
The association between community crime and childhood asthma prevalence in Chicago

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Background: Little attention has been given to exposure to crime as a possible socioenvironmental contributor to variability in urban childhood asthma prevalence.

Objective: To determine the association of violent crime, property crime, and drug abuse violations with childhood asthma prevalence in Chicago.

Methods: In 2003-2005, the Chicago Initiative to Raise Asthma Health Equity conducted an asthma screening survey of children in grades K to 8 attending Chicago public and Catholic schools. Crime data were obtained from the Chicago Police Department. In addition to simple regression analysis, multilevel logistic regression analysis was performed to estimate the effect of criminal activity on neighborhood asthma variance.

Results: Of the surveys returned, 45,371 (93%) were geocoded into 247 neighborhoods. Neighborhoods were divided into quartile groups by mean asthma prevalence (9%, 12%, 17%, and 22%). Criminal activity (annual incidence per 100,000 people) was significantly higher ($P < .001$) in neighborhoods with a high asthma prevalence, especially drug abuse violations, which increased more than 6-fold (461 vs 2,921), and violent crimes, which increased more than 3-fold (448 vs 1,566). After adjusting for community race/ethnicity, only violent crime continued to be significantly associated with the neighborhood asthma prevalence (odds ratio, 1.27; 95% confidence interval, 1.04-1.55, $P < .05$). When considered alongside sociodemographic and individual characteristics, violence continued to contribute significantly ($P < .05$), explaining 15% of neighborhood variation in childhood asthma.

Conclusions: Evidence suggests an association between violent crime and childhood asthma prevalence in Chicago. A deeper understanding of the mechanisms that underlie this association may lend insight into potential interventions to address urban asthma.

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INTRODUCTION

Asthma is a leading chronic disease of childhood in the United States, with more than 9 million children diagnosed in their lifetime¹ at an estimated cost of \$10.7 billion per year (1994 USD).² At present, prevalence remains historically

high,¹ although the burden is not equally distributed. Racial disparities in asthma prevalence remain a significant area of concern,³⁻⁵ as does increased asthma prevalence in urban populations.⁶⁻⁹ Asthma rates are typically greater in black Americans, who are 4 times more likely to be hospitalized and 5 times more likely to die of asthma than are white Americans.¹⁰⁻¹³ Furthermore, asthma prevalence continues to rise in low-income and minority populations, reportedly affecting 25% of children in some communities.^{14,15}

In Chicago, asthma rates have been reported to exceed 20% in certain areas,⁹ with hospitalization rates nearly twice the national average³ and the reported number of asthma-related deaths among the highest in the nation.¹⁶ Despite modest improvements in asthma outcomes and concerted intervention efforts during the past decade, disparities persist. Racial and socioeconomic gaps remain markedly wide, with low-income and black residents experiencing much higher rates of asthma morbidity and mortality than their middle-income, nonblack counterparts.⁴ However, childhood asthma prevalence has been shown to vary greatly depending on the neighborhood in which a child lives, even in adjacent communities and neighborhoods of similar racial composition.⁹

Such findings highlight the multifactorial nature of childhood asthma. The disease has been associated with a child's age and sex,¹⁷ race,¹⁸ socioeconomic status,¹⁹ and family history of asthma.²⁰ Other individual factors, such as access to

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care,²¹ quality of care,²² patient knowledge,²³ and personal health beliefs and behaviors,²⁴ have also been linked to variations in asthma morbidity and severity. Several environmental variables have been implicated as well, including urban residence,⁶ community socioeconomic status and social capital,^{25,26} indoor allergens,²⁷ environmental tobacco smoke,²⁸ and ambient air pollutants.²⁹

