



Food sources among young people in five major Canadian cities

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Abstract

Objective To examine food sources among young people in five major Canadian cities.

Methods As part of the 2016 Canada Food Study, respondents aged 16–30 were recruited from five Canadian cities (Toronto, Montreal, Halifax, Edmonton, and Vancouver) using in-person intercept sampling and completed an online survey ($n = 2840$ retained for analysis). Descriptive statistics were used to summarize food preparation and purchase locations. A linear regression model was fitted to examine correlates of the proportion of meals that were ready-to-eat or prepared outside the home.

Results In total, 80% of meals were prepared at home and 20% were prepared outside the home. More than 25% of meals prepared at home were ready-to-eat/box food. Of all meals consumed, 42% were either ready-to-eat/box food prepared at home or prepared outside the home. Food for meals prepared at home was purchased predominantly at grocery stores/supercentres while meals prepared outside the home were purchased predominantly at fast food/quick service/coffee shop outlets. Respondents who were younger, identified as Aboriginal, had obesity, had no children, lived in residence at school, university, or college, and reported poorer cooking skills reported more meals that were ready-to-eat or prepared outside the home.

Conclusions The current findings indicate that a substantial proportion of meals consumed by young people consist of meals either prepared outside the home or ready-to-eat/box food prepared at home. Dietary recommendations should highlight basic patterns of food preparation and eating, such as limiting ultra-processed food and food prepared outside the home.

Résumé

Objectif Examiner les sources de nourriture des jeunes de cinq grandes villes canadiennes.

Méthode Dans le cadre de l'Étude sur les aliments au Canada de 2016, des répondants de 16 à 30 ans ont été recrutés par échantillonnage sur place dans cinq villes canadiennes (Toronto, Montréal, Halifax, Edmonton et Vancouver) et ont répondu à un sondage en ligne ($n = 2840$ ont été retenus pour l'analyse). Les données recueillies sur la préparation et le lieu d'achat des aliments ont été résumées au moyen de statistiques descriptives. Un modèle de régression linéaire a été adapté pour permettre l'examen des corrélats de la proportion de repas prêts-à-servir ou préparés à l'extérieur du foyer.

Résultats En tout, 80 % des repas étaient préparés au foyer et 20 % étaient préparés à l'extérieur du foyer. Plus de 25 % des repas préparés au foyer étaient des aliments prêts-à-servir/en boîte. De tous les repas consommés, 42 % étaient soit des aliments prêts-à-servir/en boîte préparés au foyer, soit des aliments préparés à l'extérieur du foyer. Les aliments pour les repas préparés au foyer étaient principalement achetés dans des épicerie ou des centres commerciaux, tandis que les repas préparés à l'extérieur du foyer étaient principalement achetés dans des débits de restauration rapide ou des cafés. Parmi les répondants, les plus jeunes, les Autochtones (auto-identifiés), les personnes obèses, les personnes sans enfants, les personnes vivant en résidence à l'école, à l'université ou au collège et celles qui déclaraient avoir peu de compétences en cuisine ont dit consommer plus de repas prêts-à-servir ou préparés à l'extérieur du foyer.

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Conclusions Les constatations à ce jour indiquent que les aliments préparés à l'extérieur du foyer ou prêts-à-servir/en boîte préparés au foyer représentent une proportion importante des repas consommés par les jeunes. Les recommandations alimentaires devraient donner des consignes de bases sur la préparation et la consommation des aliments, comme de limiter les aliments ultra-transformés et les aliments préparés à l'extérieur du foyer.

Keywords Diet, food, and nutrition · Fast foods · Cooking · Nutrition policy

Mots-clés Alimentation et nutrition · Aliments de restauration rapide · Cuisine (préparation) · Politique nutritionnelle

Introduction

Food sources have important implications for diet quality. Food prepared at home is typically of better nutritional quality than food prepared outside the home, which tends to be associated with higher intakes of energy, sugar, sodium, fat, and saturated fat, and lower intakes of fruit and vegetables, fibre, and calcium (Kant and Graubard 2004; Larson et al. 2006; Binkley 2008; Seguin et al. 2016; An 2016; Tiwari et al. 2017; Mills et al. 2017). Consuming foods prepared at fast food outlets has been associated with weight gain, providing empirical evidence linking food preparation and purchasing behaviours with diet-related outcomes (Pereira et al. 2005). This link is concerning, considering that an estimated 62% of Canadian adults have overweight or obesity, with 25% having obesity (Public Health Agency of Canada 2011).

