A Child's View: Social and Physical Environmental Features Differentially Predict Parent and Child Perceived Neighborhood Safety

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ABSTRACT *Parent and child perceived neighborhood safety predicts child health outcomes such as sleep quality, asthma, physical activity, and psychological distress. Although previous studies identify environmental predictors of parent perceived safety, little is known about predictors of child perceived safety. This study aims to identify the social and physical environmental neighborhood features that predict child and parent perceived neighborhood safety and, simultaneously, to assess the association between child and parent perceptions. Data were from the QUebec Adipose and Lifestyle InvesTigation in Youth (QUALITY) cohort, an ongoing study of Caucasian children (aged 8–10 years) with a parental history of obesity, and their biological parents from Québec, Canada. Measures of social and physical neighborhood features were collected using a spatial data infrastructure and in-person audits. Structural equation modeling was used to test direct and indirect associations between neighborhood features, child and parent perceived safety. Results suggest that among children (N=494), trees and lighting were positively associated with perceived neighborhood safety, whereas a high proportion of visible minorities was associated with poorer perceived safety. Parents' perceptions of safety were more strongly tied to indicators of disorder and a lack of community involvement, and to traffic. Child perceived safety was partly explained by parent perceived safety, suggesting moderate concordance between perceptions. Although associated with each other, parent and child perceived safety seemed to be determined by distinct environmental features. Though this study focused on determinants of child and parent perceived safety, future research investigating the impact of neighborhood safety on child health should consider both child and parent perspectives.*

KEYWORDS *Québec, Socioecological model, Neighborhood, Safety, Parent, Child*

Socioecological models have been lauded as the preferred twenty-first century approach to public health.¹ A socioecological approach considers the complex and dynamic interactions between individuals and their physical and sociocultural surroundings.² These interactive models link neighborhood environments to poorer health through direct (e.g., exposure to toxic environments) and mediated risk exposures. This mediated component refers in part to the impact of environmental neighborhood features on health through *perceptions* of the environment.³ Even when adjusting for objectively measured environmental features, those who perceive

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their neighborhood less favorably (e.g., as less safe) experience poorer health compared to others who perceive their neighborhood more favorably.⁴ Factors other than environmental features contributing to neighborhood perceptions include individual socioeconomic position, ethnicity, sex, and age.^{5,6}

Perceptions of neighborhood safety are strongly associated with health outcomes. Among adults, feeling unsafe is associated with adopting poorer health habits (e.g., increases in sedentary behavior, decreased physical activity, and active transportation), and experiencing poorer mental (e.g., anxiety, deteriorated psychological well-being, and social withdrawal) and physical (e.g., poorer self-reported health, stress-related diseases, and chronic conditions) health.⁷⁻¹⁰ With respect to child health, parent perceived unsafety is associated with asthma,¹¹ sleep problems,¹² psychological distress,¹³ and weight-related behaviors (e.g., physical activity).¹⁴ Parents' perceptions of safety may influence child health by impacting the household environment and parenting decisions (e.g., restricting children's outdoor activities).¹⁵

Although theories of stress, coping, and resilience emphasize the importance of cognitive appraisals of stressors as an intervening factor shaping child health,¹⁶ research has too often bypassed children's own perceptions of neighborhood safety and focused exclusively on parents' perceptions.¹⁷ Parents may express greater concerns related to traffic and personal safety than children, although few studies have directly compared parent and child perceptions.¹⁷ Identifying predictors of child perceived safety is important in part because children develop a sense of self and of their preferences during pre-school years, with more complex awareness and autonomy emerging around age 7 years.^{18,19} Moreover, children's own perceptions of safety are associated with their health-related behaviors (e.g., physical activity) and outcomes (e.g., psychological distress).^{20,21}

While little research has investigated predictors of child perceived safety, research conducted among adults identifies many potential predictors such as traffic safety, disorder, and unfavorable neighborhood conditions. Injury due to traffic is an obvious concern for parents and for children when playing outside or crossing streets.¹⁷ Environmental features suggesting a lack of personal safety can also influence perceived neighborhood safety. Although counterintuitive, extensive reviews suggest no reliable direct link between crime rates and feeling unsafe.²² Public health and criminological research suggests that personal safety is most often inferred from features signaling a breakdown of "healthy" community features such as social control, cohesion, and order.^{8,23} For adults, these include physical signs of disorder (e.g., litter, vacant and dilapidated homes and lots, and graffiti), in part, because of their effects on perceptions of social control (i.e., the ability of informal and formal agents, such as residents and police officers, to exert control over the neighborhood) and actual social behavior in the community (e.g., use of public spaces).²⁴

