

Neighborhood Safety and Overweight Status in Children

Julie C. Lumeng, MD; Danielle Appugliese, MPH; Howard J. Cabral, PhD; Robert H. Bradley, PhD; Barry Zuckerman, MD

Objective: To determine if there is a relationship between parental perception of neighborhood safety and overweight at the age of 7 years.

Design: Cross-sectional analysis of the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development.

Setting: Ten urban and rural US sites.

Participants: A total of 768 children selected via conditional random sampling with complete data at follow-up.

Main Outcome Measures: Parents reported demographics and perception of neighborhood safety by standardized questionnaire. Child overweight status was defined as a body mass index greater than or equal to the 95th percentile for age and sex from measured anthropometrics at the age of 7 years. The base model included relationship of the safety reporter to the child, sex, and baseline body mass index z score at the age of 4.5 years. Covariates tested included maternal marital status, educa-

tion, and depressive symptoms; child race/ethnicity; participation in structured after-school activities; Home Observation for Measurement of the Environment total score; and neighborhood social cohesiveness.

Results: The sample was 85% white, and 10% of the children were overweight. Neighborhood safety ratings in the lowest quartile were independently associated with a higher risk of overweight at the age of 7 years compared with safety ratings in the highest quartile (adjusted odds ratio, 4.43; 95% confidence interval, 2.03-9.65). None of the candidate covariates altered the relationship between perception of neighborhood safety and child overweight status.

Conclusions: Perception of the neighborhood as less safe was independently associated with an increased risk of overweight at the age of 7 years. Public health efforts may benefit from policies directed toward improving both actual and perceived neighborhood safety.

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Author Affiliations: Center for Human Growth and Development and Department of Pediatrics and Communicable Diseases, University of Michigan, Ann Arbor (Dr Lumeng); Data Coordinating Center (Ms Appugliese) and Department of Biostatistics (Dr Cabral), Boston University School of Public Health, Boston, Mass; Center for Applied Studies in Education, University of Arkansas at Little Rock (Dr Bradley); and Department of Pediatrics, Boston University School of Medicine, Boston (Dr Zuckerman).

THE MOST RECENT US NATIONAL data confirm the growing obesity epidemic: 15.8% of 6- to 11-year-old children are overweight (defined as a body mass index [BMI] \geq 95th percentile for age and sex)¹ and the racial disparities continue to increase.² Well-described risk factors for childhood overweight in the United States include African American or Hispanic race/ethnicity,² elevated parental BMI,^{3,4} and a large amount of television viewing.⁵ The most recent data suggest that lower socioeconomic status is associated with overweight in children,^{4,6} but the relationship is complicated and appears to vary based on a combination of sex, age, race/ethnicity, and the degree of poverty.⁷ The home environment and parenting have received significant attention in the literature,^{4,8-11} but the neighborhood and built environment as independent contributors to child overweight risk have not been

examined as thoroughly. The built environment, which has been associated with other health outcomes,¹²⁻¹⁵ has been recognized by the Centers for Disease Control and Prevention as a potentially important area for public policy to address the childhood obesity epidemic¹⁶ and an area that requires additional research.¹⁷

Our clinical experience in an urban pediatric clinic that serves a low-income population has been that unsafe neighborhoods significantly affect children's daily activities. Anecdotally, parents in an urban setting frequently express their reluctance to allow their children to play outside for fear of exposure to violence, crime, and illicit drug use. Prior assessments of perception of neighborhood safety have focused on physical activity levels as an outcome^{18,19} or used children's (not parents') assessments of neighborhood safety.¹⁹ However, parental perception of neighborhood safety may be more salient than the child's perception because parents of young children typi-

cally exert substantial control over where their children spend time.

