Exploring the mediating roles of physical activity and television time on the relationship between the neighbourhood environment and childhood obesity

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ABSTRACT

OBJECTIVE: Understanding the mechanisms by which neighbourhood environments influence childhood obesity is needed to facilitate the development of prevention strategies. The objective of this cross-sectional study was to identify the distinct types of neighbourhoods in which Canadian children reside and examine the extent to which physical activity and sedentary behaviour mediate the relationship between neighbourhood type and childhood obesity.

METHODS: Baseline data from the National Longitudinal Survey of Children and Youth (1994/1995) were used for this study. Latent class analysis was used to group children (age 0–11; $N = 22,831$) into neighbourhood types based on perceived and census-derived measures of neighbourhood attributes. A path analysis was used to determine the extent to which levels of physical activity and sedentary behaviour mediated the relationship between the resulting neighbourhood types and obesity.

RESULTS: Five neighbourhood types were identified. Children living in the high safety-low deprivation neighbourhood type, which had the most supportive attributes with regard to physical activity, were significantly less likely to be obese than children living in the other neighbourhood types. Relative to the high safety-low deprivation neighbourhood, the relationship between neighbourhood type and obesity was partially mediated by physical activity and sedentary behaviour (7%–12% of total effect) among the other urban neighbourhoods, and no mediating effect was found in the rural neighbourhood.

CONCLUSIONS: Intervention strategies attempting to address the increased risk of obesity associated with neighbourhood environments should be tailored according to urban and rural setting and should consider taking a comprehensive approach aimed at improving a range of obesity-related behaviours.

KEY WORDS: Childhood obesity; physical activity; sedentary behaviour; neighbourhood; mediation

La traduction du résumé se trouve à la fin de l'article.

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Childhood obesity has become a serious public health issue in North America, its prevalence having risen rapidly over the past three decades.^{1,2} In recent years, a growing number of studies have examined the role of residential neighbourhood attributes in weight-related behaviours, such as the physical activity (PA) and sedentary behaviour (SB) of children.^{3–5} It has been hypothesized that changes to the neighbourhood environment to facilitate or promote PA, such as improving access to parks and recreational facilities,⁶ may represent viable interventions that contribute to reductions in obesity prevalence among children.⁷

The social-ecological model provides a conceptual framework linking the neighbourhood environment to obesity.^{8,9} Within this framework, weight-related behaviours, such as PA and SB, mediate the relationship between the neighbourhood environment and obesity.^{8,9} However, few studies have explicitly examined the extent to which PA and SB mediate the effect of neighbourhood environments, and those that have done so report finding no mediating effect. For example, using a range of objective and subjective PA and SB measures, Veitch et al. found no mediating effect on the relationship between the neighbourhood social environment and body mass index (BMI) in a cross-sectional and prospective sample of 8–15-year-old children.¹⁰ Similarly, a

cross-sectional study of 12–16-year-old African American adolescents that examined the relationship between perceived neighbourhood disorder and obesity found no mediating effect for PA.¹¹

Studies of the neighbourhood environment often examine only the independent effect of neighbourhood attributes on obesity, PA or SB. However, neighbourhood attributes coexist with each other, and together specific combinations of attributes may have a synergistic or antagonistic effect on health behaviour. For example, the effect of park density on PA may be influenced by the crime rate within the same neighbourhood. One approach to

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Figure 1. Mediation model tested in this study: a) direct effect (unadjusted by mediators); b) mediation model

studying the synergistic or antagonistic effect of neighbourhood attributes is to group neighbourhoods with similar patterns of attributes into neighbourhood classes or types using statistical methods, such as latent class analysis (LCA).^{12–15}

LCA is an analytical method that enables researchers to group neighbourhoods into latent classes such that neighbourhoods within each class are more alike in terms of their attributes than are neighbourhoods between classes. In contrast to looking at the independent effects of each neighbourhood's attributes, LCA enables researchers to identify groups of neighbourhoods with distinct characteristic profiles and to subsequently investigate how these groups differ in terms of their relationships with outcomes of interest (i.e., obesity). Wall et al. compared statistical approaches to analyzing the effects of neighbourhood characteristics on adolescent weight status and recommended LCA as a means of addressing this relationship because of the complex interdependence of individual neighbourhood attributes.¹⁵ Latent classes of neighbourhoods derived from profiles of neighbourhood characteristics may be a more appropriate measure to study the mediating effects of PA and SB on obesity.