Among environmental factors that warrant further investigation, reported exposure to violence (ETV) has been previously associated with poor health outcomes.³⁰ However, few data exist detailing the association of community crime and childhood asthma prevalence. Research to date is limited to a recent study³¹ of 1,213 children living in urban Puerto Rico, in which no association was identified between the caretaker's report of ETV and childhood asthma risk. This finding is seemingly at odds with studies of violence and asthma morbidity. Caretakers' self-report of ETV has been significantly associated with more symptom days³² and nights³³ in children with asthma and with decreased lung function in children in general.³⁴ The psychobiological mechanisms underlying such findings are not fully understood; however, it is often suggested that psychological stressors, such as violence, are likely to impact immune function through activity of the hypothalamic-pituitary-adrenocortical axis.³⁵

Further research is needed to determine whether and how violence affects asthma outcomes. Accordingly, the purpose of this study was to provide greater insight into the effect of community crime on childhood asthma proportions across neighborhoods using data collected from nearly 50,000 Chicago schoolchildren as part of the Chicago Initiative to Raise Asthma Health Equity (CHIRAH) study.

METHODS

Participant data were obtained from a cross-sectional survey screening for asthma conducted as part of the CHIRAH study. The CHIRAH study consisted of a large sample of children attending Chicago public and Catholic elementary and middle schools during the 2003 to 2005 school years. An overview of the study design follows; further details about the methods may be found in the 2009 article by Weiss et al.³⁶

The institutional review boards of Northwestern University and the Cook County Bureau of Health Services approved this study. The Chicago Public School Board and the Archdiocese of Chicago approved the asthma screening protocol in their respective schools. Administration of the survey was conducted with the consent of the participating schools; caregiver consent to participate was implicit in the return of completed surveys.

School Sample

Eligible schools had not participated in on-site asthma screening within 2 years and had more than 50% of enrolled students reportedly residing in the school district. To gain a representative sample of students, schools were stratified first by the percentage of black students enrolled ($>50\%$ vs $\leq 50\%$ based on participant self-report) and then by family

income ($>70\%$ vs $\leq 70\%$ receiving subsidized or free lunches). This process resulted in 4 groups of schools: those with a high vs low percentage of black students and those with students from mid- vs low-income groups.

Schools were identified by means of population proportionate and cluster sampling methods in each of the 4 race-income sampling groups (high black/middle income, high black/low income, low black/middle income, and low black/low income). Initially, 5 schools were selected in each race-income sampling group using population proportionate methods to represent larger neighborhood areas. For each of the 5 schools in a given group, the 2 cluster schools in closest proximity were also chosen, resulting in 60 schools selected during the first wave. In the second year of recruitment, 78 additional schools were selected using population proportionate probabilities from the 4 race-income sampling groups, resulting in a total of 138 schools.

Twenty-eight schools refused to participate, 2 were excluded due to a status change, and 3 were not used, yielding a final sample of 105 schools (76%) located throughout the city. Refusal to participate was generally related to competing academic priorities and an unwillingness to distract classes from daily lessons. In each school, all children in grades K to 8 were eligible and were asked to participate.

Survey Instrument

The screening survey was distributed at school and was taken home for an adult caregiver to complete in English or Spanish. The survey consisted of questions that included the child's birth date, height, weight, sex, report of physician- or nurse-diagnosed asthma, age at diagnosis, the child's race/ethnicity, current asthma status, relationship to the child of the person completing the survey, the names and ages of others living in the household with asthma, the child's home address, and the Brief Pediatric Asthma Screen Plus.^{37,38} This analysis includes only children with reported physician- or nurse-diagnosed asthma.

Neighborhood Selection Criteria

To evaluate community-level effects on asthma outcomes, participants were geocoded using ArcGIS US StreetMap (ESRI, Redlands, California) and were linked with their respective neighborhoods. Neighborhoods were defined by police beat. Chicago has 25 police districts, which encompass adjacent community areas. Chicago's 77 community areas are aggregates of census tracts within the city and were designed to be homogenous on key census indicators, including population characteristics, economic status, and living conditions. Within community areas of a given district, the Chicago Police Department defined 279 smaller, geographically contiguous units, known as police beats, which represent even more coherent social and physical units within the city. In this study, 32 police beats had fewer than 15 children from the sample and were not included in the analysis; the final sample represented 247 of the 279 police beats (89%).

