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A Test of the Family Stress Model on Toddler-Aged Children's Adjustment Among Hurricane Katrina Impacted and Nonimpacted Low-Income Families

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Hurricane Katrina dramatically altered the level of social and environmental stressors for the residents of the New Orleans area. The Family Stress Model describes a process whereby felt financial strain undermines parents' mental health, the quality of family relationships, and child adjustment. Our study considered the extent to which the Family Stress Model explained toddler-aged adjustment among Hurricane Katrina affected and nonaffected families. Two groups of very low-income mothers and their 2-year-old children participated (pre-Katrina, $n = 55$; post-Katrina, $n = 47$). Consistent with the Family Stress Model, financial strain and neighborhood violence were associated with higher levels of mothers' depressed mood; depressed mood was linked to less parenting efficacy. Poor parenting efficacy was associated to more child internalizing and externalizing problems.

By some estimates, Hurricane Katrina is the most expensive natural disaster ever to affect the United States (Bacon, 2005). The financial, psychological, and emotional toll of Hurricane Katrina on the lives of residents in the Gulf Coast is unprecedented. Although the damage inflicted by Hurricane Katrina did not discriminate by socioeconomic status, impoverished families may be at heightened risk for experiencing more difficulty recovering from Hurricane Katrina than their more affluent counterparts. Impoverished families have fewer financial reserves from which to draw during times of need and the increased cost demands associated with recovery may be overly taxing for low-income families.

According to the Family Stress Model, felt economic pressure increases children's risk for problem behaviors indirectly by increasing parents' psychological distress and disrupting family relationships (Conger & Elder, 1994). Thus, although families residing in the New Orleans area may experience more economic strain since Hurricane Katrina, children of impoverished families may be at heightened risk for experiencing adjustment problems because of the psychological effects of severe economic strain on their parents. Alternatively, the experience of Hurricane Katrina might invalidate the Family Stress Model in that the psychological stress associated with experiencing the disaster, rather than perceived economic hardship, may influence parental depression and anxiety levels as well as levels of child problem behavior.

The study presented here had three goals. First, we sought to describe the experiences of low-income families post-Katrina by evaluating the extent to which Hurricane Katrina differentially influenced the level of felt environmental, psychological stress, and child adjustment among impoverished families. That is, levels of environmental stress, psychological distress, poor parenting efficacy, and child problem behaviors were expected to be higher among a group of families

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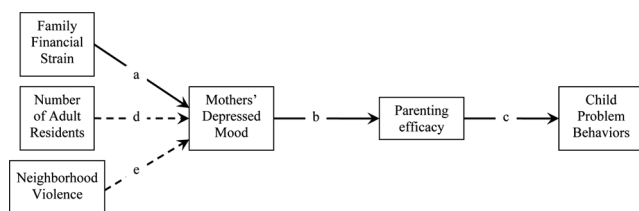


FIGURE 1 The Family Stress Model: Extending the model to include availability of adult residents and neighborhood violence.

recruited and assessed pre-Hurricane Katrina as compared to a separate group of families recruited and assessed post-Hurricane Katrina. Second, we attempted to replicate and extend the Family Stress Model using a sample of very low-income mothers and their toddler-aged children (see Figure 1). That is, in addition to economic hardship, the influence of neighborhood violence and the number of adult in-home residents on mothers' depressed mood also were considered (see Figure 1). Finally, we estimated the extent to which hurricane-related stress, rather than economic hardship, neighborhood violence, and adult in-home residents, increased risk for mothers' depressed mood and child problem behavior by comparing group differences in the overall fit of the Family Stress Model across the pre- and post-Katrina samples. The following sections first describe the tenets of the Family Stress Model and the proposed extension of the model. Next, the role of exposure to hurricane-related stressors on mothers' depressed mood and child problem behaviors are considered. Finally, the specific hypotheses evaluated in this article are described.

THE FAMILY STRESS MODEL AND CHILD PROBLEM BEHAVIORS: A REPLICATION AND EXTENSION

The Family Stress Model describes a process by which the experience of severe economic pressure undermines parents' mental health and parenting and subsequent child adjustment (Conger & Elder, 1994). As depicted in Figure 1, Conger and Elder argued that the experience of financial strain is psychologically stressful for parents and likely results in feelings of depression, inadequacy, and pessimism about their futures (Figure 1, path a). Feelings of depression, combined with the reality of very limited financial resources, may lead to increases in parental irritability. Parents must make difficult decisions regarding how to meet the immediate needs of the family with their limited financial resources (Corcoran & Adams, 1997; Mayer, 1997). Prolonged financial hardship is expected to undermine the quality of family relationships by increasing the ease and frequency of family

conflict while at the same time decreasing parents' perceptions of parenting efficacy (Figure 1, path b). Theoretically, the emotional distress associated with severe economic pressure is the mechanism by which risk for poor parenting and child maladjustment increases (Figure 1, path c; Conger et al., 1992).

