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Hurricane Katrina's Impact on the Mental Health of Adolescent Female Offenders

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Abstract

Exposure to multiple traumatic events and high rates of mental health problems are common among juvenile offenders. This study draws on Conservation of Resources (COR) stress theory to examine the impact of a specific trauma, Hurricane Katrina, relative to other adverse life events on the mental health of female adolescent offenders in Mississippi. Teenage girls ($N = 258$, 69% African American) were recruited from 4 juvenile detention centers and the state training school. Participants were interviewed about the occurrence and timing of adverse life events and hurricane-related experiences and completed a self-administered mental health assessment. Hierarchical linear regression models were used to identify predictors of anxiety and depression. Pre-hurricane family stressors, pre-hurricane traumatic events, hurricane-related property damage, and receipt of hurricane-related financial assistance significantly predicted symptoms of anxiety and depression. Findings support COR theory. Family stressors had the greatest influence on symptoms of anxiety and depression, highlighting the need for family-based services that address the multiple, inter-related problems and challenges in the lives of female juvenile offenders.

Keywords

female juvenile offenders; hurricane exposure; family stressors; anxiety; depression

On August 29, 2005, the deadliest and most costly natural disaster in the history of the United States, Hurricane Katrina, made landfall on the Louisiana/Mississippi Gulf Coast (Swanson, Forgette, Van Boening, Holley, & Kinnell, 2007). Although a great deal of national attention focused on New Orleans, the impact on Mississippi was devastating: 238 Mississippians killed, 383,700 homes in south Mississippi destroyed, and an estimated \$125 billion in property damaged ("Mississippi's Invisible Coast: Sun Herald Editorial," 2005). The mental health impacts of the storm were likewise staggering, particularly for those who lacked social and economic safety nets (Abramson, Garfield, & Redlener, 2007; Larrance, Anastario, & Lawry, 2007). Studies have noted marked increases in psychiatric disorders and suicide rates among storm survivors (Kessler, Galea, Jones, & Parker, 2006; Weisler, Barbee IV, & Townsend, 2006).

This study used a retrospective design to assess the impact of a specific trauma, Hurricane Katrina, relative to other adverse life events on the mental health of female adolescent offenders in Mississippi. We chose to target this population because adolescents are at higher risk than

adults for emotional distress following a trauma (Buckner, Beardslee, & Bassuk, 2004; Ickovics, Meade, Kershaw, Milan, Lewis, & Ethier, 2006) and because female adolescent offenders have a high incidence of risk factors that are associated with adverse psychological responses to disaster. Female gender, pre-existing psychopathology, and previous exposure to trauma have all been shown to increase the likelihood of negative outcomes (Drabek, 1986). Exposure to multiple traumatic events (Acoca & Dedel, 1998; Dembo, Williams, Wothke, Schmeidler, & Brown, 1992) and high rates of mental health problems (Otto, Greenstein, Johnson, & Friedman, 1992; Robertson, Dill, Husain, & Undesser, 2004) are well documented among this population. In addition, female juvenile offenders are under-represented in the research literature (Hoyt & Scherer, 1998) and underserved in the juvenile justice system (Acoca, 1999).

While much is known about adult mental health responses to disaster, there has been comparatively little research on disaster responses among adolescents (Norris, 2005b). Moreover, existing studies have been limited in the scope of outcomes examined. Much of the research tends to focus on symptoms of posttraumatic stress disorder (PTSD) (Garrison, Bryant, Addy, Spurrier, Freedy, & Kilpatrick, 1995; La Greca, Silverman, Vernberg, & Prinstein, 1996; La Greca, Silverman, & Wasserstein, 1998) though it is evident that affected youth experience a wide range of negative outcomes, including anxiety, depression (Abramson et al., 2007; Weems, Pina, Costa, Watts, Taylor, & Cannon, 2007), and problems with behavior and conduct (Norris, 2005b). We are not aware of any research on the impact of a disaster on the mental health of juvenile offenders. However, previous research has linked trauma exposure to posttraumatic stress disorder (PTSD) among female juvenile offenders (Cauffman, Feldman, Waterman, & Steiner, 1998; Dixon, Howie, & Starling, 2005). Although 70% of the study participants witnessed violence and half reported sexual abuse, not all girls were diagnosed with PTSD (Dixon et al., 2005). Moreover, not all traumas were associated with PTSD. Witnessing domestic violence, sexual abuse, and being a victim of fire were associated with greater likelihood of PTSD than other types of traumatic events (Dixon et al., 2005). To understand the relationship between traumatic events and subsequent adjustment, we turn to a conceptual framework based on the Conservation of Resources (COR) stress theory (Hobfoll, 1989, 1998) that has been applied to a range of adverse life events including natural disasters (Arata, Picou, Johnson, & McNally, 2000; Ennis, Hobfoll, & Schroder, 2000; Freedy, Hobfoll, & Ribbe, 1994a; Freedy, Shaw, Jarrell, & Masters, 1992). The present study examines the impact of Hurricane Katrina, family stressors and traumatic events occurring before and after the hurricane on symptoms of anxiety and depression among female juvenile offenders.