Measures of Crime

For 2003-2005, the incidence of total crime, violent crime, property crime, and drug abuse violations in Chicago were obtained from the Chicago Police Department. Incidence was evaluated annually by police beat per population of 100,000, was averaged across the 3 study years, and was stratified as high, moderate, or low by crime type. Violent crime refers to criminal acts with a high risk of injury or death, including homicide (murder and nonnegligent manslaughter only), criminal sexual assault, robbery, and aggravated assault/battery. Property crime includes criminal acts committed without force or the threat of force, such as burglary, larceny-theft, motor vehicle theft, and arson. Drug abuse violations represent arrests for the production, distribution, or use of unlawful controlled substances, including cocaine, marijuana, synthetic narcotics, and dangerous nonnarcotic drugs. Thorough explanations of crime type are provided by the Federal Bureau of Investigation's Uniform Crime Reporting Program.³⁹

Statistical Analysis

Neighborhoods were assigned to quartile groups according to childhood asthma prevalence. The multiple *t* test was performed to evaluate criminal activity across each group. This method allowed us to test the null hypothesis of no difference in the mean between 3 or more groups simultaneously and produces an accurate assessment of the effects of community factors on asthma prevalence.^{40,41} Proc Multtest in SAS was used for this analysis (SAS Institute Inc, Cary, North Carolina).

Multilevel logistic regression analysis was performed to estimate the effect of violent crime on neighborhood variance of childhood asthma. A nonconditional model (null model) was used to estimate neighborhood-level variance. This variance reflects the total neighborhood-level variance, including all individual and neighborhood factors in the model. Under the null hypothesis, neighborhood-level variance is expected to be zero, indicating no between-neighborhood variability in the health outcomes of interest. The neighborhood-level variance was translated into a median odds ratio (OR), which can be compared with intuitive ORs of individual variables.^{42,43} The median OR is interpreted as how much a child's odds of developing asthma would increase (in median) if this child moved to a neighborhood with a higher asthma risk due to the factors in the model. A median OR of 1 indicates that there are no differences between neighborhoods in the odds of the child having asthma. We first estimated the null model and then included neighborhood and individual variables. For example, the incidence of violent crime was introduced into the models as a 2-category variable. A series of multilevel models were developed to assess the relative effects of violent crime on childhood asthma compared with the effects of individual factors. All individual and neighborhood variables were looked at in this manner. SAS GLIMMIX was used for multilevel analysis (SAS Institute Inc).

RESULTS

Of the 62,005 surveys distributed, 48,917 were completed and returned, for a response rate of 79%. Of these 48,917 surveys, 45,371 (93%) were successfully geocoded. Of these children, 11% were aged 3 to 5 years, 34% were aged 6 to 8 years, 33% were aged 9 to 11 years, and 22% were 12 years or older. Forty-nine percent of the children were boys, and 28% self-identified as white, 30% as black, and 42% as Hispanic. Overall asthma prevalence was 13%, with 9% of children having a household member with asthma. White and Hispanic children had a mean asthma prevalence of 10% and 11%, respectively, whereas black children had a mean asthma prevalence of 19% (Table 1).

To determine the association between criminal activity and asthma prevalence, neighborhoods were categorized into quartile groups by mean asthma prevalence: 9% in group 1, 12% in group 2, 17% in group 3, and 22% in group 4 (Fig 1). The annual incidence of crime directly and significantly increased with neighborhood asthma prevalence ($P<.001$) (Table 2). The incidence of violent crime, property crime, and drug abuse violations also significantly increased with neighborhood asthma prevalence (Table 2).