A number of studies support the assumptions of the Family Stress Model. Regardless of ethnicity or geographical region, felt economic pressure has been linked to increased parental depression (Brody et al., 1994; Conger et al., 1992; Mistry, Vandewater, Huston, & McLoyd, 2002; Yeung, Linver, & Brooks-Gunn, 2002), parental anxiety (Leinonen, Solantaus, & Punamäki, 2003) and marital conflict (Conger et al., 1992; Sobolewski & Amato, 2005). Parental depression and anxiety as well as marital conflict also have been found to mediate the link between economic hardship and harsher, less involved parenting (Conger et al., 1992; Mistry et al., 2002; Sobolewski & Amato, 2005; Yeung et al., 2002).

Two clear gaps in the work validating the Family Stress Model exist. First, the unique stressors associated with extreme poverty, like the unavailability of adult caregivers or residing in impoverished neighborhoods, on mothers' depressed mood have rarely been considered (see Jackson, Brooks-Gunn, Huang, & Glassman, 2000, for an important exception). Second, the impact of family financial strain on children's adjustment during the early childhood period has largely been neglected. We sought to extend the Family Stress Model by considering the influence of adult residents and neighborhood danger on mothers' depressed mood. First, having other adult residents in the home, in addition to mothers, was expected to reduce feelings of depression because adult residents were expected to alleviate some of the burden associated with raising and caring for young children (e.g., Bradley et al., 1994; see Figure 1, path d). Although single-parent status has been linked to higher levels of parental depression (e.g., Cairney, Boyle, Offord, & Racine, 2003), the protective effects of adult in-home residents is less frequently considered. Using a sample of 93 welfare mothers and their preschool-aged child, Jackson and colleagues (2000) found that instrumental support, in the form of the availability of adults with whom mothers could rely upon during times of need, was associated with less financial strain and less maternal depression among mothers of preschool-aged children. Quite possibly the availability of adults within the home reduces mothers' feelings of depression, particularly when these adults provide instrumental support for mothers (see Figure 1, path d). Alternatively, the presence of adult residents in the home who are not providing to the home economy through direct or indirect income (e.g., providing instrumental support in the form

of child care assistance) may overly tax the very limited financial resources and increase mothers' feelings of depressed mood.

Second, neighborhood disadvantage and level of neighborhood violence consistently emerge as risk factors for maternal depression, poor parenting, and child problem behaviors. Disadvantaged neighborhoods are typically defined by high levels of poverty, unemployment, crime, and residential overcrowding (Plybon & Kliwer, 2001). Protecting children from the dangers associated with living in disadvantaged and high crime neighborhoods is particularly challenging for parents. Not surprisingly, residing in dangerous neighborhoods has been linked to more maternal depression (Cutrona et al., 2005; Ross, 2000) and to less nurturing, warm, and supportive parenting (Ceballo & McLoyd, 2002; Duncan, Brooks-Gunn, & Klebanov, 1994; Furstenberg, 1993; Klebanov, Brooks-Gunn, & Duncan, 1994; Mistry et al., 2002). Moreover, during early childhood exposure to neighborhood violence has been directly linked to increases in children's externalizing (Bates, Luster, & Vandenberg, 2003; Dodge, Pettit, & Bates, 1994; Greenberg et al., 1999; Linares et al., 2001; Plybon & Kliwer, 2001) and internalizing problems (Linares et al., 2001). The level of neighborhood violence was expected to be directly associated with mothers' feelings of depression, such that any effects of neighborhood violence on toddler-aged children's problem behavior would be indirect (see Figure 1, path e).

DOES EXPOSURE TO HURRICANE-RELATED TRAUMA INVALIDATE THE FAMILY STRESS MODEL?

Although the Family Stress Model suggests that economic hardship undermines parents' mental health, disrupts family processes, and increases children's risk for problem behaviors, this model may not be valid during times of trauma, such as after a natural disaster. Empirical evidence suggests that the prevalence of adult and child psychological distress is significantly higher among individuals who have recently experienced a traumatic event, like a devastating hurricane, than those who have not experienced a traumatic disaster. Recently, Kessler, Galea, Jones, and Parker (2006) compared levels of mental illness of a group of 1,043 adults who had recently experienced Hurricane Katrina with a select sample of 826 adults who participated in the National Comorbidity Survey–Replication Study and who were residing in the hurricane affected region 2 to 4 years prior to Hurricane Katrina. The rates of mental illness were twice as high among the post-Katrina adults (31.2%) than the pre-Katrina adults (15.7%; Kessler et al., 2006). Quite possibly, increased

prevalence of mental illness in the post-Katrina sample is directly tied to the level of exposure to traumatic hurricane-related events (e.g., rising floodwaters, being separated from family members). That is, Weems, Watts, et al. (2007) found that exposure to hurricane-related events was associated with more symptoms of posttraumatic stress disorder (PTSD) and depression among adults living in the Gulf Coast region after Hurricane Katrina. In other words, adult levels of psychological distress following a disaster seem to be directly tied to their level of exposure to the disaster-related event. If levels of psychological distress after a disaster-related trauma are more closely tied to exposure to the trauma than to environmental stressors such as economic pressure, neighborhood conditions, or available caregivers, then the Family Stress Model may not be valid among families who have recently experienced a disaster-related trauma.

