contextual differences in the experience of negative psychosocial consequences after the Hurricane Katrina disaster. The study is guided by broad contextual models of lifespan human development (e.g., Bronfenbrenner, 1977), more specific models of risk and resilience to stress (e.g. Hobfoll, 1989; Sandler, 2001), and our own observations in the region following the storm. The study is prompted by recent calls to better understand the broader social implications and concomitants of traumatic stress (Ozer & Weiss, 2004). Past research has tended to focus on posttraumatic stress disorder (PTSD) and PTSD symptoms. In this study we were interested in examining impact across psychosocial domains (i.e., symptoms, social support, discrimination) and thus couch the study in both past PTSD literature and a broader theoretical literature.

Sandler's (2001) risk and resilience model draws upon a broad theoretical basis (e.g., Buss, 1990; Deci & Ryan, 1985; Maslow, 1954) and delineates basic human needs and goals that when fostered protect individuals from psychological harm and when hindered place individuals at risk. For residents of the Gulf Coast many of these basic human needs were endangered by the catastrophic landfall of Hurricane Katrina and continued to be threatened in the aftermath of the disaster. Illustratively, nearly one hundred miles of coastal homes were utterly destroyed, 80% of the city of New Orleans was flooded with up to 20 feet of water, and individuals and families were displaced and exposed to a number of related negative consequences (e.g., reported discrimination, severed ties to social support, intense helplessness). A primary goal in Sandler's model is one of maintaining physical safety. This goal was clearly and severely disrupted by the disaster. The model predicts, and research suggests, that the level of physical threat a person faces is directly related to the intensity of posttraumatic stress reactions (e.g., Caldera, Palma, Penayo, & Kullgren, 2001; Gurwitsch, Sitterle, Young, & Pfefferbaum, 2002; La Greca, Silverman, & Wasserstein, 1998). Given the extent of devastation, it is likely that residents who directly experienced traumatic events associated with the hurricane would experience a high number of emotional symptoms such as those associated with PTSD (American Psychiatric Association (APA), 1994) and related problems such as anxiety, somatization, and depression (Weisler et al., 2006).

Based on Sandler's (2001) model, other needs that were likely disrupted by Hurricane Katrina include the individual's sense of self-worth and sense of social connectedness. As reviewed by Sandler (2001), experiences that lead to positive self-evaluation lead to positive affect, while negative self-evaluation is accompanied by distress. The adverse conditions precipitated by Hurricane Katrina at both the family and community level threatened positive self-evaluations among survivors in multiple ways, including the disruption of esteem-supporting relationships (e.g., with co-workers, teachers, friends, neighbors) and potential affiliation through the media with disvalued groups (e.g., looters). After Hurricane Katrina, extremely adverse conditions for positive self-evaluation existed and the context in which many individuals found themselves hindered the use of strategies to maintain positive self-evaluations (such as cutting ties to groups that are perceived negatively and affiliating with groups that are perceived positively). This may have been particularly true for disadvantaged and racial or ethnic minority families and also those residing in places like metropolitan New Orleans where media attention was often focused on acts of violence and looting (Thevenot, 2005; Welch, 2005). In such contexts, the community was not supportive of positive self-evaluation and was not likely to be perceived as one with a strong level of social relatedness and support. Such a context could foster perceptions of discrimination and of being treated differently because of the individual's background (e.g., being a racial or ethnic minority, being from New Orleans).

In terms of social relatedness, the Katrina disaster seriously disrupted social ties and one's ability to access not only his or her extended community, but family members as well. Because many Katrina survivors were relocated, supporting relationships at the family, neighborhood, church, and school levels of organization were interrupted. Moreover, families were often separated and dispersed to different geographical locations. Clearly the adverse conditions precipitated by Hurricane Katrina threatened the goal and need for a bond of mutual value, caring, and concern. The Katrina disaster threatened the amount or the stability of contact with social ties in all persons affected. Once again, however, the context in which an individual experienced the disaster may have had profound effects on social connectedness and perceptions of discrimination. In particular, in those communities where the neighborhood was perceived as coming together to overcome the adversity, individuals should have perceived a greater sense of social support and less discrimination. Such social and interpersonal effects on the expression of psychological symptoms following a traumatic event have been examined at the individual level and are consistent with this hypothesis (e.g., Lepore, Silver, Wortman, & Wayment, 1996). Research has also examined cultural differences (i.e., US versus Mexico) in the experience of

posttraumatic stress following a hurricane and results have pointed to differences in the expression of posttraumatic stress symptoms (Norris, Perilla, & Murphy, 2001b). Drawing the existing theoretical and empirical literature together, the context within which an individual experiences a disaster is a potentially important factor in disaster reactions as it may foster the differential experience of risk and protective factors.