Communities with a higher proportion of black residents tended to have a higher proportion of children with asthma ($P<.001$) (Table 2). Demographic characteristics were controlled to investigate whether criminal activity remained predictive of asthma prevalence. After adjusting for a participant's age, sex, household asthma history, and socioeconomic status, the overall incidence of crime and the incidence of violent crime, property crime, and drug abuse violations were found

Table 1. Characteristics of Chicago Schoolchildren in the Study Sample (N=45,371)

Variable	All Children		Children with asthma	
	No.	%	No.	%
Reported asthma diagnosis				
Yes	5,908	13	NA	NA
No	39,463	87	NA	NA
Age group, y				
3-5	5,086	11	601	12
6-8	15,337	34	1,915	12
9-11	14,977	33	2,020	13
≥12	9,971	22	1,372	14
Sex				
Male	22,358	49	3,383	15
Female	23,013	51	2,525	11
Household member with asthma				
Yes	4,126	9	1,498	36
No	41,245	91	4,410	11
Race/ethnicity				
White	12,916	28	1,233	10
Black	13,511	30	2,619	19
Hispanic	18,944	42	2,056	11

Abbreviation: NA, not applicable.

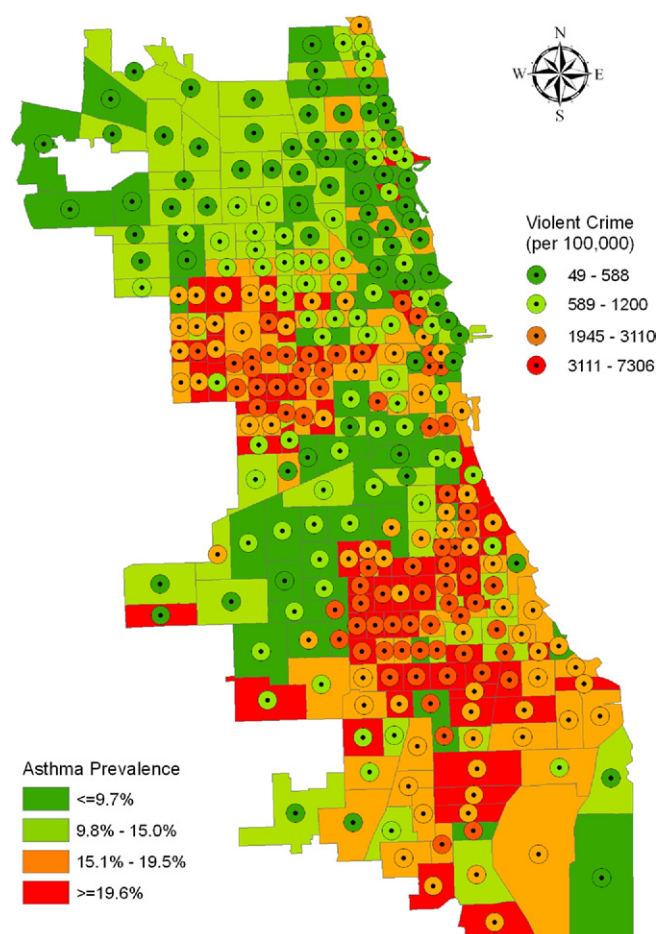


Figure 1. Mean childhood asthma prevalence and the annual incidence of violent crime in Chicago arranged by police beat.

to be significantly associated with the likelihood of asthma ($P<.001$) (Table 3). After including race/ethnicity, only violent crime remained significantly associated with the likelihood of childhood asthma, with an OR of 1.27 (95% CI, 1.04–1.55) for neighborhoods with a high vs low incidence of violent crime and an OR of 1.15 (95% CI, 1.02–1.29) for those with a moderate vs low incidence of violent crime (Table 3).

To further evaluate neighborhood variance in childhood asthma rates as a function of violent crime, individual characteristics were modeled alongside community variables in multilevel models. A child's age, sex, household asthma history, and community racial composition were all significant factors associated with observed variation in neighborhood asthma prevalence (Table 4). Community socioeconomic status, however, was not significantly associated with neighborhood asthma rates (Table 4). When considered alone, violent crime accounted for 54% of the observed variation in neighborhood asthma rates (Table 4, from values for neighborhood variance: model II/model I). With the inclusion of individual

and community variables, including community race/ethnicity, violent crime continued to contribute significantly ($P<.05$) to neighborhood asthma prevalence, explaining 15% of the observed variation (Table 4, from values for neighborhood variance: model IV-model V/model I).

