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STABILITY AND CHANGE IN STRESS, RESOURCES, AND PSYCHOLOGICAL DISTRESS FOLLOWING NATURAL DISASTER: FINDINGS FROM A LONGITUDINAL STUDY OF HURRICANE ANDREW

Frank H. Norris
J. L. Perilla
Jasmin K. Riad
K. Kaniasty
E. Lavizzo

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Fran H. Norris

Julia L. Perilla

Georgia State University

Jasmin K. Riad

University of Delaware Disaster Research Center

Krzysztof Kaniasty

Indiana University of Pennsylvania

Evelyn A. Lavizzo

Georgia State University

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Correspondence concerning this article should be addressed to Fran H. Norris, Department of Psychology, Georgia State University, University Plaza, Atlanta, Georgia 30303. Electronic mail may be addressed to fnorris@gsu.edu.

Abstract

The stress, resource, and symptom levels of 241 residents of southern Dade County, Florida were assessed 6 and 30 months after Hurricane Andrew. Percentages meeting study criteria for depression and PTSD did not change over time. Whereas mean levels of intrusion and arousal decreased, depressive symptoms remained stable, and avoidance/numbing symptoms actually increased. Intrusion and arousal were associated more strongly with pre-disaster factors (gender, ethnicity) and within-disaster factors (injury, property loss) than with post-disaster factors (stress, resources), but the reverse was true for depression and avoidance. Changes over time in symptoms were largely explained by changes over time in stress and resources. The study implies that ongoing services are needed to supplement the crisis-oriented assistance typically offered to disaster victims.

Stability and Change in Stress, Resources, and Psychological Distress Following Natural Disaster: Findings from a Longitudinal Study of Hurricane Andrew

Answers to questions regarding the longevity of psychological reactions to disaster remain elusive despite considerable research. Studies vary widely in their sampling procedures, assessment strategies, and time frames of their designs. Methodological issues aside, the disasters themselves vary in trauma potential and vulnerability of stricken populations. Yet, almost all studies that have examined the outcomes of adult residents 3 to 12 months after a community-based disaster[1] have documented substantial psychological morbidity in the form of post-traumatic stress disorder (PTSD), anxiety, depression, sleep disorders, or psychosomatic complaints, regardless of whether the event was an earthquake (De la Fuente, 1990), tornado (Madakasira & O'Brien , 1987), hurricane (David, Mellman, Mendoza, Kulick-Bell, Ironson, & Schneiderman, 1996), volcano eruption (Lima, Pai, Santacruz, & Lozano, 1991), flood (Smith, Robins, Przybeck, Goldring, and Solomon , 1986), or technological hazard (Bowler, Mergler, Huel, & Cone, 1994). In contrast, studies that first examined these outcomes 2 to 3 years post-disaster have reported very low rates of PTSD and other psychological disorders (Canino, Bravo, Rubio-Stipec, & Woodbury, 1990; Freedy, Addy, Kilpatrick, Resnick, & Garrison, 1997; Shore, Tatum, &Vollmer, 1986b). Occasionally, however, effects of disasters have been observed for as long as five years (Davidson, Fleming, & Baum, 1985; Logue, Hanson, & Struening , 1981) showing that, in some instances, psychological consequences of disasters may be evident for a very long time.

Longitudinal data are perhaps the best for drawing conclusions regarding the course of post-disaster symptomatology. Steinglass and Gerrity (1990) studied two communities that experienced disasters in 1985: Albion, Pennsylvania, which had been struck by a devastating tornado, and Parsons, West Virginia, which had been seriously flooded. Adults and families were assessed at 4 and 16 months post-disaster. Initially, Steinglass and Gerrity observed very high rates of stress symptoms in both Albion (76%) and Parsons (49%). Symptoms lessened considerably over the ensuing year, but rates in both

communities were still quite high, specifically, 41% in Albion and 24% in Parsons. Murphy (1985) studied groups exposed in different ways to the eruption of Mt. St. Helens one and three years afterwards. At one year post-event, the bereaved groups were higher than the property loss group, which was higher than controls, on several measures of psychological distress. Levels of distress decreased significantly over time, with the bereaved and property loss groups improving to about the same degree. However, the groups maintained their same rank order, which suggests that recovery was less than complete. Phifer and Norris (1989) examined psychological symptoms over four post-flood waves in a sample of 200 older victims and controls following a flood that occurred in eastern Kentucky. The most highly exposed respondents showed increased negative affect and decreased positive affect for two years post-flood. There were some intriguing nonlinear trends in the data, with effects being strongest in the second post-disaster wave (Spring 1982, 9-12 months post-event). Thompson, Norris, and Hanacek (1993) studied 831 Hurricane Hugo victims and controls at points 12, 18, and 24 months postevent. Disaster exposure had substantial effects on Wave 1 measures of depression, anxiety, somatic complaints, general stress, and traumatic stress. By Wave 3, effects were much weaker, but still present. Bromet, Parkinson, and Dunn (1990) studied nuclear power plant workers and mothers living near TMI at 9, 12, 30, and 42 months after the accident. Rates of depression and anxiety among the TMI mothers remained stable over time, but those among the workers declined. Employing the longest follow-up interval we identified in the literature, Green et al. (1990) interviewed 120 people in 1986 who also had been interviewed in 1974 regarding their reactions to the Buffalo Creek dam collapse in 1972 (see also Gleser, Green, & Winget, 1981). Rates of PTSD dropped from 44% in 1974 to 28% in 1986, but even the 1986 rate was quite substantial. Moreover, symptom levels on a variety of measures continued to approximate those of outpatient norms.

Taken together, these studies on the long-term effects of disasters generally indicate that psychological consequences peak during the first year and became less prevalent thereafter, leaving only a minority of communities, and only a minority of victims within those communities, substantially impaired. Thus a second question has generally accompanied the question regarding the duration of disaster effects:

For whom are long-term effects most likely? This question must be considered on both community and individual levels. As for the former, several authors have emphasized the importance of characterizing any given disaster along several dimensions that may contribute to its trauma potential, such as intensity, duration, and source (e.g., Baum, 1987; Green, 1982). All other things being equal, the events that appear to be most pathogenic are those that (a) precipitate substantial terror and horror, through extreme physical force or many deaths, (b) have a high impact ratio, meaning a large proportion of the community is affected; or (c) are human-caused rather than of natural origin.

Yet, even within communities, it is clear that individuals vary markedly in their outcomes. It has become increasingly apparent that a variety of individual and environmental factors influence long-term adjustment. These factors are nicely outlined in Freedy, Resnick, and Kilpatrick's (1992) "multivariate risk factor model" for predicting mental health following disaster exposure. Three broad categories of variables are incorporated by the model. Pre-disaster factors include demographic characteristics, such as gender and age, past history of exposure to other "high magnitude" (traumatic) events, and pre-existing resources, such as coping skills and social support. Within-disaster factors include the objective nature of individuals' exposure and their subjective perceptions of the event. Post-disaster factors include events occurring in the weeks or months after a disaster (sometimes referred to as secondary stressors), ongoing coping efforts and receipt of support, and severity of resource loss. This model provides a straightforward framework for organizing the literature and drawing new inferences about risk factors for better and poorer psychological outcomes. Although it is not explicit in the framework, it is perhaps implicit that as time-since-event increases, post-disaster factors should surpass within-disaster factors in importance.