Conservation of Resources Theory

According to COR theory (Hobfoll, 1989, 1998), resource loss is central to the experience of psychological distress, and resource gain is necessary for well-being. Resources can be objects (e.g., a home, car, or clothing), conditions (e.g., family stability, companionship, employment), personal characteristics (e.g., self esteem, optimism, sense of mastery), or energies, which are resources that aid in the acquisition of other kinds of resources (e.g., money, credit, insurance). Family support, stability, and cohesion are especially important resources for adolescents, as they are dependent upon their parents for material and financial resources. Even the adolescent's personal characteristics are strongly influenced by, if not largely dependent upon, family relationships. COR theory posits that resources are necessary for coping and adjustment, so psychological stress can occur when individuals' resources are chronically threatened with loss or when resources are depleted. In a cross-national study of psychological functioning following Hurricane Hugo, all types of resource loss were associated with symptoms of acute stress disorder among college students (Sattler, Preston, Kaiser, Olivera, Valdes, & Schlueter, 2002).

A second premise of COR stress theory is that in order to gain resources or prevent resource loss, one must invest in other resources (Hobfoll & Lilly, 1993). For adolescents, academic, athletic, and interpersonal success (e.g., popularity with peers) increase personal characteristic resources and condition resources (Freedy et al., 1994a). On the other hand, individuals who lack resources are vulnerable to resource loss, and initial loss makes them more vulnerable to further loss. Thus exposure to multiple traumatic life events can result in cumulative resource depletion and poor adjustment. Although the psychological effects of natural disasters generally decline after the first year (Steinglass & Gerrity, 1990), 14% of adults continued to be depressed 30 months after Hurricane Andrew (Norris, Perilla, Riad, Kaniasty, & Lavizzo, 1999). The stability of symptoms was largely explained by exposure to post-disaster traumatic events and by decreases in personal (self-esteem, perceived control) and social resources over time (Norris et al., 1999).

There are a number of reasons that resource allocation is relevant to this study. Female juvenile offenders have greater exposure to traumatic events that may predispose them to resource loss. Physical and sexual abuse, parent incarceration, and violence in the homes of female offenders have been well documented (Acoca & Dedel, 1998; Dixon et al., 2005). Most of these adverse events involve the loss of one or more types of resources. Thus, these past experiences may exhaust personal and family resources. Female juvenile offenders also may be vulnerable to negative mental health outcomes due to limited condition (family relationships) and energy (family income) resources. Family dysfunction and family instability are common among juvenile offenders (Dembo et al., 1992; Robertson, Baird-Thomas, Dill, & Morse, 2006), and many come from homes where there have been issues of substance abuse and/or mental illness (Shelton, 2000). Lastly, the majority of incarcerated youth in Mississippi are African American. African American families are more likely than other ethnic groups to be low income and headed by females (U.S. Census Bureau, "Statistical Abstract of the United States," 2005). Consequently, they experience higher levels of stress due to economic disadvantage and exposure to adverse life events than other groups, especially Whites (Ennis et al., 2000; Kessler & Cleary, 1980; Schulz, Williams, Israel, Becker, Parker, James, & Jackson, 2000). Persons with limited financial resources and weak social support networks tend to do worse than those who have stronger social support networks and who can readily replace lost resources (Kaniasty & Norris, 1993). To summarize, family and personal resources are likely to be limited among female juvenile offenders. Exposure to any traumatic event that taxes the resources of these girls and their families or that result in resource loss is expected to lead to psychological distress and maladjustment.