The aim of this study was to examine the mediating role of PA and television (TV) time on the relationship between neighbourhood type and obesity in a nationally representative sample of Canadian children (Figure 1). Neighbourhood type was determined by latent class analysis using perceived and census-derived measures of neighbourhood characteristics known to be related to obesity. It was hypothesized that specific neighbourhood types would be associated with risk of obesity, and that PA and TV time would partially mediate this relationship.

METHODS

Sample

Baseline data from the National Longitudinal Survey of Children and Youth (NLSCY)¹⁶ were used for this study. The survey, conducted by Statistics Canada, collected information on children biennially starting in 1994/1995. The baseline data were used, because subsequent cycles had fewer questions about the neighbourhood environment. The baseline sample consisted of children aged 0–11 from the 10 provinces of Canada. Trained interviewers conducted the survey in person at the home of the

children. The person most knowledgeable (PMK) about the child, typically the mother, responded to the survey questions. In addition to administering the parent survey, interviewers completed a short questionnaire about the respondent's neighbourhood environment. This cross-sectional study included the baseline responses relating to all children who participated in the survey ($N = 22,831$).

Neighbourhood measures

Neighbourhood attributes were selected on the basis of their previous associations with obesity. Measures included responses to items from the NLSCY, living location (assigned by Statistics Canada), and material and social deprivation (linked by postal code using the 1996 Postal Code Conversion File). As LCA is best suited for categorical data,¹⁷ all neighbourhood items were categorized or dichotomized. The wording of the individual items can be found in Table 1.

Neighbourhood safety (two items): Respondents were asked to indicate on a four-point scale (strongly agree to strongly disagree) how they would rate statements about the safety of their neighbourhood. Responses were dichotomized to agree and disagree.

Neighbourhood social cohesion (five items): Respondents were asked to indicate on a four-point scale (strongly agree to strongly disagree) how they would rate statements about the cohesion of their neighbourhood. Responses were dichotomized to agree and disagree.

Neighbourhood disorder (five items): Respondents were asked to indicate the presence of five specific problems in the neighbourhood (a big problem; somewhat of a problem; no problem). Responses were dichotomized to no problem and a problem.

Access to parks and play spaces (one item): Respondents were asked to indicate on a four-point scale (strongly agree to strongly disagree) how they would rate the parks and playgrounds in the neighbourhood. Responses were dichotomized to agree and disagree.

Traffic (one item): Interviewers were asked to rate the volume of traffic on the street (very light; light; moderate; heavy; and very heavy). Responses were dichotomized to light and moderate to heavy.

Neighbourhood aesthetics (one item): Interviewers were asked to rate the general condition of most of the buildings on the block or within 100 yards of the respondent's house (badly deteriorated; poor condition with peeling paint and need of repair; fair condition; and well-kept with good repair and exterior surface). Responses were dichotomized to well-kept condition and fair to poor condition.

Living location: Respondents were assigned into urban and rural categories according to the type and population size of the municipality they resided in. Responses were recoded into three categories (urban $\geq 100,000$, semi-urban 15,000–99,999 and rural $< 15,000$).

Table 1. Item response probabilities from latent class analysis ($N = 22,831$)