Although we cannot review the entire body of risk-factor research in the confines of this article, we will draw upon a few examples that illustrate these points. A number of studies have found women to be at higher risk for post-disaster depression and PTSD (De la Fuente, 1990; Green et al., 1990; Shore, Tatum, & Vollmer, 1986a; Steinglass & Gerrity, 1990). Studies that have distinguished middle-aged adults from younger and older adults have almost always found this group to be most adversely affected (Gleser et al.,

1981; Phifer, 1990; Price, 1978; Thompson et al., 1993). There is much less knowledge about the roles of culture and ethnicity, but these factors may be very important in some settings (Green, 1996; Palinkas, Rusell, Downs, & Peterson, 1992). Six months after Hurricane Andrew, rates of PTSD varied dramatically by ethnicity, even within subgroups exposed to the same stressors, with Spanish-preferring (i.e., less acculturated) Latinos showing the highest rates (38%), non-Hispanic Whites showing the lowest rates (15%), and non-Hispanic Blacks (23%) and English-preferring Latinos (19%) being in-between (Perilla, Norris, & Lavizzo, 1998).

As for within-disaster factors, there is much evidence that severity of exposure is a risk factor for poor outcomes. Following events as varied as Hurricane Hugo (Norris & Uhl, 1993), the Mt. St. Helens eruption (Murphy, 1985), and the Buffalo Creek dam collapse (Gleser et al., 1981), disaster victims who experienced injuries, bereavement, or threat-to-life have been shown to be at substantially higher risk for poor outcomes than disaster victims who experienced property loss alone.

For understanding long-term effects, post-disaster factors seem especially critical. Freedy, Saladin, Kilpatrick, Resnick, and Saunders (1994) showed that post-disaster life events were more predictive of poor outcomes than severity of initial disaster exposure (see also McFarlane, 1989). This effect should not be interpreted as a confound but rather as a mediator or perpetuator of disaster-related effects. A number of studies have shown disaster victims to be at higher risk than general populations for experiencing life-event stress over the ensuing months (Hutchins & Norris, 1989; Janney, Minoru, & Holmes, 1977; Melick, 1978; Murphy, 1985). Furthermore, the discrete changes tapped by life-event scales may be only the "tip of the iceberg." Following Hurricane Hugo, Norris and Uhl (1993)showed that the effects of disaster-related stressors were largely mediated by victims' subsequent chronic stress in many life domains.

Perhaps the most important element for understanding the post-disaster environment is the extent to which resources were lost. The increasing attention given to these dynamics in the aftermath of disasters has been strongly influenced by the theory of Conservation of Resources (COR; Hobfoll, 1988; Hobfoll & Lilly, 1993), which is based on the premise that individuals strive to obtain, retain, and protect their

resources. Resources are defined as those things that are highly valued. Hobfoll classified resources into four distinct types: objects (e.g., housing), conditions (e.g., marriage), personal characteristics (e.g., self-esteem), and energies (e.g., time, money). Given this, stress will ensue when: (a) resources are threatened; (b) resources are lost; or (c) resources are invested without a gain. An important corollary is that initial loss makes individuals more vulnerable to further loss, a process that may ultimately result in "loss spirals." Freedy and his colleagues have employed COR theory to understand reactions to a number of natural disasters. Scored simply as a count of losses tallied from a comprehensive inventory, resource loss correlated highly with symptom severity 2-3 months following Hurricane Hugo (Freedy, Shaw, Jarrell, & Masters, 1992), 4-7 months following the Sierra Madre earthquake (Freedy et al., 1994), and 2 years following both the Loma Prieta earthquake and Hurricane Hugo (Freedy et al., 1997). Kaniasty and Norris (1993; see also Norris & Kaniasty, 1996), have shown that post-disaster deterioration of social support is an especially important mediator of the effects of disasters on mental health.

The present study takes another look at these two enduring questions: How lasting are the psychological consequences of a major disaster, and for whom are these consequences most severe? The case we present is Hurricane Andrew, the most costly disaster ever to occur in the United States. Whether measured in dollars ($20 billion) or in more human terms (55 deaths, 250,000 homeless, 100,000 jobless) the devastation was undeniably profound. The present analysis, to our knowledge, is the first to employ Freedy et al.'s (1992) multivariate risk factor model in a longitudinal analysis of stability and change. Our study covers a period from 6 months to 2 1/2 years following this extraordinary event.

Method

Sample and Interviewing Procedures

In January 1993, our research team visited Dade County (South Miami) and selected the neighborhoods to be included in the study. A publication of the Miami Herald that listed neighborhoods according to proportion of homes damaged and property value was extremely helpful in terms of finding areas with different levels of damage and SES. Predominant race/ethnicity of residents was usually evident

when touring the neighborhoods. Census data were used to confirm our impressions and finalize our choices. Beginning on February 25, six months after the impact, interviewers were instructed to approach persons in the selected areas (no more than one per household) and request their participation in the study. Interviews took place in the respondents' current homes and lasted approximately one hour. By the end of March, 404 persons had been interviewed (response rate 76%). The end result was a sample balanced across gender (205 females and 199 males), ethnicity (134 Latinos, 135 non-Hispanic Blacks, and 135 non-Hispanic Whites), and age (147 18-39 years old, 124 40-59, 130 60+, 3 missing). At Wave 1, 97 Latinos elected to complete the interview in Spanish, 37 in English.

Approximately 28-30 months post-event, we attempted to reinterview all study participants. We were successful for only 241 (60%) of those participants, primarily due to difficulties in locating people in this highly transient area. Table 1 shows the characteristics of the Wave 2 sample and compares them to those observed in the original Wave 1 sample. As this table shows, the Wave 2 sample was disproportionately female and married. However, this sample was comparable to the original sample in ethnic make-up, education, age, and severity of disaster exposure. Moreover, no evidence for attrition bias emerged in tests comparing Wave 2 respondents and drop-outs on measures of other life events, chronic stress, and resources (not shown in Table 1). Nor did the two groups differ in initial symptoms, except that the Wave 2 sample had shown somewhat higher levels of arousal symptoms at Wave 1 than did those respondents who failed to continue in the study. Altogether, the amount of attrition was sizable and may be expected to reduce the power of the analyses, but there was little evidence that the Wave 2 sample differed appreciably from the original Wave 1 sample.

Measures

Demographic characteristics. Gender was scored such that men received a score of 0 and women received a score of 1. Ethnicity was scored using two orthogonal contrast codes: (a) Minority vs. Majority, for which Spanish-preferring Latinos and non-Hispanic Blacks both received scores of +1 and non-Hispanic Whites received scores of -2 and (b) Latino vs. Black, for which Spanish-preferring Latinos

received scores of +1, Blacks received scores of -1, and Whites received scores of 0. Because relatively few (n = 24) English-preferring Latinos remained in the sample at Wave 2, and previous analyses have shown that they differ from Spanish-preferring Latinos on many measures, we coded them to the mean (0) in each contrast. This procedure excluded them from these contrasts but retained them in the sample. Education and age were both scored continuously in years. In addition, we included a quadratic term for age because previous research has shown that middle-aged adults may be most disturbed by disaster (e.g., Thompson et al., 1993). This term was scored such that middle-aged respondents had high scores and both younger and older adults had low scores. Marital status was coded such that unmarried people received scores of 0 and married people received scores of 1.

Disaster-related stressors. All respondents experienced some degree of exposure to the disaster. Three measures of severity of exposure were included here. Threat to life (no = 0, yes = 1) was assessed by the question: "Did you ever feel like your life was in danger during the incident?" Injury (no = 0, yes = 1) was defined as such when it was the direct result of the hurricane to either the respondent or another household member. Property damage was rated on a 5-point scale from none (= 1) to enormous. (= 5).

