The influence of country of birth and ethnicity on BMI among Canadian youth: A national survey

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Conflict of Interest Statement

The authors report no conflicts of interest.

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Abstract

Background

Body mass indices (BMI) of youth often change when they immigrate to a new country. This occurs by the adoption of new behaviours and skills; a process called acculturation. We investigated whether differences existed in BMI by country of birth (Canadian-born vs foreign-born) and ethnicity, both individually and together. We also examined whether time since immigration and health behaviours explained any observed BMI differences.

Methods

Data sources were the Canadian Health Behaviour in School-Aged Children Study and the Canada Census of Population. Participants were youth in grades 6-10 (weighted n = 19,272). Sociodemographic characteristics, height, weight, and health behaviours were assessed by questionnaire. WHO growth references were used to determine BMI percentiles.

Results

Foreign-born youth had lower BMI than youth born in Canada (-4 percentage points: 95% confidence interval: -6, -2). This did not decrease with increased time since immigration. Similarly, East and South East Asian youth had lower BMI than Canadian host culture peers (-4%: -6, -2). Finally, foreign-born Arab/West Asian and East Indian/South Asian youth had lower BMI than Canadian-born peers of the same ethnicity (-14: -22, -7 and -8: -14, -3% respectively).

Interpretation

Immigrant generation and ethnicity were associated with BMI among Canadian youth both independently and together. Some ethnic groups showed differences by country of birth, i.e. East Indian and South Asian, while others showed no such difference, i.e. East and South East Asian. Our findings reinforce the need to investigate country of birth and ethnicity when considering determinants of childhood obesity.

Introduction

When a person immigrates to a new country their health changes, eventually approximating that of those born in the host country via a process called acculturation.(1) Obesity is one outcome that could be influenced by acculturative changes in diet and physical activity.(2–5) Obesity is prevalent in Canada; 10% of 11-17 year old youth are obese.(6) Even at this early age, obesity is associated with physical, mental, and social health problems.(7–9) In Canada, research has found that immigrants have a lower body mass index (BMI) than Canadian-born peers.(10,11) Findings from international studies have been inconsistent.(12–19)

Two proposed explanations exist for these discrepancies. The "time since immigration" hypothesis proposes that those who immigrated more recently are less acculturated than established immigrants who have had time to adopt the norms and behaviours of the host country.(17,20) Lower acculturation may therefore lead to a lower prevalence of obesity. The second posits that this relationship is driven by ethnic differences in the prevalence of obesity. Ethnicity is a determinant of BMI, with increased risks for overweight and obesity among Hispanic and Black individuals,(13,21) and lower risks among those of East and South East Asian descent.(10–14) It is thus difficult to establish the etiological pathway between birth status and BMI from existing literature because studies 1) have not considered time since immigration, 2) have been of specific ethnic groups and 3) have not explored interactions between immigration and ethnicity. Using a national sample of Canadian school-aged youth, the objective of this study was to examine the independent and joint effects of country of birth and ethnicity on BMI. Subsequent analyses investigated the effect of time since immigration, and if differences in BMI persisted after controlling for behaviours associated with obesity. We

hypothesized that foreign-born youth would have a lower BMI than Canadian-born peers, this difference would diminish over time, and differences would also exist by ethnicity.

Methods

Data Sources

Data from young people were obtained from Cycle 6 (2010) of the *Canadian Health Behaviour in School-Aged Children* (HBSC) Study. HBSC is a self-reported general health survey conducted under the auspices of the World Health Organization, and completed by students in classrooms.(22) The 2010 Canadian HBSC collected information from 26,078 youth in grades 6 through 10 in 436 schools from 8 provinces and 3 territories.(22) In each province, a systematic, multi-stage cluster sample approach was used, with whole classes selected from a list of eligible and consenting schools. Conversely, in the three Canadian territories, a census of all students in Grades 6 through 10 was attempted. Survey weights were developed and applied to ensure generalizability of estimates nationally.

This study received ethics approval from the Queen's University General Research Ethics Board and Health Sciences Research Ethics Board (File #GEDUC-430-09 and #6007743). Consent was obtained at the school board, school, parent and child levels. Approximately 57% of schools approached agreed to participate, and 77% of the estimated students in schools that gave consent participated in the study. Less than 10% declined to participate or spoiled their questionnaires intentionally, and remaining non-participants generally either failed to return consent forms, failed to receive parental consent, or were absent on the day of the survey.(22) From the original sample of 26,078 youth, 7299 were excluded due to missing data (Figure 1). This left a final

unweighted sample of 18,783 (weighted sample of 19,272). Included participants were slightly older (14.0 vs. 13.4 years of age, $p < .0001$). More second than first generation youth filled out all relevant covariate information (76% vs. 66%, $p < .0001$), and differences in response rates by ethnicity ranged from 64% to 76% (not shown). No other differences were found between those included and excluded from the analyses.

