The Influence of Community Violence and Protective Factors on Asthma Morbidity and Healthcare Utilization in High-Risk Children

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ABSTRACT We examined the longitudinal effects of community risk and protective factors on asthma morbidity and healthcare utilization. Three hundred urban caregivers of children with poorly controlled asthma were enrolled in a randomized controlled trial testing the effectiveness of a behavioral/educational intervention and completed measures of exposure to community violence (ECV), social cohesion (SC), informal social control (ISC), child asthma control, child asthma symptom days/nights, and healthcare utilization. Latent growth curve modeling examined the direct and interaction effects of ECV, SC, and ISC on the asthma outcomes over 12 months. Caregivers were primarily the biological mother (92 %), single (70 %), and poor (50 % earned less than \$10,000). Children were African American (96 %) and young (mean age=5.5 years, SD=2.2). ECV at baseline was high, with 24.7 % of caregivers reporting more than two exposures to violence in the previous 6 months ($M=1.45$, $SD=1.61$). Caregiver ECV-predicted asthma-related healthcare utilization at baseline ($b=0.19$, $SE=0.07$, $p=0.003$) and 2 months ($b=0.12$, $s.e.=0.05$, $p=0.04$). ISC and SC moderated the effect of ECV on healthcare utilization. Our findings suggest that multifaceted interventions that include strategies to curb violence and foster feelings of cohesion among low-income urban residents may be needed to reduce asthma-related emergency services.

KEYWORDS Asthma morbidity, Community violence, Healthcare utilization, Urban caregivers

INTRODUCTION

Asthma is a chronic inflammatory lung disease that disproportionately impacts inner-city minority children.¹⁻⁴ African American children with asthma are more likely to report functional disability,^{5,6} have two to three times higher outpatient and emergency department (ED) visits,⁷ are >3 times as likely to be hospitalized and >4 times as likely to die from asthma compared with white youths⁸ and present at the ED with more severe symptoms.⁹ Research consistently suggests a complex interplay between individual (e.g., genetic predisposition), family (e.g., parental smoking, socioeconomic status, and maternal stress), and environmental risk factors (e.g., allergen exposure), which undermine asthma management and exacerbate vulnerability to poor outcomes.¹⁰⁻¹⁶ Community violence, which may range from

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perceived threats to direct victimization, is one stressor that has an especially robust connection to asthma morbidity, as it is proposed to precipitate asthma exacerbations and result in increased healthcare utilization.^{17,18} In a prospective study, adults with asthma who were exposed to violence had >2 times more asthma-related ED visits and >2 times more hospitalizations compared with adults without community violence exposure.¹⁹ Community violence exposure also contributes to disparities in the course of asthma among children. A cross-sectional study of Brazilian children aged 4–12 years with asthma identified youths who were exposed to high levels of violence to be twice more likely to experience asthma symptoms than their peers with no exposure.²⁰

The role of community violence in contributing to asthma disparities is thus a public health focus, but conceptual models for health disparities are also exploring protective influences at the community level. *Informal social control*, defined as the willingness of neighbors to intervene for common community goals, and *social cohesion*, which reflects high levels of trust and solidarity among neighbors that inhibit community violence,²¹ were associated with higher levels of perceived health in Hispanic adolescents residing in Chicago and in an international sample.²² Collective efficacy, often conceptualized as a combination of these two constructs,^{21,23} was related to fewer symptom nights among children with respiratory problems including asthma²⁴ and was surmised to reduce asthma morbidity by limiting adverse health behaviors and environmental hazards that trigger exacerbations.²⁵

These findings demonstrate that the “social context matters” in asthma morbidity.²⁶ Although understanding contextual factors at the level of families and neighborhood is regarded as fundamental to reducing asthma disparities,²⁷ the longitudinal effects of community risk and protective factors are understudied in pediatric asthma populations. We aimed to address this gap in science by testing the direct and interaction effects of community violence exposure, social cohesion, and informal social control on asthma morbidity and healthcare utilization over time in low-income urban families. The primary hypotheses tested in this study are that community protective factors are statistically significant moderators of the relationship between exposure to community violence and asthma outcomes. Specifically, we believe that increased social cohesion and informal social control will weaken (or buffer) the impact of exposure to community violence.