Life events and chronic stress. We used the Traumatic Stress Schedule (Norris, 1990; 1992) to assess exposure to 10 other potentially traumatic events, such as violent crime, injury-inducing motor vehicle accidents, and bereavements due to accident, suicide, or homicide. At both Waves 1 and 2, measures were taken of events occurring in the past year and previously. Because of the skewed distributions, counts of affirmative responses were recoded so that 0 = no past-year trauma and 1 = 1 or more past-year traumatic events. Percentages with scores of 1 were 13% at Wave 1 and 15% at Wave 2. Prior events were counted to form a measure of pre-disaster trauma. Scores ranged from 0 (no events, 39%) to 4 (4 or more events, 7%). The frequencies reporting each specific event in the past year ranged from 0% to 4% (robbery, traumatic bereavement) at Wave 1 and from 0% to 6% (robbery) at Wave 2. By the conclusion of the study, lifetime rates for specific events were robbery 30%, physical assault 18%, sexual assault 6%, traumatic bereavement 30%, injury or property damage due to fire 8%, other disaster

12%, evacuated or learned of hazard other than Hurricane Andrew 8%, combat 10%, injury-causing motor vehicle accident 24%, other shocking experience 19%.

In addition, at each wave, we assessed the occurrence in the past six months of 20 other life events, such as loss of employment, other family bereavements, having a friend or family member move away, new conflicts, or stopping a church or social activity. Many of these events may be viewed as secondary to disaster impact and, in fact, were more prevalent among more highly exposed respondents. Only events rated by the respondent as undesirable (as opposed to desirable or neither way) were counted in the score. Scores ranged from 0 to 11 at Wave1 and from 0 to 9 at Wave 2.

Two scales tapping different aspects of chronic stress were also included. Ecological stress was assessed using an 11-item scale (Wave 1α = .86; Wave 2α = .70) that tapped conditions such as shortages of food and water, problems with insects and sanitation, perceived crowding, and fear of crime. Each item was scored on a 4-point scale ranging from not at all (= 1) to a great deal (= 4). The second measure of ongoing stress was acculturative stress, measured using a 7-item version (Wave 1α = .82; Wave 2α = .87) of Williams and Anderson's (1996) measure. Acculturative stress seemed important to assess in this multi-cultural setting and refers specifically to the extent to which the respondent experienced discomfort and interpersonal anxiety when interacting with other ethnic groups or believed that other groups were treated better than his/her own. Each item was scored on a 4-point scale, from strongly disagree (= 1) to strongly agree (= 4). High scores represent high stress on all measures.

Personal and social resources. Three measures of resources were included in these analyses. Self-esteem was assessed using Pearlin and Schooler's (1978) 6-item version (Wave 1α = .77; Wave 2α = .67) of Rosenberg's (1965) scale. Perceived control was measured using Wheaton's (1982) 6-item version (Wave 1α = .57; Wave 2α = .64) of Rotter's (1966) Internal-External Control Scale. All items on these two scales were assessed using the same 4-point scale from strongly disagree (= 1) to strongly agree (= 4). Social embeddedness, which refers to the size, activeness, and closeness of the respondent's social network, was assesssed with 6 items that had varying responses formats (Wave 1α = 61; Wave 2α = 61).

Psychological distress. Two measures of psychological distress were included at each wave. The Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977) has 20 items (Wave 1α = .90; Wave 2α = .87) and assesses frequency of depressive symptoms in the past week. Each item is scored on a 4-point scale from none of the time (= 0) to most or all of the time (= 3). This scale has been used as a measure of distress in a number of epidemiological studies, including the Hispanic Health and Nutrition Examination Survey (Guarnaccia, Angel, & Worobey, 1989).

To assess post-traumatic stress symptoms, we used the 30-item Revised Civilian Mississippi Scale (RCMS, Wave 1α = .89; Wave 2α = .89). The original Mississippi Scale for Combat-Related PTSD (Keane, Caddell, & Taylor, 1988) measures self-reported symptoms of post-traumatic stress in veteran populations. Because of its excellent psychometric characteristics, Keane and his colleagues subsequently developed a civilian form of the scale. Psychometric analyses indicated that the civilian form had high internal consistency but limited discriminant validity (Vreven, Gudanowski, King, & King, 1995). Norris and Perilla (1996) revised the Mississippi in a number of ways. They used only 30 items, dropping those that tapped symptoms that seemed well captured by other items or seemed overly general for a measure of PTSD. Whereas the original version elicits frequency of symptoms "in the past," 18 items in the revised version "anchor" the symptom to a specific event (e.g., "Since Hurricane Andrew, unexpected noises make me jump"), and 12 items do not ("I am able to get emotionally close to others.") The decision to not anchor certain items was based on commentaries (Solomon & Canino, 1990) that argued that respondents are often not able to attribute certain numbing and arousal symptoms to a specific event. We scored all items on the same 5-point scale from not at all true (= 1) to extremely true (= 5). The total scale yields three continuous measures that correspond to the three PTSD symptom clusters: intrusion (7 items, Wave 1α = .84; Wave 2α = .82); avoidance (9 items, Wave 1α = .66; Wave 2α = .67); and arousal (8 items, Wave 1α = .74; Wave 2α = .67).

To create a dichotomous measure of PTSD, each item was dichotomized by recoding values of 1 and 2 (not or rarely true) to 0 (symptom absent) and recoding values of 3, 4, and 5 (somewhat, very, or

extremely true) to 1 (symptom present). Items (e.g., 9, 17, 18) were then organized by symptoms (e.g., re-experiencing) within criteria (e.g., intrusion). These symptom frequencies were similar to those obtained using structured diagnostic instruments (see Green, 1993) in that some symptoms (e.g., disturbed sleep, re-experiencing) were quite common, whereas others (e.g., amnesia) were relatively rare. To meet criteria for PTSD as defined by the American Psychiatric Association's (1994) Diagnostic and Statistical Manual (DSM-IV), the respondent had to show at least one intrusion symptom (Criterion B), three avoidance/ numbing symptoms (Criterion C), and two arousal symptoms (Criterion D).

Translation and Pretest

The translation and centering processes posed our greatest challenge prior to entering the field. One person translated the selected scales into Spanish, and a second translated the scales back into English. The project director then met with the two translators (one Colombian, one Uruguayan), a Dominican, and a Mexican to resolve any discrepancies or changes in meaning resulting from the translations. The instrument was also carefully reviewed by a Puerto Rican and a Cuban. These steps assured that regional variations in Spanish were taken into consideration in developing the instrument.

When this task was completed, in February 1993, we conducted two pilot studies, involving volunteers from Atlanta's Latino community. (Atlanta has a large and diverse Latino community, numbering 60,000 officially and up to 100,000 unofficially.) The first sample (Study 1, $n = 53$) consisted of bilingual participants who completed a paper-and-pencil version of the interview schedule on two different occasions. In the first session, half of the participants were randomly assigned to complete the English version, half to complete the Spanish version. One week later, each participant completed the alternative version. Psychometric data for scales that were included in both the pretest instrument and the Andrew instrument are shown in Table 2.

A second sample (Study 2, $n = 20$) involved Spanish-speaking people who were not bilingual. Our concern was that bilingual persons, though useful for evaluating instrument comparability, would tend to be more acculturated and educated than many Latinos in Homestead and Miami. These adults were

interviewed in their own homes using the Spanish version of the questionnaire. The interviewers reported back to the investigators on the scales' comprehensibility and acceptability to Spanish-speaking people. The scales included here were all evaluated favorably by the interviewers.

Results

Stability in Rates of PTSD and Depression

How much change was observed in this sample as a whole over the two-year interval separating Waves 1 and 2? Table 3 shows the percentage of the analysis sample that met criteria for PTSD and depression at each timepoint. That PTSD symptoms were highly prevalent at both waves is quite evident. The percentage of the sample who showed one or more intrusion symptoms (Criterion B for PTSD) declined only by 5% over this two year period. The percentage of the sample who showed three or more avoidance/numbing symptoms (Criterion C for PTSD) increased by 6% between Waves 1 and 2. The percentage of the sample who showed two or more arousal symptoms (Criterion D for PTSD) declined by only 10%. Altogether, 26% of the two-wave sample showed a constellation of symptoms consistent with a diagnosis of PTSD at Wave 1, as did 29% of this sample at Wave 2.