The multiple geographic regions affected by Katrina provided a unique opportunity to examine contextual differences in the expression of the socio-emotional difficulties which ensue following a major catastrophe. Physically, the residents of metropolitan New Orleans experienced much less immediate storm surge flooding and wind damage but were subjected to prolonged disruption and destruction prompted by the broken levees flooding the city. In the public image view, many news reports often portrayed New Orleans residents in the immediate aftermath as lawless and looting not for food but for financial gain (Dalrymple, 2005; Welch, 2005). The residents along the Gulf Coast of Mississippi (e.g., Waveland to Biloxi) were confronted with immediate and in many cases total destruction of property due to their closer proximity to the hurricane's landfall. Many of these residents were not prepared and the devastation in this region surpassed all expectations which possibly worsened the impact in terms of psychological symptoms (Bolstad & Zinbarg, 1997; Foa, Zinbarg, & Olasov-Rothbaum, 1992). However, news reports often portrayed residents of the Mississippi Gulf Coast areas (e.g., Bay St. Louis, Long Beach, Gulfport) as banding together to overcome the total destruction of their communities (Cauchon, 2005, September 9).

Reasoning from these considerations and a very limited understanding of the broader societal influence on disaster reactions (Ozer & Weiss, 2004), there is a need to examine contextual differences in the experience of psychological symptoms, perceived discrimination, and social support in the aftermath of disaster. The importance of documenting contextual differences in the response to trauma is highlighted by the growing realization that the response to trauma is not one-dimensional and interventions that treat individuals with "one size fits all" prevention interventions (Mitchell, 1983) are not only ineffective but may be detrimental (McNally, Bryant, & Ehlers, 2003). The importance of examining whether regional context accounts for variance in the psychosocial response of disaster survivors (e.g., psychological symptoms, perceptions of discrimination, and perceptions of social support) is also highlighted by a growing realization that primary prevention may be fostered not just at the individual level but also at broader social and government policy level (Ozer & Weiss, 2004).

In this study, we first sought to document impact by describing the experiences and psychological symptoms of those residing in the affected region in the early months following the storm. In addition, we attempted to extend the literature on the role of context in disaster reactions. Though social support is often hypothesized to be protective factor and discrimination can be thought of as a risk factor, in this study we wanted to explore regional differences in the experience of these factors. The broad question guiding the study was "in addition to exposure does regional context impact response and what besides PTSD and other psychological symptoms constitute a disaster Reaction?" To date, research on traumatic experience response has been narrowly focused on exposure and its relation to PTSD and other psychological symptoms (see Ozer & Weiss, 2004 for additional relevant discussion). The extent of the Katrina disaster raised the question "What other social systems are impacted (e.g., discrimination, social support) and how does context influence this?"

Drawing from the theoretical considerations outlined above and regional differences in the experience of the storm, we predicted that context would be uniquely associated with individual responses. Specifically, we predicted that residents of metropolitan New Orleans would report experiencing greater perceptions of discrimination than residents of the Mississippi Gulf Coast. We predicted that residents of the Mississippi Gulf Coast would report greater psychological symptoms due to the intensity of their experience, but that perceptions of positive social support would be more common than in metropolitan New Orleans. We took a multivariate approach to contextual differences given the multiple potential influences on psychological symptoms, perceptions of discrimination, and perceptions of social support. In particular, given the potential role of gender in predicting emotional symptoms (Norris, Perilla, Ibañez, & Murphy, 2001a) and also of racial or ethnic minority status in perceptions of discrimination (Sellers & Shelton, 2003; Turner & Avison, 2003), gender and racial minority status were of interest. We predicted that the context would predict psychological symptoms, perceived discrimination, and perceived social support beyond these and other demographic variables and also beyond the number of traumatic events the person experienced.

## Method

### *Participants*

A total of 401 individuals aged 18–86 years (59% female, mean age 33 years) were surveyed for this study. Fifteen individuals either failed to report residence or reported residing in an area outside the three regions of interest and thus were not included in the final sample ( $N = 386$ ). All participants were recruited in areas affected by Hurricane Katrina and the recruitment strategy aimed to include a representative sample from each of the communities (i.e., those with or without resources would have an equally likely chance to be recruited). Characteristics of the sample are presented in Table 1.

