

DISADVANTAGED NEIGHBORHOOD INFLUENCES ON DEPRESSION AND ANXIETY IN YOUTH WITH PERINATALLY ACQUIRED HUMAN IMMUNODEFICIENCY VIRUS: HOW LIFE STRESSORS MATTER

Ezer Kang

Wheaton College, Department of Psychology

Claude A. Mellins, Curtis Dolezal, and
Katherine S. Elkington

Columbia University, New York State Psychiatric Institute

Elaine J. Abrams

Columbia University, Mailman School of Public Health

Children living with perinatal HIV illness (PHIV+) disproportionately reside in disadvantaged neighborhoods and contend with persistent mental health challenges. This study examined the influences of disadvantaged residential neighborhood on anxiety and depression, and potential resources that buffer against internalizing problems when youths were exposed to neighborhood stressors. Multilevel analysis of 196 PHIV+ and 129 perinatally HIV-exposed but uninfected youth (PHIV-) in New York City found that higher exposure to neighborhood disorder was associated with higher levels of depression and anxiety for PHIV+ and PHIV- youths. Stressful events unrelated to residential neighborhoods significantly mediated the relationship between neighborhood disorder and anxiety and depression. Social problem solving and

This work was supported by three grants from the National Institute of Mental Health: R01-MH069133 (PI: Claude Mellins, PhD), P30 MH43520 (Center PI: A.A. Ehrhardt, PhD), and T32 MH19139 Behavioral Sciences Research in HIV Infection (PI: A.A. Ehrhardt, PhD).

Correspondence to: Ezer Kang, Wheaton College, Department of Psychology, 501 College Avenue, Wheaton, Illinois 60187. E-mail: ezer.kang@wheaton.edu

JOURNAL OF COMMUNITY PSYCHOLOGY, Vol. 39, No. 8, 956–971 (2011)

Published online in Wiley Online Library (wileyonlinelibrary.com/journal/jcop).

© 2011 Wiley Periodicals, Inc. DOI: 10.1002/jcop.20483

religiosity did not moderate the relationship between neighborhood disorder and internalizing problems. Our findings highlighted that interventions that attenuate the negative effects of stressful life events were equally critical in addressing the broader impact of disadvantaged neighborhoods on the mental health of youth affected by HIV. © 2011 Wiley Periodicals, Inc.

INTRODUCTION

Emerging studies have highlighted the prevalence of mental health disorders among youth living with perinatal HIV illness (PHIV+) in the United States (Gadow et al., 2010; Kang et al., 2010; Mellins, Brackis-Cott, Dolezal, & Abrams, 2006; Mellins et al., 2003). In a recent study that compared the prevalence of psychiatric disorders between perinatally HIV-infected and perinatally HIV-exposed but uninfected youth (PHIV-) aged 9 to 16 years old living in New York City (NYC), 61% of PHIV+ youths met diagnostic criteria for a psychiatric disorder, compared with 49% among the PHIV- youths (Mellins, Brackis-Cott, et al., 2009). Several family and individual child factors have been associated with mental health disorders including the caregiver's positive HIV serostatus and poor mental health functioning (Mellins, Elkington, et al., 2009), child awareness of his or her own HIV status (Gadow, et al.; Santamaria et al., 2011), and stressful life events (Gaughan et al., 2004). Given that HIV disproportionately affects African American children living in high-poverty neighborhoods in the United States (Center for Disease Control [CDC], 2009), the ecological and socioeconomic dimensions of urban poverty and how they potentially work together with family-related and child-related influences on mental health disorders warrant careful examination, particularly as it informs prevention and treatment for adolescents with perinatal HIV (Kang, Mellins, Ng, Robinson, & Abrams, 2008; Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001).

Substantial research has implicated the direct and indirect influences of disadvantaged neighborhoods on children's reported behavioral problems (Kohen, Brooks-Gunn, Leventhal, & Hertzman, 2002) even after controlling for family-level (Brooks-Gunn, Duncun, Klebanov, & Sealant, 1993; Caspi, Taylor, Moffit, & Plomin, 2000; Caughy, Hayslett-McCall, & O'Campo, 2007; Leventhal & Brooks-Gunn, 2000; Vaden-Kiernan et al., 2010) and genetic (Caspi, et al.) factors. In a randomized controlled study of families who participated in a national housing relocation program in NYC, families that moved from a high-poverty to a low-poverty neighborhood reported significantly less distress than families who remained in high-poverty neighborhoods, and boys in families that relocated reported significantly fewer anxiety and depressive symptoms than boys who remained in public housing (Leventhal & Brooks-Gunn, 2003b). Several theories posited that increasing geographic concentration of poverty coupled with the migration of middle class families out of the inner city collectively impeded the establishment of meaningful social relations and support within neighborhoods (Moore, Daniel, Gauvin, & Dubé, 2009; Wilson, 1987) and the availability of community resources (e.g., schools, parks, informal employment networks) that fostered positive behavioral outcomes (Brooks-Gunn, et al.; Keels, 2008). Wandersman and Nation (1998) further argue that relatively chronic environmental stressors such as noise, crowding, and pollution exhausted the children's coping resources over time and consequently resulted in poorer behavioral

outcomes. Moreover, exposure to community violence, endemic in many high-poverty neighborhoods, has been associated with increased internalizing and externalizing problems (Foster & Brooks-Gunn, 2009; Kliewer et al., 2004; Kliewer, Murrelle, Mejia, de Torres, & Angold, 2001). Lambert, Nylund-Gibson, Copeland-Linder, and Ialongo (2010) study of urban African American early adolescents found significant differences in impulsive behavior and depressive symptoms between children exposed to repeated experiences of community violence at 6 to 8 years follow-up. These findings are particularly relevant for PHIV+ youths who mostly reside in poor neighborhoods. For example, a cohort of 77 PHIV+ youths served at a pediatric HIV clinic in NYC lived in neighborhoods where the median household income was \$24,903 based on the 2000 census (compared with the national mean of \$41,994), and the mean percentage of residents living below the 1999 poverty rate was 34% (compared with the national mean of 12%; Kang et al., 2010).