METHOD

This is a secondary data analysis of all participants from a randomized controlled trial (RCT) testing the effectiveness of a behavioral/educational intervention for high-risk children with asthma.²⁸ The RCT was approved by the Johns Hopkins University Medical Institution and the University of Maryland Medical Institutional Review Boards. Caregivers of 300 inner-city children with asthma aged 3–10 years were recruited from two major urban hospitals after the child was discharged from the Pediatric ED from December 2008 to January 2010.

A Health Insurance Portability and Accountability Act (HIPAA) waiver for contact information was used to inform families of the study by mail. Caregivers who did not decline to participate by returning a letter or calling to opt out were contacted by the study team to screen for study interest and eligibility. Eligibility criteria included child age 3–10 years, physician diagnosed asthma, >2 symptom days or rescue medication use/week or >2 symptom nights/month or persistent

asthma,²⁹ controller medication use during the prior 6 months and two or more ED visits or one hospitalization during the prior 12 months of the index ED visit. Children were excluded if they had other major respiratory conditions, and only one child per family was eligible to enroll in the study.

Of the 1,630 initially identified as potential children with asthma based on electronic patient records, 1,081 had incorrect phone or address information and were unreachable. Study staff screened and enrolled 300 (70 %) of the 549 families who were successfully contacted Fig. 1. Following informed consent, caregivers were randomized into a standard asthma education attention control group or a behavioral/education intervention group and prospectively followed for 12 months. Research assistants administered study questionnaires face-to-

FIG. 1 Recruitment and retention flow diagram.

face to caregivers at baseline, 6 months, and 12 months post-enrollment. Asthma health status and healthcare utilization data were also collected by telephone at 2 months. Caregivers received \$30.00 payment for completion of each survey at baseline, 6 months, and 12 months and \$10.00 for completion of the 2-month survey.

Measures

Community Protective Factors: Social Cohesion and Informal Social Control. Caregivers were administered to two scales of neighborhood characteristics, informal social control and social cohesion.²¹ Informal social control was measured using a five-item Likert scale (1=very likely to 5=very unlikely) asking respondents to indicate the likelihood of intervening in several scenarios (e.g., “A fight broke out in front of our house”). Scale scores ranged from 5 to 25 (mean=12.16, SD=5.58). A low score reflected more informal social control. Social cohesion was similarly measured using a five-item Likert scale (1=strongly agree to 5=strongly disagree; sample item: “People around here are willing to help with their neighbors”), which included two reverse coded items. The mean score for social cohesion was 13.4 (SD=4.64; range 5=25), where a low score is indicative of higher social cohesion. Internal consistency for the scales administered to this sample of caregivers was moderate to high (social cohesion Cronbach’s alpha=0.78; informal social control Cronbach’s alpha=0.88) and consistent with previously published psychometrics for this measure.

Community Risk Factor: Violence Exposure. Violence exposure was operationalized using the safety in community subscale from the crisis in family systems (CRISYS).³⁰ The eight-item subscale measures direct exposure to violence (e.g., “Were you a victim of a crime while you were outside or away from your home?”) and indirect exposure (e.g., “Did you see violence?” “Did you hear violence?”) over the past 6 months. The dichotomized items are summed (0=no; 1=yes), and higher scale scores indicate greater exposure to community violence. The CRISYS had adequate 2-week test–retest reliability in a sample of low-income African American women ($r=0.88$, $p<0.001$)³⁰ and demonstrated acceptable internal consistency in this sample (Cronbach’s alpha for safety in community subscale=0.69).

Asthma Morbidity and Healthcare Utilization. Caregivers reported on the frequency of day and nighttime symptoms over a 2-week period (e.g., *How often over the past 2 weeks has your child had asthma symptoms during the day including cough, wheeze, chest tightness, difficulty taking a deep breath, or shortness of breath?*) based on the NAEPP-EPR guidelines.²⁹ Symptom-free days and nights were calculated by subtracting the number of days and nights of asthma symptoms over 2 weeks from 14 days. Asthma control level was ascertained using an algorithm based on NAEPP-EPR guidelines²⁹ and included caregiver report of the number of symptom days and nights in the past 2 weeks, rescue medication use and activity limitation frequency over the past 30 days, and the number of ED visits and hospitalizations over the past 6 months. Children were categorized as well controlled, not well controlled, or very poorly controlled. A healthcare utilization variable was created by summing number of urgent care visits, ED visits, and hospitalizations for asthma in the prior 6 months for baseline, 6-month, and 12-month data and prior 2 months for the 2-month follow-up.