DISCUSSION

On initial investigation, we found childhood asthma prevalence by neighborhood to be directly associated with community crime, including the incidence of violent crime, property crime, and drug abuse violations. The odds of being diagnosed as having childhood asthma remained tied to these variables after controlling for age, sex, family history of asthma, and socioeconomic status. However, after adjusting for race/ethnicity, only the incidence of violent crime continued to contribute significantly to the likelihood of asthma. Community violence explained 15% of observed neighborhood variability in childhood asthma given simultaneous adjustments for potential confounders, including community race/ethnicity.

To our knowledge, this study is the first to investigate the effect of violence on childhood asthma using an objective measure of ETV, namely, the incidence of crime in a community. Previous studies^{31–34} have used parent or child report of ETV as a proxy for actual crime in a community. However, it is conceivable that individuals may be inclined to either overestimate or underestimate the occurrence of violence in their neighborhood. Indeed, it has been suggested that studies of community violence should use direct and indirect measures to evaluate violence in its immediate and broader community context.⁴⁴ The present findings confirm the utility of the latter measure, which has been shown in other studies⁴⁵ to affect a child's development.

More significantly, this study is the first to show an association between community crime, in particular the incidence of violent crime in a neighborhood, and being diagnosed with asthma. Although many studies^{32–34} have linked ETV with asthma severity and morbidity, none have shown an association between asthma prevalence and violence. In a study of 1,213 urban Puerto Rican children, neither a child's report of being a victim of nor witnessing neighborhood violence were significantly associated with increased asthma odds (OR, 0.75; 95% CI, 0.31–1.80 and OR, 1.16; 95% CI, 0.66–2.06, respectively).³¹ In contrast, the likelihood of asthma in participants in the present study was significantly associated with neighborhood violence, even after controlling for potential confounders (Table 3). These incongruous findings may be due to limited statistical power in the former study, incomparable measures of violence (self-report vs actual incidence), a difference in effect between discrete exposures to violence vs chronic exposure, or complex gene-environment interactions within each distinct study sample.

Residents of violent communities have been shown to experience pervasive feelings of vulnerability⁴⁵ and to be more fearful of crime compared with residents of nonviolent communities.⁴⁶ It has also been suggested that those living in

Table 2. Incidence of Crime in Neighborhoods of Chicago Schoolchildren Grouped From Low to High Mean Asthma Prevalence

Variable ^a	Neighborhood Quartile Groups by Mean Asthma Prevalence			
	Lowest quartile: 9% asthma (n=61)	Second quartile: 12% asthma (n=62)	Third quartile: 17% asthma (n=62)	Highest quartile: 22% asthma (n=62)
Racial/ethnic distribution, mean %				
White	34	39	13	3
Black	7	11	73	91
Hispanic	59	51	15	6
Incidence of crime, No. annually/100,000 people				
Total	2,879	2,710	4,837	5,487
Violent crimes	448	421	1,223	1,566
Property crimes	2,361	2,289	3,614	3,921
Drug abuse violations	461	574	2,064	2,921

^a $P < .001$ for all.

violent neighborhoods are likely to perceive their environment and their existence in it as largely beyond their control.⁴⁷ As such, studies of ETV and asthma outcomes have often conceptualized community violence as a source of chronic psychological stress.^{34,47,48} In children with asthma, there is evidence that chronic stress coupled with an acute incidence of stress substantially increases the risk of asthma exacerbations.⁴⁹ Symptoms of posttraumatic stress have also been associated with more severe asthma in children.⁵⁰ Furthermore, parental stress has been prospectively associated with increased risk of childhood wheeze early in life.⁵¹

The psychobiological mechanisms that underlie such outcomes in children are not fully understood. However, evidence suggests that stress in parents may affect early child-

hood immune function. In children predisposed to atopic asthma, parental report of high levels of stress has been associated with greater atopic immune profiles.⁵² Similarly, higher levels of chronic stress have been associated with heightened cytokine production and higher eosinophil counts in children with asthma⁵³ and lower morning cortisol levels in adolescents with asthma.⁵⁴ Consistent with such findings, psychological stressors have been suggested to affect immune function through activity of the hypothalamic-pituitary-adrenocortical axis.