A Multiple Factor Conceptual Model of Disaster Impact on Mental Health

A variety of individual and environmental factors influence reactions to disasters, thus we draw on a conceptual model that considers pre-disaster factors, disaster-related exposure, and post-disaster factors (Freedy et al., 1992). Research has identified a number of pre-existing characteristics of the individual that influence mental health outcomes, such as demographic characteristics, past history of exposure to other traumatic events, and pre-existing resources (NSW Institute of Psychiatry and Centre for Mental Health, 2000; Smith, North, McCool, & Shea, 1990). For example, a study of children's pre-disaster emotional and behavioral functioning found that pre-existing levels of anxiety predicted post-traumatic stress reaction (La Greca et al., 1998). A recent study of youth in post-Katrina New Orleans examined the role of pre-hurricane anxiety in predicting post-hurricane symptoms of PTSD, anxiety, and depression (Weems et al., 2007). When controlling for the number of hurricane-related events, pre-disaster anxiety significantly predicted symptoms of PTSD and other internalizing disorders after the disaster. That study was limited by a small sample size ($n = 52$) and over represented children of higher income families. There is a need to better understand how non-

disaster traumatic experiences interact with the experience of natural disasters to produce negative mental health outcomes.

The trauma potential of a disaster is usually conceptualized in terms of harm (injury or threat), loss, and disruption occurring during or shortly after the event (Norris & Uhl, 1993; Vernberg, La Greca, Silverman, & Prinstein, 1996). Negative mental health outcomes largely depend upon these measures of exposure. The greater the disaster's destruction and disruption, that is, the greater the losses, the more severe the psychological effects (Norris, 2005b). Studies that assess the level of hurricane exposure among youth using an index found a positive relationship between exposure and psychological distress (Goenjian, Molina, Steinberg, Fairbanks, Alvarez, Goenjian, & Pynoos, 2001; Hardin, Weinrich, Weinrich, Hardin, & Garrison, 1994; Khoury, Warheit, Hargrove, Zimmerman, Vega, & Gil, 1997; Weems et al., 2007). Few studies have examined specific harms and losses resulting from a hurricane. The types of hurricane-related losses strongly related to mental health problems were severe property damage (David, Mellman, Mendoza, Kulick-Bell, Ironson, & Schneiderman, 1996), social resource losses (Garrison et al., 1995), and personal characteristic resource loss (e.g., sense of optimism) (Sattler et al., 2002).

Post-disaster factors include events occurring during the disaster recovery period. Studies involving adults have demonstrated that secondary stressors are better predictors of poor mental health outcomes than the severity of disaster exposure and help to explain the long-term effects of disasters (Freedy, Saladin, Kilpatrick, Resnick, & Saunders, 1994b; Norris et al., 1999; Norris & Uhl, 1993). Following Hurricane Hugo, Norris and Uhl (1993) found that the effects of the disaster-related stressors were largely mediated by subsequent chronic financial, marital, and other stressors. Although domestic violence and parental psychopathology increase after disasters (Larrance et al., 2007; Norris, Friedman, & Watson, 2002), relatively few studies of youths' reactions to disasters have examined the effects of family dysfunction and other traumatic events occurring in the months after a disaster. La Greca et al. (1996) examined post-disaster stressful life events – such as divorce – and found that greater numbers of these events predicted higher levels of post-hurricane PTSD symptoms among elementary school children. Similarly, exposure to violence and other undesirable events after a hurricane were associated with post-traumatic stress reactions among adolescents (Garrison et al., 1995; Hardin et al., 1994). There is less research on resource gain following a disaster. A recent study of Katrina-exposed youth found that as extra-familial support (e.g., teachers, friends) increased, PTSD, anxiety, and depression decreased (Pina, Villalta, Ortiz, Gottschall, Costa, & Weems, in press).

Hypotheses

Based on COR stress theory and research utilizing a multiple factor conceptual model of disaster impact on mental health, we hypothesize that: (a) Greater exposure to family stressors and traumatic events prior to the hurricane will be associated with more symptoms of anxiety and depression. (b) Controlling for pre-hurricane family stressors and trauma, hurricane-related resource loss (i.e., property damage to one's home and the injury or death of significant others) will be associated with more symptoms of anxiety and depression. (c) Controlling for pre-hurricane family stressors and trauma, resource gain (i.e., hurricane-related financial assistance to the family) will be associated with fewer symptoms of anxiety and depression. (d) Controlling for pre-hurricane stressors and hurricane exposure, post-disaster family stress and traumatic events will be associated with more symptoms of anxiety and depression.