Adults' perceptions of safety are also tied to factors contributing to the use of public space, such as features supporting natural surveillance (e.g., residential density and land use) and walkability (e.g., well-lit areas, trees, and public green spaces).⁷ Natural surveillance encompasses the concepts of "eyes-on-the-street" (e.g., based on the use of public space) and eyes-from-the-street (e.g., based on the presence of clear sight lines from the street). However, neighborhood features associated with high usage, such as traffic and the presence of businesses, can also lead to increased noise levels and in turn to poorer child health and well-being (e.g., elevated blood pressure, and self-reported stress).²⁵

Indicators of neighborhood stratification (e.g., poverty and ethnic composition) additionally contribute to inferences of safety due to implicit biases linking disadvantage to disorder and a lack of safety.^{6,26} Social structural characteristics such as the

proportion of lone-parent households, income level, perceived neighborhood collective efficacy (i.e., the ability of residents to work together to solve problems) and perceived trust, can also shape perceived safety in part by contributing to a lack of actual and perceived social capital or collective community involvement, and cohesiveness.^{23,27,28} Still, it remains unclear if these dimensions of structural characteristics or neighborhood quality are important for children or how such information is processed when forming their impressions.²⁹

This study addresses an important gap in the literature which has yet to address the environmental predictors of child perceived neighborhood safety or to jointly examine parent and child perceived safety. Furthermore, the study considers predictors of child perceived safety among a vulnerable population. Specifically, the study draws from a sample of children with a parental history of obesity. These children were in poorer health and were more likely to be overweight or obese than the general population.³⁰ Though a more restricted population, overweight and obese youth represent a significant proportion (approximately 30 %) of Canadian youth.³¹ Because parent and child perceptions of neighborhood safety have been linked to child obesity risk factors,^{14,21} this study provides a unique opportunity to investigate determinants of perceptions of safety in a vulnerable population.

The main hypothesis is that children's perceptions of safety are directly associated with environmental features indicative of traffic and personal safety. A second hypothesis is that environmental features are also *indirectly* associated with child perceived safety, by virtue of their influence on parent perceived safety. We used structural equation modeling to simultaneously estimate the hypothesized direct and indirect associations between environmental neighborhood features and child and parent perceived safety.

METHODS

Data

The Quebec Adipose and Lifestyle Investigation in Youth (QUALITY) studies the natural history of the development of childhood obesity and its metabolic and cardiovascular consequences in a cohort of 630 children and both biological parents living in Québec, Canada. Details on cohort eligibility and selection have been published elsewhere.³⁰ Briefly, families were recruited using a school-based sampling strategy. To be recruited, children had to be Caucasian, aged 8–10 years, and have at least one obese biological parent. By design, the QUALITY cohort emphasizes internal validity and therefore may not be representative of the general population of Québec families with children aged 8–10 years. Compared to the general population, QUALITY participants were more likely to be obese and were more affluent.³⁰ Nevertheless, the sample included a wide range of neighborhoods based on indicators of socioeconomic status, residential density, and availability of resources.

At an in-clinic visit, together both biological parents completed a self-administered questionnaire, while the children's questionnaire was interviewer-administered. Data were collected between September 2005 and December 2008. Written informed consent was obtained from parents, and assent was provided by children. This study received approval from the Ethics Board of the CHU Sainte-Justine University Hospital Center. This study is cross-sectional and considers families living within the Greater Montreal

Area (GMA) ($N=512$), for whom neighborhood data were available and with complete data on variables of interest, representing a final sample of 494 families.

Outcome and Mediating Variables

Child Perceived Safety. Children's perceived neighborhood safety was measured by taking the mean of their responses to the statements "There is no danger walking around or cycling alone in my neighborhood [during the day]," and separately, "[at night]" (1=completely agree, 2=somewhat agree, 3=somewhat disagree, 4=completely disagree). These variables correlated positively ($r=0.54$, $p\leq 0.001$). Measures of perceived safety to walk in one's neighborhood are best conceptualized as a global measure of feelings of safety.³² This measure is therefore taken to represent children's global feeling of neighborhood safety (i.e., potentially representing both traffic and personal safety concerns).