Data Analysis

Latent growth curve modeling (LGCM) using Mplus version 6³¹ was performed to test the direct and indirect effects of community risk and protective factors on asthma morbidity over time. LGCM is a type of structural equation model (SEM) that estimates how well a model (i.e., hypothesized relationships among variables) actually fits the observed relationships among variables in the data. A benefit of LGCM is that it can include time points that are not equally distributed (e.g., baseline, 2 months, 6 months, and 12 months). LGCM can easily accommodate predictors that are measured at multiple time points (i.e., time-varying covariates). The use of maximum-likelihood estimation with robust standard errors (MLR) minimizes the potential impact of missing data (<9 % in current study).³¹ A power analysis was conducted in advance to determine if the sample size was large enough to statistically test the hypothesized models. Based on standard statistical criteria ($\alpha=0.05$, $\beta=0.80$, moderate effect size) a minimum sample of 217 participants was needed for this study (actual study sample size is 300).^{32,33}

Several common fit indices were used to assess the ability of the hypothetical model to reproduce the same relationships found in the sample data,³⁴ including the Chi-square test of goodness of fit, the relative Chi-square statistic that accounts for sample size, and the Akaike Information Criteria (AIC). Criteria for “good fit” are ratios of 3:1 for the relative Chi-square,³⁵ and lower AIC values indicate improved fit between nested models.³⁴ Population-based indices address the potential replication of results in other randomly selected samples from this population; included in this study were the mean square error of approximation (RMSEA), with values <0.06 preferred,³⁶ and the comparative fit index (CFI) and the Tucker–Lewis index (TLI) with preferred values over 0.90.^{34,36}

Outcome variables included healthcare utilization and symptom-free days and nights, which were measured at all four time points, and asthma control, which was measured at baseline, 6 months, and 12 months. Control variables included treatment group assignment (intervention vs. control), child’s age, caregiver education level, and baseline asthma severity. Time-varying covariates in the model were measured at baseline, 6 months, and 12 months and included community violence exposure, informal social control, and social cohesion. Interaction terms were created between exposure to community violence and both informal social control and social cohesion to test for a moderating effect of the community protective factors on the relationship between violence and the asthma outcomes.

RESULTS

The children ($N=300$) were primarily male (59 %), African American (96 %), Medicaid eligible (92 %), and young (mean age=5.5 years, $SD=2.2$). Caregivers were most often the child’s biological mother (92 %), had achieved a high school degree or more education (70 %), single (70 %), unemployed (54 %), and low income with an annual household income less than \$10,000 (50 %). Baseline asthma morbidity was high in this sample of urban children, with over half of caregivers (59 %) reporting five or more symptom days for their children ($M=7.24$, $SD=5.31$), 45 % endorsing five or more symptom nights ($M=6.61$, $SD=5.61$), and 45 % indicating daily rescue medication use by their child over the last 2 weeks. Baseline number of ED visits was high ($M=3.23$, $SD=3.19$; range, 0–20 visits in

prior 6 months). Nearly a third of children (31.1 %) had more than two urgent care visits for asthma ($M=1.32$, $SD=2.34$; range, 0–16 visits), and 30 % had one or more asthma hospitalizations in the previous 6 month period ($M=0.49$, $SD=1.42$, range, 0–7).

At baseline over a third of the caregivers reported hearing violence outside of the home in the prior 6 months ($n=113$; 37.7 %) and nearly a quarter indicated that they witnessed violence outside of the home ($n=70$, 23.3 %). Thirteen caregivers had been a victim of a crime in the community (4.3 %), five children (1.7 %) were reported to be victims of violence, and 2.3 % of other household members were victims of community violence per caregiver report. On average, caregivers positively endorsed 1.45 ($SD=1.61$) of the items on the safety in community subscale, with nearly a quarter (24.7 %) endorsing more than two violence exposures in the previous 6 months. However, community protective factors were also evident. Nearly two thirds of caregivers indicated that neighbors were likely or very likely to intervene if a fight broke out in front of their home (65.6 %) or if children were spray painting graffiti on a local building (65.2 %), and most agreed that they resided in a close-knit neighborhood (58.5 %) where people were willing to help with their neighbors (62.9 %) (Table 1).

Latent Growth Curve Model Results

A series of three nested LGC models were used to assess changes in asthma control, symptom-free days and nights, and healthcare utilization over time as a function of exposure to community violence, social cohesion, and informal social control. The same model testing procedure was carried out for each outcome. Model one only looked at changes over time in the DV (called an “unconditional” model). Model two added independent variables including control variables (only measured at baseline) and time-varying covariates (measured at multiple time points). Model three builds off of model two by incorporating interactions between exposure to community violence and each the community protective factors at each time point. The same three models were used for each outcome. Fit statistics indicating how well hypothetical relationships in the models compare to the actual relationships among variables in the data are presented in Table 2.