Neighbourhood attribute	Item	Probability				
		Class 1 ($n = 8560$; 25.4%)	Class 2 ($n = 1167$; 6.0%)	Class 3 ($n = 2393$; 11.4%)	Class 4 ($n = 6701$; 38.2%)	Class 5 ($n = 4010$; 19.1%)
Safety	It is safe to walk alone in this neighbourhood after dark.	0.93	0.30	0.70	0.86	0.58
Safety	It is safe for children to play outside during the day.	0.99	0.48	0.83	0.95	0.78
Cohesion	Neighbours deal with problems together.	0.85	0.12	0.16	0.90	0.76
Cohesion	There are adults that children can look up to.	0.97	0.29	0.46	0.97	0.92
Cohesion	People are willing to help their neighbours.	0.99	0.31	0.57	1.00	0.99
Cohesion	Adults watch out that children are safe.	0.99	0.20	0.57	0.99	0.92
Cohesion	If I'm away, my neighbours will keep their eyes open for possible trouble.	0.99	0.32	0.64	0.98	0.95
Parks and play spaces	There are good parks and play spaces.	0.69	0.55	0.71	0.90	0.82
Disorder	Presence of litter, broken glass or garbage in the street or sidewalk	0.12	0.78	0.18	0.08	0.54
Disorder	Presence of people selling or using drugs	0.04	0.60	0.05	0.02	0.40
Disorder	Presence of alcoholics and excessive drinking in public	0.04	0.61	0.07	0.01	0.38
Disorder	Presence of groups of young people who cause trouble	0.08	0.80	0.22	0.14	0.63
Disorder	Presence of burglary of homes and apartments	0.17	0.58	0.26	0.41	0.65
Traffic	Moderate to heavy traffic on the street	0.25	0.63	0.36	0.14	0.47
Aesthetics	Buildings in neighbourhood in well-kept condition	0.66	0.20	0.60	0.90	0.46
Living location	Living location					
	Rural ($< 15,000$)	0.67	0.08	0.20	0.07	0.22
	Semi-urban (15,000–99,999)	0.11	0.15	0.12	0.11	0.10
	Urban ($> 100,000$)	0.22	0.77	0.68	0.83	0.68
Material deprivation	Material deprivation					
	Low	0.08	0.12	0.29	0.59	0.19
	Medium	0.34	0.23	0.34	0.35	0.39
	High	0.58	0.65	0.37	0.06	0.42
Social deprivation	Social deprivation					
	Low	0.49	0.09	0.24	0.42	0.27
	Medium	0.32	0.17	0.33	0.38	0.24
	High	0.18	0.74	0.43	0.20	0.49

Material and social deprivation: Material and social deprivation indices were linked to each respondent's enumeration area.¹⁸ Both material and social deprivation were recoded to tertiles representing low, medium and high deprivation.

Socio-economic measures

Three measures of socio-economic status were included in the study: income adequacy, paternal education and maternal education. Income adequacy was derived by Statistics Canada and combines both household size and household income into five categories of income adequacy: lowest, lower middle, middle, upper middle and highest.

Obesity and weight-related behaviours

Obesity: Body mass index (BMI), defined as weight divided by height squared (kg/m^2), was calculated from parent-reported height and weight for all children. Biologically implausible measurements were flagged, using a Stata macro developed by the World Health Organization (WHO),¹⁹ and were removed from the analysis. Overweight and obese were defined according to the WHO criteria as BMI z score > 1 and > 2 respectively.²⁰

Physical activity: The PMKs of children aged 4 and up were asked two questions about the children's PA in the previous 12 months: 1) "How often has he/she taken part in organized sports which involve coaching or instruction?" and 2) "How often has he/she taken part in unorganized sports or physical activities?" There were five response options for both questions: most days; a few times a week; about once a week; about once a month; and almost never.

TV time: The PMKs of children aged 4 and up were asked two questions: 1) "On average, how many days a week did your child watch TV" and 2) "On those days, how many hours of TV did they watch". The responses were multiplied to create a variable indicating the number of hours per week the child watched TV.

Analysis

All analyses were weighted, using cross-sectional weights derived by Statistics Canada, to reflect population estimates of children in 1994–1995. Prior to weighting, weights were standardized by dividing each weight by the average of all weights. LCA was used to identify a set of distinct neighbourhood types derived from responses to the previously described set of 18 neighbourhood items (Table 1). The optimal solution was determined using the Lo-Mendell-Rubin likelihood ratio test and the Bayesian Information

