

A Comparison of Dietary Practices At or En Route to School between Elementary and Secondary School Students in Vancouver, Canada

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Abstract

Background: There is evidence that dietary quality declines as children age in North America, but few studies have explored whether food environment exposures in secondary schools as opposed to elementary schools are associated with changes in students' school-day food choices.

Methods: This study examined differences in dietary practices (at or en route to and/or from school) between students in their last years of elementary school (grades 5-7) and first year of secondary school (grade 8) in Vancouver, Canada, controlling for socio-demographic characteristics and school-level socio-economic status. Demographic characteristics and dietary data were collected through a cross-sectional survey (n=950 from 26 schools) and combined with school-level socioeconomic data derived from the 2006 Canadian Census.

Results: Multi-level logistic regression analyses indicated that secondary school students were significantly more likely to report daily consumption of fast foods (Odds Ratio (OR)=1.92; 95% Confidence Interval (CI)=1.18-3.12) and minimally nutritious packaged snacks (e.g., candy or chocolate bars) (OR=1.60; CI=1.05-2.45), and to report regular purchases from off-campus

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retailers (OR=1.63; CI=1.10-2.42). Gender, food insecurity, lower acculturation to Canada, and access to more weekly spending money were associated with nutritionally-poor practices.

Students attending schools drawing from lower income neighborhoods were also significantly more likely to consume fast foods and packaged snacks daily. The majority of students sampled did not report consuming healthy foods such as fruit and vegetables daily at or en route to and/or from school. Intake of fruit, vegetables and low fat milk did not differ significantly between elementary and secondary school students.

Conclusions: Findings suggest that research and intervention strategies should address modifiable school-level exposures and policies to improve dietary practices for both elementary and secondary school-aged youth, while at the same time, addressing socio-cultural factors associated with eating behavior.

Keywords: Dietary Intake, Food Purchasing, Youth, School health, Socioeconomic status

Introduction

Like American youth, most Canadian school-children and adolescents do not meet national dietary recommendations,^{1, 2, 3} and the prevalence of adverse nutrition-related outcomes including obesity and type 2 diabetes is rising.^{4, 5} Consequently, improving the eating habits and nutritional health of children and adolescents is a priority area for international public health efforts. Recent initiatives including the Institute of Medicine's strategies for enhancing obesity prevention⁶ and the World Health Organization's Health Promoting Schools framework and Nutrition Friendly Schools initiatives⁷ now emphasize the importance of schools as key institutions for nurturing healthy habits. Yet, in-depth understanding is still lacking about the factors that shape food practices in schools where children and adolescents spend a substantial portion of their time.

To inform emerging school-based intervention strategies, a small but growing number of researchers have begun investigating whether and how characteristics of school food environments impact dietary behaviors.⁸⁻¹⁴ Several studies have examined associations between characteristics

of the school environment and obesity outcomes, or impacts of specific school-based interventions. However, few have carefully evaluated whether nutrition-related outcomes differ after students transition from elementary school to secondary school, where they may have more autonomy over food choices; or how differences in these two contexts shape specific dietary practices. Moreover, most studies have been conducted in the United States (U.S) and may not be generalizable to other developed countries, including Canada where the school food setting differs.

Unlike the U.S., Canada does not have a nationally funded school lunch program. And while school environment research is in its infancy in Canada, there is evidence that food environment exposures differ between elementary and secondary contexts.¹⁵ In Canadian schools, foods are generally available from a variety of sources including cafeterias (some of which include subsidized meal programs for vulnerable students), vending machines, school stores, fundraisers (e.g. pizza lunches, bake sales) and special food days or food provided or sold by parents or community groups, which vary widely among and between elementary and secondary schools. For instance, in the province of British Columbia (BC), Canada's westernmost province, 82% of elementary schools report hosting food-based fundraisers in the last month compared with only 39% of secondary schools.¹⁵ On the other hand, vending machines are common in secondary schools, but are found in less than 2% of BC elementary schools.¹⁵