Parent Perceived Safety. Parents' perceived neighborhood safety and attractiveness was assessed in three items, based on agreement that the neighborhood "is at high risk for crime," "is attractive," and that "kids can play outside without danger" (1=very true, 5=not at all true). Similar measures have been used to reflect adult perceived safety in previous research.³³ The current analysis used each item as an observed indicator (manifest variable) of a latent variable representing perceived safety. Each item loaded significantly on the factor ($ps\leq 0.001$).

Parent Perceived Neighborhood Collective Efficacy. Parents' perceived neighborhood collective efficacy and trust was measured based on agreement that "When there is a problem, neighbors come together to solve it," "In our area, some adults are role models," "People in this area are ready to help neighbors," and "We can trust adults in this area to make sure children are safe" (1=completely agree, 2=agree, 3=disagree, 4=completely disagree). A latent variable was estimated to represent perceived neighborhood collective efficacy and trust. Each item loaded significantly on the factor ($ps\leq 0.001$).

All variables reflecting perceptions were re-coded so that high values were more favorable (e.g., reflect greater perceived safety).

Neighborhood Features

Neighborhood features were measured by adopting an ego-centered approach that considers the environment surrounding the family residence. Ego-centered neighborhoods can be constructed using a road network buffer (i.e., the walking or driving route surrounding the residence) or a circular buffer (i.e., a circular shape in which the residence is the center point). A road network buffer may be preferable for specific walking or driving-related outcomes (e.g., active transportation).³⁴ However, individuals can be aware of a much broader area surrounding their household than the immediate road network, and these broader exposure areas may be important in explaining perceptions and experiences.³⁵ Therefore, this study used a 1-km circular buffer for variables obtained from a spatial data infrastructure and a 500-m walking network for in-person neighborhood audits.

Information on the social and physical environment was obtained through the Montreal Epidemiological and Geographical Analysis of Population Health Outcomes and Neighborhood Effects (MEGAPHONE) spatial data infrastructure. For each measure, population-weighted proportions or averages of dissemination areas overlapping a 1-km circular buffer centered on family's residential location were computed.

Data were from validated sources collected in 2006 (e.g., Census Canada and Statistics Canada). Measures included the following: level of *traffic* (i.e., total length of streets with a high level of traffic during peak travel times [meters/1,000]), *residential density* (i.e., number of residential housing units per square hectare), proportion of *visible minorities* (i.e., persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in color), *single-parent families* and *low-income households* (i.e., income before taxes that was below the Canadian low-income threshold). *Land use mix* (i.e., variety with respect to use of space for residential, commercial or business purposes) was based on an entropy equation with scores ranging from 0 (homogeneity in land use) to 1 (heterogeneity, i.e., the developed area is evenly distributed among different land use categories).³⁶

For the in-person audits, one of five independent pairs of trained observers audited the ten street segments surrounding the family residence (i.e., the street segment where the residence is localized and up to nine first- and second-degree connecting streets) to record features of the physical microenvironment using an adapted version of an existing neighborhood assessment tool.³⁷ Observers received training over 9 days (e.g., reading a detailed procedure manual, a full-day group lab training with photo illustrations, and test-site training with an expert trainer). Measures of the neighborhood were obtained based on consensus between the pair of observers. Though infrequent, discordant ratings were settled by obtaining consensus with a third observer or, in limited cases, by using Google Street View (more details on the procedure have been published elsewhere).³⁸ The amount of *graffiti*, *trees*, *garbage*, how *well-lit* the area was, how *well-maintained buildings* were, and the *number of corner stores* was assessed for each street segment using a dummy variable or ordinal scale to quantify or describe features of the environment (e.g., amount of graffiti, 1=almost none or none, 2=a little, 3=a lot). Next, ratings for the ten street segments were combined into one variable (e.g., total proportion of graffiti surrounding the residence). Due to skewness, the variables were split into two to four dummy variables to reflect the average physical environment in the ten street segments surrounding families' residence (e.g., low, medium, or high level of graffiti).