In addition to chronic exposure to neighborhood disadvantage, families living in persistent poverty contend with personal and immediate daily stressors that include residential transience and exposure to traumatic and discriminatory events (Amone-P'olak, Ormel, Huisman, Verhulst, & Burger, 2009; Felner et al., 1995; Tracy, Zimmerman, Galea, McCauley, & Stoep, 2008; Wadsworth et al., 2008). Najman et al.'s (2010) prospective longitudinal study, for example, found that cumulative and recurrent experiences of poverty in childhood were associated with higher levels of depression and anxiety in adolescence and young adulthood. Many youths with perinatal HIV in the United States further contend with multigenerational psychiatric and substance abuse disorders and multiple family losses. Coupled with the demands of managing the stigma of living with HIV, these daily stressors function as proximal factors through which poverty influences mental health outcomes (Santiago, Wadsworth, & Stump, 2011). Different types of stressors have varying effects on psychopathology. Environmental stressors, which are independent of an individual's behavior, for example, are distinguished from person-related stressors, which are largely determined by circumstances within an individual's control. When exposed to chronic neighborhood-level stressors (e.g., poverty, high rates of drug-related crimes), youth were more susceptible to adverse mental health outcomes related to person-related stressors (e.g., family illness or death; Attar, Guerra, & Tolan, 1994).

Substantial studies on resilience have identified protective factors that explain why some youths living in impoverished urban neighborhoods adapt successfully despite chronic exposure to adverse conditions (Luthar & Cicchetti, 2000). Religiosity and social problem solving, for example, have been associated with fewer externalizing behaviors and fewer risk behaviors among urban youth (Grant et al., 2000; Pearce, Jones, Schwab-Stone, & Ruchkin, 2003; Regnerus, 2003). The internalization of religious beliefs and practices have been suggested to regulate and promote prosocial behavior (Ellison & Levin, 1998). Religion may also establish social networks that foster and reinforce prosocial norms and values (Johnson, Joon Jang, De Li, & Larson, 2000; Krause, Ellison, Shaw, Marcum, & Boardman, 2001), particularly among African Americans who make up 68% of children and adolescents living with AIDS in the United States in 2007 (CDC, 2009). Adolescent problem-solving skills that entail future time orientation, consequential thinking, and planning may also mitigate maladaptive behavior by influencing their decisions in social situations (Green, 2006; Traube et al., 2007). Despite studies showing delays in requisite neurocognitive skills for social problem solving (D'Zurilla & Nezu, 1990), including executive functioning (Kang et al., 2010) and language (Brackis-Cott, Kang, Dolezal, Abrams, & Mellins, 2009), it remains uncertain whether problem-solving skills per se buffer against the adverse influences of disadvantaged environments.

Despite consistent findings of behavioral problems among older children with perinatal HIV and recognition of an environment's potential role, no studies to date have examined the influence of neighborhood stress on mental health in children living with perinatal HIV infection and the potential protective factors. Addressing psychiatric illness among PHIV+ youths has gained notable public health attention especially as more transition to adolescence and young adulthood and will likely contend with decisions regarding sexual behavior and self-care (Mellins, Brackis-Cott, et al., 2009). Previous studies on environmental influences on child developmental outcomes have mostly relied on U.S. census tract data as structural indicators, which inadequately measures how children are directly affected by more proximal neighborhood factors. Moreover, relatively fewer studies have examined neighborhood correlates of internalizing behavioral problems (i.e., depression and anxiety) compared with externalizing problems (i.e., defiant, aggressive, antisocial behavior; Leventhal & Brooks-Gunn, 2000; Xue, Leventhal, Brooks-Gunn, & Earls, 2005). Based on Wandersman and Nations' (1998) conceptualization of the impact of urban neighborhood conditions on adolescent mental health, this article examined the relationship between exposure to neighborhood disorder and depression and anxiety, and whether this relationship was explained in part by the life stressors encountered daily among PHIV+ and PHIV- youths. Also considered were whether youths' religious beliefs and practices and their repertoire of social problem-solving skills buffered the effects of neighborhood disorder on depression and anxiety.

Specifically, we hypothesized first that increased exposure to neighborhood disorder and stressful life events would be uniquely associated with increased depression and anxiety, whereas high levels of religiosity and social problem solving would be uniquely associated with decreased depression and anxiety. Second, the occurrences of stressful life events would *mediate* the relationship between exposures to neighborhood disorder and violence and levels of depression and anxiety for both PHIV+ and PHIV- youths, while controlling for age and gender. Based on Baron and Kenny's (1986) mediational criteria, (a) exposure to neighborhood disorder (City Stress Index [CSI]) would be positively associated with higher levels of trait depression (Child Depression Inventory [CDI]) and anxiety (State-Trait Anxiety Inventory [STAI]), (b) CSI would be positively associated with occurrence of stressful life events (Life Events Checklist [LEC]), and (c) more frequent exposure to stressful life events would be positively associated with higher levels of trait depression and anxiety. While controlling for stressful life events, the percent reduction of the regression coefficient for neighborhood disorder was used as an indication of any mediation effect. Third, religiosity and social problem solving would *moderate* the relationship between exposure to neighborhood disorder and levels of trait depression and anxiety for both PHIV+ and PHIV- youths, while controlling for age and gender. Stated differently, when exposed to conditions of disadvantaged neighborhoods, youth with greater religiosity and repertoire of social problem-solving skills would independently report less symptoms of depression and anxiety.

METHODS

Participants and Procedures

Data for this article were based on a baseline interview of the Child and Adolescent Self-Awareness and Health Study (CASA; Mellins, Brackis-Cott, et al., 2009).