Criterion.²¹ Individuals were assigned to the neighbourhood type to which they had the highest probability of belonging. Summary statistics of socio-economic status, obesity, PA and TV time were calculated for each of the neighbourhood classes. For analyses involving PA and TV time, the sample was restricted to children aged 5 and older, as PA and TV viewing guidelines are the same for children aged 5–11.²² A path analysis was used to determine the extent to which levels of PA and TV time mediated the relationship between neighbourhood class and obesity (Figure 1). Neighbourhood classes were dummy-coded with the largest class used as a reference group.²³ To account for the multiple tests due to the categorical nature of the independent variable, a p value of 0.01 was used for statistical significance for the path analysis.²³ To reduce model parameters, measures of PA frequency were dichotomized to once a week or more and less than once a week for the path analysis. Evidence of mediation was determined if at least one indirect pathway from the neighbourhood indicators to obesity was significant.²³ Unstandardized results were presented for interpretability. Stata v.10.1 (StataCorp, College Station, TX) was used to process the data and obtain frequencies and means, and Mplus v.5.2 (Muthén & Muthén, Los Angeles, CA) was used to conduct the LCA and mediation analysis. More details of the LCA and mediation analysis, including the missingness of the data, can be found in the supplementary document (Supplemental Methods) (see ARTICLE TOOLS section on the journal site).

RESULTS

Participants were equally distributed across age (mean 5.5 years [SD 3.4]) and sex (48.7% female). Almost all children were born in Canada (96.0%), and 90.2% were parent-described as White/European. Overweight and obese children made up 20.4% and 21.1% of the sample respectively.

Latent class analysis

The five-class solution was chosen as the best fitting model for the data (Supplementary Table 1). Item-response probabilities for endorsing each neighbourhood characteristic across the five latent classes are displayed in Table 1.

Description of latent classes

Summaries of each class and known relationships with obesity or weight-related behaviours are displayed in Table 2. Class 4 had the greatest number of healthy neighbourhood attributes, and class 2

Table 2. Summarized characteristics of neighbourhood classes and known relationships with obesity or weight-related behaviours*

Neighbourhood attribute	Class 1	Class 2	Class 3	Class 4	Class 5
Safety	High (+)	Low-Mid (–/0)	High (+)	High (+)	Mid-High (0/+)
Cohesion	High (+)	Low (–)	Low-Mid (–/0)	High (+)	High (+)
Parks and play spaces	High (+)	Mid (0)	High (+)	High (+)	High (+)
Disorder	Low (+)	Mid-High (0/–)	Low (+)	Low-Mid (+/0)	Mid (0)
Traffic	Low (+)	Mid (0)	Mid (0)	Low (+)	Mid (0)
Aesthetics	Mid (0)	Low (–)	Mid (0)	High (+)	Mid (0)
Living location	Rural (–)	Urban (+)	Urban (+)	Urban (+)	Urban (+)
Material deprivation	High (–)	High (–)	High (–)	Low (+)	High (–)
Social deprivation	Low (+)	High (–)	High (–)	Low (+)	High (–)

* High/mid/low defined by corresponding item response probability tertiles. For three category items, the highest probability was used to describe the class. The +/0/– symbols in brackets represent healthy/neutral/unhealthy effects of the attribute on obesity or weight-related behaviours found in past studies.

Table 3. Socio-economic status, weight status and obesogenic behaviours by class membership (%)*