Area-level measures of population demographics were obtained from the *2006 Canada Census of Population.*(23) Census responses were linked to schools to describe the neighborhoods in the 1km radius around each school, a distance that has been previously shown to represent social constructs accurately.(24)

Primary Exposures – Country of birth and Ethnicity

The primary exposure permitted categorization of youth by country of birth. This was assessed in the HBSC survey by asking "In which country were you born?" Youth born outside of Canada were categorized as "foreign-born," while youth born in Canada were classified as "Canadian-born."

Second, youth were categorized into five groups by the length of time they have been in Canada by asking "How many years have you lived in Canada?" Response options were: "I was born in Canada," "1 to 2 years," "3 to 5 years" "6 – 10 years" and "11 or more years." Due to small numbers in the fifth group, the last two responses were combined to form a "6 + years" group.

Finally, youth were categorized into seven ethnic groups by asking "How do you describe yourself?" with 16 possible response options. Youth were able to select up to 3 response categories. Responses were used to create the following ethnic groups: "Canadian host culture," "Arab and West Asian," "African," "East Indian and South Asian," "East and South East Asian," "Latin American" and "Other." These groups were based on ethnic groupings defined by the 2006 Canadian Census of Population, with three modifications.(23) First, European, North American and Aboriginal youth were combined to create a "Canadian host culture" group (Note: ethics restrictions prohibited separate study of Aboriginal youth).(25) Second, West Asian and South Asian youth were combined due to small numbers of West Asian youth. Finally, an additional group was created ("Other") that included youth who identified with multiple ethnic groups, i.e. "African" and "Latin American."

Outcome – BMI Percentile

Youth self-reported their weight and height in metric or imperial units. From these, BMI was calculated (kg/m^2). To account for growth and maturation, participants' BMI values were converted to age- and sex-specific BMI percentile scores using World Health Organization growth references.(26)

Covariates

Individual-level covariates collected via the student survey were age, gender, and perceived family wealth. These are known predictors of BMI among youth.(14,27–31) At the school-level, covariates included: population center category,(32) percentage of immigrants in the community, and median income quartile.

Seven behaviours were considered as explanatory variables for observed differences in BMI percentile. These included time spent: 1) watching television, 2) using a computer, 3) playing video games, 4) engagement in physical activity, 5) snacking while watching television, 6) snacking while on the computer or playing video games and 7) frequency of eating at fast food restaurants. These were chosen as modifiable behaviours that are associated with BMI and which may differ by ethnicity and country of birth.(33,34) The first three items were categorized by asking the number of hours spent each day in that activity.(35) Physical activity referred to the number of days a week with at least 60 minutes of moderate-to-vigorous physical activity.(36) Snacking was assessed by asking "How often do you eat a snack while you watch TV (including videos and DVDs)?" with response options ranging from "never" to "every day."(37) A similar question asked about snacking while playing video games. Finally, one item was used to assess frequency of eating at fast food restaurants, with seven responses ranging from "Never," and "Rarely (less than once a month)," to "5 or more days a week."(38)

Analysis Plan

All analyses used a multi-level approach due to the clustered nature of these data and the inclusion of school-level covariates. Level 1 refers to individual-level and Level 2 refers to school-level variables.(39) Cross-tabulations were used to explore youth BMI percentile by each of the exposure variables. All p-values calculated for associated statistical tests used the Rao-Scott chi-square test to control for clustering at the school-level.

Multi-level linear regression was used to explore the relationship between country of birth and BMI percentile. Country of birth and ethnicity were included in the modeling process; time since immigration was not as it is collinear with country of birth. Six hierarchical regression models were built with the outcome of BMI percentile, following established precedents.(39) First, an empty model was built. This investigated the random effect of school on BMI percentile.(39) Second, the "base model" was created that included country of birth and ethnicity as predictors of BMI percentile. The third and fourth models controlled for individual-level and school-level covariates respectively. The fifth model included all covariates found to be significant in models 3 and 4, using a liberal value of $p<.20$ to indicate significance. Finally, a sixth model was built that controlled for the variables identified for the adjusted model, and investigated the effect of the seven behaviours that may explain potential differences observed by country of birth and ethnicity.