Table 3 also shows the percentage of the sample who had a score of 16 or above on the CES-D scale at each wave. The CES-D does not provide a clinical diagnosis of Major Depression (Fechner-Bates, Coyne, & Schwenk, 1994). Nonetheless, this value has been established as one that differentiates between more and less serious levels of depressive symptoms in urban samples (Comstock & Helsing, 1976). In the two-wave sample, 39% were at or above this cutpoint at Wave 1, as were 36% at Wave 2. None of these changes were greater than might be explained by sampling error.

Stability and Change in Psychological Distress, Stress, and Resources

Although useful descriptively, dichotomous measures provide a less sensitive assessment of change than do continuous measures. To facilitate comparisons across measures as well as across time, each scale was standardized using its Wave 1 mean and standard deviation. Thus Wave 2 means may be interpreted relative to Wave 1 means of 0 and standard deviations of 1. Across the 11 dependent variables, the

multivariate effect of time was highly significant, F (11,207) = 8.95, $p < .001$. Univariate results are presented in Table 4 (W1 - W2 t). The mean level of depressive symptoms observed at Wave 1 (M = 14.1, SD = 11.7) was much higher than the published norms for the CES-D (M = 7.9 - 9.2, SD = 7.5 - 8.6; Radloff, 1977). Nonetheless, this mean did not decline significantly over the ensuing two years. Intrusion and arousal levels did decline significantly, but symptoms of avoidance and numbing actually increased.

Table 4 also shows changes in stress and resource levels. Life-event and ecological stress decreased between Waves 1 and 2, but acculturative stress and past-year trauma did not. Whereas perceived control was stable, self-esteem and social embeddedness significantly lessened over this time.

The main effects of time represent average effects and mask the considerable variability observed in individuals' changes over time. Even when an individual's change is defined conservatively as one that exceeds 1 SD on the measure, substantial percentages of the sample experienced increases in acculturative stress (17%) and avoidance symptoms (24%) and decreases in self-esteem (19%), perceived control (18%) and social embeddedness (23%). Likewise, substantial percentages of the sample experienced decreases in ecological stress (23%), intrusion symptoms (18%) and arousal symptoms (19%).

Correlations

In interpreting the results from the various regression equations presented below, it needs to be kept in mind that the various predictors were not independent of one another. Thus, there are a number of predictor variables that had significant bivariate correlations with one or more of the outcome variables that did not show significant relations in the multivariate analysis. Although no relations were of a magnitude that would cause problems with multi-collinearity, many predictor variables were modestly-to-moderately correlated with other conceptually related variables. These correlations are shown in Table 5.

The bivariate (zero-order) correlations between the predictor variables and the Wave 1 outcome variables are shown in Tables 6 and 7. Table 6 shows the relations between the various predictors and those symptom outcomes that did not show an overall decline or improvement in the sample. These outcomes were depression, which was stable, and avoidance, which actually increased significantly over

time. Table 7 shows the relations between the various predictors and intrusion and arousal, symptoms that showed an overall decline or improvement over the two year interval bounded by Waves 1 and 2. Gender correlated positively with depression, avoidance, intrusion, and arousal (women higher in all cases). The Minority versus Majority contrast code correlated positively with avoidance and intrusion (minority groups higher). The Latino versus Black contrast code also correlated positively with intrusion, indicating that Latinos were more symptomatic than African Americans on this measure. The reverse trend held for arousal, with African Americans more symptomatic than Latinos in this case, $r = -.11$, $p = .098$. Age correlated negatively with depression, avoidance, intrusion, and arousal: younger adults were more symptomatic than older adults. Education correlated inversely with intrusion: the higher the education, the lower the intrusion. Marital status correlated positively with intrusion: married persons were more symptomatic on this measure than single, divorced, or widowed persons.

Almost all of the bivariate correlations between the within-disaster factors and the Wave 1 symptom measures were significant, indicating that the more severe the exposure to the hurricane, the higher the depression, avoidance, intrusion, and arousal.

Post-disaster factors also correlated with the outcome measures. Whereas life-event stress was highly correlated with all outcomes, past-year trauma correlated significantly only with depression. This finding suggests that the post-traumatic stress measure was tapping effects of Hurricane Andrew, as intended, rather than consequences of other potentially traumatic events. Ecological stress and acculturative stress both correlated positively with all symptom outcomes: the higher the stress, the higher the symptoms. Self-esteem correlated inversely with depression, avoidance, and arousal but did not correlate with intrusion. Perceived control correlated inversely with all symptom outcomes. Social embeddedness correlated inversely with depression and avoidance but did not correlate with intrusion or arousal.

Predicting Recovery: Regression Models

To identify factors that most strongly facilitate or hinder recovery over time, we examined the variance in the outcome variables (e.g., depression) accounted for by sets of predictors representing pre-

disaster factors (e.g., gender, ethnicity, education), within-disaster factors (threat, injury, property damage), and post-disaster factors (e.g., subsequent life events, ecological stress, social embeddedness). Post-disaster factors were separated into two sets representing stress and resources as they existed at Wave 1, six months after the hurricane, and stress and resources as they existed at Wave 2, two years later. Because the effects of Wave 2 factors were always tested with the effects of Wave 1 factors and Wave 1 symptoms controlled, they may be interpreted as showing the effects of changes in stress and resource levels on changes in symptom levels.

Depression. All three relevant sets of variables explained significant variance in depression at Wave 1, six months post-event (see Table 6). Initially, pre-disaster factors explained 13% of the variance in depression, primarily due to the effects of gender, $\beta = .26$, $p < .001$ (women higher), and age, $\beta = -.17$, $p = .017$ (younger adults higher). Neither of these factors remained significant in the final equation. Within-disaster factors combined to explain 6% of the variance over and above that explained by the pre-disaster factors. Injury, $\beta = .13$, $p = .056$, and property damage, $\beta = .15$, $p = .023$, both had effects upon entry, but threat to life was the only significant factor in the final equation. Post-disaster factors explained an additional 31% of the variance. Life events and ecological stress, both tapping different secondary stressors, each exerted strong independent effects, such that the higher the stress, the higher the depression. Each resource was inversely related to depression; the higher the self-esteem, perceived control, and social embeddedness, the lower the depression. The final equation explained 50% of the variance in Wave 1 depression, $R = .71$, Adjusted $R^2 = .46$, $F\ (18, 194) = 10.82$, $p < .001$.

Wave 1 depression explained 19% of the variance in Wave 2 depression. With Wave 1 depression controlled, other effects may be interpreted as related to changes in depression over the two-year interval bounded by Waves 1 and 2. Neither the pre-disaster set of predictors nor the within-disaster set of predictors explained significant additional variance in Wave 2 depression. Initially, the set of Wave 1 post-disaster predictors explained an additional 9% of the variance. Wave 1 measures of elf esteem, $\beta = -.24$, $p = .002$, and social embeddedness, $\beta = -.17$, $p = .015$, had significant effect upon entry, but these effects

dropped out when the set of Wave 2 post-disaster predictors were entered. This last set explained an additional 23% of the variance. Change in depression was primarily associated with changes in life-event stress (more stress, more depression), and changes in resources (fewer resources, more depression). The final equation explained 54% of the variance in Wave 2 depression, $R = .74$, Adjusted $R^2 = .48$, $F(26,186) = 8.50$, $p < .001$.