We therefore sought to document our clinical impression by investigating the relationship between parental perception of neighborhood safety and overweight in children at the age of 7 years in 10 diverse regions of the United States. We focused on overweight at the age of 7 years because overweight prevalence increases most rapidly in childhood around this age,¹ and the racial/ethnic disparities in overweight prevalence also widen significantly during this same period of childhood.¹ We hypothesized that parents who perceive their neighborhood as unsafe would be more likely to have overweight children because they restrict their children's access to outdoor activities. We also hypothesized that this relationship would be attenuated by the availability of an after-school program, a stimulating home environment, or increased social cohesiveness in the neighborhood. In examining these hypotheses, it is critical to control for potentially confounding factors known to be associated with obesity.

METHODS

The sample was composed of children and their parents enrolled in the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD-SECCYD). The NICHD-SECCYD²⁰ is a longitudinal study of relationships between child behavior and development and key developmental contexts, especially child care experience. Families who participated in this study were recruited through hospital visits to mothers shortly after the birth of a child in 1991. Families lived in the areas of Little Rock, Ark; Irvine, Calif; Lawrence, Kan; Boston, Mass; Morganton, NC; Philadelphia, Pa; Pittsburgh, Pa; Charlottesville, Va; Seattle, Wash; and Madison, Wis.

Of the 8986 mothers who gave birth during the sampling period, 5416 (60%) met the eligibility criteria. Mothers were required to be healthy, to be older than 18 years, to not be planning to move within the next year, to live within an hour of the study site, and to be conversant in English with a singleton child whose birth was normal and uncomplicated. An additional inclusion criterion at the Philadelphia site was that families live in a neighborhood that was not extremely unsafe as documented by local police, given the planned home visits. One hundred thirty-one families (1.4% of the original pool of 8986 potential families) were excluded for this reason. Notably, the study protocol for the duration of the study dictated that if the neighborhood was deemed too unsafe for a home visit, the home visit would still be completed but with a security guard or police officer present.

Of the 5416 eligible families, 3015 (56%) were selected using a conditional random sampling plan that ensured that the recruited families reflected economic, educational, and ethnic diversity.²¹ Of the 3015 families selected for participation, 1526 (51%) agreed to participate. Of the 1526 families who agreed to participate, 1364 (89%) completed the initial data collection.²⁰ This initial sample was representative of the demographics of the catchment areas from which the sample was recruited: 24% of the children were of an ethnic/racial minority, 10% of the mothers had less than a high school education, and 14% of the mothers were single at the time of the child's birth. The study involved extensive data collection at frequent intervals. Data used in this analysis were collected during assessments scheduled for children at the age of 4.5 years and in the spring and fall of the child's

first grade year in school. This study was approved by the institutional review boards of all pertinent institutions.

PERCEPTION OF NEIGHBORHOOD SAFETY

The Neighborhood Questionnaire is a 16-item measure of neighborhood characteristics that was completed during the child's first-grade year in school by the mother and another adult living in the home who acted as a caregiver (hereafter referred to as the father). More than 85% of these caregivers were fathers, 9% were the mother's partner, and the remainder were grandparents or relatives.²² Two scales of the Neighborhood Questionnaire are the Neighborhood Safety Subscale (NSS) and the Neighborhood Social Involvement Subscale.²³

The NSS score consists of the mean of 5 items. On the overall Neighborhood Questionnaire, the number of possible response categories (eg, items on the Likert scale) varied from 2 to 10, and on the NSS, response categories varied from 4 to 5. Responses were therefore rescaled to a 0 to 10 range and averaged to provide the overall score via the methods used in the original scale. Parents responded to the following questions: (1) "How do you feel about your neighborhood?" (2) "How satisfied are you with police protection around here?" (3) "How often are there problems with muggings, burglaries, assaults, or anything else like that around here?" (4) "How much of a problem is the selling and using of drugs around here?" and (5) "How well do the police and people in this neighborhood get along?" Higher scores represent greater perceived neighborhood safety.

