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## School and Community Influences on the Long Term Post-Disaster Recovery of Children and Youth Following Hurricane Georges

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### Abstract

Disasters affect the school and community microsystems in which children and youth recover. This study explored characteristics of the *school* (school violence, teachers' attitudes) and *community microsystem* (neighborhood climate, neighborhood monitoring, community violence) that may affect the disaster exposure and internalizing psychopathology relationship in children and youth 12–27 months after Hurricane Georges hit Puerto Rico. A representative sample (N=1,637) of caregivers and children/youth completed structured interviews in Spanish. Controlling for gender and perception of poverty, for children (age 6–10 years), hurricane exposure increased risk for internalizing psychopathology, but the school and community variables did not have an influence. For all youth (age 11–17 years), witnessing community violence and poor teacher attitudes increased the risk of psychopathology. In addition, neighborhood climate and school violence were moderators. For non-exposed youth, poor neighborhood climate and perceiving greater school violence increased the risk of internalizing psychopathology, whereas for exposed youth it did not.

### Keywords

Disasters; Psychopathology; School Microsystem; Community Microsystem

### Introduction

Following a natural disaster, children are at risk for mental health problems, often due in part to their own exposure to traumatic, disaster-related events, but also because of the long term effects disasters have on their families, neighborhoods, and schools (Bonanno, Brewin, Kaniasty, & La Greca, 2010; La Greca, Silverman, Vernberg, & Roberts, 2002). A limitation of most child disaster research is that it has been conducted at the individual level,

without viewing children in their broader ecological context (Kilmer & Gil-Rivas, 2010). In their comprehensive review of the costs of disaster, Bonanno and colleagues (2010) describe how disasters tax the communities in which they occur through the loss of buildings and infrastructure, the straining of the remaining resources and social services, and because members of a once united community may now be competing for limited resources and may feel more lonely and isolated as residents relocate.

Post-disaster, children and youth can show symptoms of post-traumatic stress, depression, separation anxiety, generalized anxiety, and distress for a prolonged time period (Felix et al., 2011; La Greca & Prinstein, 2002; La Greca, Silverman, Vernberg, & Prinstein, 1996). Although the prevalence of psychopathology for children and adults tends to decrease with time after a disaster (Norris et al, 2002), following Hurricane Katrina, prevalence increased, and this was hypothesized to be due to prolonged difficulties in the recovery environment (Kessler et al. 2008; Weems et al. 2010). Using bioecological theory as a guide (Bronfenbrenner & Morris, 2006), the current study explores how risk factors in the post-disaster *school* (school violence, poor perception of teachers' attitudes towards students) and *community microsystems* (community violence, neighborhood climate [crime, urban decay, neighborhood social networks], neighborhood monitoring [adult monitoring of child misbehavior]) affected child and youth psychopathology following Hurricane Georges. The risk factors assessed in this study were chosen because of their existing empirical relationship to child and youth mental health; however, there has been little research on them within the context of post-disaster recovery.

### **The Influence of the Post-Disaster School Microsystem**

When taking a public mental health approach to children's disaster recovery, schools are on the top of the list for service delivery (Kilmer, Gil-Rivas, & MacDonald, 2010; Pynoos, Goenjian, & Steinberg, 1998). Schools provide an important context for restoring familiar roles and routines following disasters, including a sense of safety and protection. However, it can take years for schools and school districts in the affected areas to recover, leaving many pupils to cope with relocation and reenrollment in different schools following a disaster (Kilmer et al., 2010). Likewise, the school staff and teachers take a toll in dealing with large changes in the student population, potential overcrowding in remaining schools, increases in learning and social-emotional problems in students, as well as teacher and administrator's own distress following a disaster (Felix et al., 2010; Jaycox et al., 2007; Kilmer et al., 2010).

Under normal circumstances, research suggests that the students' perceptions of teachers' attitudes towards them affect their motivation and attitudes towards school (Eccles et al., 1993). Even the most motivated, compassionate, supportive, and efficacious teacher who was also disaster-affected may have less to give students than usual during the first few years of post-disaster recovery. However, students may also be sent to schools in non-disaster affected areas, and may experience a different school microsystem. Consequently, students' view of their teacher's attitudes towards students, which is examined in this study, can be helpful in understanding variations in mental health post-disaster.

If a child perceives school as unsafe due to violence occurring on-campus, the protective and restorative functions of the school may be diminished. Students who are victimized by peers are at greater risk of mental health problems (Craig, 1998; Egan & Perry, 1998; Felix, Furlong, & Austin, 2009; Kochenderfer & Ladd, 1996). Mental health recovery post-disaster may be undermined if children or youth are contending with feeling unsafe in their school; therefore, participants' perception of the violence at their school was assessed in this study.

### The Influence of Post-Disaster Community Microsystem

After a disaster, individual recovery is tied to community recovery (Hobfoll et al., 2007). The recovery and reconstruction period can last for years after a disaster (Silverman & La Greca, 2002). If a community was already experiencing the chronic stressors of poverty, crime, unemployment, and urban decay, the addition of both the acute stressor of the disaster and the potential additional chronic stressors in the recovery period, can place more children at risk for psychopathology. Similarly, due to economic hardships faced after a disaster, some families may need to relocate to a lower socioeconomic status neighborhood than where they had resided previously, in order to find affordable housing.