School food environments are thought to be promising settings for nutrition-related programs with emerging research suggesting that school-based interventions can improve dietary quality.⁸⁻¹¹ Recent school food policy changes proposed in both Canada and the U.S. seek to improve diet-related outcomes for youth.¹⁶⁻¹⁹ In BC, the provincial government has initiated several programs including Action Schools! BC, Sip Smart! BC, Farm to School and the School Fruit and Vegetable Snack Program to improve access to nutritious foods and to reduce exposures to foods of low nutritional quality.²⁰ Moreover, revised province-wide guidelines now restrict the sale of foods and beverages with poor nutritional quality across all settings where foods are sold

inside schools including cafeterias, vending machines, fundraising efforts and school events.^{21,22}

Despite these efforts, little is known about whether and why students' dietary practices differ across educational settings. Thus, identifying school-level exposures that influence dietary behaviors might help to inform nutrition intervention strategies and food policy changes.

Socio-cultural factors including gender, socio-economic status and food security are also established determinants of dietary practices.²³⁻²⁶ For example, dietary practices and concerns related to eating and body image differ by gender^{27,28} and boys report greater energy and nutrient intakes than girls. Overall, boys choose foods both higher (e.g. grains, milk products, and meat/alternatives) and lower (e.g. soft drinks, salty snacks and French fries) in nutritional quality.²⁹ Further, students from low-income and food insecure households may consume fewer milk products,^{30, 31} fruit, and vegetables,³⁰ and more fast food³² and sugar-sweetened beverages^{31,33} than food secure youth. Additionally, while research from the U.S. has examined differences in dietary intake among youth who are more or less acculturated,³⁴ relatively little is known about whether children who immigrate to Canada acquire or reject the dietary norms encountered at school.

There is also growing interest from researchers with regard to the roles of socioeconomic conditions within and surrounding schools and their neighbourhoods in shaping nutrition-related outcomes.^{35,36} At least two Canadian studies of youth have reported positive associations between area-level socioeconomic status (SES) and intake of fruit, vegetables and fiber, and negative associations with intake of minimally nutritious choices.^{37, 38} There is some evidence from both the U.S. and Canada that secondary schools and schools in neighborhoods characterized by lower SES are more likely to have access to nearby fast food vendors.³⁹⁻⁴¹ While the mechanisms through which area-level SES impact students' diets remain unclear, examining and controlling for differences in school-SES may help clarify understandings about the broader contextual factors associated with dietary practices.

Clearly, the multiple levels of influence on food choice are complex. More evidence is needed to understand the dynamics of school-day dietary intake and food purchases and whether varied policies and food environment exposures in secondary schools are associated with the declining dietary quality reported for older children. The primary objective of this study was to assess whether dietary practices at or en route to/from school differ among students in their final years of elementary school and first year of secondary school in Vancouver, Canada.

Methods

This study draws on cross-sectional data from the 2012 Individual Eating Assessment Tool (IEAT) survey. Sampling was based on a two-stage cluster approach described previously,³³ which sampled schools from all six geographic sectors within the Vancouver Board of Education,²² with a school-level participation rate of 74%. Classes were recruited through invitations to teachers and school administrators and all students in the selected classes were invited to participate.

The survey was completed on-line, in-class by 964 students from 20 elementary schools (grades 5-7) and 6 secondary schools (grade 8), between March-June 2012 (student-level response rate=81%). The sample included socio-demographically diverse public school students in their last year(s) of elementary school or first year of secondary school. The survey protocol was informed by previous studies with adolescents^{42, 43, 44} and was pilot tested with 10 content experts and 54 students from grades 7-12 to ensure face and content validity. A field test was then carried out in one grade 6/7 split classroom to further ensure comprehension of core questions and feasibility in the school context. All protocols were approved by the Behavioural Research Ethics Board at the University of British Columbia and the Vancouver Board of Education. Active student assent was required to commence in-class surveys and consent forms were sent home to parents who could indicate dissent to their child's participation by returning signed forms.