All 768 children had an NSS score from at least 1 reporter; 739 had an NSS score from 2 reporters, one of whom was always the mother. The NSS scores differed significantly based on the identity of the reporter, with mothers perceiving the neighborhood as slightly safer than fathers ($\Delta=0.16$; $P=.004$). When both parents completed the NSS questionnaire, we used the score that reflected a perception of the neighborhood as less safe based on the assumption that the parent who had the greatest concern about safety would do more to control the child's access to people and places outside the home. We therefore controlled for the identity of the neighborhood safety reporter a priori in the base model.

OVERWEIGHT STATUS

Height and weight were measured during the laboratory visit at the age of 4.5 years and in the spring of the child's first grade year in school (when children in the United States are on average 7 years old). Trained research assistants certified for accuracy in measurement weighed the children, who were lightly clothed and without shoes, on a physician's scale (Detecto physician's scale model 437, Cardinal/Detecto, Webb City, Mo) to the nearest 100 g. Children's height was measured without shoes, using a T square, to the nearest 0.3 cm. Details of the measurement procedures are documented elsewhere.²⁴ The BMI was calculated as weight in kilograms divided by the square of height in meters, and child overweight was defined dichotomously as a BMI greater than or equal to the 95th percentile for age and sex based on National Center for Health Statistics norms.²⁵

INDEPENDENT VARIABLES

Demographic data consisted of the child's sex, race/ethnicity (white, black, or other), maternal marital status (single vs not), and maternal education (years of education completed). Maternal education was included as a continuous variable. We elected to use maternal education as our measure of socioeconomic status because this variable had the most complete data

of the available indicators. Maternal education was correlated with income-to-needs ratio (Spearman rank correlation=0.59; $P<.001$).

Additional characteristics assumed to modify an association between perception of neighborhood safety and overweight were tested as potential covariates. These included maternal scores on the Center for Epidemiological Studies Depression Scale²⁶ reported during the child's first grade year, the child's participation in structured after-school activities (dichotomized as >1 hour per week vs not) reported in kindergarten, parental perception of neighborhood social cohesiveness reported on the Neighborhood Social Involvement Subscale of the Neighborhood Questionnaire during the child's first-grade year, and quality of the home environment as measured by the Home Observation for Measurement of the Environment (HOME) total score. The HOME was administered by trained observers during home visits at the child's age of 4.5 years. The HOME is an observational measure of the stimulation and support available to the child in the home.²⁷ The NICHD-SECCYD did not include maternal anthropometric data or child television-viewing patterns in the time frame of this analysis.

STATISTICAL ANALYSIS

All data analysis was performed using SAS statistical software, version 8.2 (SAS Institute Inc, Cary, NC). In our analyses, we excluded children without data for NSS scores ($n=337$) or BMI at first grade ($n=371$). Children who had moved residences in the past 12 months were also excluded ($n=162$), since we were interested in assessing the role of the neighborhood in overweight risk. We examined the sample included in our model ($n=768$) vs those excluded because of missing data ($n=596$) and found statistically significant differences. Although the NSS scores did not differ significantly ($P=.76$), children included in the sample were more likely to be overweight (10% vs 6%; $P=.002$), slightly more likely to be female (51% vs 45%; $P=.05$), more likely to be white (85% vs 75%; $P<.001$), and had mothers who were more educated (14.7 vs 13.7 years; $P<.001$). Additional information regarding differences in the samples is available from the authors on request.

Univariate statistics were first computed to provide a description of the sample of 768 children. We dichotomized the child's BMI at the age of 7 years as overweight (BMI \geq 95th percentile) vs not overweight to create a dependent variable that could be used in a multiple logistic regression model.

Then, bivariate analyses were performed to inform the development of the multivariate model. We analyzed all covariates by overweight status using t tests for continuous variables and cross-tabulations with χ^2 tests. We analyzed associations between NSS scores and these covariates with t tests, analysis of variance, and correlation coefficients. To characterize the relationship among neighborhood safety, race/ethnicity, and socioeconomic status, we regressed the NSS score on race/ethnicity and socioeconomic status. We also performed a cross-tabulation of overweight status and NSS score in quartiles (with cut points at the scores 6.83, 7.67, and 8.67) to assess potential nonlinearity in their relationship. We next fit logistic regression models with overweight status as the outcome.