In general, comprehensive reviews of the research find that neighborhood context, even when controlling for family factors, matter in terms of child and adolescent outcomes (Leventhal & Brooks-Gunn, 2000; 2003). For example, Leventhal and Brooks-Gunn (2000) found that high SES neighborhoods had a positive relation to school readiness and academic achievement, whereas low SES neighborhoods can negatively affect child mental health. Based on the work of Jencks and Mayer (1990), Leventhal and Brooks-Gunn (2003) posit that neighborhoods may exert their influence through *institutional resources* (e.g., quality and quantity of educational, recreational, and social opportunities), *norms and collective efficacy* (e.g., formal and informal monitoring and control of residents' behavior), and *relationships and ties* (e.g., social networks and behaviors such as monitoring-supervision and warmth). Overall, these are indicators of neighborhood climate, which is assessed in this study.

Chronic community stressors (e.g., economic hardship and neighborhood violence) are often inter-correlated and lead to more significant problems when acute stressors are present (Marin, Martin, Blackwell, Settler, & Miller, 2007). Thus, it is important to assess the aspects of the community microsystem that can influence child and youth psychopathology post-disaster. A secure neighborhood environment in which parents feel their child is safe and other adults monitor them, may promote resilience and/or recovery post-disaster. However, if the community is characterized by violence, lack of monitoring and social ties, and infrastructure decay, then these added stressors are likely to impede recovery. We examine the role of neighborhood monitoring in this study.

A sociological study highlights the importance of neighborhood social and physical conditions on mortality following a disaster like the 1995 Chicago heat wave (Browning, Wallace, Feinberg, & Cagney, 2006). In terms of physical conditions, affluence was negatively associated with heat wave mortality, largely due to the level of commercial decline in a neighborhood. Under average conditions, neighborhood commercial decline did not affect mortality among the elderly, but it did in times of disaster. Likewise, under average conditions, social support and collective efficacy were beneficial in reducing

mortality, but not in this crisis situation. This study was done with elderly adults and mortality, but to translate some of the core ideas to the context of youth and this study, this suggests that neighborhood climate and monitoring could conceivably affect post-disaster psychopathology.

Exposure to community violence is a risk factor for psychopathology (Guerra, Huesmann, & Spindler, 2003; Luthar & Goldstein, 2004; Margolin & Gordis, 2000), and our study contributes to the relatively recent empirical attention on the mutual influence of community violence and exposure to disaster or terrorism on mental health. Salloum and colleagues (2011) found a relation between Hurricane Gustav exposure and posttraumatic stress symptoms for children with high levels of prior disaster exposure and low exposure to community violence, or with high community violence exposure and low prior disaster exposure. For children who were high on both, the impact of another disaster did not add to their already higher levels of distress. Likewise, for children low on both, the threat of Hurricane Gustav did not have significant impact on mental health. Aber, Gershoff, Ware, and Kotler (2004) found that when controlling for prior mental health, social attitudes, and demographics, victimization and witnessing community violence had a stronger influence on change in and current mental health than did direct or family exposure to the September 11, 2001 terrorist attacks. This suggests that exposure to community violence, which is examined in this study, is an important contextual influence to consider when understanding the role of natural or man-made disaster exposure on long term psychopathology.

### **Current Study on Risk and Protection Within the Recovery Environment**

An epidemiological study was planned and funded to study psychopathology in a random sample of the island's population of children and adolescents when Hurricane Georges struck Puerto Rico (PR) as a category three hurricane. A category three hurricane rating indicates sustained winds of 111–130 mph, that devastating damage will occur, and a high risk of death and injury (National Hurricane Center, n.d.). Indeed, many communities reported property damage, 416 government shelters were opened for approximately 28,000 persons, 700,000 persons were without water and 1,000,000 had no electricity for some time (Centers for Disease Control and Prevention, 1998).

In this study, we examine the role of disaster exposure and the school and community microsystem on rates of children and youth with internalizing psychopathology at approximately 18 months post-disaster. This is important to assess given the relatively limited empirical research on the influence of the school and community microsystem post-disaster. The psychopathology criteria used in this study was whether or not the child or youth met the Diagnostic and Statistical Manual of Mental Disorders -4<sup>th</sup> edition (DSM-IV; American Psychiatric Association, 2000) criteria for full symptom count and duration for an internalizing disorder at around 18 months post-disaster (participants may or may not have met the functional impairment criteria). This is a strength of this study, as assessing whether DSM-IV diagnostic symptom criteria was met provided a reliable standard for determining the presence or absence of internalizing psychopathology, compared with sometimes arbitrary and varying symptom cut off points used in some disaster studies (Bonanno et al., 2010). Previous analyses of the same study showed increased risk of internalizing disorders

and corresponding impairment in children and youth approximately 18 months post-disaster (Felix et al., 2011). In addition, most prior research examined a small range of mental health symptoms only (e.g., any symptom of posttraumatic stress), whereas this study can show whether children and youth met diagnostic symptom criteria for any internalizing disorder, which is a more stringent indication of psychopathology.