### *Measures*

*Survey of exposure to hurricanes and their aftermath* (SEHA Events): We asked participants a set of 23 questions to assess level of exposure to hurricane-related traumatic events. Example items include: “During the storm did you see windows and doors breaking?” and “During the storm did you hear about tornados in your area?” Respondents indicate No (0) or Yes (1) as to whether they were exposed to the events or situations as done in a number of previous studies (Norris et al., 2001b; La Greca et al., 1998). In this sample, the internal consistency reliability estimate (coefficient alpha) for the survey was .77. The 16 most common experiences are presented in Table 1. The survey also asked about the individual’s place of residence at the time of the storm’s landfall and this variable was used to create three community context based on region: (1) metropolitan New Orleans (New Orleans; Orleans Parish, Louisiana); (2) Greater New Orleans (Greater NOLA; e.g., Metairie, Kenner, Gretna); and (3) the Mississippi Gulf Coast (Miss Gulf; e.g., cities along the coast from Waveland to Ocean Springs, Mississippi). We distinguished between metropolitan New Orleans and Greater New Orleans in dividing the sample because only metropolitan New Orleans flooded due to the levee breaks. The survey also asked respondents to report where they went during the storm and how far away from home they evacuated.

*Perceived discrimination* (Williams, Yu, Jackson, & Anderson, 1997): Perceived discrimination was assessed in terms of the prevalence of perceived day-to-day discrimination following the storm (e.g., treated with less courtesy, treated with less respect, people acting as if you are dishonest or less smart) as done in previous research (Turner & Avison, 2003). The scale consists of nine items and scores are simple counts (yes, no) of the number of events or situations that occurred. In this sample, the internal consistency reliability estimate (coefficient alpha) for the discrimination items was .94.

*Brief symptom inventory-18* (BSI-18; Derogatis, 2000): The BSI-18 is a self-report measure that consists of 18 items assessing psychological symptoms and is a briefer version of the Symptom Checklist-90-R (SCL-90-R; Derogatis, 1994). Items are rated on a five-point scale [one (not at all) to five (extremely)] to reflect the level of distress an individual has experienced by each of the symptoms during the previous month. Designed to be brief and easy to administer, the test measures three primary symptom dimensions (depression, anxiety, and somatization) as well as total global severity, and is designed to provide an overview of symptoms and their intensity at a specific point in time. In this sample, the internal consistency reliability estimate (coefficient alpha) for the BSI-18 was .93.

*Posttraumatic stress disorder checklist* (PTSD Checklist; Amaya-Jackson, McCarthy, Newman, & Cherney, 1995): The PTSD Checklist was designed to assess PTSD symptoms in youth and was modified for use in the current study (i.e., items were edited for relevance to adults and items not assessing the DSM-IV (APA, 1994) symptoms were not used). This checklist was chosen based on the reading ease of the wording which is designed to facilitate assessment in youth. The modified version used in this study included 25 items assessing symptoms corresponding to each of the major PTSD symptom categories (i.e., re-experiencing, avoidance/emotional numbing, and hyperarousal) specified in the DSM-IV (APA, 1994). The rating scale for the experience of symptoms is as follows: 0 = not at all, 1 = some of the time, 2 = most of the time, or 3 = all of the time. In this sample, the internal consistency reliability estimate (coefficient alpha) for the PTSD items was .93.