We accounted for clustering by site with bias-corrected generalized estimating equations based on the methods of Mancl and DeRouen.^{28,29} We computed both unadjusted and adjusted odds ratios and their corresponding 95% confidence intervals from these logistic regression models. We used an α level of .05 (2-tailed) to determine statistical significance. A base model for estimating overweight status on the parent's perception of neighborhood safety was created including child sex and identity of the safety reporter a priori.

Each of the candidate covariates was then tested by entering them one by one into the base model. Covariates that altered the relationship of NSS scores to child overweight in these models by more than 10% were retained in the final model.³⁰ Although this method of modeling is not able to test for potential joint confounding, limiting the number of covariates included simultaneously in the model allowed us to maintain the stability of the model. In addition, variables found to be differentially distributed between those in the analysis sample and those not in the sample were evaluated for potential confounding effects.

RESULTS

The sample included 768 children. The mean \pm SD age of the children at the time of the anthropometric measures in the spring of first grade was 7.0 ± 0.3 years (range, 6.3-8.1 years). Approximately half of the sample were male and 10% were overweight, consistent with national data for children of this age.³¹ The mean \pm SD NSS score was 7.69 ± 1.5 (range, 1.3-10.0; potential range, 0.0-10.0). The NSS scores were normally distributed with a slight positive skew. Of the mothers, 42% had at least a bachelor's degree; 20% had a high school education or less (**Table 1**). Overweight children had mothers who were less educated and came from homes with lower HOME scores. However, overweight children did not differ from children who were not overweight by sex, race/ethnicity, relationship of the safety reporter to the child, maternal marital status, maternal depressive symptoms, amount of structured after-school activities, or Neighborhood Social Involvement Subscale scores (Table 1).

In bivariate analyses, lower parental neighborhood safety ratings were associated with African American race, lower maternal education, more maternal depressive symptoms, fewer structured after-school activities for the child, and a lower HOME total score. Child sex, child age (restricted to first grade), and maternal marital status were not related to parental neighborhood safety ratings (**Table 2**).

In an attempt to better characterize perception of neighborhood safety in relation to race/ethnicity and socioeconomic status, we performed regression analysis of race/ethnicity on parental neighborhood safety ratings, adjusting for maternal education as a proxy for socioeconomic status. Given the limited sample size, we categorized race/ethnicity as white and nonwhite. Race/ethnicity was significantly independently associated with parental perception of neighborhood safety. White parents were significantly more likely to perceive the neighborhood as safe (mean \pm SD NSS score, 7.83 ± 1.39) than were nonwhite parents (mean \pm SD NSS score, 6.84 ± 1.82), independent of socioeconomic status ($P<.001$).

OVERWEIGHT STATUS AND NEIGHBORHOOD SAFETY

Results from the bivariate analyses showed that parents of children who were overweight in first grade perceived their neighborhoods as significantly less safe than parents of children who were not overweight ($P<.001$) (Table 1). We next evaluated the unadjusted risk of overweight in each quartile of NSS scores in a cross-

Table 1. Characteristics of Children Who Were Overweight and Not Overweight in the Spring of First Grade