We examine the following hypotheses for children (6–10 years) and youth (11–17 years) separately, for empirical and practical reasons. Prior research indicates younger children may show greater distress post-disaster (La Greca & Prinstein, 2002; Silverman & La Greca, 2002); and our prior research with this sample has shown some differences in patterns of results for children and youth (Felix et al., 2011; Felix et al., 2013). Practical considerations included that younger children were not surveyed about the school microsystem, whereas youth were, and the exposure to community violence measure was different for children than youth. Based on the prior research reviewed we hypothesize the following:

- H1** Youth with high levels of perceived school violence and poor perceptions of teachers' attitudes towards students will be more likely to have internalizing psychopathology post-disaster than youth with better school environments.
- H2** Children and youth from families living within stressful neighborhoods, as measured by poor perceptions of neighborhood climate and monitoring and higher levels of community violence, will be more likely to have internalizing psychopathology post-disaster than comparison children and youth with similar levels of exposure, but without a stressful neighborhood.

## Methods

### Participants

This study used the dataset collected by Canino and colleagues (2004) in PR. The confidentiality of the participants was protected as required by the University of Puerto Rico Institutional Review Board. All participants received thorough written and verbal explanations of the study and gave written assent/consent. Children aged 4 to 17 years were selected from a probability household sample that included four strata: PR's health reform areas, urban vs. rural areas, participant age, and participant sex using US 1990 Census' block groups as primary sampling units. These units were classified according to economic level and size, grouped into block clusters, and further classified as urban or rural. Three hundred block clusters were randomly selected and divided into two random replicates. Within these clusters, 44,741 households were listed. Random selection of 21 households per cluster in the first replicate and 25 in the second replicate created a total of 6,867 households for enumeration. A household was selected if it had children between the ages of 4 to 17. One child was selected at random from each household using Kish (1965) Tables adjusted for age and gender. Out of 2,102 eligible households, 1,890 children and 1,897 primary caretakers were interviewed forming 1,886 parent-child dyads for total completion rate of 90.1% for parent-child. The final sample constituted a sampling fraction of around 2.2 per 1000 children in the population. Excluded from the sample were homeless or transient children, children who had been living away from home for more than 6 months,

and those living in institutions without families in the community. For this study, we only used participants age 6 years and older (N=1,637) as the community microsystem measures were only available for this age range.

Interviews occurred from September 1999 to December 2000 (50% of interviews had been completed by late May, 2000, 18 months post-disaster). The sample was weighted to represent the general population in the year 2000 as indicated by the US Census, with 51.1% male, 50.2% age 4–10 years and 49.8% age 11–17 years. The weights corrected for differences in the probability of selection because of the sampling design and adjusted for no response. The gender distribution by age group was 50.6% male for children aged 6–10 years and 52.5% male for youth aged 11–17 years. Perception of poverty, rather than income, was used in this study because prior research with this sample showed that income was not related to prevalence of a mental disorder (Canino et al., 2004), perhaps because much of the island's population would be considered low income. Over half the sample perceived they “lived well” (51.4%), 33.7% indicated they lived “check to check, and 15.0% said they “lived poorly.” Approximately, 11.0% of the sample met DSM-IV diagnostic symptom criteria for internalizing disorder.

## Measures

A multi-stage method was used for cross-cultural adaptation and translation of study measures derived from the medical, sociological and psychological literature (Bullinger et al. 1998; Brislin, Lonner, & Thorndike, 1973). The result was a translated version of the instruments that tackle the major dimensions of cross-cultural equivalence: content, semantic, technical, criterion and concept equivalence (Canino & Bravo, 1994; Matías-Carrelo et al, 2003).

**Diagnostic Interview Schedule for Children**—Last-year DSM-IV psychiatric disorders were assessed using the latest translation into Spanish of the DISC-IV (Bravo et al., 2001), with parallel youth and parent interview versions. The DISC interview has questions about the symptom criteria for a particular disorder by symptom category type, and the duration and severity of symptoms, to determine if it meets diagnostic criteria. The test-retest reliability of the DISC-IV has been reported in both Spanish and English-speaking clinic samples yielding comparable results (Bravo et al., 2001; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). In community samples, reports of parents and youth have shown a test-retest reliability ranging between .22–.85 for symptom counts across disorders in English-speaking samples and .29–.88 for different diagnoses in Spanish-speaking samples (Bravo et al. 2001; Shaffer et al., 2000). Criterion and concurrent validity was supported for most diagnoses (Schwab-Stone et al., 1996). Both parents and youth age 11–17 years were interviewed with the DISC. Children under the age of 11 years were not interviewed with the DISC because their reports may not be reliable (Schwab-Stone, Fallon, Briggs, & Crowther, 1994). *Internalizing psychopathology* refer to the presence of DSM-IV criteria (excluding impairment) for any depressive disorder (Major Depression and Dysthymia) or anxiety disorder (Social Phobia, Separation Anxiety, Panic, Generalized Anxiety and Post Traumatic Stress). The children and youth in this particular study could meet diagnostic symptom criteria, without having impairment as measured by items on the



DISC. Shaffer and colleagues (2000) note that this is not uncommon in a community sample, especially for anxiety. Therefore, we used the structured DISC algorithms that do not require impairment and indicate presence or absence of the symptom diagnostic criteria, which includes meeting the minimum number of symptoms, requirements for type of symptom category for that disorder, and duration requirements for a disorder.