Method

Participants and Procedures

Participants selected for this study were girls who had a recent history of incarceration. Female adolescents were recruited from the state training school for girls and from four county detention centers. Recruitment began in November 2005 and ended in December 2006. Of the 351 girls approached, 305 youth assented to be in the study, a recruitment rate of 86.9%. There was no significant racial difference between those who refused (55% African American) and those who participated (68% African American), $\chi^2 (2, N = 349) = 3.10, p = .21$. Those who refused tended to be slightly younger (mean age 15.20) than those who participated (mean age 15.62), though this difference was not statistically significant, $F (1, 349) = 3.31, p = .07$. No information was available on the socioeconomic status (SES) of participants. However, approximately half of the families of children and youth involved in the Mississippi juvenile justice system receive public assistance, indicating lower SES.

Data collection instruments consisted of a structured interview on Hurricane Katrina related experiences and other adverse events, a history of arrests/incarcerations, and a self-administered mental health questionnaire. Data were collected post-Katrina. The timing of adverse life events was based on participant recall. Informed assent was obtained from all study participants. Parental consent also was obtained unless the participant was committed to the training school, in which case permission was obtained from the state juvenile justice agency. Almost all of the study participants were incarcerated at the time of the interview. Some were interviewed in their homes because they had been released from custody. Participants were paid \$20 for their time. This study was approved by the Mississippi State University Institutional Review Board.

Measures

Time to interview—Participant recruitment and data collection took place over 14 months. Logistical problems created by Hurricane Katrina coupled with administrative restrictions in securing access to some of the detained youth were the primary reasons for the extended data collection period. Storm damage resulted in a temporary halt in admissions to the training school and detention facilities. Monthly incarceration rates did not return to pre-hurricane levels until approximately seven months afterward. Because the psychological effects of natural disasters generally decline over time (Norris, 2005b; Steinglass & Gerrity, 1990), we created a variable to control for the time lapse between the hurricane and the interview. Time to interview is measured in days.

Hurricane Katrina impact—The following measures of hurricane impact were selected to reflect resource loss or gain. Object loss was assessed by *property damage* which was coded as *none* (0), *some damage to home/can live in it* (1), and *serious damage/cannot live in it* (2). Condition loss was assessed by *injury/death* (yes = 1, no = 0), reporting a family member or friend being seriously injured or killed during the hurricane. Resource gain was assessed by receiving *financial assistance* (yes = 1, no = 0) due to the storm.

Symptoms of anxiety and depression—The Adolescent Psychopathology Scale-Short Form (Reynolds, 2000) was used to assess symptoms. Feelings of worry and anxiety in the past six months were assessed by 11 items. The internal consistency reliability (Cronbach's α) of total scores for our sample was .88. Symptoms of depression occurring within the past two weeks, including depressed mood, decreased appetite, feelings of worthlessness, and lack of energy, were assessed by 11 items ($\alpha = .87$). Items assessing anxiety and depression were coded as *never or almost never* (0), *sometimes* (1), and *nearly all the time* (2). Scales were

formed by summing the responses. Scores therefore could range from 0 to 22, with higher scores indicating more symptoms of anxiety or depression.

Adverse life events—The Life Stressor Checklist-Revised (Wolfe & Kimerling, 1997) is a 30-item measure of stressors designed for adults. We modified the instrument for our study population and reduced the number of items to 22. For each life event listed, there are questions about the participant's age when the event occurred. From these responses we determined whether the event occurred before or after Hurricane Katrina. For cases with missing data on the adverse life events measure, we coded the event as not having occurred. The internal consistency reliability for the full scale is .77. We formed two subscales from the adverse life events scale for this study.

Family stressors include incarceration of parent or other family member, foster care placement, serious family money problems, emotional abuse, physical neglect, and domestic violence ($\alpha = .63$). The pre-disaster measure is the count of all events reported, which could range from 0 to 7. The post-disaster measure was the report of any family stressor after the hurricane (1 = any stressor, 0 = none).

Traumatic events—The pre-disaster and post-disaster measure of trauma exposure was the report of any of the following (1 if any were reported, 0 if none): experiencing a disaster other than Katrina, being a victim of robbery, mugging or physical assault, or unwanted sexual contact.