Participants were recruited from four medical centers in NYC that provided family-based primary and tertiary care to HIV-affected families. Inclusion criteria for study participation were as follows: (a) youth aged 9 to 16 years with perinatal exposure to HIV (as confirmed by medical providers), (b) caregiver and youth's cognitive capacity to complete interview, (c) English or Spanish speaking, and (d) caregiver with legal capacity to sign consent for child participation. Among 443 eligible participants across study sites, 11% refused being contacted by the research team and the site study coordinators were unsuccessful at contacting 6%. A total of 367 (83%) caregiver/ youth dyads were approached and 93% were enrolled. Data were not collected on patients who refused to participate because of confidentiality regulations. The final baseline sample included 325 caregiver/youth dyads: 196 PHIV+ and 129 PHIV- youths. Written informed consent and assent forms approved by the institutional review board from all sites were reviewed and signed by caregivers and youths, respectively, before each interview. Monetary reimbursement for time and transportation was provided upon completion of the interview.

Measures

Primary child mental health outcomes. Children completed the CDI (Kovacs, 1981) and the trait scale of the State Trait Anxiety Inventory-Child version (STAI-C; Spielberger, 1973). The CDI was a 27-item measure that assessed the intensity of depression symptoms in children (Kovacs, 1981). For each item, the child selected one of three sentences that best described his or her feelings over the past 2 weeks. A total score was calculated, ranging from 0 to 54. The trait scale of the STAI-C was a self-report measure widely used to assess trait anxiety, permitting the identification of subjects who were prone to generalized anxiety. The trait scale comprised 20 items, each rated on 3-point Likert scales reflecting the degree to which youths experienced each symptom. The possible range for this scale was 20 to 60. Adequate reliability and validity was established for both measures (Kovacs, 1981; Spielberger, 1973). Among our sample, Cronbach alphas were .815 for the CDI and .888 for the STAI-C.

Predictors

Neighborhood stress. Perceived neighborhood stress was measured by a 16-item CSI (Ewart & Suchday, 2002), which assessed neighborhood disorder and exposure to violence. Participants rated how often they experienced stressful events that occurred in their residential neighborhood in the past year by selecting responses scored 0 (*never*) to 3 (*often*). The mean score of these 16 items was calculated with higher scores indicating higher neighborhood disorder.

Stressful life events. The Life Events Checklist is a 43-item questionnaire, on which participants indicated whether or not specific life events occurred in the past year and rated whether the event had a "good," "bad," or "neutral" effect on the respondent (Sarason, Johnson, & Siegel, 1978). The content of the Life Events Checklist was developed at a pediatric HIV mental health program (Mellins, Havens, & Kang, 1993), and the events were related to one's family (e.g., increase arguments between parents), self (e.g., major illness), or peers (e.g., having a close friend with a drug problem). Five items related to environmental stressors were excluded (e.g., you saw or heard violent arguments between your neighbors; you heard gunshots on your block). The sum of the impact ratings of all items designated as "bad" by the respondent was calculated,

ranging from 1 to 46, with higher scores reflecting more adverse effect from stressful life events.

Religiosity. A modified version of the Systems of Belief Inventory (SBI-15R; Holland et al., 1998), a 15-item instrument, was used to measure religious and spiritual dimensions of coping with chronic illness. Participants indicated on Likert scales the frequency of participation in religious activities, belief in a higher order and its personal significance, and the extent to which one's beliefs facilitated coping with life stressors. The mean of these six items ranged from 0 to 18, with higher scores reflecting higher religiosity. This modified version of the SBI-15R showed adequate reliability with this sample (Cronbach's $\alpha = .78$).

Social problem solving. A 25-item instrument was adopted from the Social Problem-Solving Inventory (SPSI; D'Zurilla & Nezu, 1990), a scale developed to assess cognitive, affective, or behavioral responses to real-life problem-solving situations. Participants rated statements on a 5-point scale, ranging from 0 (*not at all true of me*) to 4 (*extremely true of me*). Mean scores were calculated such that higher scores reflected greater problem-solving ability.

Demographics. Background information is as follows: child and caregiver age, gender, ethnicity, HIV status, caregiver work, education, relationship to child (e.g., biological vs. adoptive parent, relative), and household composition and income.

Statistical Analysis

Chi-square tests and *t* tests were used to compare PHIV+ and PHIV- youths. Hierarchical multiple regression models were conducted (a) to test for a direct association between neighborhood stress on childhood depression and anxiety, and, if an association was found, (b) to determine whether daily stressful events mediated this association. A 10% or greater reduction in the regression coefficient for neighborhood stress was used as evidence of any mediation effect (Baron & Kenny, 1986). Gender and age were added as covariates in the final models. Additional regression analyses were conducted to test whether social problem solving or religiosity moderated the relationship between neighborhood stress and childhood depression and anxiety. This was tested in the regression models by interaction terms between stress and the potential moderators.

RESULTS

Demographic characteristics of the sample ($n = 325$) are presented in Table 1. PHIV+ and PHIV- youths were comparable for the majority of demographic variables, including child age, gender, and race/ethnicity. Families of PHIV+ youths reported a slightly higher average annual income (\$25,000–30,000), compared with families of PHIV- youths (\$20,000–25,000), and supported an average of four people ($t = -2.73, p = .007$). PHIV- youths were more likely to be living with their biological parent than PHIV+ youths ($\chi^2 = 36.9, p < .001$).

The majority of PHIV+ youths were told their diagnosis (70%) and received antiretroviral therapy (86%). The median HIV ribonucleic acid viral load was 3,120 copies/ml; 35% had undetectable viral loads (≤ 400) and 5% had viral load values $\geq 100,000$ copies/ml.