**Hurricane Exposure Questionnaire**—Questionnaires for parents and youth (11–17 yrs.) were adapted from an earlier study in PR about psychological consequences to mud slides (Bravo, Rubio-Stipec, Canino, Woodbury, & Ribera, 1990), and a hurricane in North Carolina (Norris & Kaniasty, 1992). This measure was adapted for children using the La Greca and colleagues (1996) hurricane exposure questionnaire as a guide. Items assessed direct exposure to the child and to the family as an organized unit. Questions asked of the child (6 items) include items related to *life threat/loss* (e.g., physical injury to the child or a significant other; loss of a family member or a person close to him/her; death of a pet), *loss of material objects* (e.g., toys, favorite books, and belongings) and *child's disruption of every day life* (e.g., separation from family due to the hurricane; staying overnight out of home; still living out of home at time of interview). Parents responded to 10 questions that provided information about their *exposure to the hurricane* (e.g., feeling afraid of dying or being hurt, becoming ill or injured during the hurricane) or *loss or damage to their home* (e.g., trees falling on the house, flooding, walls or roof falling, breakage of windows or door, total loss of the house). A dichotomous measure was also created that divided the sample into those who had no exposure experience and those with at least one exposure experience of either child or family exposure. Cronbach's  $\alpha$  for this sample was .72, indicating acceptable internal consistency.

**School Violence**—This five-item scale was used in large epidemiological studies in PR (Canino et al., 2004) and PR and the Bronx (Bird et al., 2006). A series of yes or no questions measure the youth's perception that their current school is a violent place, with higher scores indicating a perception of the school as violent (range 0–1). A sample item is “In the past 12 months, in your school, have there been kids who belong to gangs?” It does not measure direct victimization of the student. A total score was created using the mean of the summed items. In our study, Cronbach's  $\alpha$  was .59.

**Teacher Attitudes from the School Efficacy Scale (Eccles et al., 1993)**—We used three items from the 10-item scale used in the Middle School Family Survey Study. The original scale measured the relationships between students and teachers by inquiring about the accuracy of a series of situations that occur in their school. Psychometric data obtained in a longitudinal study in PR showed an adequate level of internal consistency ( $\alpha = .69$ ), and it was also capable of differentiating school characteristics as expected. We conducted a factor analysis and used the three items that emerged with the greatest internal consistency ( $\alpha = .72$ ), which focused on teacher attitudes about students (e.g., “Teachers give up with some students”). A continuous total score was created by taking the mean of the summed items (range 1–4). Higher scores indicate poor perception about teacher attitudes towards students.



**Violence Exposure Scale for Children-Revised (VEX-R; Fox & Leavitt, 1995)—**

This 14-item instrument inquired about being a witness to or victim of violent and criminal events in order of increasing severity. In a cartoon format, the events are depicted as being witnessed by or occurring to a child character and children are asked to rate the frequency of the event on a 4-point scale. A sample item is “José sees a person throw something at another person. How often have you seen a person throw something at another person?” A continuous total score was created by taking the mean of the items (range 0–3). Interrater reliability was .72–.86 in a sample of minority preschool children (Shahinfar, Fox, & Leavitt, 2000). In our study, internal consistency was good for personal victimization ( $\alpha = .78$ ) and witnessing violence ( $\alpha = .82$ ). Higher scores indicate greater exposure to violence.

**Exposure to Community Violence (Richters & Martinez; 1993)—**The original scale assessed 19 violence exposure events, for which the participant reports yes or no if s/he experienced, witnessed, or had vicarious exposure. The scale has good internal consistency ( $\alpha$ 's range from .76–.92) and test-retest reliability  $r = .81$ . For this study, we used a shortened version of 11-items and only the scales representing experienced and witnessed. Sample items include “Being beaten up or mugged” and “Someone has broken into or tried to force their way into the house or apartment.” A continuous total score was created by taking the mean of the summed items (range 0–1). For our sample, the  $\alpha$  for personal victimization was .64 and for witnessed violence the  $\alpha$  was .80. Higher scores indicate greater exposure to violence.

**Neighborhood Climate (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998)—**For this study, 8-items were used from the 17-item original scale to assess parents' perception of their neighborhood. Items include perception of crime-level, urban decay, and the neighborhood social network (e.g., “There's a lot of crime in the neighborhood”). Cronbach's  $\alpha$  for the original scale was .95, indicating good internal consistency. For our sample, the internal consistency was acceptable ( $\alpha = .69$ ). Participants were asked to rate their current neighborhood; higher scores indicate a better neighborhood (range 0–1).