Table 1  
Comparison of regional groups on demographics

	Total <i>n</i> = 386	New Orleans <i>n</i> = 94	Greater NOLA <i>n</i> = 164	Miss Gulf <i>n</i> = 128
Age ( <i>M</i> / <i>SD</i> )	32.8 (14.2)	35.5 (14.7)	32.3 (14.7)	31.5 (12.9)
Female (%)	60.3	58.5 <sup>1</sup>	51.8 <sup>2</sup>	72.4 <sup>1, 2</sup>
Race/ethnicity (%)				
Caucasian	75.3	75.0	81.0	68.0
African-American	18.4	21.7	11.0	25.6
Hispanic	4.2	2.2	5.5	4.0
Asian	0.8	0.0	1.2	0.8
Other	1.3	1.1	1.2	1.6
Annual family income (%)				
< \$20,000	17.1	18.1	10.0	25.2
\$20,000–\$50,000	37.5	43.6	29.4	43.3
> \$50,000	45.4	38.3 <sup>1</sup>	60.6 <sup>1, 2</sup>	31.5 <sup>2</sup>
Evacuation distance from home (%)				
0 miles	7.8	10.3	1.3	14.5
0–20 miles	14.6	4.6	9.4	28.2
20–50 miles	9.7	1.1	13.8	10.5
50–100 miles	17.8	18.4	19.4	15.3
> 100 miles	50.1	65.5 <sup>1</sup>	56.3 <sup>1</sup>	31.5 <sup>1</sup>
Total number of traumatic experiences ( <i>M</i> / <i>SD</i> )	5.2 (3.5)	5.5 (4.6)	4.6 (2.8) <sup>1</sup>	5.6 (3.1) <sup>1</sup>
During storm	2.1 (1.9)	1.8 (2.4) <sup>1</sup>	1.7 (1.6) <sup>2</sup>	2.7 (1.7) <sup>1, 2</sup>
After storm	3.1 (2.1)	3.7 (2.5) <sup>1, 2</sup>	2.9 (1.9) <sup>1</sup>	2.9 (2.0) <sup>2</sup>
Television exposure (%) Reported viewing:				
Destruction/homes destroyed	97.7	94.7	99.4	97.6
Suffering	94.3	94.7	96.3	91.3
Crime and violence	84.9	89.4 <sup>1</sup>	87.8 <sup>2</sup>	78.0 <sup>1, 2</sup>
Death	80.8	89.4 <sup>1</sup>	83.5 <sup>2</sup>	70.9 <sup>1, 2</sup>
Common direct experiences (%)				
1. Separated from friends	70.6	79.8 <sup>1</sup>	72.6 <sup>2</sup>	61.4 <sup>1, 2</sup>
2. Separated from neighbors	59.8	78.7 <sup>1</sup>	64.0 <sup>1</sup>	40.0 <sup>1</sup>
3. Separated from relatives	51.2	59.6	48.2	48.8
4. Home damaged/destroyed	46.0	51.6	40.2	49.2
5. Saw trees being damaged	43.9	28.0 <sup>1</sup>	37.8 <sup>2</sup>	63.3 <sup>1, 2</sup>
6. Heard about tornadoes in area	41.9	21.5 <sup>1</sup>	37.8 <sup>1</sup>	62.2 <sup>1</sup>
7. Taken to different city/state	31.3	47.9 <sup>1</sup>	32.9 <sup>1</sup>	16.7 <sup>1</sup>
8. Saw others hurt/sick/die	24.9	23.4	22.0	29.9
9. Saw breaking windows/doors	24.0	18.3 <sup>1</sup>	15.3 <sup>2</sup>	39.1 <sup>1, 2</sup>
10. Separated from pets	17.5	23.4 <sup>1</sup>	12.8 <sup>1, 2</sup>	19.2 <sup>2</sup>
11. Witnessed crime or violence	16.2	14.0	12.2 <sup>1</sup>	23.0 <sup>1</sup>
12. Got hurt or sick	12.3	6.5 <sup>1</sup>	9.1 <sup>2</sup>	20.6 <sup>1, 2</sup>
13. Saw roads washed away/flooding	9.9	12.9	6.1	12.5
14. Separated from child	9.9	12.8	7.3	11.1
15. Rescued	4.5	13.8 <sup>1</sup>	0.0 <sup>1</sup>	3.3 <sup>1</sup>
16. Trapped in shelter	4.5	9.6 <sup>1</sup>	0.6 <sup>1, 2</sup>	5.6 <sup>2</sup>

Note: NOLA = New Orleans, Louisiana; Miss Gulf = Mississippi Gulf Coast; *M* = mean; *SD* = standard deviation. Like superscripts indicate significant differences at  $p < .05$ .

*Family support scale* (FSS; Dunst, Trivette, & Cross, 1986): The FSS measures the helpfulness of 18 different sources of support. The sources include individuals (e.g., spouse, parents, friends, physician) and groups (e.g., church, school, day care). Respondents indicate the extent to which each source is helpful. Consistent with the scale's development social support was calculated as a count of the number of sources

rated as very helpful. In this sample, the internal consistency reliability estimate (coefficient alpha) for the FSS items was .91.

### *Procedures*

Data collection sites included Federal Emergency Management Agency (FEMA) disaster recovery centers, local shelters, satellite campuses of the University of New Orleans, the Gulf Coast campus of the University of Southern Mississippi, and public places in each of the communities (e.g., local parks, service establishments, public office waiting rooms, and other public areas frequented by individuals in the immediate months post-disaster such as community meetings). Consent forms explained that all data collected were anonymous. Researchers collecting the surveys were available to answer questions and provide referral information for any who wished to get further help in the aftermath of the storm. Institutionalized individuals were not recruited. The surveys took less than one half hour to complete. Such recruitment procedures are common for anonymous surveys and are essential to obtain a diverse sample of the community. Participants were allowed to fill out the survey in the area where they were recruited or to return the survey in return-addressed stamped envelopes with no identifying information. We recruited individually and in groups (e.g., in community meetings). All data were collected between October, 2005 and January, 2006. A list of resource phone numbers was appended to the end of the consent form and contained contact information for various aid groups and organizations (e.g., Red Cross). Missing or incomplete data on one or more measures was handled by pair- or analysis- (when more than two variables) wise deletion of missing cases (Tabachnick & Fidell, 2001). Missing data appeared to be random (i.e., cases with missing data were not correlated with study variables).