Table 1. Demographic Characteristics of Perinatally HIV-Infected (PHIV+, N = 196) and Perinatally HIV-Exposed, But Uninfected (PHIV-, N = 129) Youth

	Total	HIV+	HIV-	X ² /t ^a	p
	N (%)	N (%)	N (%)		
<i>Youth characteristics</i>					
Female	162 (50)	98 (50)	64 (50)	0.00	1.000
African American	150 (46)	92 (47)	58 (45)	0.96	.327
Latino	126 (39)	69 (35)	57 (44)		
Age ^b	12.57 (2.25)	12.71 (2.18)	12.35 (2.35)	-1.40	.164
Viral load ^b		14,649 (25,471)	n/a		
HIV status disclosed		138 (70)	n/a		
Antiretroviral medication		169 (86)	n/a		
<i>Caregiver characteristics</i>					
Caregiver female	285 (88)	171 (87)	114 (88)	0.02	.897
HIV+ caregiver	149 (46)	61 (31)	88 (68)	41.64	<.001
Biological parent	158 (49)	68 (35)	90 (70)	36.92	<.001
Caregiver lives with a partner	134 (41)	82 (42)	52 (40)	0.04	.844
Caregiver is employed	86 (27)	59 (30)	27 (21)	2.91	.088
Caregiver education ^b	11.63 (3.19)	11.73 (3.35)	11.48 (2.94)	-0.69	.494
Household income ^{b,c}	5.53 (2.78)	5.86 (2.91)	5.02 (2.48)	-2.73	.007
Household size ^b	4.49 (1.81)	4.41 (1.81)	4.61 (1.83)	0.97	.333

^aChi-square tests for dichotomous variables (with continuity correction for 1 degree of freedom tests) and *t* tests for continuous variables comparing HIV+ and HIV-.

^bMean (standard deviation).

^cIncome assessed using a categorical variable for which a score of 5 = \$20,000 and a score of 6 = \$25-30,000.

In the past year, youth in this sample reported being adversely affected by various personal stressful events, which included death of a family member (28%), poor academic performance (25%), loss of close friend not by death (13%), family-related illness/injury (11%), and arguments between parents (11%). Bivariate correlations indicated that traits of depression and anxiety were significantly associated with increased neighborhood stress, higher frequency of daily stressful events, and fewer social problem-solving skills (Table 2). Depression was also significantly associated with less religious affinities, and anxiety was significantly associated with younger age.

Testing Mediation Model

Separate multiple regression models were constructed to determine whether stressful life events mediated the relationship between neighborhood stress, depression, and anxiety, respectively. As shown in Table 3, higher neighborhood stress was associated with higher levels of anxiety. When daily stressful events was added to the model, there was a 30% reduction in the size of the regression coefficient for neighborhood stress, indicating that daily stressful events partially mediated the association between neighborhood stress and anxiety. This mediation effect was less pronounced after also adjusting for gender and age (12% overall reduction in β for neighborhood stress). The association between neighborhood stress and anxiety remained statistically significant.

Table 4 showed parallel regression analyses for child depression. There was a 38% reduction in the regression coefficient for neighborhood stress when the daily stressful event variable was added to the model, which indicated a partial mediation effect.

Table 2. Correlations and Descriptive Statistics for Model Variables (N = 325)

	1	2	3	4	5	6	7	M (SD)	Range
Child depression ^a	1	.562***	.206***	.247***	-.382***	-.131*	.073	6.47 (5.66)	0-29
Anxiety ^b		1	.267***	.277***	-.503***	.082	-.159**	33.11 (7.73)	20-60
Neighborhood stress			1	.398***	-.168**	.053	.225***	0.66 (0.52)	0-2.94
Daily stressful events ^c				1	-.176**	.111*	.042	2.46 (3.07)	0-25
Social problem solving					1	.030	.092	2.36 (0.43)	1-3.52
Religiosity						1	-.246***	1.76 (0.69)	0-3
Age							1	12.57 (2.25)	9.01-16.99

Note. M = mean; SD = standard deviation.

^aChild Depression Inventory; higher score = more depressive symptoms.

^bState Trait Anxiety Inventory-Child version; higher score = more anxiety symptoms.

^cExclude physical neighborhood related-stressors. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3. Final Multilevel Regression Model for Anxiety on Neighborhood Stress, Individual, and Family Characteristics (N = 325)

	<i>Adj R</i> ²	<i>R</i> ² Δ	<i>R</i> ² Δ <i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Step 1	.068					
Neighborhood stress				4.00	0.81	<.001
Step 2	.100	.035	<.001			
Neighborhood stress				2.79	0.86	.001
Daily stressful events				0.51	0.15	<.001
Step 3	.158	.063	<.001			
Neighborhood stress				3.51	0.86	<.001
Daily stressful events				0.47	0.14	.001
Gender				1.99	0.79	.012
Age				-0.73	0.18	<.001

Note. SE = standard error.

Table 4. Final Multilevel Regression Model for Depression on Neighborhood Stress, Individual, and Family Characteristics (N = 325)

	<i>Adj R</i> ²	<i>R</i> ² Δ	<i>R</i> ² Δ <i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Step 1	.039					
Neighborhood stress				2.26	0.60	<.001
Step 2	.069	.032	.001			
Neighborhood stress				1.40	0.64	.029
Daily stressful events				0.36	0.11	.001
Step 3	.091	.027	.008			
Neighborhood stress				1.21	0.65	.065
Daily stressful events				0.36	0.11	.001
Gender				1.83	0.60	.003
Age				0.13	0.14	.347

Note. SE = standard error.

When gender and age were added to the model, the overall reduction in the size of the correlation coefficient for neighborhood stress was 46%. Furthermore, the association between neighborhood stress and depression was nonsignificant in the final model.

Another covariate that was considered was child's HIV and disclosure status. Because disclosure of HIV serostatus to the child was closely associated with age (older youth were more likely to know their serostatus), both variables were not included in the same regression model to avoid issues of multicollinearity (youths who were disclosed about their serostatus were significantly older than those undisclosed, $t = -9.4$ [2, 194], $p < .001$). Subsequent regressions (not shown; available from authors) using HIV and disclosure status as a covariate instead of child age produced very similar results.

Testing Moderation Model

Additional regression analyses were conducted to test for a moderation effect for social problem solving or religiosity. In these regressions, the main effects were entered first, followed by an interaction term between neighborhood stress and the potential

moderator (either social problem solving or religiosity). In analyses for both depression and anxiety, these interaction terms were not significant. Specifically, the neighborhood stress by social problem solving ($\beta = .095, p = .934$) and religiosity ($\beta = -.147, p = .871$) interactions were not significant for depression. Similarly, city stress by social problem solving ($\beta = .897, p = .541$) and religiosity ($\beta = .554, p = .653$) interactions were also not significant for anxiety, which suggested that social problem solving and religiosity did not moderate the association between neighborhood stress and youth mental health.