**Neighborhood Monitoring (Loeber et al., 1998)—**Two items were used from the original four-item scale to assess parents' perceptions about the degree of adult monitoring of child misbehavior in the neighborhood (e.g., “If [CHILD] did something wrong or misbehaved in the neighborhood, would someone in the neighborhood let you know?”). Cronbach's  $\alpha$  for the original scale was .75, indicating acceptable internal consistency. For this study,  $\alpha$  was .60. Higher scores reflect better neighborhood monitoring (range 0–1). Participants were asked to rate their current neighborhood.

### Analytic Strategy

To test our hypotheses, multiple logistic regression analyses were conducted to evaluate the independent and interactive effects of hurricane exposure and school and community moderators on internalizing psychopathology using SAS 9.1. Children represented 300 different communities, based on U.S. Census data, in PR. Although the data were hierarchical in nature, we did not employ multilevel modeling since the mean number of

individuals in each community was three, which was too small to ensure the reliability of the estimates of within/between cluster parameters.

We divided the sample by age groups (children age 6–10 years,  $N = 726$ , and youth age 11–17 years,  $N = 911$ ), based on our prior work on age comparisons with this dataset (Felix et al., 2011) and because the two age groups have different surveys available. The youth completed the school violence and school efficacy measures, but the children were not presented those measures. For exposure to community violence, children completed a different, age-appropriate measure than what the youth completed. Neighborhood climate and monitoring measures involved parent report only; whereas, the other school/community measures used child/youth report. Missing rates on survey items were minimal, ranging from 0–1.5% for children and 0–2.2% for youth, respectively.

We hypothesized that characteristics of the community and school microsystems will moderate the relation between hurricane exposure and internalizing psychopathology. We tested the model for each age group separately. Perception of poverty and gender were entered in the first step as control variables, hurricane exposure and either the school or community microsystem variables were entered in the second step, two-way interaction terms were entered in the third step. School and community variables were mean-centered to facilitate interpretation of the interaction terms and to control for multicollinearity (Aiken & West, 1991). To understand the moderating effect, we plotted fitted probability values for internalizing psychopathology and the respective school or community moderator, by exposure group. A standard practice is to choose groups at the mean and at low ( $-1SD$  from the mean) and high ( $+1SD$  from the mean) values of the continuous moderator variable (Aiken & West, 1991). As shown in Figure 1 and 2, we plotted probability scores for internalizing psychopathology by exposed and non-exposed group at the mean, low, and high levels of moderating factor.

## Results

Preliminary results from t-tests indicated there were significant differences in a number of school and community variables for exposed and unexposed groups for both age groups. Exposed children ( $M=.99$ ,  $SD=.80$ ) witnessed more community violence than unexposed children ( $M=.74$ ,  $SD=.64$ ),  $t(722)=4.39$ ,  $p<.05$ ); but there was no difference for personal victimization. For youth, there was no difference for either personal or witnessed victimization. For both age groups, those exposed to the hurricane (child:  $M=.80$ ,  $SD=.21$ ,  $t(722)=2.41$ ,  $p<.05$ ; youth:  $M=.81$ ,  $SD=.18$ ,  $t(907)=2.95$ ,  $p<.05$ ) were currently living in a neighborhood with relatively worse neighborhood climate than the unexposed youth (child:  $M=.84$ ,  $SD=.19$ ; youth:  $M=.85$ ,  $SD=.19$ ). There was no difference in perception of neighborhood monitoring between exposed and non-exposed children and youth. For poor perception of teacher attitudes, unexposed youth ( $M=1.65$ ,  $SD=.78$ ) had a better perception of their teachers than the exposed youth ( $M=1.72$ ,  $SD=.82$ ,  $t(907)=2.93$ ,  $p<.05$ ). Chi Square analysis was used to compare exposed and unexposed groups on sex, perception of poverty, and rates of internalizing psychopathology. There was no sex difference by exposure group for either children or youth. The children and youth in the exposed group had a greater perception of poverty than those in the non-exposed group (child:  $\chi^2(2, 726)=10.37$ .; youth:

$\chi^2(2, 911)=23.10; p<.05$ ). For children, there was a significant difference between exposed and unexposed children on the presence of any internalizing psychopathology (10.5% vs. 4.3%;  $\chi^2(1,726)=9.13; p<.05$ ), with the exposed group having a higher rates of internalizing psychopathology. For youth, the rates were similar (14.1% for exposed and 12.1% for non-exposed).