Dietary Practices, Dependent Variables

Food frequency questions were informed by a tool used previously with Canadian students in grades 5-12,⁴⁵ adapted to focus on usual intake of foods consumed at or en route to/from school (“on school-days”). Questions asked about typical intake of food or beverage items over the past 30 days to capture usual dietary practices, including some which are typically reported only sporadically over the course of a month. Dependent variables were selected to represent categories of foods recommended or discouraged by regional (Province of BC) and national guidelines^{22,46} and that are at the focus of recent policy debates and school-health interventions. Consumption of minimally nutritious foods included: 1) typical fast foods, 2) sugar-sweetened beverages and 3) packaged snacks. Intake of nutritious foods included: 1) fruit, 2) vegetables, 3) whole grains, and 4) low-fat milk (see table 1 for specific items included in each category). Response options were: Never, once/month, 2-3 times/month, once/week, 2-4 times/week, once/day (every school day), and 2+ times/day (every school day, multiple times). For each food category, students’ intake was defined as daily or more (versus less than daily) on school days to represent broad adherence to recommendations about key foods of interest. Intake was coded as daily if responses to questions in a given category summed to 5 times per week or more.

Off-campus food purchasing behavior assessed students’ typical frequency of procurement from fast food/take out restaurants, food courts, convenience stores and coffee shops in a typical month at or en route to/from school. Students who purchased food off-campus weekly or more were considered habitual/frequent purchasers, similar to other studies.^{47, 48}

Independent Variables

Students in their last year of elementary school, or who shared a “split classroom” with grade 7 students (which included students in grades 5 and/or 6 in the same classes as grade 7 students) were compared to those in their first year of secondary school (grade 8). Gender identity was reported as male/female. A proxy measure for level of acculturation (high, medium or low) was informed by previous public health literature^{49,50} and was assessed using language spoken at

home (English/other), country of birth (Canada/other), and parents'/guardians' country of birth (Canada/other). Students who spoke another language at home, were born outside Canada, and whose parents/guardians were born outside Canada were classified as least-acculturated, whereas students using English at home, born in Canada, and with Canadian born parents/guardians were classified as most acculturated. Household food insecurity was measured with five questions developed by the United States Department of Agriculture (USDA), used previously in national surveys in the U.S. and Canada.^{51, 52, 53} An example item was, "In the past 12 months, were you hungry but didn't eat because your family didn't have enough food? never/sometimes/a lot," Based on USDA coding recommendations,⁵³ individual items were recoded as never=0 versus sometimes/a lot=1, and then summed. A dichotomous food security variable was created (total score of 0-1=food secure; ≥ 2 =food insecure). Participants who brought lunch from home every school-day were compared to all other students to examine the role of routinely packing a lunch from home. Based on work from Darling et al,⁵⁴ students' weekly spending money was examined in \$10 increments (none/ $>$ \$0-10/ $>$ \$10-20/ $>$ \$20).

School-level SES was estimated using a school's median income derived from median family income estimates pertaining to students' neighborhoods of residence using Census dissemination area values from the 2006 Canadian Census. This variable was constructed by the BC Ministry of Education and was weighted by the proportion of students per school living in each neighborhood in 2006/2007.⁵⁵

Data Analysis

Descriptive statistics included means, standard deviations (SD), and frequencies. Unadjusted associations between categorical variables were assessed using Pearson's chi-square tests (statistical significance defined as $p \leq 0.05$). Multi-level logistic regression models were initially tested with no covariates (null models) for each dependent variable, all of which demonstrated significant variation between schools at the $p \leq 0.05$ level, with the exception of

minimally nutritious packaged snacks ($p=0.06$: borderline significant) and whole grains ($p=0.38$). Models then assessed associations between school type (elementary/secondary) and food practice variables, with all other covariates of interest (i.e. gender, acculturation, food security, lunch from home, access to spending money, school socio-economic status) entered sequentially into models and serving primarily as control variables. Findings from exploratory bivariate analyses of factors associated with daily fast food intake (not shown), and a literature review of potential correlates of school-day dietary choices that may confound the associations between school type and dietary choices, informed the decision to include the variables reported in final models (Tables 2 and 3). The magnitude of associations between independent and dependent variables was assessed using adjusted odds ratios (OR) and 95% confidence intervals (CI), generated by exponentiating the coefficients and CIs from multilevel logistic regression models.