Preliminary Analyses—Participants ranged in age from 11 to 19 years ($M = 15.57 \pm 1.51$) and were either African American (69%) or Caucasian (31%). Most participants (60%) reported that their parents were separated or divorced, and for almost all (96.5%) the separation/divorce occurred before Hurricane Katrina. Information on academic achievement was only available on girls incarcerated at the state training school. Of these, only 20% read at grade level; 51% read two or more grades below their current grade placement and 30% read below the 5th grade level.

Most participants had a history of juvenile justice involvement. Ninety (90) girls (35%) had not been arrested prior to Hurricane Katrina and 105 or 41% had no incarceration before the hurricane. The length of involvement in the juvenile justice system ranged from less than 1 year to 7 years ($M = 1.89 \pm 1.63$). Study participants averaged 3.43 arrests (± 6.49), 2.10 incarcerations (± 3.69), and 46.32 days incarcerated (± 99.83) prior to Hurricane Katrina. Participants cited a number of reasons for the offense that first brought them to the attention of the Youth Court. The most frequently cited reason for first arrest was for aggressive behavior (29.9% assault and weapons), followed by disruptive behavior (25.2% disorderly conduct or disturbing the peace), and status offenses, such as truancy and running away from home (20.8%). Other reasons for first arrest included theft (14.6%), alcohol and drug-related offenses (5.5%), and other charges (4.0%).

Descriptive statistics are reported in Table 1. At the time of the hurricane, most (84%) of the girls were with their family, 9% were either incarcerated or in residential treatment, and the rest were with their boyfriend or others. Just over half of the participants reported damage to their homes, and almost 15% had their homes seriously damaged or destroyed. The families of most participants (58%) received hurricane-related financial assistance. Ten percent reported that someone close to them was either injured or killed by the storm. Other adverse life events occurring before Hurricane Katrina were common: 26% of the girls reported that a parent or other family member had been incarcerated, and 16% had two family members incarcerated; 14% were placed in foster care; 17% had experienced serious financial problems; 8% said that they were neglected; 21% reported emotional abuse; and 37% witnessed violence

among family members. On average, girls experienced $1.38 (\pm 1.51)$ of these family stressors prior to the storm. In addition, almost one-third reported experiencing a traumatic event (such as criminal victimization) in their lives before Hurricane Katrina. Post-hurricane adverse events were also prevalent: 17% reported at least one family stressor, and 19% reported a traumatic event that occurred after the storm. Mean scores on the anxiety and depression scales were $8.29 (\pm 4.88)$ and $7.76 (\pm 4.67)$ respectively. Approximately 12% scored in the clinical range for generalized anxiety disorder and major depression based upon APS-SF scoring criteria (Reynolds, 2000).

Analytic Strategy

Although all study participants were interviewed about experiences related to Hurricane Katrina, 44 did not complete the mental health assessment and 3 cases were dropped from analyses due to inconsistent responses suggesting inattention, carelessness, or reading difficulties. The final sample size was 258. Bivariate (zero-order) correlations between the predictor variables and outcomes and hierarchical linear regression models were used to test hypotheses based on COR stress theory. To identify those factors that contributed most to symptoms of distress, the predictor variables were entered in three blocks: Step 1 included race, pre-disaster family stressors, and pre-disaster traumatic events; Step 2 added measures of hurricane impact; and Step 3 added time to interview, post-disaster family stress, and post-disaster trauma. We examined the contribution of each set of variables to overall model fit.

Results

Correlations

Zero-order correlations are presented in Table 1. A number of predictor variables were significantly correlated with each other. However, one would expect property damage and the receipt of hurricane-related financial assistance to be correlated. None of the significant relationships between predictor variables are of a magnitude that poses a problem with multicollinearity. Property damage was not associated with either mental health outcome. However, property damage was significantly associated with outcomes in the multivariate models. The pattern of property loss not having zero-order correlations with anxiety and depression scores, yet being a significant contributor in the hierarchical regression models, discussed in the next section, is consistent with that of a suppressor variable (Pedhazur, 1997). Hurricane-related injury or death was significantly correlated with greater symptoms of anxiety and depression. Financial assistance was negatively associated with anxiety. Pre-disaster family stressors and trauma were positively associated with the number of symptoms of anxiety and depression. Post-disaster family stress was associated with depression, and post-disaster trauma was positively correlated with symptoms of both internalizing disorders. Finally, scores on the measures of anxiety and depression were strongly correlated.