We also investigated the interaction between country of birth and ethnicity. This stratified each ethnicity into 2 groups: Canadian-born, and foreign-born, while controlling for covariates identified in the sixth model.

All analyses were conducted using SAS v9.3 using PROC SURVEYFREQ for cross-tabulations and PROC MIXED for regression models. All analyses considered the sample weights and accounted for clustering at the school-level (SAS Institute, Cary, NC).

Results

Our sample was comprised predominantly of youth born in Canada (91.6%). Most self-identified as being part of the Canadian host culture (78.2%). Other major ethnic groups included East and South East Asian (5.7%), African (3.8%), and East Indian and South Asian (2.9%) (Table 1). The intra-class correlation revealed that the school-level accounted for 2.7% of the variation in BMI percentile.

Differences in BMI were observed by country of birth. The BMI of foreign-born youth was 4 percentage points lower (95% CI: -2, -6) than Canadian-born youth. Stratification of the foreign-born group showed that BMI was not linearly associated with time since immigration, and only youth who immigrated 6+ years previously were significantly different from those born in Canada (Table 1). Observed differences between country of birth and BMI changed <6% after controlling for the seven behaviours that we hypothesized may explain this relationship.

BMI differed by ethnicity. After adjusting for relevant covariates, the BMI of the East Indian and South Asian group and the East and South East Asian group was 3 to 4 percentage points lower than that of the Canadian host culture (Table 2). Minimal changes in effect estimates (< 3%) were observed for the ethnicity-BMI relationship after controlling for the seven behavioural factors.

Findings from the country of birth by ethnicity interaction analyses are shown in Table 3. This interaction was statistically significant (p = .0002). When compared to Canadian-born youth of the same ethnicity, foreign-born Canadian host culture, Arab and West Asian, and East Indian

and South Asian youth had a lower BMI, with differences ranging from -6 to -14 percentage points (Table 3).

Discussion

The most important finding of this study was that the BMI of foreign-born youth was lower than Canadian-born peers, and this association was not linear with time since immigration. This goes against the theory of acculturation. BMI also differed by ethnicity, with East and South East Asian youth having lower BMIs than youth of the Canadian host culture, irrespective of country of birth. These findings were robust, and persisted after controlling for key behaviours that may explain this relationship. Finally, the relationship between country of birth and BMI appeared to be modified by ethnicity.

Previous research that has examined the association between immigration status and obesity measures within youth has reported mixed findings. Studies of youth in Sweden and the US both found that immigrants are more likely to be overweight and obese.(28,40) In Canada, boys who spent their entire life in Canada had 1.6-fold increased odds of being overweight (95% CI:1.2-2.3).(12) However, another Canadian study found no difference between by country of birth.(10) This is likely due to demographic differences in the samples being investigated. While the first study only investigated youth aged 9-12 from low income, inner city neighborhoods in Montreal, the latter looked at a diverse national sample of 6-17 year olds over time.

We were surprised to find that BMI did not change linearly with increased time since immigration. As per previous research of Canadian(41) and US adults,(3) we anticipated that

differences in BMI would disappear over time. However, this was not the case, and the opposite relationship was observed in our sample. This counters the theory of acculturation. This could be attributable to economic changes that occur over time. Once initial migration costs (i.e. furniture, housing) have been paid for, parents may be able to afford a healthier lifestyle and become aware of resources available within the Canadian environment. This remains a provocative and interesting finding, and in light of our conclusions, needs to be examined by ethnic group to ascertain the reason for this relationship.

Compared to Canadian youth, we found that East and South East Asian youth reported heights and weights consistent with lower BMI irrespective of country of birth, a finding supported by others.(10–13) Immigrant and ethnic differences in other determinants of obesity, such as insufficient sleep and smoking,(42) may explain these relationships. We examined ethnicity and country of birth together to determine the effect of their possible interaction and found that foreign-born Canadian host culture, Arab and West Asian, and East Indian and South Asian youth had lower reported BMI levels compared to Canadian-born youth of the same ethnicity. This may be due to the latter having an unhealthier dietary pattern compared to foreign-born peers, as previously shown in Asian and Hispanic youth living in the US.(43) Interestingly, we observed no such relationship among these ethnic groups. An interaction between country of birth and ethnicity has been shown in studies of US children and adolescents, and, similar to our studies, found a protective relationship for Asian immigrant youth. They also found an increased risk for 2nd and 3rd generation Black youth, i.e. youth were US-born but parents or grandparents were born abroad. These differences may be attributable to different sociodemographic factors at play in the US and Canada.(13)

Limitations

We did not measure acculturation directly and used country of birth and time since immigration as proxy measures. This may have resulted in misclassification of youth, biasing any effect estimates observed. In addition, there were differences in the number of people who completed the entire survey by country of birth and ethnicity. It could be that youth of low acculturation did not complete the entire questionnaire, biasing the results towards no effect.