Canadians frequently consume food prepared outside the home. Canadian industry research shows that approximately 60% of Canadians purchase meals or snacks from a restaurant once a week or more, with 31% eating out a few times a week (Canadian Restaurant and Foodservices Association 2010). Findings from a national Canadian survey completed by over 35,000 people indicate that youth and young adults are more likely than other age groups to consume foods prepared at fast food outlets (Garriguet 2004). Several US studies including a variety of age groups have shown an increase in consumption of food prepared outside the home over the past few decades, with fast food outlets becoming a more prominent source of energy in comparison to other food establishments (Guthrie et al. 2002; Bauer et al. 2009; Poti and Popkin 2011). Data from six nationally representative nutrition surveys, including 38,565 individuals aged 19–60 in the US, show that foods prepared outside the home comprise about one third of daily energy intake (Smith et al. 2013).

Alongside foods prepared outside the home, ultra-processed or “ready-to-eat” meals prepared at home (i.e., products made from industrial ingredients, which are convenient, attractive, and profitable) account for an increasing proportion of dietary intake (Monteiro et al. 2013;

Moubarac 2017). Like food prepared outside the home, ultra-processed foods typically have lower nutritional quality than foods made “from scratch”, and greater consumption of ultra-processed foods has been associated with poorer diet quality (Monteiro et al. 2010; Moubarac et al. 2012; Moubarac et al. 2017; Moubarac 2017). Data from household food expenditure surveys conducted over several years by Statistics Canada show that between 1938 and 2001, the energy share of ultra-processed product purchases increased from 24% to 55% in Canada, consistent with an increase in household food expenditure in this category (Moubarac et al. 2014). Recent data from a nationally representative Canadian survey of 19,797 respondents show that ultra-processed foods comprise nearly half of the dietary energy consumed by Canadians (Moubarac 2017). Similar to Canada, nationally representative US data show that an average of 58% of daily energy intake comes from ultra-processed food (Steele et al. 2017).

In addition to an increase in ultra-processed foods as part of an overall shift in food sources, purchase locations for food prepared at home have shifted over the years. Food purchasing behaviours are important, as food shopping frequency at different types of retailers is associated with dietary intake and body weight (Minaker et al. 2014; Minaker et al. 2016). For example, Canadian data show that shopping frequently at farmers' markets is associated with lower BMI and waist circumference, and higher fruit and vegetable intake, while shopping frequently at convenience stores is associated with poorer dietary quality, including lower fruit and vegetable intake (Minaker et al. 2016). A nationally representative US study that followed trends in household packaged food purchases from 2000 to 2012 found that, although grocery chains represented the largest annual volume of purchases across all years, purchases from grocery stores have decreased, while purchases from mass merchandisers (i.e., Walmart), warehouse clubs (i.e., Costco), and convenience stores have increased (Stern et al. 2016).

To date, little research has assessed population-level patterns of food sources in Canada, and none has specifically examined these behaviours among youth and young adults.

The primary objective of the current study was to examine food sources among youth and young adults in five major Canadian cities, including (1) the proportion of meals and snacks prepared at home and outside the home; (2) purchase locations for meals prepared at home and outside the home; and (3) the proportion of meals prepared at home that were ready-to-eat.

Methods

Data were collected via a self-completed online survey as a part of the 2016 Canada Food Study, a national cohort survey examining eating patterns among youth and young adults in Canada. Respondents were recruited using in-person intercept sampling in five cities (Toronto, Montreal, Halifax, Edmonton, and Vancouver) from a sample of sites stratified by region/neighbourhood and site type (mall, transit hub, park, or other shopping district). Trained research assistants (bilingual French/English in Montreal; English elsewhere) invited potential respondents to enroll in a study on food choices that would involve completing online surveys. Eligible respondents resided in one of the five cities, were 16–30 years of age, and had access to the Internet, as well as a laptop, desktop computer or tablet. Eligible respondents were asked to provide their email address and were sent an invitation with a personalized link to the survey, as well as email reminders to complete the survey. Since the smaller screen size of smartphones often requires additional scrolling for survey response options and renders any images smaller, respondents were discouraged from attempting to complete the survey via smartphone, although they were not restricted from doing so. No differences were observed for any primary outcomes between participants who completed the survey using a smartphone versus another device.