DISCUSSION

The prevalence of mental health problems among youths with perinatal HIV who disproportionately reside in disadvantaged neighborhoods necessitates a clearer understanding of the relationship between environmental stress and mental health outcomes. Our preliminary findings suggested that the experiences of stressful life events for both perinatally HIV-exposed groups mediated the relationship between youth's exposure to neighborhood disorder and symptoms of depression and anxiety. In other words, the adverse consequences of environmental stress on depression and anxiety were partially explained by stressful life events encountered by youths affected by HIV.

It was noteworthy that PHIV+ youths exposed to neighborhood stressors were equally susceptible to traits of depression or anxiety as PHIV- youths. This suggested that factors that placed PHIV+ youth at risk for mental health disorders were not narrowly confined to illness-related stressors such as HIV treatment burden or stigma management per se (Orban et al., 2010), but rather extended to chronic and recurrent exposure to poverty, violence, and neighborhood disruptions. Furthermore, our study supported previous findings that high rates of mental health disorders cannot be solely attributed to HIV illness, but rather to broader contextual and familial influences endemic in high-poverty neighborhoods in the United States (Kang et al., 2008; Mellins et al., 2003).

Our results also supported previous findings that the relationships between neighborhood characteristics (e.g., lack of residential connection and access to community resources) and depression were mediated by a number of proximal factors, which included family-related stress (Hammack, Robinson, Crawford, & Li, 2004), collective efficacy among neighborhood residents (Xue et al., 2005), and adverse life events (Bolland, Lian, & Formichella, 2005; Cutrona, Wallace, & Wesner, 2006; Sampson, Morenoff, & Gannon-Rowley, 2002). The realities of daily stressors often fostered a pessimistic appraisal of stressful events and dampened one's sense of personal efficacy (Bolland, et al.). This was noteworthy for youths in our study because they often faced chronic and cumulated life stressors in the context of living in disadvantaged neighborhoods. Ross, Reynolds, and Geis (2000) argued that exposure to disadvantaged neighborhoods challenged one's perception of control over life circumstances and perpetuated a sense of hopelessness and disconnectedness with one's community. As such, living in such neighborhoods often rendered children more vulnerable to experiencing adverse life events, which, in turn, increased their risks for anxiety and depression. Twenty-seven percent of youth in this study, for example, experienced the death of a family member in the past year. Cumulative exposure to such life stressors may have undermined optimism and perpetuated a sense of hopelessness and despair as suggested by our findings. This was consistent with

Cutrona et al.'s (2005) finding that African American women who faced multiple adverse events were more likely to report the onset of depression if they resided in economically disadvantaged neighborhoods than in less disadvantaged ones, while adjusting to family demographic factors.

Stressful life events also mediated the relationship between neighborhood stress and symptoms of anxiety, as supported by previous studies (Roosa et al., 2010). Cross-sectional and longitudinal research have shown that chronic and cumulative exposure to environmental stress, including noise, crowding, and substandard housing, during childhood was linked to dysregulated stress among 13-year-olds as measured by physiological markers—elevated hypothalamic-pituitary-adrenocortical activity (Evans & English, 2002; Evans & Kim, 2007). Children's continual development of social expectations and risk appraisal skills rendered them more susceptible to anxiety when exposed to elevated and chronic life stressors (Kendall et al., 2010). This was noteworthy given the high rates of anxiety disorders for both PHIV+ and PHIV– youths—46% of the entire sample as reported in an earlier study with this cohort (Mellins, Brackis-Cott, et al., 2009).

Also suggested by our findings, neighborhood disorder promoted greater experience of stressful life events, which, in turn, adversely affected mental health outcomes (Santiago et al., 2011). Cumulative exposure to concentrated social and environmental disadvantages such as geographic and racial isolation, residential instability, life-cycle status, and crime (Sampson et al., 2002) may have heightened the occurrences of stressful life circumstances that led to increased rates of depression and anxiety. As such, there was tentative support for prioritizing structural interventions and policies that improved the environmental conditions of low-income neighborhoods and reduced the incidence of community violence and disorder. Such efforts necessitate collaborative work across disciplines of urban planning, sociology, economic development, and public health.

However, “one-size-fits-all” interventions that focus on environmental stressors (e.g., decreasing crime rates) at the expense of more proximal stressors (e.g., coping with family illness), or vice versa, are misguided (Caughy, O'Campo, & Brodsky, 1999). Concerted efforts to develop multilevel interventions that attenuate negative effects of stressful life events, while also attending to larger social structures, are critical in addressing the broader impact of disadvantaged neighborhoods. To the extent that stressful events can be alleviated, such intervention might effectively mitigate the impact of neighborhood stressors most notably on depressive and anxiety symptoms.

Our findings did not support the hypothesis that religiosity and social problem-solving skills protected youth exposed to neighborhood stressors against depression and anxiety. For many youth living in neighborhoods of concentrated poverty, cumulative exposure to crime, high rates of unemployment, and neighborhood decay often overwhelmed any protective scaffolding provided by internal and familial resources. Protective resources may have lost their buffering function against the adverse effects of neighborhood disorder over time (D'Imperio, Dubow, & Ippolito, 2000). Individual resources may themselves be depleted by chronic neighborhood stressors, as suggested by the significant negative relationship between social problem solving and neighborhood stress in this study. It is also arguable that religiosity and social problem solving buffered against selective stressors and adversities. Previous studies on high-risk urban youth, for example, have found that religiosity mediated the influences of neighborhood stressors on illicit drug use (Jang & Johnson, 2001; Regnerus, 2003) and conduct problems (Pearce et al., 2003). Our findings suggested

that religiosity served a less protective function against internalizing problems when youth encountered stressors of disadvantaged neighborhoods, underscoring the importance of identifying protective effects of specific outcomes (Grant et al., 2000).