Conclusions

Country of birth and ethnicity both act as determinants of BMI, individually and synergistically. We investigated the role of important health behaviours on these differences, and found that they did not explain observed differences. For those in public health, our findings stress the importance of considering both ethnicity and country of birth when designing and implementing interventions. Interventions will likely be more successful with a homogenous target group due to similar prior attitudes and beliefs while interventions that target a heterogeneous group will have to consider diverse attitudes and backgrounds.(44–47) Given the myriad of health problems that accompany excess weight and the high proportion of Canadians that are immigrants, uncovering reasons for weight gain will lead to a better understanding of the determinants of childhood obesity.

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Contributors Statement

All authors conceived the study design. AK conducted the statistical analyses and had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors interpreted the findings, were involved in writing the paper and had final approval of the submitted and published versions. The authors report no conflicts of interest.

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Table 1: Description of mean BMI percentile by immigrant status and additional covariates, 2010 Canadian HBSC (weighted n = 19,272)

	Total		BMI Percentile	Difference from referent group	
Main Effects	**Weighted n**	**%**	**Mean (95% CI)**	**Mean (95% CI)**	**p-value**
Country of birth					
Canadian-born	17659	91.6	58 (57 , 58)	Referent	
Foreign-born	1613	8.4	54 (52 , 55)	-4 (-6, -2)	<.0001
Time since immigration					
Canadian born	17659	91.6	58 (57 , 58)	Referent	
6+ years	891	4.6	52 (50 , 54)	-6 (-8 , -4)	<.0001
3-5 years	396	2.1	56 (53 , 59)	-2 (-5 , +1)	.30
1-2 years	325	1.7	55 (52 , 59)	-2 (-6 , +1)	.23
Ethnicity					
Canadian host culture	15071	78.2	57 (57 , 58)	Referent	
Arab and West Asian	300	1.6	58 (54 , 61)	+1 (-3 , +4)	.78
African	737	3.8	60 (58 , 62)	+3 (0 , +5)	.028
East Indian and South Asian	559	2.9	52 (49 , 55)	-5 (-8 , -3)	.0001
East and South East Asian	1089	5.7	53 (51 , 56)	-4 (-6 , -2)	.0003
Latin American	187	1.0	60 (56 , 65)	+3 (-2 , +7)	.24
Other	1330	6.9	59 (57 , 60)	+1 (+3 , 0)	.15
Individual Level Covariates					
Gender					
Male	9567	49.6	61 (60 , 62)	Referent	
Female	9705	50.4	53 (52 , 54)	-8 (-9 , -7)	<.0001
SES – Individual (Material wealth)					
Well off	11064	57.4	56 (55 , 57)	Referent	
Average	6436	33.4	58 (57 , 59)	+2 (+1 , +3)	<.0001
Worse off	1772	9.2	61 (59 , 63)	+5 (+6 , +3)	<.0001
Area Level Covariates					
Median Household Income per year					
Quartile 4 (> $67,605)	4512	23.4	56 (55 , 58)	Referent	
Quartile 3 ($53,112 - $67,605)	4440	23.0	56 (54 , 58)	0 (-2 , +2)	.85
Quartile 2 ($43,571 - $53,117)	4311	22.4	56 (55 , 58)	0 (-2 , +2)	.99
Quartile 1 (< $43,571)	6008	31.2	59 (58 , 61)	+3 (+1 , +5)	.002

Table 1: Description of mean BMI percentile by immigrant status and additional covariates, 2010 Canadian HBSC (weighted n = 19,272) (continued)