Intercorrelations among variables were examined, using point biserial correlations. Overall, the correlations are small, but many were significant. Hurricane exposure was positively correlated to perception of poverty (child:  $r=.12, p<.05$ ; youth:  $r=.16, p<.05$ ) and internalizing psychopathology (child:  $r=.11, p<.05$ ; youth:  $r=.08, p<.05$ ). Of the school and community moderators, hurricane exposure was negatively correlated to neighborhood climate for children ( $r=-.09, p<.05$ ) and youth ( $r=-.10, p<.05$ ). Hurricane exposure was positively correlated to personal community violence ( $r=.10, p<.05$ ) and witnessed community violence ( $r=.11, p<.05$ ) for children, but not for youth. School violence and poor perception of teacher attitudes were positively correlated to internalizing psychopathology for youth ( $r=.16, p<.05$  and  $r=.14, p<.05$ , respectively). For both age groups, personal (child:  $r=.10, p<.05$ ; youth:  $r=.15, p<.05$ ) and witnessed community violence (child:  $r=.11, p<.05$ ; youth:  $r=.21, p<.05$ ) were positively correlated to, whereas neighborhood climate (child:  $r=-.08, p<.05$ ; youth:  $r=-.08, p<.05$ ) was negatively correlated to, internalizing psychopathology. These analyses give preliminary support to the potential role of school and community factors in understanding exposure-disorder relationship. Our next analyses control for perception of poverty as extant research indicates a strong relation between poverty level and severity of disaster exposure (Norris et al., 2002).

### **Influence of School and Community Microsystems**

Results of multiple logistic regression analyses are presented in Tables 1 and 2.

**School Microsystem**—For youth, school factors were used as moderators to explain the exposure-psychopathology relationship with the influence of gender and perception of poverty controlled. Results indicate school violence and poor perception of teacher attitudes were significantly associated with increased internalizing psychopathology post-disaster. The relationship between hurricane exposure and internalizing psychopathology was moderated by perception of school violence. For the exposed youth, risk of internalizing psychopathology was the same regardless of perceptions of school violence. However, for the non-exposed group, risk of internalizing psychopathology decreased as perceptions of school violence decreased (see Figure 1).

**Community Microsystem**—Results are displayed in Table 2. For children, after controlling for gender and perception of poverty, none of community variables were shown to have significant direct or moderating influence on internalizing psychopathology. For youth, after controlling for gender and perception of poverty, witnessing community violence was related to risk for internalizing psychopathology for all youth, but was not a moderator of the exposure-psychopathology relationship. Only perceptions of neighborhood climate exerted a significant, moderating effect on the exposure-psychopathology

relationship. At high levels of (e.g., positive) neighborhood climate, the non-exposed group was at lower risk of internalizing psychopathology than the exposed group. As neighborhood climate declined, their risk becomes similar to the exposed group (see Figure 2).

## Discussion

Mental health outcomes after a disaster depend on a combination of risk and resilience factors (Bonanno et al., 2010), many of which may be at the broader ecological context level of family, school, and community, as opposed to the individual-level (Kilmer & Gil-Rivas, 2010). Pfefferbaum, Pfefferbaum, and Norris (2010) described the concept of community resilience as applied to disasters. They note that community resilience has been described as the ability of social units to mitigate the effects of hazards and to initiate recovery activities that limit social disruption and the effects of future events (Bruneau et al., 2003). This study examined if aspects of the school and community recovery environment moderated the relation of hurricane exposure to internalizing psychopathology (i.e., DSM-IV symptom criteria for an internalizing disorder). Preliminary analysis suggested a difference between hurricane exposed and non-exposed groups on exposure to community violence and neighborhood climate for children; and for youth, differences in neighborhood climate and perceptions of teacher attitudes towards students. For each, disaster-exposed children and youth were in worse environments, which supports the possibility that post-disaster, some families may relocate into worse neighborhoods perhaps out of availability and financial concerns. Unfortunately, we could not directly assess relocation in this study. This preliminary analysis did not control for perception of poverty; but this was accounted for in our models, as poverty is related to severity of disaster exposure (Norris et al., 2002).

We found partial support for our hypothesis that the community microsystem would affect the mental health recovery of children and youth post-disaster. For youth, current neighborhood climate was related to rates of internalizing psychopathology at approximately 18 months post-disaster. When there was a positive neighborhood climate, the non-exposed youth were at lower risk of internalizing psychopathology than exposed youth. However, when there was poor neighborhood climate, risk for internalizing psychopathology between the two groups was similar. This is supported by the general literature on the influence of neighborhood context on child and youth outcomes (Leventhal & Brooks-Gunn, 2000; 2003) and that community resilience can affect individual outcomes. To our knowledge, this is one of the first studies to empirically examine neighborhood climate on the post-disaster adjustment of children and youth.

We did not find that neighborhood monitoring or community violence moderated the exposure-psychopathology relationship. Instead, neighborhood monitoring did not have a relation to internalizing psychopathology at all, but witnessing community violence increased risk regardless of exposure status. Research is only beginning to emerge in this area, so it is too early for definitive conclusions. However, the lack of a differential effect for community violence is in contrast to a study of youth following the September 11<sup>th</sup> terrorist attacks in New York City (Aber et al., 2004), where there was an interaction between youth's personal exposure to community violence and overall family exposure to

the terrorist attacks on predicting posttraumatic stress symptoms. Another study also found some support for community violence as moderator of hurricane exposure and distress for some youth (Salloum et al., 2011). These investigators found a positive association between exposure to Hurricane Gustav and posttraumatic stress symptoms for children with high exposure to either Hurricane Katrina or community violence, but not both. When children had cumulative trauma that included both high Katrina and community violence exposure, Gustav was not related to posttraumatic stress symptoms. In addition, they found community violence had a significant relation to depression post-disaster, which is consistent with our study. Both of the above studies were conducted within a few months of the disaster, whereas our study reflects a longer-term recovery environment, which may explain the difference in moderation results. In addition, the samples for each study were very different from one another—adolescents in New York City, children in New Orleans, and our sample of children and youth in Puerto Rico—therefore, more research is needed to understand the potential moderating role of community violence post-disaster.