There were 950 students in the final analytic sample. Fourteen completed surveys were excluded due to inappropriate comments on open ended questions. Missing data (range: 1.2%-33.7%) for acculturation, food insecurity, packed lunches, and spending money were imputed with 10 sets of multiple imputations by chained equations.⁵⁶ Stata (version 12, 2011, StataCorp LP) was used for all analyses.

Results and Discussion

Approximately 75% of participants were elementary school students (mean age=12.1y, standard deviation (SD)=0.68). Secondary school students were slightly older, with a mean age of 13.4 years (SD=0.51). While 66.7% of students spoke English at home and 75.6% were Canadian-born, only 22.2% had both parents/guardians born in Canada. Nearly 16% reported experiencing food insecurity in the last 12 months (Table 1).

The proportion of key intake variables reported by students as being consumed daily (Table 1) included: fast food items (17.2%), sugar-sweetened beverages (31.4%), packaged snacks (20.3%), fruit (49.6%), vegetables (42.3%), whole grains (34.7%), and low-fat milk (46.3%).

Thirty-six percent of students reported purchasing food off-campus each week. There were few significant differences in the intake of nutritious foods between secondary and elementary students. However, in adjusted models, secondary students were significantly more likely to report three out of four of the habitual minimally nutritious dietary practices (Table 2).

Secondary students were nearly twice as likely to consume fast foods daily (OR=1.92; CI=1.18-3.12), and had significantly higher odds of daily packaged snack intake (OR=1.60; CI=1.05-2.45) and weekly off-campus food purchasing (OR=1.63; CI=1.10-2.42) compared to elementary students in adjusted models. We did not examine specific school food environment characteristics in this study, however, in Vancouver, secondary students generally have more opportunities to purchase food inside schools at cafeterias, school stores and vending machines, which are seldom available at the elementary level.¹⁵ Secondary students may also travel farther distances to school and are more often allowed off-campus during the day. Thus, secondary students likely had more access to vendors selling fast foods and snacks (e.g., potato chips and chocolate bars) than elementary students who might only be offered these foods on occasional theme days, fundraising events or if granted permission to leave campus during lunch.

In adjusted models, gender, food insecurity, and lower acculturation to Canada were independently associated with nutritionally-poor dietary practices. Boys were significantly more likely than girls to consume fast food (OR=1.99; CI=1.32-2.29) and sugar-sweetened beverages daily (OR=1.74; CI=1.27-2.38), similar to previous findings.^{57, 58} Adolescent boys have higher caloric requirements,⁵⁹ potentially contributing to increased food intake overall.⁶⁰ At the same time, dieting is a relatively common practice among adolescent girls,⁶⁰ which could result in efforts to limit choices perceived as fattening,⁶¹ such as soda or fast food.

Food insecure students were significantly more likely to consume fast foods daily (OR=1.83; CI=1.07-3.14). Previous research suggests that food insecure families prioritize price,⁶² opting for affordable, filling meals, which could promote intake of foods with lower dietary

quality.⁶³ Students who were least acculturated to Canada also had substantially higher odds of consuming fast food items daily (OR=6.17; CI=2.84-13.39), a result contrary to previous work where greater acculturation was associated with higher frequency of fast food consumption.⁶⁴ Perhaps least acculturated youth chose fast food to model what they perceive as typical North American dietary choices.⁶⁵

Lunch from home and access to spending money were also associated with school-day choices. While students who brought lunch from home daily had lower odds of purchasing food off-campus (OR=0.59; CI=0.43-0.82), they were more likely to consume minimally nutritious snacks daily (OR=1.77; CI=1.21-2.58). For these students, packaged snacks may represent “treats” packed in lunches or items purchased during the day. These findings suggest that it may be important to include parents as part of nutrition interventions because they can be important gatekeepers regarding the quality of packed lunches and, may have influence over students’ discretionary spending.

Secondary school students more commonly reported access to higher amounts of spending money than their elementary school peers. Consistent with findings from Darling et al,⁵⁴ students with >\$20/week of spending money were nearly 3-times more likely to consume fast foods (OR=2.73; CI=1.17-6.34) and had higher odds of regularly buying food off-campus. However, even smaller amounts of spending money (>\$10-\$20/week) were associated with increased likelihood of off-campus food procurement. Access to spending money appears more relevant for influencing less nutritious food purchases than it does for healthful choices such as fruit and vegetables.