Surveys were completed between October and December 2016, were completed in English or French, and took approximately 1 h to complete. Respondents were sent an invitation to a second survey 4 to 10 days later (data not included in this analysis). Respondents received a \$2 cash incentive upon initial recruitment and a \$20 Interac e-transfer after completing the study. Respondents were provided with study information and indicated their consent prior to completing the surveys. In total, 49,065 people were approached to participate in the study, of whom 6720 (13.7%) were eligible, agreed to be contacted, and were sent an email invitation. Of the 6720 who were invited, 3234 accessed the survey link, for a cooperation rate of 48.1%. The final analytic sample included 3000 respondents, after deleting those who terminated the survey before completing a requisite amount or failed a data integrity check question. A full description of the study methods can be found in the Technical Report (Hammond et al. 2017).

Measures

Socio-demographic

Socio-demographic information included sex at birth, age, recruitment city, race/ethnicity, self-reported height and weight, current living situation (*live with parent(s)/guardian(s); roommate(s); partner/spouse; child(ren); residence at school, university, or college; alone; other*), parental status (*children, including step-children or adopted children; no children*), and student status (*not a student; full-time student; part-time student*). Race/ethnicity was derived from responses to two items: Aboriginal status, and cultural or racial background. Respondents could select (multiple) from the following categories: *White; Chinese; South Asian; Black; Filipino; Latin American; Southeast Asian; Arab; West Asian; Japanese; Korean; Other; Don't know; or Refuse to answer*. Categories were then collapsed to those who identified exclusively as *White, Chinese, South Asian, or Black; Aboriginal* (regardless of whether others were also selected); or *Other/Mixed* (any other background or multiple backgrounds), including *Don't know/Refuse to answer/Missing*. To classify BMI, respondents were asked to report their height and weight, which were used to calculate BMI and categorize respondents as *underweight* (< 18.50); *normal weight* (18.50–24.99); *overweight* (25.00–29.99); *obese* (> 30.00); or *not stated*, using WHO guidelines (World Health Organization 2017). Self-reported data were checked for extreme values (i.e., height < 3 ft or > 7 ft.; weight < 45 lb or > 1100 lb; BMI < 14 or > 48), and out-of-range values were set to *missing/not stated* BMI ($n = 42$). Respondents were also asked, “How would you rate your cooking skills?” and could select one of the following options: *Poor; Fair; Good; Very good; Excellent; Don't know; or Refuse to answer*. Cooking skills were recoded on a scale of 1 (poor) to 5 (excellent).

Food source dietary recall

Participants were asked a series of questions about the meals they ate in the last 7 days, including where the food was prepared and who prepared it (see Fig. 1). Meals prepared in someone else's home were categorized as meals prepared at home. Those who selected “*Don't know*” or “*Refuse to answer*” for a particular meal for any of the 7 days were excluded from estimates related to that meal type. The tool used in the current study was validated in a previous related study (O'Neill et al. 2017).

Purchase locations for meals prepared outside the home

For each meal that was prepared at a “Restaurant, take-out, cafeteria, vending machine, etc.”, respondents were asked:

Fig. 1 Food source dietary recall measure

Remember: We are asking about WHERE your food was PREPARED, not where you ate it.
For example: If you made lunch at home and brought it to work or school, this would be prepared at "home". If your food came from home - even if it needed little or no preparation (e.g., an apple or crackers) - that counts as at "home".

We're also asking WHO prepared the food. If the food preparation was shared equally with someone else, choose "Home, by you". If someone else did most of the food preparation, choose "Home, by someone else".

DO NOT include drinks.

Yesterday, on Tuesday, August 1, please indicate WHERE each meal was PREPARED.

	Home, by you (incl. minimal / no prep)	Home, by someone else (family, partner, friend)	Restaurant, take-out, cafeteria, vending machine, etc.	Someone else's home	Did not eat	Don't know	Refuse to answer
BREAKFAST	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LUNCH	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DINNER	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SNACKS/OTHER	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

"You said you had food prepared outside the home on [date]. Please indicate WHERE each of those meals was purchased." Response options included the following: *Fast food/quick service/coffee shop* (i.e., *order from a counter, pizza delivery, etc.*); *Sit-down restaurant with a server*; *Cafeteria (NOT including fast food chains)*; *Ready-to-eat/take-away from grocery store*; *Food truck/food stand/street food*; *Convenience store/gas station*; *Sports, recreation, or entertainment venue*; *Vending machine*; *Some other place*; *Don't know*; and *Refuse to answer*.