## **Results**

### *Preliminary and descriptive analyses*

Examination of the scores' ranges and skew for continuous variables indicated acceptable levels for the planned analyses. Table 1 provides a comparison of the three regional groups on demographic variables and hurricane experiences. Comparison of the groups on demographic variables indicated significant differences in gender and family income. Residents also differed in the number of traumatic events experienced and the evacuation distance reported. As shown in Table 1, the sample participants were exposed to a wide range and large number of potentially traumatic events. Individuals in Mississippi experienced a greater number of traumatic events during the storm and were less likely to evacuate more than 100 miles from their place of residence. New Orleans residents reported experiencing more events after the storm.

Salient from Table 1 was the almost universal exposure to watching events on television (up to 99%).<sup>1</sup> Table 2 presents a breakdown of PTSD symptoms and psychological symptoms from the BSI-18 for descriptive purposes. Results indicate that symptoms were very prevalent. Univariate comparison of symptom scores indicated that residents of Mississippi tended to report a greater number of symptoms; however, hypothesis testing is presented in the next section.

Correlation coefficients among the main measures are presented in Table 3. The pattern of significant correlations indicated that the number of traumatic events experienced was positively related to PTSD symptoms, BSI symptoms, and perceptions of discrimination, and negatively related to evacuation distance. Evacuation distance was significantly negatively related to PTSD symptoms, BSI symptoms, and perceptions of discrimination. PTSD symptoms were significantly positively related to perceptions of discrimination and significantly negatively related to social support.

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<sup>1</sup>We examined the relation of the number of TV experiences to the variables of interest in this study and it was modestly correlated with PTSD symptoms and BSI-Scores (both  $r$ 's = .10,  $p < .05$ ). However, there was very little variance in this variable (most reported seeing all events) and it did not add to the prediction of symptoms in the regression models and so was not included in the final regression models reported in this paper.

Table 2  
Percentage of individuals reporting PTSD and BSI symptoms

	Total <i>n</i> = 386	New Orleans <i>n</i> = 94	Greater NOLA <i>n</i> = 164	Miss Gulf <i>n</i> = 128
<b>B. Re-experience:</b>				
1. Distressing recollections	59.3	58.1	58.5	61.3
2. Distressing dreams	31.6	35.1	25.2	37.3
3. Feeling of reoccurrence	42.7	42.6	36.6	50.8
4. Distress at exposure to cues	81.8	77.7	80.5	86.5
5. Physiological reactivity to cues	27.7	28.7	23.2	32.8
<b>C. Avoidance and numbing:</b>				
1. Avoid thoughts, feelings and conversations	60.7	50.0	62.2	66.7
2. Avoid places and people	41.5	31.9	39.6	51.2
3. Inability to recall aspects	17.8	11.8	17.1	23.0
4. Diminished interest	42.0	38.3	35.0	54.0
5. Detachment from others	43.0	34.0	38.4	55.6
6. Restricted range of affect	45.8	40.4	39.6	57.9
7. Foreshortened future	33.6	28.3	35.0	35.7
<b>D. Hyperarousal:</b>				
1. Sleep problems	43.0	41.5	37.8	50.8
2. Irritability/anger	56.3	46.8	57.1	62.4
3. Difficulty concentrating	44.5	46.2	38.4	51.2
4. Hyper-vigilance/worry happen again	80.5	66.0	83.5	87.4
5. Exaggerated startle	33.6	33.3	25.0	45.2
<b>BSI</b>				
1. Faintness/dizziness	22.5	18.7	19.6	29.0
2. Feeling no interest in things	47.1	37.4	44.8	57.3
3. Nervousness/shakiness inside	36.8	24.2	36.8	46.0
4. Pains in heart/chest	22.2	20.9	20.9	24.8
5. Feeling lonely	45.8	37.4	50.3	46.0
6. Feeling tense/keyed up	52.1	43.3	54.6	55.2
7. Nausea/upset stomach	34.9	20.9	34.4	46.0
8. Feeling blue	49.6	41.8	49.1	56.0
9. Suddenly scared for no reason	21.4	13.2	16.6	33.6
10. Trouble getting breath	19.2	17.6	17.2	23.0
11. Feelings of worthlessness	22.5	18.7	19.6	29.0
12. Spells of terror/panic	18.5	14.3	16.0	24.8
13. Numbness/tingling in body	22.0	18.7	19.8	27.2
14. Feeling hopeless about future	34.8	29.7	34.4	39.2
15. Feeling restless	37.9	35.2	38.0	39.8
16. Feeling weak in body	27.4	11.0	27.6	39.2
17. Thoughts of ending your life	5.3	6.6	3.7	6.4
18. Feeling fearful	27.8	23.3	25.2	34.4

Note: PTSD = posttraumatic stress disorder; BSI = brief symptom inventory; NOLA = New Orleans, Louisiana; Miss Gulf = Mississippi Gulf Coast.