TABLE 1 Descriptive statistics

	Baseline	2 months	6 months	12 months
Healthcare utilization ^a	5.01 (5.36)	0.55 (1.04)	2.57 (3.55)	1.72 (2.58)
Symptom-free days ^a	6.75 (5.30)	11.95 (2.16)	9.75 (4.67)	9.44 (5.00)
Symptom-free nights ^a	7.39(5.60)	12.31(2.28)	10.53(4.54)	10.25(4.94)
Asthma control ^b				
Well	0.0 % (0)		10.5 % (30)	14.3 % (39)
Not well	6.7 % (20)		28.0 % (80)	24.2 % (66)
Poorly	93.3 % (280)	N/A	61.5 % (176)	61.5 % (168)
Violence exposure ^a	1.45 (1.61)	N/A	1.23 (1.61)	1.13 (1.49)
Informal social control ^a	12.16 (5.58)	N/A	12.36 (5.79)	12.12 (5.76)
Social cohesion ^a	13.40 (4.64)	N/A	13.17 (5.05)	12.83 (4.93)

^aMean (SD)

^bPercentage (*n*)

TABLE 2 Model fit statistics

Outcome	Model	χ^2	χ^2/df	RMSEA	CFI	TLI	AIC
Healthcare utilization	Unconditional	56.23***	11.25	0.26	0.00	-0.57	1,763.83
	Covariates	58.77**	1.73	0.07	0.81	0.68	1,574.82
	Interactions	66.25	1.32	0.05	0.89	0.82	1,520.42
Asthma control	Unconditional	159.05***	31.80	1.00	0.00	1.00	2,364.52
	Covariates	120.97***	5.26	0.18	0.68	0.41	1,733.55
	Interactions	134.01***	3.72	0.15	0.68	0.49	1,535.46
Symptom-free days	Unconditional	80.75***	16.15	0.32	0.00	-1.45	3,456.29
	Covariates	130.14***	2.36	0.11	0.72	0.61	3,225.64
	Interactions	137.43***	2.59	0.11	0.72	0.57	2,855.65
Symptom-free nights	Unconditional	192.26***	13.71	0.24	0.00	-0.01	3,383.78
	Covariates	189.84***	3.25	0.14	0.56	0.32	2,421.25
	Interactions	89.84***	2.54	0.11	0.77	0.63	2,395.31

RMSEA root mean square error of approximation, CFI comparative fit index, TLI Tucker–Lewis fit index, AIC akaike information criteria

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

Based on the fit statistics reported in Table 2 in comparison to the statistical criteria previously discussed, the proposed models for predicting change in asthma control and predicting symptom-free days/nights could not be used. The models lack sufficient statistical evidence to conclude that the specified relationships between exposure to community violence, informal social control, and social cohesions are plausible explanations of changes over time in these asthma outcomes. Therefore, analysis of these outcomes was terminated and no further results are reported.

The LGCM analysis of healthcare utilization indicates that the final model including interactions was the best fitting model and demonstrated acceptable overall fit as evidenced by a nonsignificant Chi-square test ($\chi^2_{(50)}=66.25, p>0.05$), RMSEA of 0.05, highest values for CFI (0.89) and TFI (0.82), and smallest AIC of the three models. Results for the final LCGM show a significant positive intercept ($I=1.19, SE=0.39, p=0.001$), indicating that average healthcare utilization over time was greater than zero, and a significant negative slope ($S=-0.46, SE=0.23, p=0.025$) reflecting statistically significant decrease in healthcare utilization over time (Table 2). Parameter estimates for the covariates indicate a trend for higher caregiver education to be associated with increased healthcare utilization at baseline ($b=0.23, SE=0.14, p=0.05$) as well as a decline in service utilization over time ($b=0.05, SE=0.03, p=0.06$). No significant relationships were found between the intercept or slope with treatment group assignment, child age, or asthma severity.