Avoidance. Similar results emerged for avoidance/numbing symptoms (Table 6). At Wave 1, pre-disaster factors combined to explain 15% of the variance. Upon entry, significant effects emerged for gender, $\beta = .21$, $p = .003$ (women higher), age, $\beta = -.16$, $p = .018$ (younger adults higher), and minority status, $\beta = .15$, $p = .052$ (minorities higher). However, only the last effect was significant in the final equation. Whereas within-disaster factors explained only 3% of the variance, post-disaster factors explained 21%. Life events made the strongest contribution: the higher the stress, the higher the avoidance. Resources, especially self-esteem and perceived control, were inversely related to avoidance. The final equation explained approximately 39% of the variance in Wave 1 avoidance, $R = .62$, Adjusted $R^2 = .33$, $F(18,194) = 6.81$, $p < .001$.

Wave 1 avoidance explained 16% of the variance in Wave 2 avoidance. Upon entry, the set of pre-disaster factors did not explain a significant amount of additional variance, although gender and minority status had modest effects in the final equation (see Table 6). With other changes controlled, women showed a greater increase in avoidance symptoms than did men. Minorities had shown higher avoidance symptoms than Whites at Wave 1, but their symptoms decreased more between Waves 1 and 2, so that there was no longer a relationship between ethnicity and avoidance. Within-disaster factors explained an additional 5% of the variance, primarily due to the effect of injury, $\beta = .16$, $p = .023$. This effect dropped to non-significance, $p = .08$, in the final equation. The set of Wave 1 post-disaster factors explained 6% of the variance. Social embeddedness had the only independent effect, $\beta = -.17$, $p = .016$: the lower the social embeddedness, the higher the avoidance. This effect dropped out in the subsequent step. Past-year trauma had an effect, $\beta = .12$, that was of borderline significance, $p = .076$, upon entry but reached the

conventional criterion, $p = .031$, in the final equation. The Wave 2 set of post-disaster factors explained an additional 19% of the variance. Avoidance increased as acculturative stress increased and as self-esteem and social embeddedness decreased. The final equation explained 48% of the variance in Wave 2 avoidance. $R = .70$. Adjusted $R^2 = .41$, $F(26,186) = 6.71$, $p < .001$.

Intrusion. Pre-disaster factors combined to explain 31% of the variance in intrusion at Wave 1 (see Table 7). Initially, significant effects were observed for each demographic factor: gender, $\beta = .28$, $p < .001$ (women higher), minority status, $\beta = .22$, $p < .001$ (minorities higher), Latino ethnicity, $\beta = .14$, $p = .037$ (Latinos higher than African Americans), age, $\beta = -.24$, $p < .001$ (younger adults higher), education, $\beta = .14$, $p = .049$ (less educated higher), and marital status, $\beta = .16$, $p = 01$ (married people higher). These effects remained in the final equation, with only the effect of education dropping below conventional criteria, $p = .058$, a very different pattern of results than observed for depression and avoidance at Wave 1. Within-disaster factors explained an additional 7% of the variance. Both threat to life, $\beta = .17$, $p = .006$, and property damage, $\beta = .16$, $p = .006$, had significant effects upon entry, although only the former effect remained significant in the final equation (the p-value for property damage was .092). Whereas post-disaster factors had explained 30% of the variance in Wave 1 depression and 21% of the variance in Wave 1 avoidance, they explained only 9% of the variance in Wave 1 intrusion. Life events had a significant positive effect (higher stress, higher intrusion). Past year trauma had a negative effect of border-line significance, $p = .06$; if other trauma was present, Andrew-related intrusion was less severe. The final equation explained 47% of the variance in Wave 1 intrusion, $R = .69$, Adjusted $R^2 = .42$, $F(18,194) = 9.59$, $p < .001$.

Wave 1 intrusion explained 24% of the variance in Wave 2 intrusion. The set of pre-disaster factors did not explain significant variance, $p = .066$, but the Latino contrast was significant, $\beta = -.23$, $p = .001$. Latinos showed disproportionate intrusion at Wave 1, but they improved more than African Americans between Waves 1 and 2. The set of within-disaster factors explained 3% additional variance due to the effect of injury, $\beta = .14$, $p = .033$. This effect dropped to a non-significant value, $p = 13$, in the final

step of the equation. Whereas the set of Wave 1 post-disaster factors did not explain additional variance, the set of Wave 2 post-disaster factors explained 14% of the variance, with increases in intrusion being associated most strongly with increases in life-event stress and decreases in self-esteem. The final equation explained 49% of the variance in Wave 2 intrusion. $R = .70$, Adjusted $R^2 = .42$, $F\ (26,186) = 6.86$, $p < .001$.

Arousal. Pre-disaster factors accounted for 12% of the variance in Wave 1 arousal (Table 7). Initially, significant effects emerged for gender, $\beta = .28$, $p < .001$ (women higher), and ethnicity, $\beta = -.17$, $p = .024$ (African Americans higher than Latinos). Though reduced in strength, both of these effects remained significant in the final equation. The ethnicity effect is of particular interest because it contrasts with that found for Wave 1 intrusion (Latinos were higher than African Americans). Within-disaster factors explained an additional 11% of the variance. Substantial effects were observed for injury, $\beta = .17$, $p = .013$, and property damage, $\beta = .24$, $p < .001$. The latter effect remained significant in the final equation but that for injury did not, $p = .09$. Post-disaster factors explained 13% of the variance in Wave 1 arousal. The higher the life-event stress, the higher the arousal. The final equation explained 36% of the variance in Wave 1 arousal, $R = .60$, Adjusted $R^2 = .30$, $F\ (18,194) = 6.03$, $p < .001$.

Wave 1 arousal explained 13% of the variance in Wave 2 arousal. Pre-disaster factors made no contribution with Wave 1 arousal controlled. Within-disaster factors as a set had an effect of border-line significance, $p = .056$, because of the specific effect of injury, $\beta = .17$, $p = .015$. Although reduced in strength, this effect remained significant in the final equation. The Wave 1 post-disaster factors accounted for an additional 6% of the variance, with social embeddedness showing the strongest effect, $\beta = -.20$, $p = .004$ (higher embeddedness, less arousal). The Wave 2 post-disaster factors accounted for an additional 11% of the variance. Increased arousal was associated with increases in life-event stress and decreases in self-esteem. The final equation explained 37% of the variance in Wave 2 arousal, $R = .61$, Adjusted $R^2 = .28$, $F\ (26,186) = 4.17$, $p < .001$.

Summary of Regression Results. Symptoms at Wave 1 were predicted by a combination of pre-disaster, within-disaster, and post-disaster measures. Post-disaster factors (secondary stress and resources) were relatively more important in predicting depression (31%) and avoidance (21%), the two symptom outcomes that did not subsequently improve in the sample as a whole, than they were in predicting intrusion (9%) and arousal (13%), the two symptom outcomes that did improve in the sample as a whole. In contrast, the pre-disaster and within-disaster factors were relatively more important in predicting intrusion (38%) and arousal (23%) than they were in predicting depression (19%) and avoidance (18%).

Relatively few of the pre-disaster factors, within-disaster factors, or initial post-disaster factors affected Wave 2 symptoms independently of their effects through Wave 1 symptoms. There were exceptions. Women were more likely to remain depressed and avoidant than men. Minorities had shown greater avoidance than Whites at Wave 1, but they improved more between Waves 1 and 2. Likewise, Latinos had shown higher intrusion symptoms at Wave 1 than African Americans, but they improved more over time. The tendency for African Americans to have greater arousal than Latinos, however, did not change at Wave 2. These effects notwithstanding, by far the most consistent and powerful predictors of changes in symptoms between Waves 1 and 2 were concurrent changes in stress and resource levels.