Our overall findings suggested that multilevel interventions that mitigate the adverse influences of neighborhood disorder on internalizing problems among youth affected by perinatal HIV should first consider means of promoting adaptive coping to person-based stressful life events not uncommon among poor African American and Latino adolescents. Second, legislate policies that improve the physical and social conditions of poor neighborhoods, most notably community violence and physical decay. Recognizing the myriad of factors that potentially influence mental health outcomes among youth living with perinatal HIV in disadvantaged neighborhoods necessitates future studies that: (a) utilize valid measures of residential indices that include structured observations of physical and social order, and ethnographic interviews that capture residential perceptions of community norms, behaviors, and values; (b) clarify potential causal relationships between long-term residence in poor neighborhoods and mental health; and (c) systematically measure perceptions of neighborhood disadvantage, rather than generally include income or socioeconomic status as confounding proxy variables in models that explain predictors of mental health in older children with perinatal HIV.

Study Limitations

Several study limitations were noteworthy. First, similar to numerous studies on neighborhood effects, findings from this cross-sectional study represented children's perceptions of their neighborhood at a single point in time (Leventhal & Brooks-Gunn, 2003a). Neighborhood effects on developmental outcomes are not static and may have lagged or cumulative effects especially for poor African American residents (Sampson, Sharkey, & Raudenbush, 2008), which suggests that "point-in-time" studies such as ours may, in fact, *underestimate* the potential effects of neighborhoods on mental health outcomes (Sharkey, 2008). Moreover the cross-sectional study design did not allow us to determine the temporal sequence of events. It is important to examine long-term mental health outcomes because externalizing and internalizing symptoms may change at different rates across a child's developmental span. Second, the lengths of residence for the families were not obtained and hence the duration of exposure to particular neighborhood stressors were unknown. It is important to consider the degree of exposure to neighborhood stress and the incidences of anxiety and depression (Galea et al., 2007). In addition, the potential effects of more proximal environmental factors such as poor housing conditions or household disrepair on mental health outcomes warrant further exploration.

Notwithstanding these limitations, findings from this study underscored the relevance and importance of systematically examining potential diverse influences of residential neighborhood characteristics on mental health functioning in youth with perinatal HIV of affected by maternal HIV. The cumulative influences of transitioning to adolescence with perinatal HIV and the interaction between the structural and cultural sequela of living in disadvantaged poor neighborhoods present a daunting yet necessary challenge for researchers to begin clarifying *how* these complex host of factors affect mental health—a crucial step towards shaping effective policy and interventions to support adolescent's potentially slippery transition to young adulthood with perinatal HIV.

REFERENCES

- Amone-P'olak, K., Ormel, J., Huisman, M., Verhulst, F.C., A.J., O., & Burger, H. (2009). Life stressors as mediators of the relation between socioeconomic position and mental health problems in early adolescents: The TRAILS study. *Journal of the American Academy of Child Adolescent Psychiatry*, 48(10), 1031–1038.
- Attar, B.K., Guerra, N.G., & Tolan, P.H. (1994). Neighborhood disadvantage, stressful life events, and adjustment in urban elementary-school children. *Journal of Clinical Child Psychology*, 23, 391–400.
- Bolland, J.M., Lian, B.E., & Formichella, C.M. (2005). The origins of hopelessness among inner-city African-American Adolescents. *American Journal of Community Psychology*, 36(3/4), 293–305.
- Brackis-Cott, E., Kang, E., Dolezal, C., Abrams, E.A., & Mellins, C.A. (2009). The impact of perinatal HIV infection on older school-aged children's and adolescents' receptive language and word recognition skills. *AIDS Patient Care and STDs*, 23(6), 415–421.
- Brooks-Gunn, J., Duncan, G.J., Klebanov, P.K., & Sealand, N. (1993). Do neighborhoods influence child and adolescent development? *American Journal of Sociology*, 99(2), 353–395.
- Caspi, A., Taylor, A., Moffit, T.E., & Plomin, R. (2000). Neighborhood deprivation affects children's mental health: Environmental risks identified in a genetic design. *Psychological Science*, 11(4), 338–342.
- Caughy, M.O., Hayslett-McCall, K.L., & O'Campo, P. (2007). No neighborhood is an island: Incorporating distal neighborhood effects into multilevel studies of child developmental competence. *Health and Place*, 13(2007), 788–798.
- Caughy, M.O., O'Campo, P., & Brodsky, A.E. (1999). Neighborhoods, families, and children: Implications for policy and practice. *Journal of Community Psychology*, 27(5), 615–633.
- Center for Disease Control. (2009). *Pediatric HIV/AIDS Surveillance (through 2007)*. Atlanta: Author.
- Cutrona, C.E., Russell, D.W., Brown, P.A., Clark, L.A., Hessling, R.M., & Gardner, K.A. (2005). Neighborhood context, personality, and stressful life events as predictors of depression among African American women. *Journal of Abnormal Psychology*, 114(1), 3–15.
- Cutrona, C.E., Wallace, G., & Wesner, K.A. (2006). Neighborhood characteristics and depression: An examination of stress processes. *Current Directions in Psychological Science*, 15(4), 188–192.
- D'Imperio, R.L., Dubow, E.F., & Ippolito, M.F. (2000). Resilient and stress-affected adolescents in an urban setting. *Journal of Clinical Child Psychology*, 29(1), 129–142.
- D'Zurilla, T.J., & Nezu, A.M. (1990). Development and preliminary evaluation of the social-problem inventory. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 2(2), 156–163.
- Ellison, C.G., & Levin, J.S. (1998). The religion-health connection: Evidence, theory, and future directions. *Health Education & Behavior*, 25, 700–720.
- Evans, G.W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioeconomic adjustment. *Child Development*, 73(4), 1238–1248.
- Evans, G.W., & Kim, P. (2007). Childhood poverty and health: Cumulative risk exposure and stress dysregulation. *Psychological Science*, 18(11), 953–957.
- Ewart, C.K., & Suchday, S. (2002). Discovering how urban poverty and violence affect health: Development and validation of a neighborhood stress index. *Health Psychology*, 21(3), 254–262.
- Felner, R.D., Brand, S., DuBois, D.L., Adan, A.M., Mulhall, P.F., & Evans, E.G. (1995). Socioeconomic disadvantage, proximal environmental experiences, and socioeconomic and