Percentage of Immigrants in the Community					
Quartile 4 (> 17%)	6399	33.2	55 (54 , 56)	Referent	
Quartile 3 (9% - 17%)	5095	26.4	58 (57 , 60)	+3 (+1 , +5)	.0007
Quartile 2 (3% - 9%)	4319	22.4	58 (57 , 60)	+3 (+1 , +5)	.0007
Quartile 1 (< 3%)	3459	18.0	58 (56 , 60)	+3 (+1 , +5)	.008
Statistics Canada Population Centre Category					
Large Urban Centre	6275	32.6	56 (54 , 57)	Referent	
Medium Centre	3501	18.2	57 (55 , 59)	+1 (+3 , -1)	.24
Small Centre	8898	46.2	58 (57 , 59)	+2 (+4 , 0)	.015
Rural	597	3.1	60 (57 , 64)	+5 (+8 , +1)	.019

Note: N values presented were weighted as per the HBSC protocol (22). SAS PROC MIXED was used to compare the levels of the variables for significant differences while controlling for the clustering effect of school. The “other” ethnic group includes youth who identified with more than one of the six identified ethnic groups.

Table 2: Mean BMI percentiles predicted by the three proposed models

	Base Model BMI percentile		**Adjusted Model** BMI percentile		**Adjusted with Explanatory variables** BMI percentile	
Main Effects	Mean (95% CI)	p-value	Mean (95% CI)	p-value	Mean (95% CI)	p-value
Country of birth						
Canadian-born	58 (57 , 59)	Referent	60 (58 , 61)	Referent	59 (57 , 60)	Referent
Foreign-born	54 (53 , 56)	<.0001	56 (54 , 58)	.0003	55 (53 , 57)	.0003
Ethnicity						
Canadian host culture	56 (55 , 57)	Referent	57 (56 , 59)	Referent	57 (56 , 59)	Referent
Arab and West Asian	57 (54 , 61)	.36	59 (56 , 63)	.29	59 (55 , 63)	.46
African	59 (57 , 61)	.01	60 (58 , 63)	.007	59 (56 , 62)	.12
East Indian and South Asian	51 (49 , 54)	.003	54 (51 , 57)	.016	53 (50 , 56)	.005
East and South East Asian	53 (51 , 55)	.023	55 (53 , 58)	.073	54 (51 , 56)	.005
Latin American	60 (55 , 64)	.076	62 (57 , 66)	.066	61 (56 , 66)	.14
Other	57 (55 , 59)	.097	59 (57 , 61)	.077	57 (55 , 59)	.91

Note: The base model did not control for any covariates.

The adjusted model controlled for gender, age, individual level SES, median neighborhood income, percentage of immigrants in the community and Statistics Canada Population Centre Category.