	Class 1 (high rural-high safety)	Class 2 (low safety-low cohesion)	Class 3 (low disorder-high deprivation)	Class 4 (high safety-low deprivation)	Class 5 (high cohesion-high deprivation)	p-value
<i>Socio-economic status</i>						
Income adequacy						
Lowest	3.1	7.6	4.2	1.2	2.6	<0.001
Lower middle	16.6	36.5	20.8	6.7	22.8	
Middle	38.2	33.3	38.2	24.9	31.4	
Upper middle	33.5	19.5	26.7	42.5	31.8	
Highest	8.7	3.2	10.2	24.7	11.4	
Maternal education						
No mother	1.2	2.1	1.7	0.8	1.0	<0.001
Less than high school	19.6	33.7	21.5	8.3	18.4	
High school	22.2	16.6	15.7	17.4	16.6	
Beyond high school	26.7	25.7	28.0	27.0	30.6	
College/university degree	30.3	21.9	33.1	46.5	33.4	
Paternal education						
No father	11.3	35.8	21.0	9.0	18.3	<0.001
Less than high school	20.5	17.9	16.4	7.6	15.1	
High school	19.1	10.6	10.5	13.5	14.1	
Beyond high school	19.4	15.3	19.9	20.4	23.2	
College/university degree	29.7	20.5	32.1	49.5	29.4	
Weight status						
Normal weight	56.4	50.2	58.2	61.9	56.8	<0.001
Overweight	21.6	18.8	19.1	19.8	21.4	
Obese	22.1	31.0	22.7	18.3	21.8	
Organized PA [†]						
Most days	3.7	2.5	2.8	5.3	3.6	<0.001
A few times a week	29.4	17.9	23.5	35.5	28.5	
Once a week	21.8	17.5	24.7	26.0	22.1	
Once a month	3.6	3.4	3.3	4.6	4.5	
Almost never	41.5	58.8	45.7	28.6	41.2	
Unorganized PA [†]						
Most days	39.0	22.3	26.4	35.0	30.9	<0.001
A few times a week	26.3	21.1	22.0	29.3	27.2	
Once a week	14.2	19.7	20.9	17.0	16.2	
Once a month	5.3	11.4	6.3	5.5	6.9	
Almost never	15.2	25.6	24.4	13.1	18.9	
Mean TV time (SD) [†]	12.5 (0.16)	14.5 (0.48)	12.7 (0.33)	11.4 (0.17)	12.3 (0.24)	<0.001

* All descriptives were weighted using sampling weights.

[†] Results were restricted to children ≥5 years of age.

had the greatest number of unhealthy attributes. On the basis of the attribute pairings unique to each class, neighbourhoods were labeled as high rural-high safety (class 1); low safety-low cohesion (class 2), low disorder-high deprivation (class 3); high safety-low deprivation (class 4); and high cohesion-high deprivation (class 5). Table 3 displays the percentages and means of the neighbourhood classes by socio-economic status, obesity, PA and TV time measures.

Mediation analysis

Results from the mediation analysis are found in Table 4. The high safety-low deprivation (class 4) neighbourhood was used as the reference group. There were significant associations between each neighbourhood class and at least one mediator (path a) with relationships in the expected direction (less PA and more TV time compared with the reference group). Compared with children living in class 4 neighbourhoods, children living in class 1, 2, 3 and 5 neighbourhoods had a z score between 0.12 and 0.35 lower (5.9%–15.6% lower probability when covariates held at the mean) of participating in organized PA; children living in class 2, 3 and 5 neighbourhoods had a z score between 0.17 and 0.39 lower (3.6%–9.5% lower probability when covariates held at the mean) of participating in unorganized PA; and children living in class 1 and 2 neighbourhoods watched between 0.37 and 1.35 more hours of TV time. Unorganized PA was negatively associated and TV time

was positively associated with obesity (path b). In comparison with the reference neighbourhood, children living within the other neighbourhood classes were significantly more likely to be obese (path c; 0.143–0.249 higher z score or 3.3%–6.8% higher probability when covariates held at the mean). The direct paths between neighbourhood classes and obesity remained significant after adjustment for the mediators (path c'). The relative indirect pathway from neighbourhood class to obesity was significant for all neighbourhood classes except for the high rural-high safety (class 1) neighbourhood, indicating partial mediation. The proportion of the relative total effect mediated ranged from 6.6% to 12.3% among the neighbourhoods with significant relative indirect effects.

DISCUSSION

Using perceived and census-derived measures of neighbourhoods, we were able to classify children as living within one of five distinct types of neighbourhood classes. There were significant differences between neighbourhood classes and levels of organized and unorganized PA, TV time and obesity. For example, compared with the high safety-low deprivation neighbourhood, children living in the other neighbourhoods had a higher probability (3.3%–6.8% when covariates held at the mean) of being obese. A mediation analysis found that variation in PA and TV time accounted for 6.6%–12.3% of the relationship for three of the

Table 4. Bootstrap estimates and bias-corrected 95% confidence intervals of the path analysis between neighbourhood class and obesity. High safety-low deprivation neighbourhood (class 4) was the reference*