Covariates

Covariates included child age, sex, and family income level (i.e., total household income in Canadian dollars for the last completed fiscal year, before taxes and deductions; 1=less than 10,000; 2=10,000 to 14,999; 3=15,000 to 19,999; 4=20,000 to 29,999; 5=30,000 to 39,999; 6=40,000 to 49,999; 7=50,000 to 59,999; 8=60,000 to 79,999; 9=80,000 to 99,999; 10=100,000 to 119,999; 11=120,000 to 139,999; 12=140,000 and more).

Statistical Analysis

We used structural equation modeling (SEM) (in MPLUS 5.1) to estimate the direct and indirect associations between neighborhood features and child and parent perceived safety (see Fig. 1 for a conceptual model). The measurement model included latent variables for parent perceived safety and collective efficacy. Child perceived safety and all neighborhood measures were included as manifest variables. The structural model included the following: (i) direct paths from each neighborhood feature to child and parent perceptions; (ii) a direct path from parent perceived collective efficacy to parent perceived safety; and (iii) direct paths from parent perceptions to child perceived safety. The SEM took into account correlations between neighborhood features when estimating regression parameters. The SEM adjusted for the effects of child sex and age on child perceptions and of family

FIG. 1 Conceptual model linking environmental neighborhood features to parent and child perceived safety.

income on parent and child perceptions. The β coefficients indicate the strength of relationships, adjusting for other paths in the model.

RESULTS

Descriptive Statistics of the Studied Sample

Children in this cohort ranked their neighborhood in the middle of the scale with respect to feeling safe ($M=2.52$, $SD=0.91$). Although a range of family incomes were represented, the sample’s median household income (\$80,000–\$99,000 CAD dollars) was higher than the median Québec family income in 2008 (\$63,830 CAD dollars). Families were dispersed within the GMA (see Fig. 2), although neighborhood buffers showed some overlap (% of buffer zone overlapped by one or more other buffers—1-km circular buffers: median=78 %, $SD=31.66$ %, interquartile range (IQR) 45.67 %; 500-m network buffers: median=0.57 %, $SD=31.33$ %, IQR 40.17 %). Families lived in neighborhoods showing diversity in terms of social and physical features (see descriptive statistics in Table 1). Observed associations suggested concordance between data obtained from the spatial data infrastructure and data collected through neighborhood audits (see Table 2). For instance, a census-based measure of the proportion of low-income households was associated with greater indicators of disorder observed in-person (e.g., less well-maintained buildings and more graffiti and litter).

SEM Fit Statistics

The estimated SEM had a good fit with the observed data ($N=494$, $\chi^2=231.24$, $df=167$, $\chi^2/df=1.38$, $p\leq0.001$, $CFI=0.99$, $RMSEA=0.03$).

FIG. 2 Image depicting the distribution of families across the GMA, with 1-km circular buffers surrounding family residences.

Direct and Indirect Associations between Neighborhood Features and Child Perceived Safety

Children whose parents perceived their neighborhood as safe also tended to perceive their neighborhood as being safe (see Table 3). Child perceived safety was also indirectly associated with parent perceived collective efficacy, through parent perceived safety (indirect effect $b=0.12$, 95 % confidence interval (CI) 0.03 to 0.20). Children perceived their neighborhood as being less safe when there was a high proportion of visible minorities living in their neighborhood and safer when there was more street lighting and more trees. Older children reported perceiving more safety than younger children. Girls reported perceiving less safety than boys. Family income was indirectly associated with children's perceptions of safety (indirect effect $b=0.01$, 95 % CI 0.01 to 0.02). Specifically, parents with a lower household income level tended to perceive lower levels of collective efficacy, and therefore less safety, and in turn so did their children. Parents' perceived safety, features of the social and physical environment, children's age, and sex accounted for 14 % of the variance in children's perceptions of safety.