### *Does context predict psychological symptoms, discrimination, and social support?*

A series of hierarchical regression<sup>2</sup> analyses were conducted to test whether context predicted psychological symptoms, discrimination, and social support and results are summarized in Table 4. In the first model

<sup>2</sup>We used a regression approach as opposed to an ANCOVA approach consistent with the idea that ANCOVA models are intended for use in controlling unwanted noise (for example in an experimental design) and are less useful when interpreting a multi-variable prediction model (see e.g., Tabachnick & Fidell, 2001). Univariate ANOVAs were conducted on PTSD symptoms, BSI global severity, discrimination, and social support. Each result was consistent with those presented in the regression analyses. The exception was social support which was not significant; however, the pattern of mean scores was consistent with the results from the regressions.

Table 3  
Zero-order correlations among the measures

	1	2	3	4	5	6
1. PTSD symptoms	–					
2. BSI-Global severity	.76**	–				
3. SEHA events	.39**	.28**	–			
4. Evacuation distance	–.20**	–.15**	–.45**	–		
5. Discrimination	.11*	.06	.39**	–.20**	–	
6. Social support	–.01	–.10*	–.05	.02	–.05	–

Note: PTSD = posttraumatic stress disorder; BSI = brief symptom inventory; SEHA = survey of exposure to hurricanes and their aftermath—total number of events.

\* $p < .05$ .

\*\* $p < .01$  two tailed.

predicting PTSD symptoms, demographic variables [age, sex (coded 1 = female, 2 = male), minority status (coded 1 = majority, 2 = minority), income and time (i.e., data collection date)<sup>3</sup> were entered in the first step and produced a significant change in  $R^2$  with sex (being female) associated with greater PTSD symptoms. Proximity (evacuation distance) and total number of events experienced were entered in the second step and also produced a significant change in  $R^2$  with the number of events predicting more PTSD symptoms. Geographic region (dummy coded as Mississippi versus others, New Orleans versus others as suggested by Tabachnick & Fidell, 2001, p. 112) was entered in the last step and also produced a significant change in  $R^2$ . Interpretation of the standardized betas indicated that residing in Mississippi was associated with a greater number of PTSD symptoms.

In the second model predicting BSI symptoms, demographic variables and time were again entered in the first step and produced a significant change in  $R^2$  (being female was associated with greater BSI symptoms). Proximity (evacuation distance) and total number of events experienced were entered in the second step with events predicting more BSI symptoms. Geographic region was entered in the last step and also produced a significant change in  $R^2$ . Interpretation of the standardized betas was somewhat ambiguous due to non-significant betas for the variables in this step but indicated that regional context predicted significant variance in BSI symptoms.

In the third model predicting perceptions of discrimination, demographic variables and time were again entered in the first step and produced a significant change in  $R^2$ . In this model, age, female sex, minority status, and income were associated with greater perceptions of discrimination. Number of exposure events in the second step predicted greater discrimination and geographic region in the last step also produced a significant change in  $R^2$ . Interpretation of the standardized betas indicated that residing in metropolitan New Orleans was associated with greater perceptions of discrimination.

In the final model predicting social support, demographic variables and time were entered in the first step and produced a significant change in  $R^2$ . In this model, age, minority status, and income were associated with greater social support. Proximity (evacuation distance) and total number of exposure events were entered in the second step and did not produced a significant change in  $R^2$ . Geographic region was entered in the last step and produced a significant change in  $R^2$ . Interpretation of the standardized betas indicated that residing in Mississippi was associated with greater social support.

## Discussion

The results of this study suggest that the residents of the areas affected by Hurricane Katrina were subjected to a large number of traumatic events and experienced a number of psychological symptoms in the relatively immediate aftermath of the hurricane. These findings are consistent with Centers for Disease Control and Prevention reports on Hurricane Katrina (see Weisler et al., 2006). Results are also consistent with previous

<sup>3</sup>Date of data collection was used to control for the effect of time since the storm on the outcomes.