Purchase locations for meals prepared at home

Respondents who indicated they prepared any meals at "Home, by you" or "Home, by someone else" were asked, "Please think about food PREPARED AT HOME (by you or someone else) IN THE LAST 7 DAYS. Where was it purchased?" and could select all that applied from the following: *Grocery store or supercenter*; *Warehouse club* (e.g., *Costco*); *Convenience/corner store*; *Drugstore/pharmacy*; *Farmer's market, product stand, or CSA*; *Ethnic or specialty food store/market*; *Bulk food store*; *Grocery delivery*; *Food bank*; *Some other place*; *Don't know*; and *Refuse to answer*. Respondents were then asked about the proportion (%) of food purchased at each location and were shown only the locations selected in the previous question: "Still thinking about the food PREPARED AT HOME IN THE LAST 7 DAYS, how much was purchased from each place? Enter a percentage for each source. Sources must add up to 100%."

Ready-to-eat/box food

Respondents were asked, "Thinking about the meals prepared at home in the last 7 days, what percentage was "ready-to-eat" or "box food" (e.g., microwave, frozen or packaged meals)? This includes foods like frozen pizza, chicken fingers, Kraft dinner, minute rice, canned soup, baking mixes, instant oatmeal, toaster waffles, etc.", and responded on a slider from 0 to 100%, using 5% increments.

Primary outcome

An overall measure of meals that were "ready-to-eat/prepared outside the home" was derived by determining the proportion of meals that were prepared at home (excluding ready-to-eat), and then subtracting it from 1 to give a continuous variable with values ranging from 0 (no meals were ready-to-eat/prepared outside the home) to 1 (all meals were ready-to-eat/prepared outside the home).

Analysis

Data were weighted using post-stratification sample weights constructed based on population estimates for 2016 from the 2011 Census (Government of Canada 2011). Sample probabilities were created for 30 demographic groups (age by sex) based on weighted proportions. Weights were calculated as (1/sample probability) for each group and were applied to the full dataset. Estimates reported are weighted unless otherwise specified. Descriptive statistics were used to summarize food preparation and purchase locations. A linear regression

model was fitted using a GLM framework to examine correlates of consuming meals that were ready-to-eat/prepared outside the home, adjusting for sex at birth, age, race/ethnicity, BMI, parental status, student status, current living situation, and cooking skills. Respondents were excluded from analyses on a case-wise basis for missing data. Analyses were conducted using IBM SPSS version 24 and SAS version 9.4.

Results

Of the 3000 respondents who completed the initial Canada Food Study survey, a subsample of 2840 were included in the current analysis, after excluding participants with missing data on the variables of interest. Table 1 presents characteristics of the respondents included in the analysis.

Meal preparation locations from food source dietary recall

Table 2 shows the preparation locations of meals eaten in the previous week, by meal type and as a weekly total. As indicated in Table 2, participants did not report eating a meal for breakfast, lunch, or dinner on 11.0% of these occasions. The majority of meals and snacks were prepared at home, by respondents. Across all meals that were reported, 79.9% were prepared at home and 20.1% were prepared outside the home. Across all snacks that were reported, 83.3% of snacks were prepared at home and 16.7% were prepared outside the home. On average, 39.4% of the entire sample had at least one meal per day that was prepared outside the home and 12.6% had at least one snack per day prepared outside the home. Over the course of the week, 83.1% of all participants reported at least one meal prepared outside the home and 41.7% reported at least one snack prepared outside the home.

Purchase locations for meals prepared outside the home

Table 3 shows the purchase locations for meals prepared outside the home. The majority of meals prepared outside the home were purchased at a fast food/quick service/coffee shop outlet. Convenience stores comprised 1.6% of all meal purchases and 17.5% of all snack purchases.

Purchase locations for meals prepared at home

Table 4 shows the purchase locations for food prepared at home. More than three-quarters (76.6%) of food prepared at home was purchased at a grocery store or supercenter, followed by a warehouse club (7.0%), farmer's market, produce stand, or CSA (4.7%), and ethnic or specialty food store/market (4.3%). Of the entire sample, 64 respondents

(2.2%) indicated they had no meals prepared at home in the previous week.

Ready-to-eat/box food

An average of 26.2% of the meals prepared at home were categorized as "ready-to-eat" or "box food". Of all meals eaten over the 7-day period, 42.3% were ready-to-eat/box food prepared at home or meals prepared outside the home.