Testing COR Stress Theory: Hierarchical Linear Regression Models Anxiety

Standardized (β) and unstandardized (B) coefficients are reported in Table 2 for each predictor variable in the model. Assessment of the background factors (Step 1) indicated that pre-disaster family stressors and trauma were significantly associated with symptoms of anxiety. After controlling for background factors (Step 2), hurricane-related resource losses in the form of property damage and injury or death were significantly and positively associated with anxiety scores. Hurricane-related financial assistance was significantly and negatively associated with symptoms of anxiety and was the most heavily weighted predictor of anxiety in the full model. No post-Katrina factors (Step 3) were associated with symptoms of anxiety.

The full model (all predictor variables) explained 24% of the variance in anxiety. The set of background factors collectively contributed the most explanatory power of the model (Step 1

R^2 change = .16, $p < .001$). The set of hurricane exposure measures also significantly increased the amount of explained variance (Step 2 R^2 change = .07, $p < .001$). The set of post-hurricane variables did not significantly increase the explained variance beyond that of background and hurricane exposure variables (Step 3 R^2 change = .01, $p = .62$).

Depression

Pre-disaster family stressors and trauma were also significantly associated with symptoms of depression (see Table 2). The number of pre-disaster family stressors was the most heavily weighted predictor of depression in the full model. After controlling for background factors, property damage was significantly and positively associated with symptoms of depression. Receipt of hurricane-related financial assistance was significantly and inversely associated with depression scores. Presence of family stress post-Katrina yielded higher predicted depression scores. The full model explained 17% of the variance. The set of background factors collectively contributed the most explanatory power of the model (Step 1 R^2 change = .10, $p < .001$). The set of hurricane exposure measures also significantly increased the amount of explained variance (Step 2 R^2 change = .04, $p = .022$) and the set of post-hurricane variables contributed to the amount of explained variance beyond that of background and hurricane exposure variables (Step 3 R^2 change = .03, $p = .025$).

Discussion

This study focused on female juvenile offenders, a population with a constellation of risk factors that makes them susceptible to psychological and behavioral problems (Green, Miranda, Daroowalla, & Siddique, 2005; Greene, Haney, & Hurtado, 2000). Drawing on COR theory, we hypothesized that hurricane-related resource loss would increase symptoms of anxiety and depression. Our findings affirmed this and lend support to COR theory. Our results show that damage to one's home corresponds to more symptoms of anxiety and depression, as indicated by higher scores on the respective measures, while experiencing the injury or death of someone close was associated with higher scores only for anxiety. It follows from COR theory that financial assistance (representing resource gain in the wake of the disaster) would help mitigate juveniles' symptoms. Girls reported fewer symptoms of anxiety and depression when their families received storm-related financial assistance, thereby supporting our hypothesis.

Our study contributes to the literature that examines the differential effects of secondary stressors and natural disaster stressors on mental health, by incorporating measures of family problems and traumatic events that occurred both before and after the hurricane. On the basis of previous research (Garrison et al., 1995; La Greca et al., 1996; Norris et al., 1999), we predicted that aversive life events occurring after the hurricane would negatively impact mental health outcomes when controlling for the impact of hurricane exposure. Family stressors occurring prior to the hurricane were positively associated with symptoms of anxiety and depression. However, post-Katrina family stress was significantly associated with depression and not with anxiety scores. Although trauma exposure occurring before the hurricane did increase symptoms of anxiety and depression, trauma occurring after the storm did not. The time period for exposure to family stressors and other adverse life events may explain our findings. The time from the hurricane until the interview was a maximum of 14 months, a relatively short period of time compared to the reference period before the storm. After controlling for the cumulative effects of adverse life events on mental health of female juvenile offenders, exposure to additional stressors post-hurricane, within a limited time frame, contributes little to symptoms of distress.