Table 4  
Summary of regression analyses

Step	Model $R^2$	$\Delta R^2$	$\beta$	$t$	$p$
<i>Model 1-predicting PTSD symptoms</i>					
1. Demographics	.17**	.17**			
Date			-.04	-0.8	.400
Age			-.01	-0.2	.877
Sex			-.40	-7.9	.000
Income			.01	0.1	.912
Minority status			.05	0.9	.335
2. Proximity	.30**	.13**			
Evacuation distance			-.01	-0.2	.844
Events experienced			.38	7.2	.000
3. Region	.31**	.01*			
Miss Gulf			.11	2.0	.045
New Orleans			-.03	-0.7	.504
<i>Model 2-predicting BSI global severity</i>					
1. Demographics	.09**	.09**			
Date			-.10	-1.8	.066
Age			.01	0.2	.818
Sex			-.28	-5.3	.000
Income			-.01	-0.1	.952
Minority status			-.02	-0.3	.728
2. Proximity	.16**	.07**			
Evacuation distance			-.09	-1.5	.130
Events experienced			.24	4.1	.000
3. Region	.18**	.02*			
Miss Gulf			.10	1.7	.099
New Orleans			-.09	-1.5	.121
<i>Model 3-predicting discrimination</i>					
1. Demographics	.25**	.25**			
Date			-.05	-1.0	.314
Age			.11	2.2	.032
Sex			.18	3.8	.000
Income			-.20	-4.1	.000
Minority status			.39	8.1	.000
2. Proximity	.33**	.08**			
Evacuation distance			.02	0.4	.667
Events experienced			.32	6.2	.000
3. Region	.35**	.02*			
Miss Gulf			-.02	-0.3	.727
New Orleans			.13	2.7	.008
<i>Model 4-predicting Social Support</i>					
1. Demographics	.05**	.05**			
Date			-.06	-1.1	.281
Age			.14	2.5	.014
Sex			-.05	-0.9	.355
Income			.14	2.6	.011
Minority status			.12	2.3	.023
2. Proximity	.05*	.00			
Evacuation distance			-.02	-0.3	.805
Events experienced			-.05	-0.8	.412
3. Region	.07**	.02*			
Miss Gulf			.18	2.9	.004
New Orleans			.04	0.8	.453

Note: PTSD = posttraumatic stress disorder; Miss Gulf = Mississippi Gulf Coast; BSI = brief symptom inventory.  $F$  for model and change for step \* $p < .05$ , \*\* $p < .01$ . All full models significant at  $p \leq .01$ .

research showing that the number of hurricane disaster events a person experiences is related to psychological symptoms (e.g., La Greca et al., 1998; Sattler et al., 2002). This finding is consistent with theoretical predictions based on the idea that disasters cause stress reactions by interrupting important human strivings, particularly those involved in resource gain and social connectedness (e.g., Hobfoll, 1989; Sandler, 2001). The current results are also consistent with models emphasizing the importance of the broader social context in human adaptation and lifespan development (e.g., Bronfenbrenner, 1977).

Findings extend the previous research on disaster reactions by examining contextual differences and have a number of potentially important implications for social policy. For example, evacuation distance was negatively associated with symptoms and traumatic experiences. Residents of the Mississippi Gulf Coast in this study were less likely than the other groups surveyed to evacuate more than 100 miles away from their residences and were subjected to a greater number of immediate events. These residents also had a greater number of PTSD symptoms. Although the relationship of evacuation distance to symptoms was not uniquely associated when controlling for the number of events experienced, this finding suggests that evacuation, not just to a safer dwelling, but far from the area of projected landfall might be a good public mental health policy. However, such a policy has to be weighed against a number of additional considerations such as evacuation transportation costs, the ability to find shelters, hotels, etc. Moreover, inference of causal associations between evacuation distance and symptoms should not be made from these data.

Although the residents of the Mississippi Gulf Coast surveyed in this study had relatively more emotional symptoms, they perceived a greater level of social support than those in metropolitan New Orleans. Such findings are consistent with the predictions we developed from theory and media coverage of the storm which depicted vast differences in the community atmosphere following the disaster. Social support was negatively related to BSI symptoms and a number of previous studies show that social support can be a protective factor (see Ozer & Weiss, 2004). Such conditions of positive social support would thus likely foster a quicker resolution of psychological problems. Although this conclusion cannot be drawn directly from this study alone, it is consistent with previous research on the role of social support (e.g., King, King, Fairbank, Keane, & Adams, 1998). Surprising and inconsistent with expectations, however, was the relatively low association between discrimination, social support, and PTSD symptoms. Though speculative there may be several reasons for this. It may be that in the relatively immediate aftermath of such a disruptive event the protective effect of social support is not as salient in concurrent associations. For example, social support may be more associated with change in symptoms (e.g., quicker resolution of symptoms in those with elevated problems as opposed to strong concurrent associations). It may be that social support systems were overwhelmed and had not yet had an impact on symptoms. In terms of discrimination, these feelings may have been more associated with emotions not assessed in this study such as anger. The results suggest that future research on the role of context in posttraumatic stress responses should examine whether communities or neighborhoods perceived as socially supportive show quicker declines in symptoms post-disaster.