Characteristics	Overweight (n = 79)	Not Overweight (n = 689)	Total (n = 768)	P Value
Neighborhood Safety Subscale score, mean (SD)	7.08 (1.6)	7.75 (1.5)	7.69 (1.5)	<.001
Age, mean (SD), y	7.03 (0.3)	7.04 (0.3)	7.04 (0.3)	.81
Sex, %				.63
Male	52	49	49	
Female	48	51	51	
Race/ethnicity, %				.84
White	85	85	85	
Black	11	9	9	
Other	4	6	6	
Identity of safety reporter, %				.23
Mother	57	64	63	
Father or other	43	36	37	
Maternal education, mean (SD), y	14.1 (2.3)	14.7 (2.4)	14.7 (2.4)	.02
Maternal marital status, %				.48
Yes	87	85	85	
No	13	15	15	
Maternal CES-D score, mean (SD)	9.71 (9.65)	7.81 (7.88)	8.01 (8.09)	.10
Structured after-school activities, %				.75
>1 h/wk	32	30	30	
≤1 h/wk	68	70	70	
HOME total score, mean (SD)	45.4 (4.8)	46.7 (4.9)	46.6 (4.9)	.03
Neighborhood Social Involvement Subscale score, mean (SD)	5.46 (2.0)	5.77 (1.9)	5.74 (1.93)	.18

Abbreviations: CES-D, Center for Epidemiological Studies Depression Scale²⁶; HOME, Home Observation for Measurement of the Environment.²⁷

Table 2. Relationship of Perceptions of Neighborhood Safety to Various Covariates

Covariate	Neighborhood Safety Score, Mean ± SD	Spearman Rank Correlation	P Value
Age		0.07	.07
Sex			.58
Male	7.65 ± 1.51		
Female	7.71 ± 1.51		
Race			<.001
White	7.83 ± 1.39		
Black	6.53 ± 1.95		
Other	7.29 ± 1.53		
Maternal marital status			.05
Single	7.38 ± 1.86		
Partnered	7.74 ± 1.43		
Maternal education		0.23	<.001
Maternal depressive symptoms		-0.22	<.001
Structured after-school activities			.03
>1 h/wk	7.86 ± 1.40		
≤1 h/wk	7.60 ± 1.55		
HOME total score		0.24	<.001
Neighborhood social involvement		0.23	<.001

Abbreviation: HOME, Home Observation for Measurement of the Environment.²⁷

tabulation and found higher risk of overweight in quartiles 1 through 3 compared with neighborhoods perceived as most safe (NSS scores in quartile 4). We found that 17% of those in the first quartile (least perceived neighborhood safety) were overweight compared with 10% in the second quartile, 13% in the third quartile, and only 4% in the fourth quartile (highest perceived safety). We

also estimated this relationship in logistic regression models that accounted for clustering by site (**Table 3**). The relationship between parental perception of neighborhood safety and a higher risk of overweight in first grade persisted in the base model, which controlled for child sex and identity of the neighborhood safety reporter (Table 3). Neither child sex nor identity of the safety reporter, variables included as confounders a priori, was significant in the model. None of the candidate covariates altered the relationship between perception of neighborhood safety and overweight in first grade by more than 10%. We tested for the presence of interactions between the covariates by adding terms to the multiple logistic regression model. We examined interactions of perception of neighborhood safety and sex, perception of neighborhood safety and identity of safety reporter, and identity of safety reporter and sex. None of these interactions were statistically significant.

CONTROLLING FOR BMI z SCORE AT 4.5 YEARS

By adding BMI z score at the age of 4.5 years as a continuous variable into the base model (which included child sex and identity of the safety reporter) as a covariate, we were able to statistically control for variability in BMI already present at the age of 4.5 years. Statistical removal of this variability enabled us to focus on overweight that developed between the ages of 4.5 and 7 years. If adjusting for BMI z score at the age of 4.5 years had significantly reduced or eliminated the association between NSS scores and overweight status at the age of 7 years, it would suggest that children were overweight before parental NSS scores were obtained and therefore weaken the explanatory model. Adjusting for BMI z score at the age of 4.5

Table 3. Unadjusted and Adjusted ORs for Overweight in First Grade From Logistic Regression Models Estimated via GEE and Accounting for Site as a Clustering Variable