Community violence exposure predicted increased healthcare utilization at baseline ($b=0.19, SE=0.07, p=0.003$) and 2 months ($b=0.12, SE=0.05, p=0.04$); a trend was also observed at 6 months ($b=0.11, SE=0.08, p=0.08$) but not at 12 months ($b=0.02, SE=0.08, p=0.40$). Informal social control and social cohesion did not directly predict healthcare utilization. Instead, the impact of these community protective factors was demonstrated through the effects they had on the relationship between exposure to community violence and healthcare utilization. Statistically significant interactions were detected between informal social control and community violence at baseline ($b=-0.005, SE=0.002, p=0.005$) and 2 months ($b=-0.003, SE=0.002, p=0.049$); the interaction also trended toward significance at

6 months ($b=-0.002$, $SE=0.001$, $p=0.07$) but not at 12 months ($b=-0.001$, $SE=0.001$, $p=0.23$). Similarly, there were statistically significant interactions between social cohesion and community violence at baseline ($b=-0.005$, $SE=0.002$, $p=0.007$) and 2 months ($b=-0.003$, $SE=0.002$, $p=0.049$) but not at 6 months ($b=-0.002$, $SE=0.004$, $p=0.70$) or 12 months ($b=-0.001$, $SE=0.002$, $p=0.33$). The negative coefficients for the interaction terms illustrate a moderating effect in which the relationship between community violence exposure and healthcare utilization weakens with more social cohesion and informal social control (Table 3).

DISCUSSION

Although an association between violence exposure and asthma outcomes is well established, this investigation, to our knowledge, is the first to explore the longitudinal effects of violence in a large sample of low-income urban caregivers of high-risk children with asthma. Latent growth curve modeling identified a deleterious impact of violence; higher caregiver exposure predicted increased healthcare utilization for asthma proximal to the experience (e.g., baseline) and more distally (e.g., 2 months). Study results are consistent with earlier prospective research that found exposure to community violence to be associated with elevated healthcare utilization in young adults with asthma²¹ and expand on the work of Koinis-Mitchell and colleagues^{37,38} who were among the first to propose and test a model of risk factors (neighborhood disadvantage) and protective processes (child adaptability and perceived control) for inner-city asthma outcomes. They found higher levels of child adaptability at baseline to be associated with more optimal asthma management at a 2-year follow-up in their small ($n=31$) sample of caregivers and children aged 8–11 years. However, neighborhood disadvantage did not predict asthma management.

The divergent results perhaps suggest that it is the specific exposure to community violence, and not the broader social construct of neighborhood disadvantage, which contributes to asthma health disparities. Our study does not answer the question of how violence affects healthcare utilization, but it is proposed to disrupt caregiver coping strategies and erode decision-making competencies.²⁰ Research in trauma-exposed populations shows that low-income urban caregivers often lack adequate resources to cope with traumatic experiences, leaving them vulnerable to depressive symptoms³⁹ and difficulties in fulfilling caregiving activities such as attending to their child's needs.⁴⁰ Caregivers who experience chronic exposure to traumatic events are at even greater risk for decreased parental effectiveness.⁴¹ When a caregiver's attention is focused on daily survival, the capacity monitor and appropriately manage their child's symptoms and follow through with preventive care visits is reduced. Instead, caregivers may wait to access healthcare services until they perceive their child as needing urgent care. Another possible explanation for the observed relationship between community violence and healthcare utilization may be the caregiver's increased need for attention and support from healthcare providers following trauma exposure.

This study presents a complex picture of risk and resilience among urban caregivers insofar as participants reported high violence exposure and but also endorsed protective influences in the community. Our findings support prior calls to implement public health programs that address community stressors like crime,^{17,28,42} but interventions solely focusing on violence reduction may not necessarily be sufficient to decrease the use of emergency services. As social cohesion

TABLE 3 Latent growth curve model of changes in healthcare utilization over 12 months

Covariates	Intercept	Slope	0 months	2 months	6 months	12 months
Model	1.19 (−0.44, 1.94)	−0.46 (−0.92, −0.01)				
Trx group	−0.07 (−4.64, 4.50)	0.005 (−0.02, 0.03)				
Child age	0.08 (−.30, 0.46)	−0.03 (−0.14, 0.08)				
Education	0.23 (−0.04, 0.50)	−0.05 (−0.11, 0.01)				
Asthma sev	−0.33 (−1.57, 0.91)	0.07 (−0.19, 0.33)				
ECV			0.19 (0.05, 0.33)	0.12 (0.03, 0.21)	0.11 (−0.04, 0.26)	0.02 (−0.14, 0.18)
ISC			0.08 (−0.15, 0.31)	0.05 (−0.30, 0.40)	0.04 (−2.57, 2.65)	0.01 (−0.04, 0.06)
ISC interaction			−0.005 (−0.002, −0.08)	−0.003 (−0.001, 0.009)	−0.002 (−0.003, −0.001)	−0.001 (−0.001, 0.001)
SC			0.03 (−0.21, 0.27)	0.02 (−0.14, 0.18)	0.03 (−0.02, 0.08)	0.01 (−0.07, 0.09)
SC interaction			−0.005 (−0.001, −0.10)	−0.003 (−0.001, −0.009)	−0.002 (−0.003, 0.001)	−0.001 (−0.001, −0.001)
Services at 0 months				0.47 (0.12, 0.82)		
Services at 2 months					0.30 (0.11, 0.49)	
Services at 6 months						0.53 (0.01, 1.08)