Specifically, it has been proposed that chronic stress elicits a state of hyporesponsiveness such that cortisol secretion is limited, resulting in increased secretion of inflammatory cytokines.³⁵ Stress-induced hyporesponsiveness of the hypota-

Table 3. Odds of Chicago Schoolchildren Being Diagnosed with Asthma Based on the Incidence of Crime in Their Neighborhood

Variable	Likelihood of Asthma, OR (95% CI)		
	Unadjusted	Adjusted without including race/ethnicity ^a	Adjusted including race/ethnicity ^b
Total crime ^c			
High vs low	1.73 (1.48–2.03) ^d	1.49 (1.26–1.76) ^d	1.16 (0.98–1.37)
Moderate vs low	1.44 (1.28–1.62) ^d	1.33 (1.19–1.48) ^d	1.08 (0.96–1.20)
Violent crimes ^e			
High vs low	2.03 (1.76–2.34) ^d	1.83 (1.52–2.20) ^d	1.27 (1.04–1.55) ^f
Moderate vs low	1.41 (1.26–1.57) ^d	1.35 (1.21–1.51) ^d	1.15 (1.02–1.29) ^f
Property crimes ^g			
High vs low	1.56 (1.32–1.84) ^d	1.37 (1.17–1.60) ^d	1.09 (0.93–1.26)
Moderate vs low	1.45 (1.28–1.63) ^d	1.32 (1.18–1.47) ^d	1.08 (0.97–1.20)
Drug abuse violations ^h			
High vs low	1.81 (1.56–2.11) ^d	1.51 (1.25–1.82) ^d	1.14 (0.96–1.35)
Moderate vs low	1.32 (1.17–1.49) ^d	1.23 (1.08–1.41) ^d	0.11 (0.99–1.24)

Abbreviations: CI, confidence interval; OR, odds ratio.

^a Adjusted for age, sex, household member with asthma, and socioeconomic status.^b Adjusted for age, sex, household member with asthma, socioeconomic status, and race/ethnicity.^c Annual incidence per population of 100,000: high, >6352; moderate, ≤6352 and >3077; and low, ≤3077.^d $P < .001$.^e Annual incidence per population of 100,000: high, >1772; moderate, ≤1772 and >452; and low, ≤452.^f $P < .05$.^g Annual incidence per population of 100,000: high, >4766; moderate, ≤4766 and >2440; and low, ≤2440.^h Annual incidence per population of 100,000: high, >2707; moderate, ≤2707 and >344; and low, ≤344.

Table 4. Variability of Neighborhood Asthma Prevalence in Chicago Schoolchildren After Controlling for Violent Crime and Violent Crime Alongside Potential Confounders

Variable	Model I: null model	OR (95% CI)			
		Model II: addition of violent crime	Model III: addition of participant data	Model IV: addition of community SES	Model V: addition of community race
Community race/ethnicity ^a					
Black vs white					1.69 (1.37–2.10) ^b
Hispanic vs white					1.09 (0.87–1.37)
Mixed vs white					1.13 (0.95–1.34)
Community SES ^c					
Low vs high				0.96 (0.79–1.16)	0.85 (0.70–1.03)
Moderate vs high				0.99 (0.88–1.11)	0.91 (0.80–1.04)
Individual characteristics					
Age 6–8 vs 3–5 y			1.05 (0.95–1.17)	1.05 (0.95–1.17)	1.05 (0.95–1.16)
Age 9–11 vs 3–5 y			1.12 (1.01–1.24) ^d	1.12 (1.01–1.24) ^d	1.11 (1.01–1.23) ^d
Age ≥12 vs 3–5 y			1.14 (1.03–1.27) ^d	1.14 (1.03–1.27) ^d	1.13 (1.02–1.26) ^d
Male vs female			1.48 (1.57–1.40) ^b	1.48 (1.57–1.40) ^b	1.48 (1.57–1.40) ^b
Household member with vs without asthma			4.48 (4.81–4.17) ^b	4.48 (4.83–4.17) ^b	4.46 (4.78–4.15) ^b
Incidence of violent crime ^e					
Low vs high		2.03 (1.76–2.34) ^b	1.78 (1.56–2.04) ^b	1.83 (1.52–2.20) ^b	1.27 (1.04–1.55) ^d
Moderate vs high		1.41 (1.26–1.57) ^b	1.34 (1.21–1.49) ^b	1.35 (1.21–1.51) ^b	1.15 (1.02–1.29) ^d
Neighborhood variance (SE)	0.13 (0.02)	0.07 (0.01)	0.05 (0.01)	0.05 (0.01)	0.03 (0.01)
Median OR (95% CI)	1.14 (1.33–1.48)	1.10 (1.22–1.34)	1.10 (1.18–1.29)	1.10 (1.18–1.29)	1.10 (1.12–1.23)