	Effect on organized PA (path a, X→M)	Effect on unorganized PA (path a, X→M)	Effect on TV time (path a, X→M)	Mediator effect on obesity (path b, M→Y)	Direct effect (unadjusted; path c, X→Y)	Direct effect (adjusted for mediator; path c', X→Y)	Indirect effect (X→M→Y)
Intercept/threshold	0.78 (0.61 to 0.94)	-0.54 (-0.72 to -0.37)	14.10 (13.30 to 15.06)		0.21 (0.02 to 0.44)	0.29 (0.09 to 0.48)	
High rural-high safety (class 1)	-0.12 (-0.18 to -0.06)	0.01 (-0.06 to 0.08)	0.37 (0.08 to 0.73)		0.14 (0.06 to 0.21)	0.14 (0.07 to 0.21)	0.00 (-0.01 to 0.01)
Low safety-low cohesion (class 2)	-0.35 (-0.47 to -0.24)	-0.39 (-0.50 to -0.28)	1.35 (0.71 to 1.96)		0.25 (0.11 to 0.38)	0.22 (0.09 to 0.35)	0.03 (0.01 to 0.05)
Low disorder-high deprivation (class 3)	-0.18 (-0.27 to -0.11)	-0.30 (-0.39 to -0.21)	0.39 (-0.04 to 0.83)		0.19 (0.09 to 0.28)	0.17 (0.07 to 0.26)	0.02 (0.01 to 0.04)
High cohesion-high deprivation (class 5)	-0.13 (-0.19 to -0.06)	-0.17 (-0.24 to -0.09)	0.21 (-0.17 to 0.57)	0.02 (-0.03 to 0.06)	0.17 (0.08 to 0.25)	0.16 (0.07 to 0.24)	0.01 (0.00 to 0.02)
Organized PA				-0.07 (-0.12 to -0.03)			
Unorganized PA				0.01 (0.00 to 0.01)			
TV time							

* Results were restricted to children ≥5 years of age. Bold indicates significance at $p < 0.01$.

neighbourhood classes but did not explain any of the relationship in the high rural-high safety neighbourhood.

By using LCA, we were able to examine the effect of distinct profiles of a relatively large set of neighbourhood attributes on obesity. Because of the potential synergistic or antagonistic effect of neighbourhood attributes and the correlation between attributes, methods such as multivariable regression would not be able to disentangle the independent effects of each characteristic on obesity or weight-related behaviours.¹⁵ However, studies using such methods are still common, which may in part explain the inconsistent findings in the literature on the relationship between built environment factors and obesity.^{4,24,25} For example, studies using latent methods have found associations between neighbourhood class and obesity when traditional analysis of individual environmental attributes did not reveal any association.^{26,27} The use of more advanced statistical methods to model the effect of the neighbourhood environments characterized by a comprehensive set of attributes may help to advance the field and elucidate the causal pathways leading to risk of obesity.²⁸

This is the first study to explicitly examine the extent to which PA and TV time mediate the relationship between neighbourhoods as a whole and obesity among children. Other studies have examined mediation among specific attributes of the neighbourhood environment (e.g., disorder, social cohesion, access to facilities) and weight status and found no mediating effect of PA or SB.^{10,11,29} The presence of mediation, albeit low, supports the need for neighbourhood interventions to act on PA and TV time. However, the low mediating effect also suggests that other unmeasured pathways exist, and further studies are needed to elucidate these pathways.

Relative to the high safety-low deprivation neighbourhood, no mediating effect was found among children living in high rural-high safety neighbourhoods. Children living in the latter neighbourhoods had lower levels of organized PA than children living in the former but similar levels of unorganized PA. The difference in organized PA between urban and rural neighbourhood types may be related to fewer PA facilities in rural communities.³⁰ The lack of mediating effects suggests that the environment may influence risk of obesity differently in urban and rural neighbourhoods. For example, rural children have been found to have a higher intake of fat and sweetened beverages than urban children;^{31,32} therefore, the effect of the neighbourhood on diet may play a larger role in rural areas. Research is needed to explore the mediating role of diet on the relationship between neighbourhood environment and risk of obesity.