A linear regression model was fitted to examine the correlates of the proportion of meals consumed that were ready-to-eat/prepared outside the home (see Table 5). The following variables were significant in the model: age, race/ethnicity, BMI category, parental status, current living situation, and cooking skills. In particular, respondents who were younger, identified as Aboriginal, had obesity, had no children, who lived in residence at school, university, or college, and who reported poorer cooking skills consumed more meals that were ready-to-eat/prepared outside the home. Sex and student status were not significantly associated with the proportion of meals that were ready-to-eat/prepared outside the home.

Discussion

The current study provides a comprehensive examination of food sources among young people in five major cities in Canada. Of all meals consumed, 80% were prepared at home and 20% were prepared outside the home. Given that food prepared outside the home is typically more energy-dense than food prepared at home, the current results are generally consistent with previous research, which estimates that approximately one third of energy intake comes from food prepared outside the home (Guthrie et al. 2002; Smith et al. 2013).

The majority of meals and snacks prepared outside the home were purchased at fast food, quick service, and coffee shop outlets. This is comparable to previous findings that fast food establishments represent the largest proportion of calories consumed outside the home (Guthrie et al. 2002), as well as general industry trends towards convenience and quick service settings.

Of meals prepared at home, grocery stores or supercentres represented the predominant source of food purchases (77%), comparable to previous findings in the US that grocery chains represent the largest annual volume of packaged food purchases (Stern et al. 2016), as well as Canadian findings that supermarkets were visited at least once per week by 90% of people (Minaker et al. 2016). Of all meals prepared at home, over one quarter were ready-to-eat/box food, which are generally considered "ultra-processed", and have been associated with poorer diet quality (Moubarac et al. 2017). When

Table 1 Sample characteristics
(*n* = 2840)

Characteristic	Unweighted % (<i>n</i>)	Weighted %
Sex at birth		
Male	39.6% (1125)	50.9%
Female	60.4% (1715)	49.1%
Age		
Mean; SD	21.7; 3.8	23.3; 4.2
City		
Toronto	25.3% (720)	24.6%
Montreal	18.7% (530)	20.0%
Halifax	19.7% (560)	17.6%
Edmonton	17.3% (491)	16.6%
Vancouver	19.0% (539)	21.2%
Race/ethnicity		
White only	44.8% (1273)	45.4%
Chinese only	8.1% (228)	7.8%
South Asian only	6.3% (180)	6.6%
Black only	5.5% (156)	5.4%
Aboriginal (inclusive)	4.0% (114)	3.8%
Mixed/other/not stated/missing	31.3% (889)	31.0%
BMI category		
Underweight	6.9% (197)	5.8%
Normal weight	50.8% (1441)	50.6%
Overweight	16.0% (454)	17.6%
Obese	7.8% (222)	8.1%
Not stated/Missing	18.5% (526)	17.9%
Current living situation		
Parent(s)/guardian(s)	41.3% (1174)	33.8%
Residence at school, university, or college	6.0% (170)	3.9%
Other	52.7% (1496)	62.3%
Parental status (missing <i>n</i> = 3)		
One or more children	3.0% (86)	4.7%
No children	97.0% (2751)	95.3%
Student status (missing <i>n</i> = 7)		
Not a student	29.4% (832)	40.1%
Full-time student	64.1% (1816)	52.9%
Part-time student	6.5% (185)	7.0%
Cooking skills* (missing <i>n</i> = 35)		
Mean; SD	2.9; 1.0	3.0; 1.0

*Cooking skills range from 0 (poor) to 5 (excellent)

considering all meals consumed, whether prepared in or out of the home, over 40% were either ready-to-eat/box food or meals prepared outside the home. Respondents who were younger, identified as Aboriginal, had obesity, had no children, lived in residence at school, university, or college, and had poorer cooking skills reported consuming a greater proportion of meals that were ready-to-eat/prepared outside the home. Sex and student status were not significantly associated with the proportion of meals that were ready-to-eat/prepared outside the home.