In contrast to adults, children's mental health status following a traumatic disaster event seems to be specifically tied to feelings of anxiety about the traumatic event. In other words, children may be at greater risk for experiencing posttraumatic stress symptoms rather than instances of major depression or generalized anxiety disorder. Empirical research evaluating children's mental health status after a disaster suggests that PTSD (APA, 1994) symptoms are directly related to the level of exposure to hurricane-related events (La Greca, Silverman, & Wasserstein, 1998; see also Silverman & La Greca, 2002). Weems, Piña, et al. (2007) reported similar findings among school-aged children assessed pre- and post-Hurricane Katrina. After controlling for children's pre-Katrina PTSD symptoms, exposure to hurricane-related events was associated with higher levels of children's posttraumatic symptoms. Quite surprisingly, however, exposure to hurricane-related events was not related to change in children's level of generalized anxiety or depression (Weems, Piña, et al., 2007), suggesting that children's general psychological distress may be less directly tied to level of exposure to traumatic hurricane events than their specific posttraumatic stress symptoms (see also Scheeringa & Zeanah, this issue). If children's mental health status is less tied to exposure to hurricane-related events, parental psychological distress and poor parenting should be associated with poorer adjustment, consistent with the Family Stress Model.

Taken together, the results of studies evaluating parents and children's adjustment following a disaster suggest that the Family Stress Model may have limited utility following a disaster-related event. Environmental stressors, like economic pressure, neighborhood danger, and adult caregivers, may have little impact on mothers' depressed mood among mothers who have recently experienced a disaster-related trauma, like Hurricane Katrina, as compared to mothers who have not

experienced such a disaster. If Paths a, d, and e depicted in Figure 1 were statistically significant only among families who were not impacted by Hurricane Katrina, then the Family Stress Model may not be a useful explanation of correlates associated with parental depressed mood after a disaster.

In contrast, because children's psychological stress following a disaster seems to be specifically tied to stress about disaster-related trauma, children's level of problem behaviors following a disaster may be more closely tied to variations in parental depressed mood than to exposure to the trauma. Inasmuch as mothers' depressed mood influences the quality of parenting, as proposed by the Family Stress Model, then children's level of problem behaviors may not be linked to exposure to disaster-related traumatic but rather may be more closely tied to parents' depressed mood. In our investigation, we evaluated variations in the patterns of associations proposed by the Family Stress Model and depicted in Figure 1 by exposure to Hurricane Katrina in order to better understand the impact of traumatic experiences and economic or environmental stressors on toddler-aged children's risk for adjustment problems.

SUMMARY OF STUDY HYPOTHESES

Our study had three goals. First, we evaluated the extent to which levels of perceived financial strain, neighborhood violence, maternal depressed mood, poor parenting efficacy, and child problem behaviors as well as the number of available caregivers varied across two independent samples of very low-income mothers and their toddler-aged children. The pre-Katrina group was recruited and assessed 1 to 2 years before Hurricane Katrina, and the post-Katrina group was recruited and assessed 6 to 18 months after Hurricane Katrina. Second, the extended Family Stress Model presented in Figure 1 was empirically evaluated. Consistent with the Family Stress Model, higher levels of financial strain and neighborhood violence as well as fewer adult in-home residents were expected to be linked higher levels depressed mood reported by mothers. Moreover, mothers' level of depressed mood was expected to be indirectly linked to child problem behavior through diminished parenting efficacy. Finally, to consider the unique effects of experiencing hurricane-related trauma, the Family Stress Model was estimated separately for the pre- and post-Hurricane Katrina groups. Statistically significant differences in the pattern of associations could indicate unique effects of hurricane related stress on family processes influencing children's behavioral adjustment.

METHOD

Participants

Two groups of mothers with a 2-year-old child and a child enrolled in Head Start were recruited to participate with their 2-year-old child. Before Hurricane Katrina struck, 55 mother-child dyads had participated (pre-Katrina sample); after Katrina, 47 additional mother-child dyads were recruited and participated (post-Katrina sample). All families were recruited through the local Head Start agencies, but the two groups were recruited in slightly different ways.

The pre-Katrina families were recruited during the fall 2003 and 2004 Head Start registration and parent orientation meetings. Pre-Katrina families were recruited from three Head Start centers located in Jefferson parish or the county immediately adjacent to New Orleans. A total of 740 children were enrolled in the three centers, with one center enrolling 550 children. Pre-Katrina family interviews occurred between September 2003 and December 2004.

As Head Start centers reopened after Hurricane Katrina, new families were recruited to participate in the study. After Hurricane Katrina, Head Start centers opened as soon as facilities passed state building and safety codes. Consequently, Head Start centers did not hold formal registration periods or parent orientation meetings; rather, centers reopened as soon as possible and admitted children until all slots were filled. Thus, recruitment post-Katrina could not proceed in the same manner as pre-Katrina. Instead we relied on the assistance of Family Service workers who identified eligible families, described the study to them, and obtained permission for project staff to call the eligible family. Of the three Head Start centers included pre-Katrina, the largest Head Start center in Jefferson parish ($n = 550$) sustained substantial hurricane damage and was closed during the entire 2005–2006 academic year. Recruitment efforts were expanded to include both Orleans and Jefferson parish centers. Thus, children recruited post-Katrina were more likely to attend a smaller Head Start centers (post-Katrina approximate range = 45–100 children). Post-Katrina family interviews occurred between February 2006 and January 2007. Although the pre-Katrina families were not recruited from Orleans parish, all families lived in areas severely impacted by Hurricane Katrina.