Discussion

Unquestionably, Hurricane Andrew had substantial, even dramatic, effects on the population of South Florida. Six months post-event, it appeared that 20-30% of adults in the area -- and a comparable percentage of children (24%; La Greca et al., 1996) -- met criteria for PTSD. Similarly, it appeared that 33-45% of adults in the area were meaningfully depressed (see also David et al., 1996).

A full two years later, recovery appeared to be far from complete. In this study, rates and mean levels of depression were virtually unchanged. At each wave, a comparable percentage showed a constellation of symptoms consistent with a diagnosis of PTSD. Intrusion and arousal symptoms had significantly declined, but avoidance and numbing symptoms had actually increased. Overall, most people in our study stayed the same or improved, but a substantial minority (14% - 24%) grew even more

depressed or avoidant over time. Likewise a substantial minority (18% - 23%) showed continuing declines in resources, even though victims' resource levels at Wave 1, six months post-event, were probably lower than they had been before the disaster struck (e.g., Freedy, Shaw, Jarrel, & Masters, 1992; Kaniasty & Norris, 1993). These findings are especially impressive in light of a literature that has generally shown that the psychological effects of natural disasters decline after the first year (e.g., Phifer & Norris, 1989; Steinglass & Gerrity, 1990; Thompson et al., 1993) and may even be more fleeting in some cases (Cook & Bickman, 1990). Because the community-based studies that provide the strongest evidence for very enduring effects have been conducted after technological disasters (e.g., Davidson et al., 1985; Green et al., 1990), the field has generally concluded that human-caused disasters have a greater likelihood of producing chronic morbidity than disasters of natural origin, such as hurricanes or floods. One wonders, though, if long-term data were available from the world's most serious natural disasters, such as the Armero volcano eruption or the Armenian earthquake, if these distinctions would be quite so clear cut.

It is important to note that different types of psychological symptoms may dissipate at different rates following a traumatic event. In the case of Hurricane Andrew, symptoms of depression and avoidance were relatively more enduring than symptoms of intrusion and arousal. The risk factor data at Wave 1 provide insights as to why this might be so. Intrusion and arousal symptoms were more strongly influenced by within-disaster factors, such as injury, threat to life, and property loss, but depression and avoidance symptoms were more strongly influenced by post-disaster factors, such as secondary stressors and psychosocial resources. Perhaps, as time passes, symptoms more closely tied to within-disaster experiences may dissipate, whereas those more closely tied to post-disaster conditions may not necessarily do so, unless those conditions return to normal as well.

Very often after natural disasters, especially in the United States, conditions do return to normal within a reasonable period of time. Schools reopen, people repair and rebuild, social activities recommence, and threats of re-injury lay dormant except when they are reactivated by salient reminders, such as tremors, hurricane watches, or heavy rains. The clear "low-point" following most natural disasters is thought to be

one of the variables that makes them less chronically stressful than events that produce uncertain and ongoing threats of exposure to hazardous agents (Baum, 1987). The danger here is in assuming that conditions are *invariably* normalized following natural disasters. In South Dade County, approximately 90,000 housing units were completely destroyed, even more individuals permanently left the area, and large areas awaited reconstruction as late as 16 months after the hurricane struck (McDonnell, Troiano, Barker, Noji, Hlady, & Hopkins, 1995). Although our data indicate that stress levels did decrease substantially between 6 and 30 months after the hurricane, resources did not generally improve over that time. In fact, some resources-- notably self-esteem and social embeddedness -- significantly declined.

In the immediate aftermath of high-profile disasters, high levels of assistance often vividly materialize. However, the heightened level of helping and concern evident initially inevitably must cease "and in no case can it be expected to last the length of the recovery process" (Bolin, 1982, p. 60).Our impression is that the attentive media and generous outsiders often abandon communities just as the victims discover that the struggle to rebuild their physical and social environments has only just begun. Our findings clearly show that attention needs to be paid to the stress and resource levels in stricken communities long after the disaster has happened and passed -- for it is these residual stressors and resource losses, rather than the initial trauma, that may explain variations in the longevity of post-disaster distress. Our study shows that these factors not only increase the odds for disorder at a particular point in time (e.g., Freedy et al., 1994; Freedy et al., 1997), but also influence recovery patterns over time. Here, stability and change in psychological symptoms were largely explained by stability and change in stress and resources. Moreover, although our study generalizes only to adults, the importance of intervening life events and social support was also observed by La Greca et al. (1996) over the course of their longitudinal study of children exposed to Hurricane Andrew.

A few words are perhaps in order about the meaning of the life-event measure given its significant correlation with all outcome variables. As Hobfoll (1988) pointed out, life-event measures are not necessarily conceptually distinct from resource measures, and this was certainly the case here. Nearly all of

the events experienced commonly in this sample reflected changes in the social environment. Within six months of Hurricane Andrew, 46% of this sample had a friend of family member move away, and 30% had a family member move into or out of their home. Thirty percent stopped a social activity, and 28% reduced their involvement with their church. Twenty-six percent experienced the death of a family member or close friend. New conflicts were also common, with 22% of the sample acknowledging a new conflict with someone in their household, 16% having one with a family member living outside the household, and 17% having a new conflict with a friend. Similarly, at Wave 2, 20% or more of the sample reported, in the past 6 months, that a friend or family member moved away, that a family member or close friend died, or that there was a new conflict in their household. Thus, in many ways, this measure tapped into resource loss as directly as, and maybe even more directly than, the resource measures.

A few limitations of the study must be acknowledged. First of all, our sampling strategy did not provide a scientifically representative sample. Because disaster victims do not comprise a well defined population in the first place, because pre-existing neighborhoods were highly disrupted, and because we sought equal rather than statistical representation of groups defined by ethnicity, gender, and age, we opted for a purposive rather than random sampling plan. Second, our measures of psychological distress were obtained by lay interviewers using relatively short standardized scales, the 20-item CES-D and the 30-item Revised Civilian Mississippi. The estimates may not be as precise as those that would have been obtained with clinician-administered instruments. Our limited budget, need to rely on lay interviewers, and concerns over the total length of the interview given the other demands on disaster victims' time explain and justify our choice. Third, like most (but not all) disaster studies we used a retrospective design that did not control for pre-existing psychopathology. Thus we cannot estimate the extent to which these symptoms are specifically attributable to Hurricane Andrew as opposed to premorbid conditions. For this particular analysis, our study is also limited by the sizable percentage of the original sample that was lost over time. Despite the lack of initial differences between the groups, we cannot estimate to what extent the stress, resources, and symptoms of "drop-outs" may have been more or less stable than those of the participants

who were located at Wave 2. It is possible, and even consistent with these results, to speculate that persons who left the area might have recovered more fully than those who remained, thereby inflating our estimates of long-term distress. The safest generalization of our results is to those citizens who remain in a disaster-stricken area throughout the long and arduous struggle to rebuild.

These issues notwithstanding, the study also had a number of strengths. Although not formally diagnostic tools, both of the selected scales of distress have excellent psychometric properties and work well with Spanish-speaking people. We did a considerable amount of pilot work on our measures before entering the field to assure their semantic and conceptual comparability. We included Latinos, African Americans, and European Americans in equal proportions and assured that each of these samples had comparable age and gender distributions. Although we took efforts to not overburden our participants with lengthy assessments, our interview schedule provided an array of measures tapping various secondary stressors and resources. Moreover, there are still relatively few longitudinal studies of disasters. Here, the same victims were interviewed both in a relatively acute stage (6 months post-event) and long afterwards (30 months post-event).