Dietary practices were also associated with school-level SES, in that students attending schools drawing from higher-income neighborhoods were less likely to consume fast foods (OR=0.75; CI=0.62-0.91) and minimally nutritious snacks daily (OR=0.79; CI=0.67-0.94). These findings are similar to previous studies, where area-level SES was negatively associated with

intake of minimally nutritious choices, for example, items containing added sugar.^{37, 38} After adjusting for other covariates, between-school variance was no longer significant when school income was added to models predicting fast food and snack intake. The lack of significance suggests that for these variables, differences across schools were related to socio-economic differences between schools (or other variables captured by school-level SES). These findings may be the result of lower-income neighborhoods having a higher presence of fast food outlets near schools^{66, 67} or unmeasured differences in social norms, school food programs, policies, or environments, or other factors that vary with school SES, which require more attention from researchers.

After controlling for several key student-level demographic factors and school-level SES, secondary school students were consistently more likely to report regular intake of nutritionally poor foods. While previous research suggests that consumption of healthy foods decreases as children age,⁶⁸ no significant differences in the intake for fruit, vegetables and low-fat milk between elementary and secondary students were reported. Given that students in this sample were all quite similar in age, this finding may imply that differences in school food exposure in the first year of secondary school alone are not sufficient for shaping the declining intake of nutritious foods, that school-day intake declines more slowly with age than dietary quality reported through the day or that trends among Vancouver students differ from those in previous studies. Students in grades 5-8 are unlikely the primary purchasers of fresh foods for their households, and over three quarters of secondary students in this sample reported at least occasionally (i.e. weekly or more) bringing a packed lunch to school. Hence, parents likely remain key gatekeepers to a healthy diet for youth in this age group.

More than half the sample, regardless of grade-level, did not consume fruit or vegetables daily on school days, and the likelihood of regular intake did not differ significantly by gender, acculturation, food insecurity, bringing lunches from home or access to spending money. Also

contrary to previous findings,³⁷ school-level SES was not significantly associated with nutritious choices. Even after adjusting for all covariates, intake of nutritious items varied across schools, suggesting that other factors not examined here still influence the consumption of healthy school-day choices. Recent evidence suggests that friends exhibit comparable intakes of vegetables, whole grains and dairy products.⁶⁹ Examining social influences, including peer and parental influences,⁷⁰ would be valuable next steps for research.

Strengths of this study include the socio-demographically diverse sample, composed of nearly one-third of Vancouver's public schools. In Vancouver, school food environments are undergoing change following new school nutrition guidelines mandated by the Province of BC, and are the subject of growing interest from the Board of Education, city government and local university and community stakeholders interested in food system issues.^{71,72} This study provides an understanding of student dietary practices in 2012. Future research may consider using school-day specific food frequency questions, in conjunction with other dietary intake data collection methods to distinguish between items consumed at or en route to school and other locations. This approach has not been used by most school-focused nutrition studies. In future applications, such insight could help determine the relative contribution of foods available at school to overall dietary intake.

Future studies are however needed to further refine and validate feasible measures that specifically assess school-day dietary intake, and limitations of this study's measures and design should be considered. Notably, the current data cannot be extrapolated to estimate full-day or weekend dietary intake, and additional validation work is needed to ensure that the food frequency tool used here adequately captures usual school-day intake. Further work is needed to examine whether the quality of school-day dietary intake is representative of overall dietary quality. It is possible that dietary quality at school does not provide a complete picture of overall dietary quality. Student self-report of dietary intake may be subject to under- or over-reporting, and

contain some missing values.⁷³ Estimates may be further misreported by the youngest students in this sample.^{74,75} We did not examine specific features of school food environments and these findings may not be generalizable for students outside of Vancouver or in private schools.