We found partial support for our hypothesis that the school microsystem would affect risk of internalizing psychopathology in youth post-disaster. For youth, poor perception of teacher attitudes increased risk of internalizing psychopathology regardless of hurricane exposure. Perceptions of school violence had an influence on risk for internalizing psychopathology for all youth, and it also moderated the exposure-psychopathology relationship. For the exposed youth, risk of internalizing psychopathology was the same regardless of perceptions of school violence. However, for the non-exposed group, risk of psychopathology decreased as perceptions of school violence decreased. Thus, perceptions of school violence had a greater influence on risk for internalizing psychopathology for non-exposed youth. This is supported by research where school climate was found to moderate the relationship between the chronic stressor of poverty and student academic and behavioral outcomes (Hopson & Lee, 2011). To our knowledge, this is one of the first studies to empirically examine the role of the school environment in mental health recovery post-disaster. Most published works are anecdotal case studies, or discuss schools as a potential public health service delivery mechanism in disaster-affected communities. Further research is needed on the role of characteristics of the school microsystem on student mental health post-disaster, as it is an important aspect of individual and community resiliency for children and youth (Pfefferbaum et al., 2010).

### **Strengths and Limitations**

This study filled a gap in the child and youth disaster literature by empirically examining the role of the school and community recovery microsystem on rates of meeting DSM-IV symptom criteria for an internalizing disorder. The research design, sampling strategy, and measurement of disorder were high quality and represent an improvement upon much prior disaster research. However, the measurement of some of the constructs of interest could be improved to increase internal consistency. In addition, we did not have measures of school and community characteristics at the time of the disaster, and how they may have changed in the long-term aftermath. This included whether or not a child or youth had to relocate to a different school, and how this may impact mental health. This is an important area for future research. Like most disaster research, we did not have measures of mental health prior to the

disaster to delineate change directly due to the hurricane. Despite these limitations, this study supported the influence of neighborhood climate on child and youth psychopathology, and extended it to the post-disaster context. More research using an ecological framework is needed to understand the complex mechanisms that influence how children cope after a disaster (see Kilmer & Gil-Rivas, 2010). The development of children and youth is best understood within context, and this study contributed to painting that picture for youth exposed to large-scale traumas like disasters.

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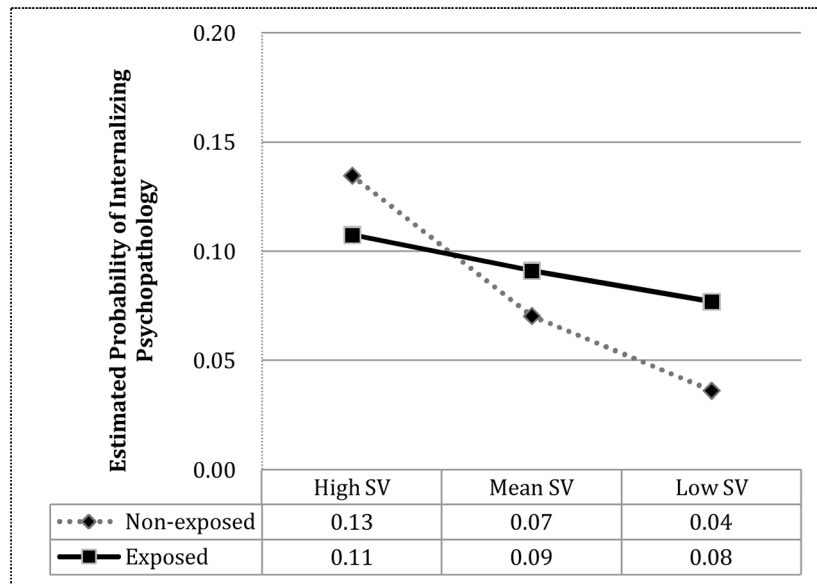
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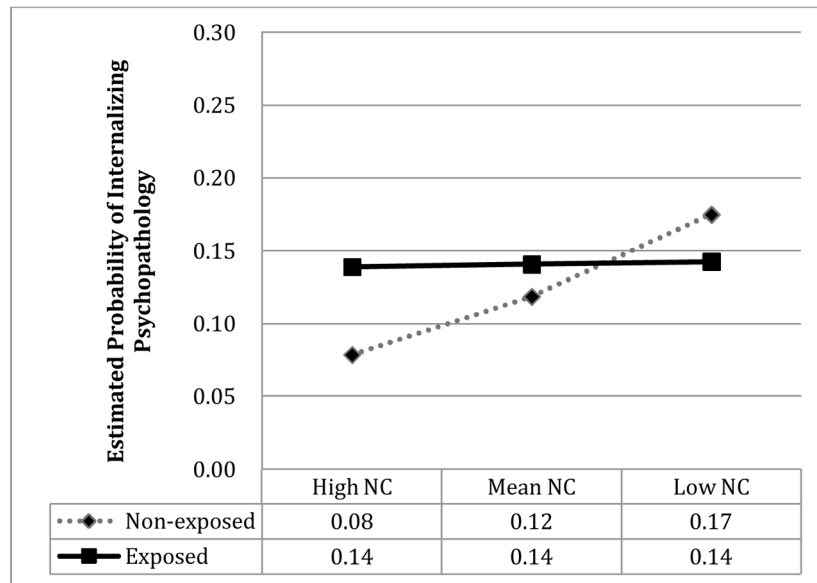
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**Figure 1.** Interaction of Hurricane Exposure and School Violence in Predicting Probability of Internalizing Psychopathology