The influence of family stressors on anxiety and depression among female juvenile offenders deserves attention from mental health professionals and juvenile justice personnel. Girls are

much more often arrested and detained because of problems in the home, compared to boys who are more often referred to the juvenile justice system for “traditional” crimes such as property and person-related offenses (Gavazzi, Yarcheck, & Chesney-Lind, 2006). We found that a substantial proportion of the girls came from dysfunctional homes as evidenced by violence among family members and by incarceration of family members. In addition, family-related problems (e.g., running away from home, domestic violence, disturbing the family peace, and ungovernable/incorrigible) were mentioned by 23% of the girls as the reason for first involvement in the juvenile justice system. It is crucial to address multiple risk factors in order to break the intergenerational cycle of crime in which many young girls are caught (Greene et al., 2000). However, detention facilities usually do not address girls’ needs by offering family-based services (Acoca & Dedel, 1998; Gavazzi et al., 2006).

This research, therefore, highlights the need for post-disaster interventions that address family background factors as well as girls’ immediate symptoms or needs. We found that the provision of hurricane-related financial assistance to the family was associated with lower levels of anxiety and depression among these adolescents. Thus, attending to financial and social service needs is shown here to reduce symptomology. However, family-related factors other than financial assistance should also be considered. In the aftermath of a hurricane or other disaster, teenage girls from chronically dysfunctional families may be expected to experience symptoms of psychological distress. Marsee (in press) reported data suggesting that exposure to a traumatic event like Hurricane Katrina increases irritability and angry outbursts, which may bring youth to the attention of law enforcement. These findings suggest that it may be possible to identify and target the teens in greatest need of clinical attention as evidenced by their exposure to traumatic events. Most post-disaster interventions for children and adolescents are informal school-based programs and tend not to be well monitored for efficacy (La Greca et al., 1996). To be effective, these interventions need to address the material needs of the teens’ families while additionally providing counseling services that address the multiple, inter-related problems and challenges in the girls’ lives. This recommendation also applies to the general mental health treatment needs of teenage female offenders, beyond disaster-related interventions. The therapeutic needs of these girls should be addressed while they are incarcerated at correctional facilities (long-term) or assessed when they are in detention (short-term) for treatment services upon their release back into the community.

Two additional recommendations are made for future studies in this area. First, the use of more sensitive measures of resource loss and resource gain might yield a clearer picture of whether loss-gain combinations interact to explain differential consequences for mental health after a disaster event. We investigated whether our gain and loss indicators interact to further explain differences in anxiety or depression in our regression models; they did not, nor did the loss indicators interact with prior family stress or trauma. That apparent discrepancy with COR theory might be overcome by incorporating additional variables. Inclusion of personal measures of loss or gain, in addition to indicators such as family loss or gain, would be helpful. Second, inclusion of resiliency indicators and a more in-depth exploration of related characteristics may aid in the understanding of why well-being is differentially influenced by exposure to disaster. In this study, there were too few instances of respondents with both high loss and very low scores on the mental health measures to warrant group comparisons for possible reasons for this difference in resiliency. Researchers interested in resiliency may need to draw larger samples if they are investigating chronically challenged populations.

Limitations of the study

A limitation of this study is its retrospective design. We interviewed participants between 3 and 14 months after Katrina and relied on their memories of the timing and duration of events since the hurricane and throughout their lives. Retrospective studies are much more common

than prospective studies in the disaster literature. In a review of 225 such studies, only 10 had true pre-disaster measures (Norris, 2005a). However, retrospective measures have been shown to be biased toward more severe psychopathological symptoms, compared to prospective studies or studies that compare results with a non-disaster control group (Norris, 2005a).

Another limitation is that we did not have a comparison group to confirm whether female juvenile offenders are relatively more or less psychologically affected by a disaster than other adolescents. Studies of Katrina-exposed children found rates of PTSD between 11% and 24%, but did not report the percent with clinically significant rates of anxiety and depression symptoms (Pina et al., in press; Spell, Kelly, Self-Brown, Davidson, Pellegrin, Palcic, Meyer, Paasch, & Baumeister, in press). Based on symptom count, we found that approximately 12% of our sample scored in the clinical range for generalized anxiety disorder and major depression. However, participants in our study had varying levels of exposure to Hurricane Katrina and varying levels of exposure to a number of other stressful events.

The findings relied on adolescents' self-reports of property damage and receipt of financial assistance, as well as other stressful events that occurred throughout their lives. The veracity of self-report data from criminal justice populations, particularly the collection of very sensitive information, is a critical methodological issue (Knight, Hiller, Simpson, & Broome, 1998; Rosay, Najaka, & Herz, 2007). The youth assent document used in this study explicitly promised to keep all responses confidential with the exceptions of sexual or physical abuse not previously reported and indications of suicidal ideation or plans. Given the assurance of confidentiality and our previous experience in collecting sensitive information from juvenile offenders, we have no reason to question the validity of the girls' information.