Demographic information collected from mothers indicated very few statistically significant differences across the pre- and post-Katrina groups. Of the participating children, 41 were boys, and 61 were girls. The proportions of participating boys and girls were similar across both samples (see Table 1). Mothers were on average 25.92 years of age; no statistical differences in

TABLE 1
Comparison of Pre- and Post-Katrina Families on Child Gender, Ethnicity, and Mother's Marital Status

	Pre-Katrina ^a (%)	Post-Katrina ^b (%)	χ^2
Child Gender			0.73
Girls	63.6	55.3	
Boys	36.4	44.7	
Ethnicity			9.12 [†]
African American	83.6	80.9	
White	14.5	4.3	
Indian/Middle Eastern	1.8	4.3	
Other (Asian/Multiracial)	0.0	10.5	
Mother's Marital Status			5.26
Single, Never Married	47.3	48.9	
Single, Widowed	3.6	0.0	
Married	34.5	46.7	
Separated	12.7	4.4	
Divorced, Not Married	1.8	0.0	
	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>
Mother's Average Age	26.31 (5.13)	25.44 (3.44)	0.93
Average Number of Children	3.24 (1.32)	3.42 (1.54)	0.42
Average Household Size	4.87 (1.85)	5.49 (2.03)	2.52
Average Per Capita Income	\$3,122 (\$2,991)	\$3,586 (\$2,020)	0.79
Average Income-to-Needs Ratio	.64 (.58)	.87 (.49)	4.40*

^a*n* = 55; ^b*n* = 47.

[†]*p* < .10; **p* < .05.

mothers age emerged across both samples (see Table 1). Children were interviewed within 2 months of their second birthdays, and children averaged 24.40 months in the pre-Katrina sample and 24.24 months in the post-Katrina sample. Participating mother-child dyads were primarily African American (pre-Katrina, 83.6%; post-Katrina, 80.9%) or White (pre-Katrina, 14.5%; post-Katrina, 4.3%). In both samples, the majority of mothers were not married (see Table 1).

All participants met the financial requirements for Head Start and were very low income. Post-Katrina families reported higher per capita income levels than the pre-Katrina sample (pre-Katrina, \$3,122; post-Katrina, \$3,586) and the post-Katrina income-to-needs ratio was statistically and significantly greater than the pre-Katrina sample (pre-Katrina, .64; post-Katrina, .87). An income-to-needs ratio of 1 indicates household income at the poverty line; both groups of mothers reported income levels well below the poverty line. Post-Katrina mothers reported a larger household size (*M* = 5.49) than the pre-Katrina mothers (*M* = 4.87), but this difference was not statistically significant (see Table 1).

Procedures

Participating mothers and children completed a structured interview at or around the target children's second birthdays. Although most families completed the

interview in their homes (or temporary homes), a few families completed the interview at their children's Head Start Center. Mother-child dyads completed one 2-hr interview, and informed consent was obtained prior to the start of the interview. Pre-Katrina mothers received a \$50 gift certificate to a local grocery store and children received a small prize worth approximately \$10. Post-Katrina mother-child dyads completed two interviews. The first interviewed involved only the mother and lasted 1 hr. During this initial interview the study was explained to mothers, informed consent was obtained, and mothers completed a series of questionnaires with a trained interviewer. Mothers were compensated \$25 for their time. Mothers and children completed a second, 2-hr in-home assessment, mothers were compensated \$50 for this visit, and children received a small prize worth approximately \$10. In most cases questionnaires were completed with an interviewer because most mothers experienced some reading difficulty. Both procedures received Institutional Review Board approval from the University of New Orleans.

Measures

Family financial strain. Family financial strain was defined as mothers' perceived inability to meet financial obligations. Financial strain was measured using the same items described by Conger and colleagues (1992). Mothers answered three items regarding how difficult

TABLE 2
Comparison of Pre- and Post-Katrina Samples on Study Constructs

	<i>Pre-Katrina</i> <i>M (SD)</i>	<i>Post-Katrina</i> <i>M (SD)</i>	<i>F</i>
Family Financial Strain	2.97 (0.96)	3.16 (0.98)	0.91
No. of Adult Residents	1.48 (0.69)	2.07 (0.78)	15.60*
Neighborhood Violence	2.11 (2.89)	1.89 (2.18)	0.18
Maternal Depressed Mood	1.73 (0.85)	1.72 (0.68)	0.01
Parenting Efficacy	4.01 (0.44)	4.00 (0.58)	0.01
Child Internalizing Behavior	0.48 (0.32)	0.54 (0.41)	0.70
Child Externalizing Behavior	0.63 (0.35)	0.63 (0.43)	0.00

* $p < .01$.

it has been to make ends meet, to pay bills on time, and how much money was left each month. Items were rated on a 5-point scale ranging from 1 (*no difficulty*) to 5 (*very difficult*). Cronbach's alpha coefficients indicated good internal consistency in mothers' reports ($\alpha = .71$). The sample mean was 3.05 ($SD = .97$), indicating good variability in financial strain (see Table 2).