**Figure 2.** Interaction of Hurricane Exposure and Neighborhood Climate in Predicting Symptoms of Internalizing Psychopathology

**Table 1**

Effects of School Microsystem Variables on Internalizing Psychopathology

Predictors	Youth Age 11–17 Years			
	$\beta$	SE	Wald's $\chi^2$	OR
Step 1				
Constant	-1.89	.10	359.33(1)	NA
Perception of poverty	.19	.13	2.31(1)	1.21
Gender (Male=1)	-.47	.19	5.79(1)	.62*
Step 2				
Hurricane exposure	.03	.22	.01(1)	1.03
School Violence	1.61	.49	10.42(1)	5.01*
Poor Teacher Attitudes	.35	.12	8.53(1)	1.43*
Step 3				
Hurricane X School Violence	-3.01	1.09	7.51(1)	.04*
Hurricane X Poor Teacher Attitudes	-.08	.25	.12(1)	.91
<hr/>				
Test	Step1	Step2	Step3	
Overall model evaluation				
Likelihood ratio test	8.19(2)*	31.34(5)***	40.26(7)***	
Score test	8.20(2)*	34.75(5)***	44.84(7)***	
Wald test	8.09(2)*	31.79(5)***	37.96(7)***	
Goodness of fit test				
Hosmer & Lemeshow	1.71(4)	4.82(8)	10.88(8)	
G (step comparison)		25.55(3)*	9.24(2)*	

Note. OR = odds ratio; CI = confidence interval; ( ) = *df*. NA= not applicable.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$ .

**Table 2**

Effects of Community Microsystem Variables on Internalizing Psychopathology

Predictors	Children Age 6–10 Years				Youth Age 11–17 Years			
	$\beta$	SE	Wald's $\chi^2$	OR	$\beta$	SE	Wald's $\chi^2$	OR
Step 1								
Constant	-3.27	.39	70.66(1)	NA	-1.89	.10	359.33(1)	NA
Perception of poverty	.31	.18	2.82(1)	1.37	.19	.13	2.31(1)	1.21
Gender(Male=1)	.56	.28	3.83(1)	1.75	-.47	.19	5.79(1)	.62*
Step 2								
Hurricane exposure	.83	.33	6.31(1)	2.30*	.15	.21	.49(1)	1.16
Community violence-Personal	.27	.24	1.27(1)	1.31	.80	1.18	.45(1)	2.23
Community violence-Witnessed	.11	.25	.19(1)	1.11	2.61	.60	18.74(1)	13.70*
Neighborhood Climate	-.67	.64	1.07(1)	.51	-.41	.53	.60(1)	.66
Neighborhood Monitoring	-.27	.58	.21(1)	.75	.19	.48	.16(1)	1.21
Step 3								
Hurricane X Personal	-.01	.61	.00(1)	.99	.15	.21	.49(1)	1.16
Hurricane X Witnessed	.05	.62	.01(1)	1.06	-2.07	1.25	2.73(1)	.12
Hurricane X Climate	-1.28	1.65	.60(1)	.27	2.23	1.16	4.07(1)	10.46*
Hurricane X Monitoring	.174	1.34	.01(1)	1.19	.18	1.03	.03(1)	1.21
Overall model evaluation								
Likelihood ratio test	6.61(2)*	22.18(7)**	22.89(11)*	8.19(2)*	45.16(7)***		57.43(11)***	
Score test	6.64(2)*	22.21(7)**	24.88(11)**	8.20(2)*	51.20(7)***		64.63(11)***	
Wald test	6.49(2)*	20.77(7)**	22.24(11)*	8.09(2)*	44.48(7)***		53.28(11)***	
Goodness of fit test								
Hosmer & Lemeshow	5.49(4)	5.70(8)	4.86(8)	1.71(4)	4.26(8)		8.72(8)	
G (step comparison)		15.57(5)*	.71(4)		37.57(5)*		12.28(4)*	

Note. OR = odds ratio; CI = confidence interval; () = df. NA = not applicable.

\*  $p < .05$ ,

\*\*\*  
 $p < .01$ ,  
\*\*\*  
 $p < .001$ .