Interestingly, residents of Mississippi reported viewing less death and violence depicted on television. A number of reasons may have accounted for this finding, including the possibility that they had less access to media coverage, the news coverage was less sensational in the Mississippi Gulf Coast, or there was simply less death and violence in the area. Other results, however, are somewhat unexpected in that they suggest that residents of Mississippi actually reported witnessing similar or higher levels of direct crime and violence. This finding of higher witnessing of actual crime may have fostered fears (in addition to the more acute nature of the trauma faced) in the Mississippi sample. Future research may benefit from a more detailed exploration of the specific events that individuals perceive as traumatic or stressful. Often researchers have assumed that “the disaster” constitutes the traumatic event responsible for emotional difficulties. But a disaster is multifaceted and little research has actually examined what people feel was most traumatic about being involved with a disaster.

Residents of New Orleans were more likely than the other regional groups to experience perceptions of discrimination, which was particularly interesting given that the sample was similar in racial composition across the regional groups and we controlled for the variance predicted by minority status. Moreover, the various regions surveyed have a very similar history of racial discrimination and segregation (see e.g., Bynum, 1998). Such findings suggest that the context was indeed the culprit and that likely factors include more negative media images and differential perceptions of the local community. Although firm empirical

conclusions about the specific role of the media or local government in this difference cannot be drawn directly from this study, such a conclusion is consistent with qualitative analyses of the media coverage of the aftermath (Dalrymple, 2005; Thevenot, 2005; Welch, 2005). Our results also point to the importance of further empirical, political, and social analyses of differences in the communities affected. For example, such analyses might examine how the leaders and government differed in the various areas as well as how media coverage may have differed. One salient difference we noticed in our experience was the stark disparity in getting a rebuilding blueprint published (McKee, 2005). The state of Mississippi's plan for rebuilding the Gulf Coast cities was quickly accepted and came much sooner than the State of Louisiana's and City of New Orleans' plans (see e.g., McKee, 2005). The lingering effects in New Orleans and possibly the belief that the federal government was largely to blame for the destruction in New Orleans are also likely contributors. The findings from this study combined with an examination of the relative strengths and weaknesses in the difference at social policy levels of analysis might foster better social policy for future storms. In addition, the findings point to the importance of examining subtle forms of discrimination and racism and their effect on both racial majority and minority groups affected by disaster. For instance, the research on aversive racism and group biases (see Gaertner & Dovidio, 2000) may be another avenue for addressing the impact disasters have on social relations.

This study is limited by the use of self-report in assessing symptoms and the results do not provide information about the number of individuals meeting diagnostic criteria for PTSD. However, it was not feasible for us to conduct a large scale assessment across the regions examined in this study in the time frame after the storm using other methods (e.g., interview measures of traumatic stress). We weighed the desire to be able to include a broad cross-section of people who were contending with major life upheaval against the burden of an extended assessment. Though we were able to recruit a diverse sample, this study is also limited by the relatively small proportion of participants who identified as a racial minority. Our findings may not be representative of all low income or racial minority survivors of Katrina. The time frame of the data collection made obtaining a truly representative sample difficult if not impossible as so many individuals had scattered so far. Moreover, although we chose a PTSD measure that would allow us to collect data across age groups, we were unable to recruit youth during this time frame. The PTSD Checklist used in this study was not previously normed or validated in adults and thus limits our conclusions about PTSD symptoms.

The current study is also limited by the cross-sectional nature of the data collection. We did not have data on the individuals before the storm so our findings might represent pre-existing differences in symptoms, perceptions of discrimination, and social support. However, our multivariate approach controlling for a number of possible confounds adds confidence to the conclusions. Moreover, symptom rates were higher than would be expected in non-disaster community samples (Derogatis, 2000), and longitudinal studies employing pre-disaster information on participants are extremely rare, difficult to conduct, and virtually impossible to plan (La Greca et al., 1998; Weems et al., 2007). Research that can serendipitously employ pre-disaster data would help to strengthen conclusions drawn from this study. Large scale screenings of residents in disaster prone areas (e.g., coastal residents along the US Gulf Coast and Eastern Sea Board) might also be worthwhile in this regard.

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