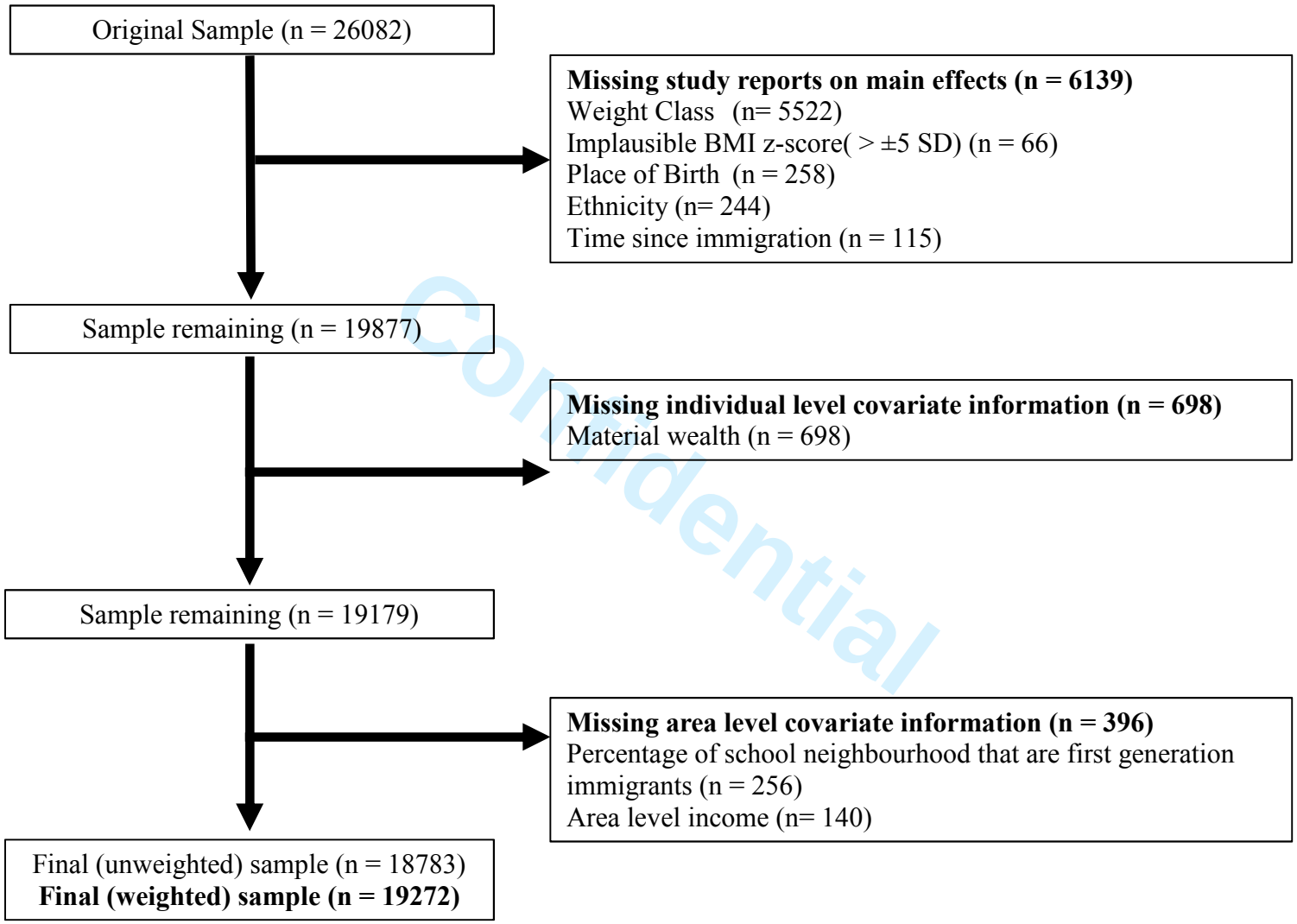
The adjusted model with explanatory variables controlled for all the variables in the adjusted model, plus TV watching, computer use, playing video games, physical activity, snacking while watching TV, snacking while on the computer or playing video games and frequency of eating at fast food restaurants.

Table 3: Exploration of the interaction between ethnicity and immigration generation, controlling for potential pathways (physical activity, sedentary behaviour and diet)

			Mean BMI Percentile	Difference between Canadian and foreign-born youth			
Ethnicity	**Country of birth**	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**p-value**	**Mean Difference (95% CI)**	**p-value**
Canadian host culture	Canadian-born	14650	59 (58 , 60)	Referent		Referent	
	Foreign-born	421	53 (49 , 56)	-6 (-9 , -3)	.0002	-6 (-9 , -3)	.0002
Arab and West Asian	Canadian-born	182	65 (60 , 70)	Referent		+6 (+1 , +11)	.024
	Foreign-born	118	50 (45 , 56)	-14 (-22 , -7)	.0002	-8 (-14 , -3)	.005
African	Canadian-born	569	60 (57 , 63)	Referent		+1 (-2 , +4)	.39
	Foreign-born	168	60 (54 , 65)	-1 (-6 , +5)	.84	+1 (-5 , +6)	.81
Latin American	Canadian-born	102	61 (54 , 68)	Referent		+2 (-5 , +9)	.59
	Foreign-born	85	61 (54 , 68)	0 (-9 , +10)	.96	+2 (-5 , +9)	.55
East Indian and South Asian	Canadian-born	344	56 (53 , 60)	Referent		-3 (-6 , +1)	.16
	Foreign-born	214	48 (44 , 53)	-8 (-14 , -3)	.003	-11 (-15 , -6)	<.0001
East and South East Asian	Canadian-born	615	53 (50 , 56)	Referent		-6 (-9 , -3)	<.0001
	Foreign-born	475	55 (52 , 59)	+3 (-1 , +7)	.16	-4 (-7 , 0)	.023
Other	Canadian-born	1206	59 (57 , 61)	Referent		0 (-2 , +2)	.85
	Foreign-born	124	58 (52 , 64)	-1 (-7 , +5)	.72	-1 (-7 , +5)	.66

Note: The model controlled for gender, age, individual level SES, median neighborhood income, percentage of immigrants in the community and Statistics Canada Population Centre Category, TV watching, computer use, playing video games, physical activity, snacking while watching TV, snacking while on the computer or playing video games and frequency of eating at fast food restaurants.

Figure 1: Study flow diagram



STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.