	OR (95% CI) (n = 768)		
	Unadjusted	Adjusted for Reporter and Sex	Adjusted for Reporter, Sex, and BMI z Score at 4.5 y
Neighborhood Safety Subscale score			
Quartile 1 (least safe) vs 4 (safest)	4.55* (2.01-10.33)	4.43* (2.03-9.65)	3.01 (0.96-9.51)
Quartile 2 vs 4	2.64† (1.33-5.27)	2.57† (1.21-5.47)	2.14 (0.53-8.60)
Quartile 3 vs 4	3.58* (1.78-7.19)	3.49* (1.62-7.53)	3.30 (0.86-12.65)
Father reporter		1.12 (0.63-2.01)	1.12 (0.58-2.18)
Male sex		0.94 (0.65-1.36)	0.80 (0.41-1.54)
BMI z score at the age of 4.5 y			9.44* (4.18-21.36)

Abbreviations: BMI, body mass index; CI, confidence interval; GEE, generalized estimating equation; OR, odds ratio.

* $P \leq .001$.

† $P \leq .01$.

years in the base model, the relationship between parental perception of a less safe neighborhood and child overweight in first grade remained, although slightly weakened. Per our stated methods, we re-entered the same candidate covariates into the base model one by one and retained those that altered the relationship between perception of neighborhood safety and overweight in first grade by more than 10%. Again, none of the covariates altered the relationship between parental perception of neighborhood safety and overweight in first grade, and none of the interactions examined were statistically significant. The change in the odds ratio for overweight risk when controlling for BMI z score at 4.5 years indicates that parental perception of neighborhood safety independently increases overweight risk in the age range of 4.5 to 7 years, although the effect also operates to some degree at younger ages (Table 3).

COMMENT

Results from a diverse sample representing 10 different sites across the United States indicate that parental perception of the neighborhood as unsafe was independently associated with an increased risk of overweight at the age of 7 years. To our knowledge, this study is the first to systematically investigate the relationship of parental perception of neighborhood safety and childhood overweight in a sample with geographic, ethnic, and socioeconomic diversity while analytically controlling for a large number of potentially confounding factors.

Previous studies in children that focused on the relationship among neighborhood safety, physical activity, and BMI have shown conflicting results. In a study¹⁹ of Hispanic, white, and Vietnamese fourth graders of diverse socioeconomic status, children's (not parents') perceptions of a more dangerous neighborhood were associated with *increased* self-reported physical activity and *lower* BMI. Another study¹⁸ of chronically ill 10- to 12-year-old children linked decreased activity patterns to child and parent perception of less neighborhood safety, but the generalizability of this study to healthy children is unclear. The differences in our findings and these prior

studies may be partially explained by the low correlation between child and parental report of neighborhood violence³² or the younger age of children in our study. Parental perception of neighborhood safety likely operates more strongly than that of the child in altering lifestyle because parents exert significant control over young children's activities.^{33,34}

We were concerned that region of residence might mediate the relationship between neighborhood safety and overweight, but accounting for clustering based on study site did not alter the relationship. Measures of socioeconomic status also did not eliminate the observed association between perception of neighborhood safety and overweight, which would be the case if parental perception of neighborhood safety were only a proxy for socioeconomic status. In addition, potential protective factors, such as structured after-school activities, increased social cohesion in the neighborhood, or a high-quality home environment did not alter the relationship between parental perception of neighborhood safety and overweight. In effect, there may well be a relatively simple and straightforward relationship between living in a dangerous neighborhood and overweight; namely, in attempting to protect their children from harm, parents not only decrease the kind of physical activity that comes from playing outdoors in the neighborhood but inadvertently increase the likelihood of sedentary activity and snacking that comes from staying indoors.

We found significant differences in perception of neighborhood safety based on race/ethnicity. Most US neighborhoods continue to be racially segregated.³⁵ It is possible that one of the many contributors to the racial disparities in overweight prevalence² may be higher crime rates and lower perception of neighborhood safety among African Americans.^{34,36} However, our study included a relatively small sample of children of minority race/ethnicity. Our inability to detect the well-documented differences in overweight prevalence by race/ethnicity, presumably because of low statistical power, suggests that these findings may not be generalizable to populations of minority race/ethnicity. The role of perceived neighborhood safety as a possible mediator between minority

race/ethnicity and childhood overweight requires further investigation with a larger sample size of children of minority race/ethnicity.