- academic adjustment in early adolescence: Investigation of a mediated effects model. *Child Development*, 66, 774–792.
- Foster, H., & Brooks-Gunn, J. (2009). Toward a stress process model of children's exposure to physical family and community violence. *Clinical Child Psychology and Psychiatry*, 12, 71–94.
- Gadow, K.D., Chernoff, M., Williams, P.L., Brouwers, P., Morse, E., Heston, J., ... Nachman, S. (2010). Co-occurring psychiatric symptoms in children perinatally infected with HIV and peer comparison sample. *Journal of Developmental & Behavioral Pediatrics*, 31, 116–128.
- Galea, S., Ahern, J., Nandi, A., Tracy, M., Beard, J.R., & Vlahov, D. (2007). Urban neighborhood poverty and the incidence of depression in a population-based cohort study. *Annals of Epidemiology*, 17, 171–179.
- Gaughan, D.M., Hughes, M.D., Olesje, J.M., Malee, K., Gore, C.A., & Nachman, S. (2004). Psychiatric hospitalizations among children and youths with human immunodeficiency virus infection. *Pediatrics*, 113, 544–551.
- Grant, K.E., O'koon, J.H., Davis, T.H., Roache, N.A., Poindexter, L.M., Armstrong, M.L., ... Westholm, R.I. (2000). Protective factors affecting low-income urban African American youth exposed to stress. *The Journal of Early Adolescence*, 20, 388–417.
- Green, M.T. (2006). Promoting resilience in children and youth: Preventive interventions and their interface with neuroscience. *Annals of the New York Academy of Science*, 1094, 139–150.
- Hammack, P.L., Robinson, W.L., Crawford, I., & Li, S.T. (2004). Poverty and depressed mood among urban African-American adolescents: A family stress perspective. *Journal of Child and Family Studies*, 13(3), 309–323.
- Holland, J.C., Kash, K.M., Passik, S., Groner, M.K., Sison, A., Lederberg, M., ... Fox, B. (1998). A brief spirituality beliefs inventory for use in quality of life research in life-threatening illness. *Psycho-Oncology*, 7, 460–467.
- Jang, S.J., & Johnson, B.R. (2001). Neighborhood disorder, individual religiosity, and adolescent use of illicit drugs: A test of multilevel hypotheses. *Criminology*, 39(1), 109–144.
- Johnson, B.R., Joon Jang, S., De Li, S., & Larson, D.B. (2000). The “invisible institution” and Black youth crime: The church as an agency of social control. *Journal of Youth and Adolescence*, 29, 479–498.
- Kang, E., Humphrey, N., Rapkin, B., Licht, C., Mellins, C.A., Robinson, L.G., ... Abrams, E.J. (2010). Residential poverty, AIDS diagnoses, and psychiatric illness: Potential influences on neurocognitive functioning in older children with perinatally acquired HIV in Harlem. Paper presented at the XVIII International AIDS Conference, Vienna, Austria.
- Kang, E., Mellins, C.A., Ng, W.Y.K., Robinson, L.G., & Abrams, E.A. (2008). Standing between two worlds in Harlem: A developmental psychopathology perspective of perinatally acquired human immunodeficiency virus and adolescence. *Journal of Applied Developmental Psychology*, 29(2008), 227–237.
- Keels, M. (2008). Neighborhood effects examined through the lens of residential mobility programs. *American Journal of Community Psychology*, 42, 235–250.
- Kendall, P.C., Compton, S.N., Walker, J.T., Birmaher, B., Albano, A.M., Sherrill, J., ... Piacentini, J. (2010). Clinical characteristics of anxiety disordered youth. *Journal of Anxiety Disorders*, 24(2010), 360–365.
- Kliewer, W., Cunningham, J.N., Diehl, R., Parrish, K.A., Walker, J.M., & Atiyeh, C. (2004). Violence exposure and adjustment in inner-city youth: Child and caregiver emotion regulation skill, caregiver-child relationship quality, and neighborhood cohesion as protective factors. *Journal of Clinical Child and Adolescent Psychology*, 33, 477–487.
- Kliewer, W., Murrelle, L., Mejia, R., de Torres, G.Y., & Angold, A. (2001). Exposure to violence against a family member and internalizing symptoms in Colombian adolescents: The