Conclusions

In this study, no differences in daily intake of healthy foods such as fruit, vegetables, or low-fat milk were reported at school or en route to/from school between elementary and secondary school students. However, students attending secondary school were significantly more likely than elementary school students to regularly choose unhealthy foods such as fast foods and minimally nutritious snacks. Results further suggested that students with increased access to spending money are more likely to consume foods with minimal nutritional value. Since secondary students have more access to spending money and opportunities to make independent food purchases, future research in Canada is needed to evaluate emerging interventions aimed at making healthy choices the easy choices for these students. School-based nutrition interventions targeting food insecure students and new immigrants are also necessary, and should consider the gendered nature of students' food practices. Future research is needed to more closely examine potentially modifiable contextual factors and policies that shape dietary differences between elementary and secondary school students and schools in diverse neighborhoods, while addressing student-level factors associated with eating behavior.

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Table 1. Characteristics and Differences Between Students from 20 Elementary and 6 Secondary Schools in Vancouver, Canada ^{a,b}				
	Combined Sample ^c	Elementary School Only	Secondary School Only	P-Value
Sample Size, n (%)	950 (100.0)	710 (74.7)	240 (25.3)	
Age in years, mean (SD)	12.5 (0.85)	12.1 (0.68)	13.4 (0.51)	<0.001
Grade in School, n (%)				N/A ^d
Grade 5	13 (1.4)	13 (1.8)	0 (0.0)	
Grade 6	139 (14.8)	139 (19.9)	0 (0.0)	
Grade 7	546 (58.2)	546 (78.0)	0 (0.0)	
Grade 8	240 (25.6)	0 (0.0)	240 (100.0)	
Gender, n (%)				0.02
Boys	487 (51.4)	380(53.6)	107 (44.8)	
Girls	461 (48.6)	329(46.4)	132(55.2)	
Student Country of Birth, n (%)				0.60
Canada	683 (75.6)	504(75.1)	179 (76.8)	
Other	221 (24.4)	167 (24.9)	54 (23.2)	
Both Parents Country of Birth, n (%)				0.90
Canada	197 (22.2)	145(22.1)	52 (22.5)	
Other	690 (77.8)	511 (77.9)	197 (77.5)	
English Spoken at Home, n (%)				0.04
Yes	634 (66.7)	461(65.0)	173(72.8)	
No	316 (33.3)	249(35.1)	67(28.0)	
Household Food Insecurity Status, n (%)				0.49
Food Insecure	131 (15.8)	100(16.3)	31(14.3)	
Food Secure	700 (84.2)	514(83.7)	186(85.7)	
Lunch from Home, n (%)				0.49
Brought Daily	395 (42.1)	299 (42.7)	96(40.1)	
Brought less than Daily	544 (57.9)	401(57.3)	143(59.8)	
Weekly Spending Money, n (%)				<0.01
None	89 (14.1)	70(15.6)	19(10.6)	
> \$0.00 to \$10.00	234 (37.1)	181(4.02)	53(29.4)	
> \$10.00 to \$20.00	146 (23.2)	99(22.0)	47(26.1)	
> \$20.00	161 (25.6)	100(22.2)	61(46.0)	
School-level Median Family Income, mean (SD)	\$60,396 (\$11,744)	\$58,880 (\$11,446)	\$65,118 (\$11,361)	<0.001
Daily School-Day Dietary Intake, n (%)^e				
Fast Food Items	162 (17.2)	112(15.9)	50(20.9)	0.07
Sugar-Sweetened Beverages	294 (31.4)	214(30.6)	80(33.9)	0.34
Minimally Nutritious Packaged Snacks	192 (20.3)	139(19.6)	53(22.1)	0.41
Fruit	467 (49.6)	344(48.9)	123(51.5)	0.50
Vegetables	393 (42.3)	287(41.4)	106(44.7)	0.37
Whole Grains	325 (34.7)	224(32.1)	101(42.3)	<0.01
Low Fat Milk	427 (46.3)	325(47.2)	102(43.8)	0.37
Weekly Off-Campus Food Purchasing, n (%)	333(35.7)	227(32.8)	106(44.4)	<0.01

^aSocio-demographic characteristics included age, grade in school, gender, student country of birth, both parent/guardian country of birth, English spoken at home, household food insecurity status (food insecure/food secure), lunch from home, weekly spending money and median school income (in \$10,000 increments using a school's median income derived from median family income estimates pertaining to students' neighborhoods of residence using Census dissemination area values).