POLICY IMPLICATIONS

Although violent crime rates are lower today than they have been in 10 years, less than 10% of people report that their fear of crime has decreased.³⁶ It is therefore important not only to understand contributors to increased violence and crime but also to understand and address the factors that contribute to the perception that a neighborhood is unsafe. A potential area for intervention is the redesign of neighborhoods. Individuals who perceive their neighborhoods as unsafe cite open drinking and drug use as significant contributors to feeling unsafe.³⁶ As reviewed by Ashe et al,³⁷ land use planning and zoning has long been used to address endemic public health problems and could be used creatively to address the childhood obesity epidemic by improving some of the features that contribute to increased neighborhood violence and the perception of the community as unsafe. In considering neighborhood redesign, the National Institute of Health recently outlined a research agenda.³⁸ Of the issues that require further study, identifying factors that mediate or moderate built environment effects was of primary importance. No matter how neighborhoods are redesigned to allow children to walk to school or the neighborhood store, parents must feel safe allowing their children to do so.

STUDY LIMITATIONS

Our study has several limitations. The findings may not be generalizable to certain populations, such as recent immigrants or the children of adolescent mothers. Our sample size of overweight children was relatively small. Therefore, the power to detect some of the differences may have been limited. We also did not have measures of actual neighborhood violence. However, prior data have indicated that poor, urban, African American mothers' ratings of their neighborhood quality correlate with actual crime rates.³⁹ Parents likely base their decisions on whether to send their children outside on their perception of neighborhood safety and not on statistics, which may account for a prior study⁴⁰ not showing an association of neighborhood crime statistics with overweight in preschoolers. We did not have data regarding physical activity measures or diet, which limits our ability to evaluate potential mechanisms of the association. Finally, as with many studies of this nature, the sample with complete data included in our analysis differs from the sample without complete data; therefore, our findings may not be generalizable to the reference population of the NICHD-SECCYD. Although we tested covariates that are predictors of missingness as potential covariates in the model and they did not alter the results, it remains possible that our results would have differed had complete data for the entire sample been available.

The independent effect of the neighborhood is challenging to study owing to difficulties in controlling for individual-level characteristics that may act as confound-

ers.⁴¹ Our data set does not include maternal weight; therefore, we were unable to control for this. However, we believe it is unlikely that maternal weight status is independently related to perception of neighborhood safety and therefore do not believe this would have acted as a significant confounder. We also did not have a measure of television viewing in our data set. An unsafe neighborhood may reduce outside activity, increase television viewing, and thereby increase the risk of overweight. However, amount of television viewing and overweight in young children has not been as strongly associated as it has been in older children.^{5,42} Therefore, it seems unlikely that inclusion of television viewing would have eliminated the relationship. In addition, studies of maternal obesity or child television viewing as risk factors did not include neighborhood safety as a covariate. Understanding the independent role of each of these variables will depend on a study that is able to include all of them in predicting child overweight.

SUMMARY

These data show a significant relationship between parental perception of an unsafe neighborhood and overweight at the age of 7 years even when many potentially confounding variables are controlled, including baseline BMI 3 years before the measures of interest. Many areas of policy development related to the built environment and neighborhood safety have not traditionally been considered relevant to child health. However, such policies may have important implications for childhood overweight. For the individual physician, these results suggest the need to understand the character of a child's neighborhood when making recommendations for lifestyle and activity changes aimed at obesity prevention and treatment.

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Correspondence: Julie C. Lumeng, MD, 300 North Ingalls Bldg, 10th Floor, University of Michigan, Ann Arbor, MI 48109-0406 (jlumeng@umich.edu).

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