Many of the same correlates of consuming meals that were ready-to-eat or prepared outside the home identified in the current study are similar to previous studies examining food preparation and ready-to-eat meal intake, with the exception of sex (Larson et al. 2006; Van der Horst et al. 2011). For example, previous research has shown that younger respondents and those with excess weight have a higher intake of ready-to-eat meals (Van der Horst et al. 2011) and that campus housing is associated with less frequent food preparation (Larson et al. 2006), consistent with our results. There is also evidence that those with better

Table 2 Preparation locations of meals eaten in the previous week, by meal type (% of each meal type; mean (SD) number of meals)

Preparation location	Breakfast (n = 2817)	Lunch (n = 2775)	Dinner (n = 2773)	All meals* (n = 2741)	Snacks/other (n = 2721)	Total (all meals, snacks/other) (n = 2673)
Home	72.8%	64.3%	77.1%	71.4%	64.3%	70.0%
Home, by you	5.1 (2.4)	4.5 (2.2)	5.4 (1.8)	15.0 (5.1)	4.5 (2.6)	19.6 (6.6)
Home, by someone else	61.4%	45.7%	45.7%	50.9%	54.3%	52.5%
Someone else's home	4.3 (2.6)	3.2 (2.4)	3.2 (2.4)	10.7 (6.1)	3.8 (2.7)	14.7 (7.7)
Someone else's home	10.0%	15.7%	27.1%	17.6%	7.1%	15.0%
Someone else's home	0.7 (1.5)	1.1 (1.9)	1.9 (2.3)	3.7 (4.8)	0.5 (1.3)	4.2 (5.6)
Someone else's home	1.4%	2.9%	4.3%	2.9%	2.9%	2.5%
Someone else's home	0.1 (0.4)	0.2 (0.5)	0.3 (0.7)	0.6 (1.3)	0.2 (0.6)	0.7 (1.7)
Outside home	8.6%	25.7%	18.6%	17.6%	12.9%	16.4%
Outside home	0.6 (1.3)	1.8 (1.9)	1.3 (1.6)	3.7 (3.8)	0.9 (1.5)	4.6 (4.5)
Did not eat	18.6%	10.0%	4.3%	11.0%	22.8%	13.6%
Did not eat	1.3 (2.1)	0.7 (1.4)	0.3 (0.8)	2.3 (3.0)	1.6 (2.3)	3.8 (4.3)

Respondents who reported “Don’t know” or “Refuse to answer” for any meals or snacks were excluded from estimates related to each corresponding meal/snack category

*All meals includes breakfast, lunch, and dinner

cooking skills are more likely to prepare food at home (Larson et al. 2006), as well as consume fewer ready-to-eat meals (Van der Horst et al. 2011), also consistent with our findings.

Strengths and limitations

This study has several strengths and limitations. First, respondents may not have accurately remembered where each of their

meals was prepared and/or purchased in the past 7 days, and therefore misreporting is a possibility. However, the tool used in the current study was highly correlated with meal preparation data collected in a 7-day food diary in a validation study (O’Neill et al. 2017). Also, respondents may not have been the primary food purchaser and, therefore, may be unfamiliar with where food prepared at home was purchased (for example, if another family member did most of the household food

Table 3 Percentage and number of meals prepared outside the home that were purchased at each location in the previous week; %, mean (SD)

Purchase location	Breakfast (n = 797)	Lunch (n = 1875)	Dinner (n = 1706)	All meals* (n = 2348)	Snacks/other (n = 1128)	Total (all meals, snacks/ other) (n = 2448)
Fast food/quick service/coffee shop	46.5%	45.1%	36.6%	42.6%	31.8%	40.4%
Fast food/quick service/coffee shop	1.1 (1.4)	1.3 (1.5)	0.8 (1.1)	2.0 (2.4)	0.8 (1.2)	2.3 (2.7)
Sit-down restaurant with a server	13.0%	17.4%	36.9%	23.4%	4.1%	19.6%
Sit-down restaurant with a server	0.3 (0.7)	0.5 (0.9)	0.8 (1.0)	1.1 (1.6)	0.1 (0.5)	1.1 (1.8)
Cafeteria	22.3%	19.5%	11.6%	17.2%	11.6%	16.1%
Cafeteria	0.5 (1.4)	0.6 (1.3)	0.3 (1.1)	0.8 (2.6)	0.3 (0.9)	0.9 (2.8)
Ready-to-eat/take-away from grocery store	7.4%	8.5%	6.2%	7.5%	16.6%	9.3%
Ready-to-eat/take-away from grocery store	0.2 (0.7)	0.2 (0.7)	0.1 (0.5)	0.4 (1.2)	0.4 (1.0)	0.5 (1.5)
Food truck/food stand/“street food”	1.2%	2.3%	1.9%	1.9%	2.3%	2.0%
Food truck/food stand/“street food”	0.1 (0.2)	0.1 (0.4)	0.1 (0.3)	0.1 (0.5)	0.1 (0.3)	0.1 (0.6)
Convenience store/gas station	2.4%	1.5%	1.3%	1.6%	17.5%	4.7%
Convenience store/gas station	0.1 (0.4)	0.1 (0.3)	0.1 (0.3)	0.1 (0.5)	0.4 (0.9)	0.3 (1.0)
Sports, recreation, or entertainment venue	0.4%	0.5%	0.9%	0.6%	1.3%	0.8%
Sports, recreation, or entertainment venue	0.1 (0.1)	0.1 (0.1)	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.3)
Vending machine	0.9%	0.9%	0.6%	0.8%	8.7%	2.4%
Vending machine	0.1 (0.2)	0.1 (0.2)	0.1 (0.2)	0.1 (0.4)	0.2 (0.7)	0.1 (0.6)
Some other place	5.8%	4.2%	3.9%	4.3%	6.0%	4.6%
Some other place	0.1 (0.6)	0.1 (0.6)	0.1 (0.4)	0.2 (1.0)	0.2 (0.6)	0.3 (1.2)