^bData sources: Median school income was provided by the BC Ministry of Education and derived from the 2006 Canadian Census. All other variables were from the 2012 Individual Eating Assessment Tool (IEAT) Survey from the Food Practices on School Days Study.

^cAll recruited classes served grade 7 students. However, some Vancouver schools house “split classes” where students from grades 6 and occasionally 5 and 6, share classrooms with 7th grade students.

^dNot applicable

^eDaily school-day dietary outcomes were defined based on responses about the following food and beverage items:

Fast Food Items: Pizza; hot dog; hamburger/cheeseburger; breaded/fried chicken or fish; French fries or fried potatoes; taco or nachos; frozen packaged dinner; *Sugar-Sweetened Beverages:* Fruit-flavoured drinks; regular pop or soft drinks; sugar-sweetened iced tea; sports drinks; energy drinks; slurpees, slushies, or snow cones; *Minimally Nutritious Packaged Snacks:* Salty packaged snacks; candy or chocolate bars; baked sweets; frozen desserts; *Fruit:* Fresh fruit (not including juice); frozen or canned fruit; dried fruit; *Vegetables:* Fresh vegetables (raw or cooked, not including French fries); frozen or canned vegetables; *Whole Grains:* Any whole grain products (e.g., whole grain bread, whole grain bagel, pita or tortilla, brown rice or whole grain pasta, oatmeal or shredded wheat were provided as examples); *Low Fat Milk:* 2% milk; 1% or skim milk; soy milk (plain). Intake was coded as daily if responses to questions in a given category summed to 5 times per week or more.

Table 2. Associations between school type, intake of minimally nutritious foods and off-campus food purchasing at or en route to school of students from 20 elementary schools and 6 secondary schools in Vancouver, Canada.^{a,b}

	Daily Fast Foods (n=828 ^c)		Daily Sugar-Sweetened Beverages (n=822 ^c)		Daily Packaged Snack Foods (n=832 ^c)		Weekly Off-Campus Food Purchasing (n=826 ^c)	
Independent Variables	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
School Type								
Elementary	1.00	---	1.00	---	1.00	---	1.00	---
Secondary	1.92	1.18, 3.12**	1.36	0.87, 2.13	1.60	1.05, 2.45*	1.63	1.10, 2.42*
Gender								
Girls	1.00	---	1.00	---	1.00	---	1.00	---
Boys	1.99	1.32, 2.99***	1.74	1.27, 2.38***	1.25	0.87, 1.79	1.32	0.97, 1.79
Acculturation								
High	1.00	---	1.00	---	1.00	---	1.00	---
Medium	1.76	0.91, 3.43	1.04	0.68, 1.61	0.68	0.42, 1.09	1.17	0.77, 1.78
Low	6.17	2.84, 13.39***	1.67	0.91, 3.04	1.54	0.81, 2.92	1.20	0.66, 2.18
Food Security Status								
Food Secure	1.00	---	1.00	---	1.00	---	1.00	---
Food Insecure	1.83	1.07, 3.14*	1.52	0.97, 2.37	1.03	0.58, 1.84	1.38	0.86, 2.21
Lunch from Home								
Less than Daily	1.00	---	1.00	---	1.00	---	1.00	---
Daily	0.92	0.59, 1.41	0.97	0.69, 1.35	1.77	1.21, 2.58**	0.59	0.43, 0.82**
Weekly Spending Money								
None	1.00	---	1.00	---	1.00	---	1.00	---
> \$0.00 to \$10.00	1.35	0.57, 3.24	0.89	0.52, 1.52	0.91	0.44, 1.87	1.44	0.82, 2.54
> \$10.00 to \$20.00	2.16	0.84, 5.56	1.02	0.57, 1.84	1.40	0.66, 2.97	2.71	1.46, 5.03**
> \$20.00	2.73	1.17, 6.34*	1.71	0.95, 3.06	1.27	0.61, 2.62	2.63	1.40, 4.95**
Median School Income (\$10,000)	0.75	0.62, 0.91*	0.85	0.71, 1.01	0.79	0.67, 0.94**	0.89	0.77, 1.04

^aAll models controlled for gender, acculturation (high=spoke English at home, born in Canada, with Canadian born parents/guardians, low=spoke another language at home, born outside Canada, and parents/guardians born outside Canada), food security status, lunch from home, weekly spending money and median school income (in \$10,000 increments using a school's median income derived from median family income estimates pertaining to students' neighborhoods of residence using Census dissemination area values).