Number of adults in the home. Mothers reported on the number of adults living in their homes. The number of adults living in the home ranged from 1 to 4, with an average of 1.75 adults ($SD = .79$). Mothers most frequently reported being the only adult in the home (41.2%) or having one other adult caregiver in the home (43.1%); 12.7% reported more than two adults in the home. Pre-Katrina mothers most frequently reported being the only adult in the home (61%), whereas post-Katrina mothers most frequently reported that there were two adults in the home (60%). Although the pre-Katrina mothers were only asked to report on the number of adults residing in their homes, the post-Katrina mothers reported on their relationship with the adult residents. Most frequently, post-Katrina mothers reported that the adult resident was a relative, followed by the father of their children.

Neighborhood violence. Mothers completed the Me and My Neighborhood Questionnaire regarding the frequency with which dangerous and violent events occurred within their neighborhood (Pitt Mother & Child Project, 2001). Mothers rated items on a Likert scale ranging from 0 (*never*) to 3 (*a lot*); items assessed the frequency with which dangerous and criminal activities occurred within their neighborhood. Items were recoded to create an index of violent events, and only the eight neighborhood violence items were included in our report. These items included whether a family member was stabbed or shot, a friend was stabbed or shot, a family member was robbed or mugged, a close friend was robbed or mugged, mothers carried a gun or knife for safety, a family member carried a gun or knife for

safety, a shooting occurred near their home, or a family member carrying a gun or knife for protection. Cronbach's alpha coefficients indicated good internal consistency in mothers' reports ($\alpha = .77$). Mothers reported an average of 2.01 violent events occurring within their neighborhood ($SD = 2.58$).

Mothers' depressed mood. Mothers completed only the Depression and Anxiety subscales from the Symptom Checklist-90-Revised (Derogatis, 1983). Respondents are presented with choices ranging from 0 (*not at all*) to 4 (*extremely*). The Symptom Checklist-90-Revised Depression and Anxiety subscales have been shown to be a valid and reliable marker for depressive and anxious symptoms (e.g., Morgan, Wiederman, & Magnus, 1998). Scoring involved averaging all depression and anxiety subscale items to create a single indicator of emotional distress. Cronbach's alpha coefficients indicated that scores were internally consistent ($\alpha = .95$). The mean score was 1.72 with a standard deviation of .77, indicating that mothers generally reported low to moderate levels of anxious/depressive symptomatology.

Parenting efficacy. Mothers' perceptions of parenting effectiveness were measured using a scale constructed for the present investigation. Items were devised specifically to contain simple wording that would be readily understood by mothers. Specifically, mothers rated how often they felt like they could manage their children; sample items included how often mothers felt like they could change their child's behavior, handle problems their child may have, and correct their child's behavior. Items were rated on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*). Cronbach's alpha coefficients indicated adequate internal consistency ($\alpha = .67$). Efficacy scores averaged 4.00 with a standard deviation of .51, indicating that mothers viewed themselves as generally effective in managing their children's behavior.

Children's problem behaviors. Given the high convergence of internalizing and externalizing symptoms during the toddler period (e.g., Gilliom & Shaw, 2004), mothers' reports of both internalizing and externalizing behaviors were used to measure child problem behaviors. Mothers completed the Child Behavior Checklist for ages 2 to 3 (Achenbach, 1994) regarding the level of children's internalizing and externalizing behaviors. All items were rated on a 3-point Likert scale from 0 (*not true*) to 2 (*very true/mostly true*). Twenty-five items were averaged to create the Internalizing Problems subscale, and 26 items were averaged to measure externalizing problems. Cronbach's alpha coefficients indicated good internal consistency (Internalizing Problems: $\alpha = .90$; Externalizing Problems: $\alpha = .92$). Consistent with previous research, internalizing and externalizing scores were statistically and significantly correlated ($r = .79$, $p < .01$). Internalizing Problem means (.51, $SD = .36$) and Externalizing Problem means (.63, $SD = .39$) indicated that children demonstrated generally low levels of problem behaviors. Because the Internalizing and Externalizing subscales were computed based on a different numbers of items, each subscale was used as an indicator of a problem behavior latent construct.

Internalizing and Externalizing raw scores typically do not vary by child gender during the toddler period (e.g., Keenan & Shaw, 1997). Quite surprisingly, statistically significant gender differences emerged in our sample. For both the pre- and post-Katrina groups, mothers reported that boys had statistically significant more externalizing (M_s : boys = .77, girls = .53), $F(1, 101) = 10.12$, $p < .01$; and internalizing (M_s : boys = .61, girls = .44), $F(1, 101) = 5.93$, $p < .05$, problems.

RESULTS

Hypothesis 1: Unique Characteristics of the post-Katrina Families

Thirty-two percent of the post-Katrina participating families did not evacuate before the storm. Families who did not evacuate for the storm primarily stayed with friends (40%), in shelters (27%), in hotels (10%), or at the Superdome (5%). Of the 32% of families who did not initially evacuate from the storm, all were evacuated outside of the area, and 84% were sent to places outside of their control. Although most (87%) were sent to shelters in Louisiana, Mississippi, or Texas, participating families also were sent as far away as California and Michigan. Post-Katrina families evacuated from the city for an average of 94.4 days ($SD = 61.9$). Upon their return, 59% of families returned to a residence that was different from where they were living before the storm (trailer, 37%; apartment, 33%; house, 30%). Only 15% of families had

homeowners insurance, and 13% of families had flood insurance before the storm, but the homes of 78% of the post-Katrina families sustained wind/storm-related damage and 46% of families homes flooded during the storm.