We introduced our study with two enduring questions: How lasting are the psychological consequences of a major disaster, and for whom are these consequences most severe? Our study clearly indicates that, following catastrophic disasters, such as Hurricane Andrew, community populations may exhibit strikingly high levels of depression and posttraumatic stress. Psychological problems may linger long after the initial danger has happened and passed -- clearly past the crisis period when services abound. As for risk factors: This appears to be a moving target. The relative importance of various factors depends upon whether one is concerned with predicting symptom levels or changes in those levels over time. Initial measures of background characteristics, stress, and resources were relatively good predictors of symptom severity but relatively poor predictors of change. Whether an individual's symptoms remained stable, improved, or worsened had more to do with subsequent stressors and resource levels than with earlier stressors and resources. There is now substantial evidence that disasters may initiate a "spiral of losses"

(Hobfoll & Lilly, 1993), wherein initial loss makes individuals more vulnerable to further loss. On the basis of their findings, Kaniasty and Norris (1993) argued that the personal losses and community destruction that are the direct consequences of natural disaster lead to declines in social embeddedness (closenss and activeness of one's social network) and perceived support (expectations of help, sense of belonging) and that it is these losses, in turn, that lead to lasting declines in psychological well-being. Norris and Kaniasty (1996) furthermore showed that the general trend for perceived social support to decline after disasters may be offset when victims are able to mobilize substantial amounts of received support (actual helping behaviors) after the event. These findings are consistent with COR theory, which states that individuals must invest resources in order to obtain and protect resources. They also provide direction about how to address this problem at the community level. Ongoing services that supplement crisis-oriented approaches and that provide a wide range of resources – psychosocial as well as material -- are needed to help disaster victims avoid a spiral of losses that, for some, may be profound.

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Footnotes

1. By community-based disasters, we mean those events, of either natural or technological origin, that strike areas with clear geographic boundaries. The survivor stays in or near the environment that has been damaged. Lindy and Grace (1985) referred to disasters of this type as centripetal and differentiated them from centrifugal disasters that involve people who temporarily occupy a common space. This focus excludes events such as shooting sprees (e.g., Hough et al., 1990; Smith, North, & Spitznagel, 1993), club fires (Green, Grace, & Gleser, 1985), and most transportation accidents (e.g., Lundin, 1995). By focusing on adult residents, we also exclude growing literatures on children (e.g., La Greca, Silverman, Vernberg, & Prinstein, 1996) and adolescents (e.g., Warheit, Zimmerman, Khoury, Vega, & Gil, 1996), as well as those concerning people who are exposed to disasters because of emergency work in either a professional (e.g., McFarlane, 1989) or volunteer (Ursano, Fullerton, Fao, & Bhartiya, 1995) capacity.

Table 1

Sample Characteristics and Tests of Attrition Effects

Wave 1 Characteristic	Wave 2 Sample	Original Sample	Wave 2 vs. Wave 1 Only (χ^2 or t)
	Demographic Characteristics		
% female	58.1	50.7	12.98***
% non-Hispanic White	34.4	33.4	
% non-Hispanic Black	30.3	33.4	
% Latino (English)	10.0	9.2	
% Latino (Spanish)	25.3	24.0	2.76
% married	71.4	64.6	11.88***
M education (SD)	11.4 (3.9)	11.4 (3.9)	-0.02
M age (SD)	48.5 (17.0)	48.4 (18.0)	-0.20
	Disaster-Related Stressors		
% threat to life	74.7	73.0	0.84
% injury	44.8	41.6	2.58
% little - some property damage	13.3	16.2	
% much property damage	33.6	35.0	
% enormous property damage	53.1	48.9	5.85
	Symptom Outcomes		
M depression (SD)	14.1 (11.7)	13.7 (11.0)	-0.85
M traumatic stress symptoms (SD)	60.3 (18.5)	59.1 (17.9)	-1.62
M intrusion (SD)	17.1 (7.3)	16.7 (7.2)	-1.45
M avoidance/numbing (SD)	18.2 (5.9)	18.0 (5.7)	-0.52
M arousal (SD)	18.6 (6.4)	17.9 (6.1)	-2.76**

* $p < .05$ ** $p < .01$ *** $p < .001$

Differences in proportions were tested with chi square. Differences in means were tested with t-tests.

Table 2

Pretest Results

Scale	Number of items	English α	Spanish α	Test-Retest Correlations raw	corrected[a]
Depression (CES-D)	20	.86	.86	.72	.84
Post-traumatic stress (RCMS)[b]	30	.82	.88	.84	.98
Traumatic events	10	NA	NA	.88	NA
Normative events	15	NA	NA	.78	NA
Self esteem	6	.85	.75	.76	.95
Perceived control	6	.77	.80	.70	.90
Acculturative stress	6	.85	.83	.86	.99

[a] Corrected for attenuation using Pedhazur's (1982) formula. This provides an estimate of cross-language stability independent of measurement error.

[b] The n was 35 rather than 53 because the total scale was administered only to those who experienced a traumatic event.

NA not applicable

Table 3

Prevalence of PTSD and Depression in the Two-Wave Sample

	Wave 1		Wave 2	
	%	95% C.I.[a]	%	95% C.I.[a]
PTSD				
Criterion B	74.3	68.7 - 79.9	69.3	63.3 - 75.3
Criterion C	27.4	21.6 - 33.2	33.6	27.6 - 39.6
Criterion D	72.6	66.8 - 78.4	63.1	56.9 - 69.3
All Criteria	25.7	20.1 - 31.3	28.6	22.8 - 34.4
Depression	38.8	32.5 - 45.1	35.5	29.3 - 41.7
Both	18.7	13.7 - 23.7	18.3	13.3 - 23.3

[a] 95% C.I. = confidence interval = percent +/- 2 standard errors.

Note: In the original sample of 404 at Wave 1, 72.8% (SE = 2.2) met Criterion B , 25.5% (SE = 2.2) met Criterion C, 70.3% (SE = 2.3) met Criterion D, 23.5% (SE = 2.1) met all criteria for PTSD, 38.2% (SE = 2.4) met criteria for depression, and 17.3% (SE = 1.9) met criteria for both depression and PTSD.

Table 4

Main Effects of Time on Symptoms, Stress, and Resources: Paired-Sample t-tests.

Dependent variable	Wave 2 M	Wave 2 SD	W1 - W2 t	W1 - W2 r	Change range	% 1+ SD increase	% 1 + SD decrease
Depression	-0.04	0.93	-0.62	.43	-2.9 to 3.1	14	15
Traumatic stress							
Intrusion	-0.27	0.94	-4.06***	.49	-2.7 to 3.1	7	18
Avoidance	0.19	1.05	2.55**	.41	-3.6 to 2.9	24	17
Arousal	-0.31	0.84	-4.39***	.37	-4.0 to 2.7	9	19
Life events	-0.32	0.67	-4.49***	.28	-3.8 to 3.3	6	1
Past-year trauma	0.18	1.43	1.61	.10	-0.4 to 7.3	13	10
Ecological stress	-0.36	0.61	-5.08***	.25	-4.6 to 3.1	6	23
Acculturative stress	0.12	1.21	1.49	.43	-4.0 to 4.4	17	12
Self-esteem	-0.16	1.06	-2.28*	.48	-3.2 to 3.2	8	19
Perceived control	-0.08	1.12	-0.91	.35	-3.6 to 2.9	16	18
Social embeddedness	-0.21	1.04	-2.96**	.48	-2.8 to 2.8	12	23

Note: All variables were standardized on the Wave 1 means and standard deviations. Thus these scores may be interpreted relative to a Wave 1 mean of 0 and a Wave 1 standard deviation of 1.

* $p < .05$ ** $p < .01$ **** $p < 001$.