Abbreviations: CI, confidence interval; OR, odds ratio; SES, socioeconomic status.

^a Race/ethnicity: black, white, or Hispanic community defined as ≥2/3 of population black, white, or Hispanic, respectively; mixed community defined as <2/3 of population black, white, or Hispanic.

^b $P < .001$.

^c Average family income: high, >\$51,632; moderate, ≤\$51,632 and >\$30,638; and low, ≤\$30,638.

^d $P < .05$.

^e Annual incidence per population of 100,000: high, >1772; moderate, ≤1772 and >452; and low, ≤452.

lamic-pituitary-adrenocortical axis has been associated with other inflammatory disorders,⁵⁵ making it more plausible that such a response in children living in violent communities may partially affect the development of asthma. That being said, other mechanisms are likely involved; for example, parents of children living in violent communities may be inclined to participate in coping behaviors associated with the development of asthma, such as smoking, or may choose to keep children indoors as a matter of safety, thereby increasing exposure to known triggers, such as cockroach and dust mite allergens.

This study is not without limitations. Its cross-sectional design limits interpretations of causality. However, the conclusion that violence preceded asthma is based on a well-defined conceptual model of the disease. Comorbid risk factors, such as poverty, parental unemployment, overcrowding, poor medical care, and limited access to medical care also complicate the study of community violence and complex disorders such as asthma.⁵⁶ Although care was taken to control for a variety of such potential confounders, we could not account for exposure to ambient or indoor pollutants by neighborhood; such exposures may be underlying contributors to the present findings. We also could not account for unreported criminal acts in the measure of community crime;

accordingly, the true incidence of crime in certain areas may be underestimated. The present study sample lacked a disaggregated Hispanic population. As such, the prevalence of asthma in certain Hispanic populations—particularly in Puerto Rican children, who have been shown to be disproportionately affected by asthma¹⁵—may be misrepresented. Community data were obtained from the 2000 US Census, although the study was conducted from 2003 to 2005, which may result in some discrepancy. Finally, neighborhoods with fewer than 15 children from this sample were not included in this analysis. That being said, this sample was quite large, with 89% of Chicago neighborhoods represented.

CONCLUSIONS

To our knowledge, this study is the first to demonstrate a link between the incidence of community crime and childhood asthma prevalence. Furthermore, it is the first to assess the effect of violence on asthma outcomes using an objective measure of crime within a community, ie, the known incidence of criminal activity as reported by the Chicago Police Department. Although the effects of property crime and drug abuse violations were attenuated by adjustments for race/ethnicity, violent crime remained a significant contributor to the likelihood of asthma, explaining 15% of the variability in

asthma rates by neighborhood. Further investigation is needed to fully understand the causal link between violence and asthma; specifically, a study controlling for potential confounders in the built environment would be particularly helpful in determining the true role of violence in asthma outcomes. However, we have shown that community violence may increase the risk of childhood asthma. This association must be considered in future health care policy efforts and in the allocation of public health resources to address childhood asthma in urban environments.

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