Analysis of variance procedures were computed to compare the mean levels of each of the constructs identified in Figure 1 across the pre- and post-Katrina groups. Although household size did not differentiate the pre- and post-Katrina families, post-Katrina families had statistically significantly more adults living in their homes (see Table 2). Given that the size of the pre- and post-Katrina samples households were similar, variations in the number of adults indicates that proportionately more of the household comprised adults in the post-Katrina group than the pre-Katrina group. Contrary to expectations, no other mean differences emerged between the pre- and post-Katrina groups. As shown in Table 2, pre- and post-Katrina mothers reported similar levels of family financial strain, neighborhood violence, depressed mood, parenting efficacy, child internalizing and externalizing problems.

Hypothesis 2: Replicating and Extending the Family Stress Model

Structural equation modeling was used to evaluate the theoretical model depicted in Figure 1. Before estimating the structural model, a set of bivariate correlations were computed to evaluate the pattern of associations among study constructs and indicators. First, the model suggests that family financial strain, and not income per se, is associated with parental distress and maladaptive family outcomes. To ensure that financial strain and not income was the critical variable of interest, the income-to-needs ratio was correlated with all study constructs; no statistically significant or marginally significant associations emerged. Second, because the length of time from Hurricane Katrina to the date of the interview varied for the post-Katrina group, the length of time was correlated with all study constructs for the post-Katrina group. No statistically significant correlations emerged indicating that the levels of financial strain, neighborhood violence, adult residents, mothers' depressed mood, parenting efficacy, and child problem behaviors was not related to the amount of recovery time from Hurricane Katrina.

Next, correlations among study constructs were computed (see Table 3). The patterns of statistically significant correlations were generally consistent with the Family Stress Model. Specifically, family financial strain, maternal depressive symptoms, parenting efficacy, and child problem behaviors were correlated in expected directions. That is, family financial strain was statistically and significantly associated with more

TABLE 3
Means, Standard Deviations, and Correlations Among Study Constructs

	1	2	3	4	5	6	M	SD
1. Financial Strain							3.05	.97
2. No. of Adults	-.21*						1.75	.79
3. Neighborhood Violence	.27**	-.15					2.01	2.58
4. Maternal Depressed Mood	.60**	-.20*	.40**				1.72	.77
5. Parenting Efficacy	-.28**	-.02	.04	-.41**			4.00	.51
6. Child Internalizing Behavior	.20*	-.02	.05	.21*	-.35**		.51	.36
7. Child Externalizing Behavior	.18†	-.07	.12	.33**	-.41**	.79**	.63	.39

† $p < .10$; * $p < .05$; ** $p < .01$.

depressed mood ($r = .60, p < .01$), less parenting efficacy ($r = -.28, p < .01$), and more child internalizing ($r = -.20, p < .05$), and somewhat more externalizing ($r = .18, p < .10$) behavior problems. In addition, mothers' depressed mood was associated with less parenting efficacy and both mothers' depressed mood and poor parenting efficacy were associated with higher levels of child problem behaviors (see Table 3). Initial evidence also supports the importance of considering the influence of neighborhood violence and the number of adult caregivers in the home on depressed mood; neighborhood violence was associated with more maternal depressive symptoms, whereas more adult residents was associated with lower levels of depressed mood (see Table 3).

Finally, a structural equation model was computed using AMOS 5.0 to evaluate the Family Stress Model depicted in Figure 1 for the entire group. The internalizing and externalizing problem behavior scores were used as indicators of a latent child problem behaviors construct. Because child problem behaviors varied significantly by child sex, child sex was controlled in all analyses. As shown in Figure 2, family financial strain was statistically and significantly correlated with neighborhood violence ($r = .28, p < .05$) and number of adult residents in the home ($r = -.21, p < .05$). The presence of adult residents was not statistically and significantly correlated with neighborhood violence. Regarding the hypothesized path coefficients, both family financial strain ($\beta = .53$) and neighborhood violence ($\beta = .21$) were statistically and significantly associated with more

maternal depressive symptoms. However, after considering the effects of financial strain and neighborhood violence, the number of adult residents was unrelated to level of mothers' depressed mood.

As predicted, mothers' depressed mood was statistically significantly and negatively associated with parenting efficacy, indicating that more depressed mood was associated with less parenting efficacy (see Figure 2). Parenting efficacy was statistically significantly and negatively associated with child problem behaviors (see Figure 2). Poor parenting efficacy was statistically and significantly linked to more child problem behaviors (see Figure 2). The indirect effect of family financial strain on parenting efficacy also was statistically significant, suggesting that mothers' depressed mood mediated the link between family financial strain and parenting efficacy. Similar indirect effects did not emerge for neighborhood violence. Although not depicted, child sex was statistically and significantly associated with child problem behaviors ($\beta = -.28, p < .01$), but child sex was not statistically significantly correlated with any of the three exogenous variables (i.e., financial strain, number of adult residents, neighborhood violence). The model provided a good fit with the data, $\chi^2(14) = 17.78 (p = .217, RMSEA = .052, CFI = .98)$.