The results from this study should be interpreted in light of several limitations. First, the study was cross-sectional; therefore, we cannot infer causal relationships. Second, the data used were from 1994 to 1995 and may not reflect current neighbourhood, PA, SB or obesity patterns. However, the purpose of the study was to examine the causal pathway between the neighbourhood environment and obesity, which would be less influenced by time. Third, the study did not account for exposure duration or self-selection bias. Fourth, measures of PA, TV time and BMI were parent-reported and are therefore subject to self-reported biases. Objective measures of activity using accelerometers and of BMI using calibrated scales should be used to validate these results. Fifth, although the included neighbourhood variables captured a

broad range of attributes that have been found to be associated with obesity or weight-related behaviours in previous studies, additional neighbourhood attributes not examined in this study may be important to include in future studies of obesogenic neighbourhoods (e.g., density of housing and recreational facilities). Sixth, dietary behaviours, a key risk factor of childhood weight status, were not measured in the NLSCY. The inclusion of dietary behaviours as an additional mediator may explain more of the relationship between neighbourhood class and obesity. Last, there were significant differences in the individual characteristics of respondents with missing and non-missing data. These individuals were more disadvantaged and likely to live in more deprived neighbourhoods; therefore, results would be biased towards the null.

Despite these limitations, the strength of the study is the use of a novel approach to studying the association between neighbourhood attributes and obesity. LCA addresses the potential synergistic or antagonistic effect of neighbourhood attributes and creates meaningful classes of neighbourhood types. Continued use of this method may provide stronger and more consistent support for the association between the neighbourhood environment and obesity, and may identify key characteristics that have more influence on obesity risk. In addition, the study made use of a large nationally representative sample of Canadian children, which supports its generalizability to Canada as a whole.

In conclusion, the findings suggest that the neighbourhoods children reside in can be grouped into distinct typologies, which are associated with PA, TV time and obesity. Among urban neighbourhoods, the relationship between neighbourhood type and obesity was partially mediated by physical activity and TV time (7%–12% of total effect); however, no evidence of mediation was found among rural neighbourhood types. Intervention strategies to reduce obesity at the neighbourhood level should be tailored according to urban and rural setting and take a comprehensive approach aimed at improving a range of obesity-related behaviours in addition to PA and TV viewing, especially in rural settings.

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RÉSUMÉ

OBJECTIF : Il est nécessaire de comprendre les mécanismes par lesquels l'environnement du quartier influence l'obésité juvénile pour faciliter l'élaboration de stratégies de prévention. L'objectif de cette étude transversale était de cerner les différents types de quartiers où habitent les enfants canadiens et d'examiner la mesure dans laquelle l'activité physique et le comportement sédentaire médient la relation entre le type de quartier et l'obésité juvénile.

MÉTHODE : Nous avons utilisé des données de référence de l'Enquête longitudinale nationale sur les enfants et les jeunes (1994–1995) pour cette étude. Au moyen d'une analyse de structure latente, nous avons regroupé les enfants (âgés de 0 à 11 ans; $N = 22\,831$) en types de quartiers d'après des indicateurs (subjectifs et dérivés du Recensement) des attributs des

quartiers. Une analyse des pistes causales a permis de déterminer la mesure dans laquelle les niveaux de l'activité physique et du comportement sédentaire médient la relation entre le type de quartier obtenu et l'obésité.

RÉSULTATS : Nous avons recensé cinq types de quartiers. Les enfants vivant dans le type de quartier à sécurité élevée et à faible défavorisation, lequel avait le plus d'attributs soutenant l'activité physique, étaient significativement moins susceptibles d'être obèses que les enfants vivant dans les autres types de quartiers. Comparativement au quartier à sécurité élevée et à faible défavorisation, la relation entre le type de quartier et l'obésité était partiellement médiée par l'activité physique et le comportement sédentaire (7 % à 12 % de l'effet total) dans les autres quartiers urbains, et aucun effet de médiation n'a été constaté dans le quartier rural.

CONCLUSIONS : Les stratégies d'intervention qui tentent d'aborder le risque accru d'obésité associé aux environnements de quartiers devraient être adaptées au milieu urbain ou rural et devraient envisager une approche globale pour améliorer une gamme de comportements liés à l'obésité.

MOTS CLÉS : obésité juvénile; activité physique; comportement sédentaire; quartier; médiation