- protective effects of family support. *Journal of Consulting and Clinical Psychology*, 69, 971–982.
- Kohen, D.E., Brooks-Gunn, J., Leventhal, T., & Hertzman, C. (2002). Neighborhood income and physical and social disorder in Canada: Associations with young children's competencies. *Child Development*, 73(6), 1844–1860.
- Kovacs, M. (1981). Rating Scale to assess depression in school-age children. *Acta Paedopsychiatrica*, 46, 305–315.
- Kraemer, H.C., Stice, E., Kazdin, A., Offord, D., & Kupfer, D. (2001). How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. *American Journal of Psychiatry*, 158(6), 848–856.
- Krause, N., Ellison, C.G., Shaw, B.A., Marcum, J.P., & Boardman, J.D. (2001). Church-based social support and religious coping. *Journal for the Scientific Study of Religion*, 40, 637–656.
- Lambert, S.F., Nylund-Gibson, K., Copeland-Linder, N., & Ialongo, N.S. (2010). Patterns of community violence exposure during adolescence. *American Journal of Community Psychology*, 46, 289–302.
- Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*, 126(2), 309–337.
- Leventhal, T., & Brooks-Gunn, J. (2003a). Children and youth in neighborhood contexts. *Current Directions in Psychological Science*, 12(1), 27–31.
- Leventhal, T., & Brooks-Gunn, J. (2003b). Moving to opportunity: An experimental study of neighborhood effects on mental health. *American Journal of Public Health*, 93, 1576–1582.
- Luthar, S.S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology*, 12(2000), 857–885.
- Mellins, C.A., Brackis-Cott, E., Dolezal, C., & Abrams, E.A. (2006). Psychiatric disorders in youth with perinatally acquired human immunodeficiency virus infection. *Pediatric Infectious Disease*, 25, 432–437.
- Mellins, C.A., Brackis-Cott, E., Leu, C.S., Elkington, K.S., Dolezal, C., Wiznia, A., ... Abrams, E.J. (2009). Rates and type of psychiatric disorders in perinatally human immunodeficiency virus-infected youth and seroreverters. *Journal of Child Psychology and Psychiatry*, 50(9), 1131–1138.
- Mellins, C.A., Elkington, K.S., Bauermeister, J.A., Brackis-Cott, E., Dolezal, C., McKay, M.M., ... Abrams, E.J. (2009). Sexual and drug use behavior in perinatally HIV-infected youth: Mental health and family influences. *Journal of the American Academy of Child Adolescent Psychiatry*, 48(8), 810–819.
- Mellins, C.A., Havens, J.F., & Kang, E. (1993). A child psychiatry service for children and families affected by the HIV epidemic. Poster session presented at the IX International AIDS Conference, Berlin. Abstract PO-B35-2343.
- Mellins, C.A., Smith, R., O'Driscoll, P., Magder, L.S., Brouwers, P., Chase, C., ... Matzen, E. (2003). High rates of behavioral problems in perinatally HIV-infected children are not linked to HIV disease. *Pediatrics*, 111, 384–393.
- Moore, S., Daniel, M., Gauvin, L., & Dubé, L. (2009). Not all social capital is good capital. *Health and Place*, 15(4), 1071–1077.
- Najman, J.M., Hayatbakhsh, M.R., Clavarino, A., Bor, W., O'Callaghan, M.J., & Williams, G.M. (2010). Family poverty over the early life course and recurrent adolescent and young adult anxiety and depression: A longitudinal study. *Journal of Public Health*, 100, 1719–1723.
- Orban, L.A., Stein, R., Koenig, L.J., Conner, L.C., Rexhouse, E.L., Lewis, J.V., & LaGrange, R. (2010). Coping strategies of adolescents living with HIV: Disease-specific stressors and responses. *AIDS Care*, 22(4), 420–430.

- Pearce, M.J., Jones, S.M., Schwab-Stone, M.E., & Ruchkin, V. (2003). The protective effects of religiousness and parent involvement on the development of conduct problems among youth exposed to violence. *Child Development*, 74(6), 1682–1696.
- Regnerus, M.D. (2003). Religion and positive adolescent outcomes: A review of research and theory. *Review of Religious Research*, 44(4), 394–413.
- Roosa, M.W., Burrell, G.L., Nair, R.L., Coxe, S., Tein, J.Y., & Knight, G.P. (2010). Neighborhood disadvantage, stressful life events, and adjustment among Mexican American early adolescents. *The Journal of Early Adolescence*, 30(4), 567–592.
- Ross, C.E., Reynolds, J.R., & Geis, K.L. (2000). The contingent meaning of neighborhood stability for resident's psychological well-being. *American Sociological Review*, 65, 581–597.
- Sampson, R.J., Morenoff, J.D., & Gannon-Rowley, T. (2002). Assessing “neighborhood effects”: Social processes and new directions in research. *Annual Review of Sociology*, 28, 443–478.
- Sampson, R.L., Sharkey, P., & Raudenbush, S.W. (2008). Durable effects of concentrated disadvantage on verbal ability among African-American children. *Proceedings of the National Academy of Science of the USA*, 105(2008), 845–852.
- Santamaria, E.K., Dolezal, C., Marhefka, S., Hoffman, S., Ahmed, Y., Elkington, K.S., & Mellins, C.A. (2011). Psychosocial implications of HIV serostatus disclosure to youth with perinatally-acquired HIV. *AIDS Patient Care and STDs*, 25(4), 257–264.
- Santiago, C.D., Wadsworth, M.E., & Stump, J. (2011). Socioeconomic status, neighborhood disadvantage, and poverty-related stress: Prospective effects on psychological syndromes among diverse low-income families. *Journal of Economic Psychology*, 32(2), 218–230.
- Sarason, I.G., Johnson, J.H., & Siegel, J.M. (1978). Assessing the impact of life changes: Development of the life experiences survey. *Journal of Consulting and Clinical Psychology*, 46(5), 932–946.
- Sharkey, P. (2008). The intergenerational transmission of context. *American Journal of Sociology*, 113(4), 931–969.
- Tracy, M., Zimmerman, F.J., Galea, S., McCauley, E., & Stoep, A.V. (2008). What explains the relation between family poverty and childhood depressive symptoms. *Journal of Psychiatric Research*, 42(2008), 1163–1175.
- Traube, D.E., Taber Chasse, K., McKay, M.M., Bhorade, A.M., Paikoff, R., & Young, S. (2007). Urban African American pre-adolescent social problem solving skills: Family influences and association with exposure to situations of sexual possibility. *Social Work in Mental Health*, 5(1–2), 101–119.
- Vaden-Kiernan, M., D'Elio, A., O'Brien, R.W., Tarullo, L.B., Zill, N., & Hubbell-McKey, R. (2010). Neighborhoods as a developmental context: A multilevel analysis of neighborhood effects on head start families and children. *American Journal of Community Psychology*, 45, 49–67.
- Wadsworth, M.E., Raviv, T., Reinhard, C., Wolff, B., Santiago, C.D., & Einhorn, L. (2008). An indirect effects model of the association between poverty and child functioning: The role of children's poverty-related stress. *Journal of Loss and Trauma*, 13, 156–185.
- Wandersman, A., & Nation, M. (1998). Urban neighborhoods and mental health: Psychological contributions to understanding toxicity, resilience, and interventions. *American Psychologist*, 53(6), 647–656.
- Wilson, W.J. (1987). *The truly disadvantaged: The innercity, the underclass, and public policy*. Chicago: University of Chicago Press.
- Xue, Y., Leventhal, T., Brooks-Gunn, J., & Earls, F.J. (2005). Neighborhood residence and mental health problems of 5- to 11-year olds. *Archives of General Psychiatry*, 62, 554–563.