Hypothesis 3: Hurricane Katrina as a Moderator of the Family Stress Process

To evaluate the extent to which unmeasured factors associated with experiencing Hurricane Katrina

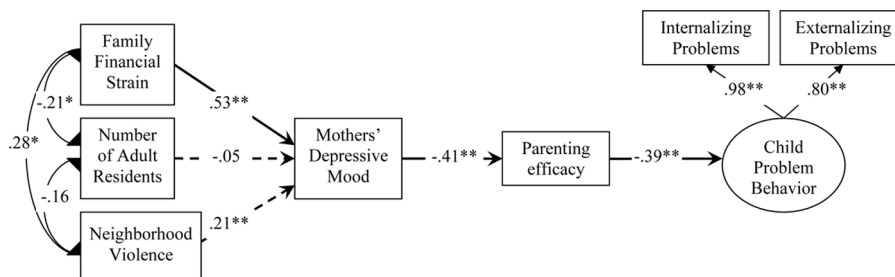


FIGURE 2 Results of the structural equation modeling evaluating the extended Family Stress Model. Note: * $p < .05$; ** $p < .01$.

differentiated the two groups, stacked models were estimated. Estimating the stacked models involved equating all path coefficients across the pre- and post-Katrina groups and then releasing each path one at a time. If releasing the path coefficient results in a statistically significant change in chi-square, then the magnitude of the path coefficient differs significantly across the two groups. No statistically significant differences emerged, indicating that the pattern of associations depicted in Figure 2 did not vary significantly across the groups.

DISCUSSION

Hurricane Katrina dramatically altered the face of the greater New Orleans area. Life in New Orleans post-Katrina has been reported to be more stressful, expensive, and dangerous than the pre-Katrina environment (Mowbray, 2006). Such pervasive environmental changes provide a natural experiment from which to consider how variations in environmental stress affect mothers' psychological distress, their parenting efforts, and indirectly their children's adjustment. Our study considered the extent to which pre- and post-Katrina life actually differed for very low-income families and evaluated the validity of the Family Stress Model for explaining the patterns of associations among environmental and family stressors, mothers' psychological distress, and children's adjustment among very low-income families. In addition, we extended the Family Stress Model by estimating the effects of environmental stressors that typify post-Katrina New Orleans, specifically more adult residents within the home and more violent events occurring within the neighborhood on mothers' mental health.

Mixed support emerged for study hypotheses. First, the post-Katrina environment seemed to vary little from the pre-Katrina environment for the families who participated in our study. Second, and as expected, the Family Stress Model offered a good explanation for the associations among family financial strain, maternal depressive symptoms, parenting efficacy, and child problem behaviors among impoverished families. Neighborhood violence also emerged as a significant factor associated with elevated levels of mothers' depressed mood. Surprisingly, the pattern of associations did not vary across the pre- and post-Katrina groups, a finding that is in direct contrast with the results of Scheeringa and Zeahnah (this issue). The following sections first discuss the role of chronic versus acute stressors on the psychological adjustment of low-income families as well as the validity of the Family Stress Model among very low-income families. Finally, the limitations and clinical implications of the work is described.

The Pervasive Effects of Poverty Versus Exposure to Traumatic Events

The events associated with Hurricane Katrina have been traumatic for many of the residents of the Gulf Coast. Not surprisingly, Kessler and colleagues (2006) reported that the rates of clinically significant mental illness are twice as high among post-Katrina residents of the greater New Orleans area as among residents evaluated 2 to 4 years before Hurricane Katrina struck. One reason for the increased mental health problems associated with Hurricane Katrina is that recovery from the storm has been pervasive and long lasting. The entire infrastructure of many Gulf Coast cities, including New Orleans, was devastated. Many area schools, hospitals, grocery stores, gas stations, banks, and homes were unsalvageable, and recovery is dependent on the pace of reconstruction. Most participating post-Katrina families left their homes for 3 months, only to return to a different and often more crowded residence. Of importance, the pre- and post-Hurricane Katrina families were demographically similar leaving open the possibility that environmental changes related to Hurricane Katrina accounted for differences both in the mean levels of and patterns of associations among theoretical constructs. Although post-Katrina mothers reporting significantly higher income-to-needs ratio, income levels for both groups were well below federal poverty levels.

Surprisingly, no statistically significant differences in mean levels of study constructs or in the pattern of associations among study constructs emerged across the pre- and post-Katrina groups. That is, levels of perceived financial, environmental, and social stressors did not vary across groups of mothers assessed either before or after Hurricane Katrina. Given the high levels of poverty, a floor effect may have occurred; incremental changes in income may have little effect on psychological distress when income is well below the poverty line. These results are generally consistent with the idea that the effects of chronic stress may be more severe than acute stress (Aber, Gershoff, Ware, & Kotler, 2004). Moreover, the psychological impact of the stressors associated with Hurricane Katrina may not be equivalent across socioeconomic groups. For the most impoverished families, the incremental increases in felt stress associated with the events of Hurricane Katrina may be insignificant as compared to the chronic stress associated with poverty.