Direct Associations between Neighborhood Features and Parent Perceived Safety

Parents' perceived lack of safety was more strongly associated with social neighborhood features such as a high proportion of single-parent families and their own perceptions of collective efficacy and trust. Physical features of the neighborhood contributing to parents' perceived lack of safety included the presence of

TABLE 1 Descriptive statistics for neighborhood features

	Number	Percent	Min	Max	Mean	SD
Physical features						
Trees—low proportion	95	19.2				
Trees—medium proportion	165	33.4				
Trees—high proportion	234	47.4				
Graffiti—low proportion	389	78.7				
Graffiti—medium proportion	91	18.4				
Graffiti—high proportion	14	2.8				
Garbage—low proportion	424	85.8				
Garbage—high proportion	70	14.2				
Well-lit—low proportion	23	4.7				
Well-lit—low medium proportion	23	4.7				
Well-lit—medium proportion	78	15.8				
Well-lit—high proportion	370	74.8				
Corner stores—low proportion	384	77.7				
Corner stores—medium proportion	71	14.4				
Corner stores—high proportion	39	7.9				
Buildings well-maintained—low proportion	81	16.4				
Buildings well-maintained—medium proportion	88	17.8				
Buildings well-maintained—high proportion	325	65.8				
Land use mix	494		0.00	0.87	0.51	0.14
Residential density	494		0.17	67.12	13.28	14.60
Rush hour traffic	494		0	9259	675.79	1349.44
Social features						
Proportion—single-parent families	494		4.94	34.19	16.37	5.40
Proportion—low-income households	494		0.10	39.97	7.92	5.81
Visible minorities—low proportion	131	26.5				
Visible minorities—medium proportion	200	40.5				
Visible minorities—high proportion	163	33				

graffiti, poorly maintained buildings, and traffic. Parents with higher household incomes perceived their neighborhood as being safer. Features of the social and physical environment and income level accounted for 60 % of the variance in parents’ perceptions of safety.

Sensitivity Analyses

In separate analyses, parental BMI was considered as an additional predictor of parent and child perceptions, given reported associations between poorer health and neighborhood perceptions.^{8,39} Additional covariates of parent perceptions, including child age and sex, parental age, and education, were also considered. None of these covariates helped further explain parent or child perceptions and were therefore not retained. Finally, non-recursive models in which child perceptions

TABLE 2 Bivariate associations between neighborhood features

	Land use mix	Residential density	Rush hour traffic	Single-parent families	Low-income households	Visible minorities
In-person audit measures ^a						
Trees	0.08*	0.16***	0.03	0.10**	0.16***	0.15***
Graffiti	0.26***	0.38***	0.10*	0.33***	0.39***	0.35***
Garbage	0.20***	0.24***	-0.04	0.24***	0.27***	0.23***
Well-lit	0.18***	0.28***	0.14***	0.21***	0.20***	0.31***
Corner stores	0.26***	0.31***	0.01	0.30***	0.31***	0.19***
Buildings well-maintained	-0.30***	-0.33***	-0.02	-0.40***	-0.42***	-0.19***
Spatial data infrastructure measures ^b						
Land use mix		0.32***	0.07*	0.32***	0.31***	0.21***
Residential density			0.11***	0.51***	0.49***	0.45***
Rush hour traffic				0.09**	0.09**	0.16***
Single-parent families					0.53***	0.27***
Low-income households						0.42***

^aDummy variables were combined to create ordinal variables used to estimate Kendall's tau

^bMeasure of association is Pearson's correlation

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

were also allowed to predict parental perceptions, and in which parent perceived safety was allowed to predict perceived collective efficacy, were considered. These pathways were not statistically significant and did not improve the model fit, and were therefore also not retained.

DISCUSSION

Perceived neighborhood safety represents an important predictor of child health. Although children have reported concerns about personal and traffic safety,¹⁷ no other studies considered a comprehensive set of social and physical environment predictors of children's overall perceived safety. Furthermore, this study is the first to consider direct and indirect associations between environmental neighborhood features, parent perceived safety, and child perceived safety among a sample of vulnerable children.

Our results suggest that parent and child perceived safety, though associated with each other, are predicted by different aspects of the neighborhood. Children draw inferences of safety from basic social and physical cues such as the number of trees, amount of lighting, and the proportion of visible minorities. In her seminal work on urban development, Jacobs (1961) noted the importance of green spaces for the physical and mental development of children,⁴⁰ while the presence of trees is associated with greater perceived safety among adults.⁴¹ On the other hand, darkness is a common fear for children.⁴² The finding that children, but not parents, perceive less safety when there is a high proportion of visible minorities living in their neighborhood may reflect an overall fear of "otherness," which peaks around age 8 years.⁴³ In Canada, a high proportion of visible minorities can also signal

TABLE 3 Regression coefficients (95 % CI) for structural equation model predicting child and parent perceived neighborhood safety