Adolescent populations are under-studied in research on the effects of disasters on mental health (Norris, 2005b). This study advances the disaster literature by identifying the differential effects of disaster-related, family-related, and trauma-related stressors—both pre- and post-hurricane—on anxiety and depression among high-risk adolescents. Findings call attention to the fact that level of disaster exposure alone is not enough to understand post-disaster psychological distress among youth. Indeed, pre-disaster stressors may contribute more than hurricane exposure to mental health outcomes. In particular, this research demonstrates the significant impact of family stressors and other traumatic events on the development of internalizing disorders. The challenge for practitioners is to identify symptoms of depression and anxiety among female juvenile offenders, recognize that they may be deeply rooted in the girls' lifetime experiences of family dysfunction and trauma, and treat them accordingly.

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Table 1

Descriptive Statistics and Correlations among Variables in the Models

Variable	%	M	SD	1	2	3	4	Correlation							
								5a	5b	6	7	8	9	10	
1. Time to interview (Days)		333.53	90.6	-											
2. African American	69.0			-.06	-.*										
3. Pre-disaster family stressors		1.38	1.51	-.01	-.16**										
4. Pre-disaster traumatic events	32.2			.03	.05	-.22**	-								
5. Property damage															
a. Some	38.8			.02	-.03	.05	.08	-.**							
b. Serious	14.7			.09	-.08	-.12	-.03	-.33**							
6. Hurricane-related financial assistance	57.8			.18**	-.10	.02	.08	.26**	-	.29**					
7. Hurricane-related injury or death	10.1			.01	-.04	.10	.16**	.16*	.01	.18**					
8. Post-disaster family stress	16.7			-.01	.06	.13*	.07	.11	-.07	.07	.13*				
9. Post-disaster trauma	19.0			-.13*	.10	.23**	.07	.04	-.06	.05	.07	.13**			
10. Anxiety		8.29	4.88	-.05	-.05	.33**	.30**	.09	-.02	-.14*	.17*	.11	.13*		
11. Depression		7.76	4.67	.05	-.04	.28**	.19	.14	.02	.00	.15*	.21	.13*	-.**	.61

Note: N = 258.

*

p < .01;

**

p < .001

Table 2

Predictors of Anxiety and Depression among Incarcerated Adolescent Females (N = 258)

Variable	Anxiety ^a		Depression ^b	
	B	β	B	β
Step 1: Background Factors				
African American	-0.34***	-0.03	-0.16***	-0.02
Pre-disaster family stressors	0.82***	0.25	0.69***	0.22
Pre-disaster traumatic event	2.43***	0.23	1.16*	0.12
Step 2: Hurricane Katrina Exposure				
Property damage				
Some	1.52*	0.15	1.63*	0.17
Serious	2.08*	0.15	2.05*	0.16
Hurricane-related injury or death	2.02***	0.12	1.29	0.08
Hurricane-related financial assistance	-2.66***	-0.27	-1.34*	-0.14
Step 3: Post-Katrina				
Time to interview (in days)	-0.00	-0.02	0.00	0.06
Post-disaster family stressors	0.70	0.05	1.97**	0.16
Post-disaster traumatic events	0.63	0.05	0.78	0.07

* $p < .05$;

** $p < .01$;

*** $p < .001$

^a $R^2 = .16$ for Step 1, $\Delta R^2 = .16$, $\Delta F(3, 254) = 16.18$, $p < .001$; $R^2 = .23$ for Step 2, $\Delta R^2 = .07$, $\Delta F(4, 250) = 5.61$, $p < .001$; $R^2 = .24$ for Step 3, $\Delta R^2 = .01$, $\Delta F(3, 247) = 0.68$, $p = .62$

^b $R^2 = .10$ for Step 1, $\Delta R^2 = .10$, $\Delta F(3, 254) = 9.11$, $p < .001$; $R^2 = .14$ for Step 2, $\Delta R^2 = .04$, $\Delta F(4, 250) = 2.91$, $p = .02$; $R^2 = .17$ for Step 3, $\Delta R^2 = .03$, $\Delta F(3, 247) = 3.17$, $p = .025$