An additional goal of our study was to replicate and extend Family Stress Model depicted in Figure 1 among urban, low-income mothers with toddler-aged children. Previous research evaluating the Family Stress Model among low-income, urban residents has evaluated the validity of the model during early adolescence (e.g., Gutman, McLoyd, & Tokoyawa, 2005). Less frequently

considered is the applicability of the Family Stress Model for explaining variations in toddler-aged children's problem behaviors. Results replicated the Family Stress Model, suggesting that family financial strain may be psychologically distressing for parents, undermine parenting efforts, resulting in higher levels of child problem behaviors regardless of children's age or family income level. Moreover, like Gutman and colleagues, neighborhood disadvantage accounted for significant portions of the variance associated with mothers' depressed mood. In contrast, the presence of more adults in the home did not protect mothers from the negative impact of financial strain or neighborhood violence on reported levels of depressive symptoms.

These results are particularly striking when considering that financial strain indirectly influenced mothers' perceived parenting efficacy. The toddler period is a unique developmental period in that parents must, for the first time, discipline and control their children's behavior. Parenting success is maximized when parents can set appropriate limits while still maintaining the warmth and sensitivity of earlier developmental periods (Kochanska, 1993; Shaw & Bell, 1993). Financial strain, and to a lesser degree neighborhood violence, may interfere with mothers' self-perceptions of being able to manage their children's behaviors by affecting feelings of depression. As suggested by social interactional theory, more depressed parents and parents who feel less effective in disciplining and managing their children's behavior are likely to gradually withdraw from discipline efforts; by failing to set limits for acceptable child behavior, children's risk for behavioral and emotional undercontrol intensifies (e.g., Patterson, Reid, & Dishion, 1992). Thus, financial strain, and the psychological distress associated with financial hardship, may set into motion a sequence of events that increases the likelihood that children will develop problem behaviors.

Efforts to extend the Family Stress Model by considering whether the number of adult residents in the home offered some protection against maternal depression were unsuccessful. The availability of adults in the home was expected to buffer the impact of financial strain and neighborhood violence on mothers' depressed mood because these adults could provide instrumental support in the form of more financial contribution to the home economy and more caregiving assistance. These results neither confirm nor refute this expectation, but they do suggest that the number of adult residents is not a proxy for instrumental support. Unfortunately, information regarding the actual financial or caregiving support provided by the adult residents was not obtained in our study. Measuring the level of actual support provided by the adults

living within the home may have produced results more consistent with expectations.

Limitations

Although the results of this study reiterate the importance of financial strain on disrupting family processes and influencing children's risk for problem behaviors, this study is not without limitations. First, future studies evaluating the validity of the Family Stress Model in disaster situations may wish to consider measuring post-traumatic symptoms, or symptoms more closely tied to the disaster, rather than general levels of problem behaviors (e.g., Scheeringa & Zeahnah, this issue; Weems, Piña, et al., 2007). That is, children's mental health status after a disaster may be more specific to the disaster rather than generalized. Second, and consistent with most evaluations of the Family Stress Model, this work is correlational; the cross-sectional design prohibits conclusions regarding the direction of effects. For instance, child problem behaviors may contribute to perceptions of poor parenting efficacy rather than the reverse. Replicating these findings with a longitudinal research design would validate the direction of effects as suggested in our article.

Third, the data relied exclusively on mothers' self-report and the pattern of associations could reflect common perceptual biases inherent to mothers' reports. Depressed mothers have been found to interpret life events and their children's own behavior more negatively than nondepressed mothers (Chilcoat & Breslau, 1998). Replicating these findings using different informants (e.g., teachers, other parents) and/or different methodologies (e.g., observer ratings) would increase the confidence that findings do not reflect mothers' own perceptual biases. Fourth, measuring actual instrumental support received from adult residents may have yielded results more consistent with expectations. That is, simply measuring the number of adult residents in the home does not quantify the amount of actual financial and caregiving support provided. Who is providing the support may be as important as how much support mothers receive. Fathers who provide financial and caregiving support may better alleviate mothers' depressed mood than other adult caregivers. Including fathers would clearly strengthen the work. Finally, the sample is small and unique. Detecting group differences between small samples is often difficult; however, statistically significant associations that emerge with small samples likely reflect a large effect (Cohen, 1988).

Implications for Research, Policy, and Practice

Despite these limitations, the results of this investigation advance understanding of the mechanisms by which

family financial strain and neighborhood violence may negatively influence child adjustment. Moreover, these findings contribute to the growing body of literature that identifies family financial strain as an important risk factor that influences parents' mental health and disrupts family processes even among very low-income families with toddler-aged children. Replicating these findings with a larger sample and considering the longitudinal effects of exposure to severe financial strain and neighborhood violence during the toddler period on children's adjustment during later developmental periods are clearly needed.

Consistent with the work of Shaw, Dishion, Supplee, Gardner, and Arnds (2006), the results of our investigation suggest that treatments targeting mothers' depressed mood that do not also address the psychological, economic, or environmental circumstances may be ineffective and may do little to reduce toddler-aged children's risk for developing problem behaviors. Shaw and colleagues (2006) developed an elegant family-based intervention designed to reduce toddler-aged children's risk for problem behaviors among very low-income families. Although families are taught effective parental management of children's behaviors, families also received treatment for other salient problems, like depression, social support, employment, and housing problems. Clinically significant reductions in child problem behaviors from ages 2 to 4 as well as maternal depression have been demonstrated (Shaw et al., 2006). Thus, treating mothers' depression or child problem behaviors without also addressing the additional stressors associated with feelings of depression may reduce the effectiveness of treatment efforts.

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