Unstandardized coefficients, with 95 % confidence intervals provided in parentheses

TX treatment group, *Asthma sev* baseline asthma severity, *ECV* exposure to community violence, *ISC* informal social control, *SC* social cohesion, *Interactions SC×ECV* and *ISC×ECV*

and informal social control moderated the effect of violence on healthcare utilization, it may be useful to also include programs that enhance community protective factors in a comprehensive approach to reducing healthcare utilization. Informal social control may work by protecting the community from violent crime while social cohesion may be a means to provide information and support to the caregiver.²¹ In the context of childhood asthma, support from neighbors perhaps influences a caregiver's adherence to care regimens by bolstering self-efficacy.²⁵ This relationship was partially supported in a sample of 253 parent caregivers of children with asthma where perceived social support had an indirect effect on asthma management abilities by reducing the experience of caregiver burden.⁴³ It is interesting that the relationships between community risk and protective factors and healthcare utilization were not supported at 12 months. This may be due to the significant decrease in healthcare utilization over time, which greatly reduced variability in the sample at 12 months. It is possible that there are relationships among violence exposure, social cohesion, informal social control, and healthcare utilization, but the associations were too small to be detectable given the current sample size.

In addition, we did not observe an effect of the community factors on the child's asthma symptoms or asthma control. The lack of support for these models perhaps reflects a methodological limitation—the data primarily pertained to the caregiver's experiences with violence. A single item on the safety in community scale prompted the caregiver for information on whether her child had been a victim of community-based violence, but the low number endorsing that experience (1.4 % of children) precluded statistical testing for an effect on asthma outcomes. It is possible that children who are directly or indirectly exposed to violence are more likely to experience asthma symptoms, as the stress associated with those experiences may induce exacerbations through neuroimmunological pathways.⁴⁴ Another possible explanation for this lack of relationship may instead be that caregivers have been shown to underestimate severity and underreport asthma symptoms.^{45,46}

In light of the lack of support for the asthma control and asthma symptoms models, future research would benefit from gathering neighborhood violence exposure data from more than one source (e.g., child and caregiver exposure), adding objective measures of community violence (e.g., census data and police records) and stress (e.g., cytokines), differentiating between indirect violence (e.g., observing violence without actual victimization) and direct violence, and including family level stressors in the model (e.g., caregiver depression, smoking, and intimate partner violence). Other limitations relate to the sample size, which precluded adding multiple indicators of neighborhood disadvantage. The *a priori* power analysis suggested sufficient sample size for the planned analyses based on anticipated results for moderate effect sizes. However, the effect sizes observed in this study are very small, especially for the interaction effects, and it may be that there was an insufficient power to detect some effects if they actually exist. Increasing sample size would provide more statistical power yielding tighter confidence intervals and associated *p* values.

There are also several issues related to the generalizability of findings. Our study population comprised caregivers who were both reachable for enrollment and who could be followed longitudinally, and thus, it may not be representative of the entire population of low-income, inner-city caregivers. Second, study children were primarily youth with poorly controlled, persistent asthma for whom other biologic factors might have more of an influence on health care utilization compared with violence exposure. It is possible that the effect of exposure to community violence on healthcare utilization may be more profound among caregivers of inner-city children with less severe asthma.

Despite these limitations, our study helps advance understanding of how community violence and protective processes may influence asthma outcomes in low-income minority families. Our results highlight the utility of a bifurcated approach to public health interventions in which community-based providers screen for neighborhood safety concerns among caregivers of young children with asthma and also facilitate linkages to pro-social activities and community resources that foster feelings of cohesion among residents. Public health programs that enhance a sense of trust and shared expectations may be useful in light of the observed moderating effect of neighborhood protective factors on the relationship between violence exposure and healthcare utilization.

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