	Child perceived safety		Parent perceived safety		Parent perceived collective efficacy	
Social perceptions						
Child perceived safety	—		—		—	
Parent perceived safety	0.56	(0.18 to 0.97)	—		—	
Parent perceived collective efficacy	−0.04	(−0.16 to 0.08)	0.20	(0.15 to 0.26)	—	
Neighborhood—social features						
Visible minorities—medium (vs. low)	−0.04	(−0.24 to 0.16)	−0.03	(−0.12 to 0.07)	0.01	(−0.20 to 0.22)
Visible minorities—high (vs. low)	−0.31	(−0.59 to −0.03)	−0.08	(−0.20 to 0.03)	−0.02	(−0.30 to 0.26)
Low-income households	0.01	(−0.02 to 0.04)	−0.01	(−0.02 to 0.01)	−0.02	(−0.05 to 0.01)
Single-parent families	0.01	(−0.02 to 0.03)	−0.01	(−0.02 to −0.00)	−0.02	(−0.04 to 0.00)
Neighborhood—physical features						
Trees—low (vs. medium)	0.11	(−0.11 to 0.33)	0.02	(−0.08 to 0.13)	0.01	(−0.23 to 0.25)
Trees—high (vs. medium)	0.19	(0.00 to 0.38)	0.01	(−0.07 to 0.09)	0.11	(−0.08 to 0.30)
Graffiti—medium (vs. low)	0.19	(−0.07 to 0.44)	−0.11	(−0.20 to −0.01)	−0.01	(−0.27 to 0.25)
Graffiti—high (vs. low)	0.39	(−0.23 to 1.00)	0.05	(−0.19 to 0.28)	0.56	(0.04 to 1.08)
Garbage—high (vs. low)	0.19	(−0.08 to 0.45)	−0.04	(−0.15 to 0.07)	−0.32	(−0.58 to −0.06)
Well-lit—low (vs. medium)	−0.12	(−0.54 to 0.29)	−0.02	(−0.20 to 0.17)	−0.10	(−0.56 to 0.37)
Well-lit—low medium (vs. medium)	−0.45	(−0.87 to −0.04)	0.01	(−0.18 to 0.19)	0.16	(−0.27 to 0.60)
Well-lit—high (vs. medium)	−0.07	(−0.30 to 0.15)	0.10	(−0.02 to 0.21)	−0.14	(−0.38 to 0.09)
Buildings well-maintained—low (vs. medium)	−0.09	(−0.40 to 0.22)	−0.09	(−0.21 to 0.03)	−0.07	(−0.37 to 0.23)
Buildings well-maintained—high (vs. medium)	−0.03	(−0.26 to 0.20)	0.11	(0.01 to 0.20)	−0.08	(−0.33 to 0.16)
Corner stores—low (vs. medium)	−0.16	(−0.40 to 0.08)	0.07	(−0.02 to 0.16)	0.15	(−0.09 to 0.38)
Corner stores—high (vs. medium)	−0.11	(−0.52 to 0.31)	0.05	(−0.10 to 0.19)	0.21	(−0.20 to 0.61)
Rush hour traffic	0.01	(−0.05 to 0.07)	−0.03	(−0.06 to −0.00)	0.02	(−0.04 to 0.09)
Land use mix	0.27	(−0.442 to 0.95)	−0.16	(−0.46 to 0.14)	−0.30	(−0.97 to 0.38)
Residential density	−0.01	(−0.02 to 0.01)	0.00	(−0.00 to 0.01)	0.00	(−0.01 to 0.01)
Demographics						
Child age	0.18	(0.09 to 0.27)	—		—	
Girl (vs. boy)	−0.21	(−0.36 to −0.05)	—		—	
Household income	0.04	(0.00 to 0.07)	0.02	(0.00 to 0.03)	0.07	(0.03 to 0.11)
R square	0.14		0.60		0.17	

Bolded coefficients are significant at the p < 0.05 level

transitional and less stable neighborhood environments, which could lead to higher levels of disorganization and isolation⁴⁴ and potentially less felt safety.