Table 5

Intercorrelations of Wave 1 Pre-Disaster, Within-Disaster, and Post-Disaster Risk Factors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Gender	..	.02	.11	-.31**	.02	-.02	-.08	.07	.10	.01	.32**	.01	.22**	.12	-.11	-.06	-.03
2. Minority vs. Majority		..	-.08	.02	-.33**	-.18*	-.31**	.21*	.05	.03	-.09	.04	-.13	.04	.21*	-.26**	-.04
3. Latino vs. Black			..	-.05	-.34**	.26**	-.13	-.06	.14	.16	-.04	-.06	-.10	.04	.05	-.02	-.30**
4. Age				..	-.11	-.05	.11	-.16	-.21*	-.02	-.28**	-.04	-.09	-.13	.11	-.01	.04
5. Education					..	-.02	.24**	-.05	-.07	.05	.18*	.04	.21*	-.17	.10	.20*	.22**
6. Marital status						..	-.08	.11	.14	.02	-.06	-.10	.00	.04	-.01	.14	-.07
7. Pre-disaster trauma							..	-.10	.07	.06	.29**	.02	.17	-.05	-.08	.12	.20*
8. Threat to life								..	.18*	.12	.09	.05	.07	.15	.11	-.11	.09
9. Injury									..	.18*	.21**	.10	.11	.17	-.06	-.04	-.01
10. Property damage										..	.20*	-.04	.21*	-.03	.09	-.12	-.01
11. Life events											..	.16	.31**	.08	-.20*	-.06	-.01
12. Past-year trauma												..	.02	.03	-.22**	-.02	-.11
13. Ecological stress													..	.15	-.06	.03	.08
14. Acculturative stress														..	-.19**	-.03	.03
15. Self esteem															..	-.02	.17*
16. Perceived control																..	.16
17. Social embeddedness																	..

* $p < .01$ ** $p < .001$

Table 6

Predicting Recovery: Correlates of Depression and Avoidance Symptoms

Set of predictors variable	Depression Wave 1 $R^2\Delta$ r_0	β	Depression Wave 2 $R^2\Delta$ r_1	β	Avoidance Wave 1 $R^2\Delta$ r_0	β	Avoidance Wave 2 $R^2\Delta$ r_1	β
Symptoms W1			.19***				.16***	
depression or avoidance			.43***	.20**			.41***	.24**
Pre-disaster factors	.13***		.03		.15***		.03	
gender	.30***	.09	.12	.15**	.26***	.07	.13	.14*
minority vs. majority	-.01	.04	.11	.10	.16*	.18**	-.02	-.14*
Latino vs. Black	-.02	-.04	-.01	-.07	-.07	-.10	.02	-.13
age	-.23***	-.03	-.04	.01	-.21**	-.04	.00	.09
age quadratic	.12	.01	.01	-.03	.17*	.07	.09	.05
education	-.02	-.02	.03	.09	-.06	-.01	.05	.08
married status	.01	.02	.01	.03	-.01	.05	.06	.04
pre-disaster trauma	.09	.00	.00	.10	.02	-.02	-.05	-.04
Within-disaster factors	.06**		.01		.03		.05**	
threat to life	.17**	.13*	.08	.07	.16*	.05	.15*	.10
injury	.23***	.07	.12	.08	.20**	.05	.18**	.10
property damage	.17**	.06	.04	.02	.11	.02	.12	.05
Post-disaster factors W1	.31***		.09**		.21***		.06*	
W1 life events	.50***	.29***	-.01	-.10	.45***	.32***	.06	-.04
W1 past-year trauma	.15*	.00	.15*	.10	.11	-.03	.16*	.12*
W1 ecological stress	.35***	.21***	-.02	-.04	.23***	.08	.07	-.03
W1 acculturative stress	.14*	-.04	.01	-.09	.24***	.11	.07	-.06
W1 self-esteem	-.44***	-.36***	-.17*	-.03	-.30***	-.22***	-.10	.06
W1 perceived control	-.19**	-.12*	.02	.04	-.24***	-.15*	-.05	-.04
W1 embeddedness	-.20**	-.14*	-.15*	-.03	-.14*	-.10	-.15*	-.05
Post-disaster factors W2			.23***				.19***	
W2 life events			.23***	.19**			.19***	.11
W2 past-year trauma			.11	-.03			.17**	.05
W2 ecological stress			.12	-.02			.15*	.00
W2 acculturative stress			.24***	.11			.32***	.23***
W2 self-esteem			-.52***	-.41***			-.42***	-.28***
W2 perceived control			-.19**	-.11			-.21**	-.11
W2 embeddedness			-.27***	-.17**			-.26***	-.13*

Note: r_0 indicates that values in the column are zero-order correlations: r_1 indicates that values in the column for pre-, within-, and post-disaster factor are partial correlations, controlling for W1 depression or avoidance. β is the final beta with all variables in the equation.

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 7

Predicting Recovery: Correlates of Intrusion and Arousal Symptoms

Set of predictors variable	Intrusion Wave 1 $R^2\Delta$ r_0	β	Intrusion Wave 2 $R^2\Delta$ r_1	β	Arousal Wave 1 $R^2\Delta$ r_0	β	Arousal Wave 2 $R^2\Delta$ r_1	β
Symptoms W1			.24***				.13***	
intrusion or arousal			.49***	.45***			.37***	.23**
Pre-disaster factors	.31***		.05		.12***		.03	
gender	.36***	.18**	.02	.01	.28***	.16*	.08	.08
minority vs. majority	.19**	.17**	-.05	-.10	.01	-.04	-.09	-.13
Latino vs. Black	.24***	.14*	-.23***	-.25***	-.11	-.20**	-.07	-.14
age	-.32***	-.14*	-.07	.00	-.17**	.02	-.07	.02
age quadratic	.17**	.02	.04	.00	.10	-.04	.05	.02
education	-.20**	-.13	.07	-.11	.04	-.05	.15*	.08
married status	.17*	.15*	.02	.05	.03	.09	-.05	-.08
pre-disaster trauma	-.04	.00	.08	.05	.10	-.03	.04	-.01
Within-disaster factors	.07**		.03*		.11***		.03	
threat to life	.29***	.15**	.12	.07	.18**	.07	.05	.05
injury	.29***	.06	.16*	.09	.25***	.11	.15*	.13*
property damage	.23***	.10	.06	.06	.24***	.16**	.06	.04
Post-disaster factors W1	.09***		.02		.13***		.06*	
W1 life events	.40***	.30***	.13	-.04	.46***	.32***	.12	-.02
W1 past-year trauma	-.04	-.11	.09	.06	.04	-.01	.11	.06
W1 ecological stress	.15*	.01	.11	.01	.29***	.08	.13	.02
W1 acculturative stress	.22***	.07	.00	-.03	.19**	.09	.06	.01
W1 self-esteem	-.09	-.05	-.08	.14*	-.18**	-.07	-.10	.09
W1 perceived control	-.19**	-.09	.03	.02	-.17**	-.12	.13	.11
W1 embeddedness	-.06	.04	-.06	-.08	-.03	-.04	-.13	-.10
Post-disaster factors W2			.14***				.11***	
W2 life events			.37***	.29***			.23***	.14*
W2 past-year trauma			.12	.03			.13	.03
W2 ecological stress			.17*	-.04			.17*	-.02
W2 acculturative stress			.05	.00			.16*	.10
W2 self-esteem			-.35***	-.30***			-.36***	-.26***
W2 perceived control			.04	-.01			.00	-.01
W2 embeddedness			.01	.03			-.18**	-.11

Note: r_0 indicates that values in the column are zero-order correlations; r_1 indicates that values in the column for pre-, within-, and post-disaster factor are partial correlations, controlling for W1 depression or avoidance. β is the final beta with all variables in the equation.

* $p < .05$ ** $p < .01$ *** $p < .001$