^bData sources: Median school income was provided by the BC Ministry of Education and derived from the 2006 Canadian Census. All other variables were from the 2012 Individual Eating Assessment Tool (IEAT) Survey from the Food Practices on School Days Study.

^cSample size after multiple imputation: 835. Missing values on acculturation, food security status, lunch from home, and spending money were handled using multiple imputation by chained equations (10 multiply imputed datasets).

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 3. Associations between school type and intake of nutritious foods at or en route to school of students from 20 elementary and 6 secondary schools in Vancouver, Canada. ^{a,b}

	Daily Fruit (n=827 ^c)		Daily Vegetables (n=819 ^c)		Daily Whole Grains (n=828 ^c)		Daily Low Fat Milk (n=810 ^c)	
Independent Variables	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
School Type								
Elementary	1.00	---	1.00	---	1.00	---	1.00	---
Secondary	0.96	0.66, 1.41	1.04	0.69, 1.57	1.61	1.14, 2.25**	0.97	0.58, 1.62
Gender								
Girls	1.00	---	1.00	---	1.00	---	1.00	---
Boys	1.04	0.79, 1.38	1.00	0.75, 1.33	1.09	0.81, 1.47	1.72	1.28, 2.31***
Acculturation								
High	1.00	---	1.00	---	1.00	---	1.00	---
Medium	1.16	0.78, 1.71	1.13	0.77, 1.67	1.30	0.86, 1.95	1.46	0.96, 2.20
Low	1.06	0.61, 1.86	1.48	0.84, 2.61	1.27	0.72, 2.25	0.84	0.47, 1.49
Food Security Status								
Food Secure	1.00	---	1.00	---	1.00	---	1.00	---
Food Insecure	0.82	0.53, 1.26	0.76	0.49, 1.17	1.08	0.71, 1.65	1.09	0.70, 1.71
Lunch from Home								
Less than Daily	1.00	---	1.00	---	1.00	---	1.00	---
Daily	1.23	0.92, 1.66	1.35	1.00, 1.83	1.48	1.09, 2.01*	1.02	0.74, 1.41
Weekly Spending Money								
None	1.00	---	1.00	---	1.00	---	1.00	---
> \$0.00 to \$10.00	0.96	0.58, 1.60	1.00	0.60, 1.67	0.70	0.43, 1.13	0.89	0.53, 1.48
> \$10.00 to \$20.00	1.10	0.63, 1.92	1.30	0.77, 2.19	0.83	0.50, 1.39	1.04	0.60, 1.80
> \$20.00	1.08	0.63, 1.82	1.22	0.72, 2.05	0.81	0.48, 1.36	0.86	0.49, 1.48
Median School Income (\$10,000)	1.14	0.98, 1.31	1.03	0.88, 1.21	0.96	0.83, 1.10	0.80	0.66, 0.97*

^aAll models controlled for gender, acculturation (high=spoke English at home, born in Canada, with Canadian born parents/guardians, low=spoke another language at home, born outside Canada, and parents/guardians born outside Canada), food security status, lunch from home, weekly spending money and median school income (in \$10,000 increments using a school's median income derived from median family income estimates pertaining to students' neighborhoods of residence using Census dissemination area values).

^bData sources: Median school income was provided by the BC Ministry of Education and derived from the 2006 Canadian Census. All other variables were from the 2012 Individual Eating Assessment Tool (IEAT) Survey from the Food Practices on School Days Study.

^cSample size after multiple imputation: 835. Missing values on acculturation, food security status, lunch from home, and spending money were handled using multiple imputation by chained equations (10 multiply imputed datasets).

* p < 0.05, ** p < 0.01, *** p < 0.001