The association between child and parent perceived safety may be due to parents actively shaping their child's perceptions (e.g., telling them it is not safe to play outside). Alternatively, children and their parents may experience similar levels of fear and react similarly to shared environments. Either way, the results identify neighborhood features that could come to influence child perceived safety through or along with parents' perceptions. In line with previous research, parents' perceptions of safety appear to be more strongly tied to social and physical cues suggesting disorder and a lack of community involvement, such as graffiti, poor upkeep of buildings, and low perceived collective efficacy and trust.²³ Because child perceived safety was not directly associated with these features, the findings may suggest that children are either less attentive to these features or have yet to draw links between these features and their own safety. Parents'—but not children's—perceptions of safety were also associated with neighborhood traffic, providing further evidence that parent perceived safety may reflect different safety concerns than child perceived safety.¹⁷

Families with lower income levels are more likely to live in neighborhoods with more psychosocial stressors and features signaling a lack of safety.^{45,46} Yet, the present results suggest that even after adjusting for environmental features, parents with lower income levels perceived less neighborhood safety. Adults living in poverty may suffer from a perceived vulnerability (e.g., worrying about falling ill, losing a job, or becoming a victim of crime), leading them to feel less safe than their better-off neighbors.⁴⁷ The link between family income level and perceived safety therefore represents an additional indirect risk for child perceived safety, health, and well-being.

Strengths of our study include the measurement of parent and child reports of perceived safety and the use of neighborhood measures obtained from a spatial data infrastructure and from in-person audits. However, because the neighborhood measures covered two different spatial configurations (i.e., a ~500-m walking network and a 1-km circular buffer), the more limited boundary may have precluded identifying relevant exposures that could have been captured with larger boundaries, and an underestimation of “true” associations. This study also benefited from the use of structural equation modeling which allowed testing multiple pathways linking the environment to perceived safety. Although the cross-sectional nature of the study precludes drawing causal links between the observed variables, the hypothesized directional associations had a good fit with the observed data.

Although our sample provided the opportunity to observe environmental predictors of perceived safety among vulnerable children, the sample also induced certain limitations. First, the families were all Caucasian and were relatively more affluent than the average Québec family. Though there was substantial variation in neighborhood indicators of socioeconomic status and access to resources, the study included neighborhoods that were manifestly fairly advantaged (e.g., with low levels of graffiti and litter). The lack of consistent linear associations between neighborhood features and perceived safety may therefore be due to limited representations of more “disorderly” or “fear inducing” neighborhoods. For instance, while moderate levels of graffiti were associated with decreased parent perceived safety, the non-significant association with high levels of graffiti may be due to limited observations. Future research using a more representative sample is warranted.

There are two additional and complementary interpretations of these findings. First, the findings may also suggest contextual neighborhood effects, which can

change the meaning or relative importance of indicators of a lack of safety. Previous findings suggest that taking into account neighborhood poverty and ethnic composition can dramatically reduce the effects of indicators of physical and social disorder on adult perceived disorder.⁶ Though not considered in this study, interactions between social (e.g., urbanicity and neighborhood disadvantage) and physical (e.g., graffiti) features may further help explain perceptions of safety. This “contextual” interpretation could help explain why, for example, the association between low lighting and lesser child perceived safety was not consistent across levels of lighting. Alternatively, the findings may also suggest that indicators of a lack of safety can come into play only when they are “non-normative.” In this respect, children and their parents may only attribute disorder to an observed feature—and feel less safe—if it stands in contrast to their expectations or preferences.⁴⁸

Finally, the study included families in which at least one parent was obese and children who were more at risk of becoming obese. Because poorer health is associated with greater perceptions of neighborhood problems³⁹ and fear of crime,⁸ our sample may be particularly vulnerable to perceiving lesser neighborhood safety. Although the present study was not designed to consider the impact of indicators of health on parent and child perceptions, such associations should be considered in future research. Though the generalizability of the observed associations is unknown, our study identifies environmental features that may be targeted to improve child perceived safety among children at risk of obesity living in similar urban environments.

Parent and child perceived unsafety represent risks for child health. This study suggests that children's perceptions of safety could be improved by increasing the neighborhood level of greenery and lighting. Because of the link between parent and child perceived safety and parents' ability to shape their child's behaviors and health, improving parent perceived safety (e.g., by removing graffiti and garbage and reducing traffic flow) should also be part of strategies to improve child health and well-being. Future research addressing the association between neighborhood safety and child health should consider both parent and child perceptions of safety, as this study demonstrates that each are determined by distinct environmental features that could come to directly and indirectly affect child well-being.

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