Don’t know/Refuse to answer were ≤0.1% for all columns and are not shown

*All meals includes breakfast, lunch, and dinner

Table 4 Mean percentage of food prepared at home in the previous week purchased at each location ($n = 2568$)

Purchase location	Mean % (SD)
Grocery store or supercentre	76.6% (28.4)
Warehouse club (e.g., Costco)	7.0% (17.2)
Farmers' market, produce stand, or CSA*	4.7% (13.0)
Ethnic or specialty food store/market	4.3% (13.0)
Convenience/corner store	2.2% (8.7)
Bulk food store	1.4% (6.7)
Drugstore/pharmacy	1.3% (6.7)
Grocery delivery	0.9% (7.6)
Food bank	0.8% (6.8)
Some other place	0.8% (6.9)

*CSA, community supported agriculture

shopping). Further, ready-to-eat food prepared at home may not be comprised entirely of ultra-processed or less healthy food, as the food market has evolved and increased in diversity, leading to healthier ready-to-eat meal options. However, ultra-processed and ready-to-eat meals still generally have a lower nutritional quality compared to other meals, and higher consumption of these foods is associated with obesity and related chronic diseases (Moubarac 2017). While misreporting in

questions related to food source may be a limitation, a strength of the measures used is the detail and specificity of the questions, such that food source for each meal in a 7-day period could be identified. For questions related to food source, examples or clarification were provided to assist respondents and optimize the quality of data collected.

In addition, the study did not recruit participants using probability-based sampling and recruited only from five major Canadian cities; therefore, generalizability is limited. For example, those living in urban centres are less likely to have excess weight or obesity than those in rural areas (Shields and Tjepkema 2006). The current study used self-reported BMI, which is associated with greater bias compared to directly measured BMI. Non-responders typically have a higher BMI than responders; therefore, we have included those with “not stated/missing” BMI values as a separate category in the analysis. Compared to national estimates, the current sample was somewhat more likely to report food insecurity and included a greater proportion of students, but reported similar levels of overweight and obesity, as well as other risk behaviours, such as tobacco and cannabis use (Hammond et al. 2017). A measure of socio-economic status (such as household income or education level) was not included in the analysis, since such measures may not be accurate among youth and young adults, many of whom have yet to

Table 5 Correlates of the proportion of meals that were ready-to-eat/prepared outside the home, from a linear regression model using a GLM framework ($n = 2038$)

Characteristic	χ^2, p	Estimate (95% CI)	p
Sex	1.01, $p = 0.31$		
Age	11.00, $p < 0.001$	-0.006 (-0.009, -0.002)	< 0.001
Race/ethnicity	14.83, $p = 0.01$		
Aboriginal vs. white only		0.09 (0.04, 0.14)	< 0.001
Aboriginal vs. Chinese only		0.09 (0.03, 0.16)	0.007
Aboriginal vs. South Asian only		0.12 (0.06, 0.19)	< 0.001
Aboriginal vs. black only		0.09 (0.02, 0.16)	0.01
Aboriginal vs. mixed/other/not stated/missing		0.08 (0.03, 0.14)	0.003
BMI category	28.25, $p < 0.001$		
Obese vs. underweight		0.06 (0.001, 0.11)	0.04
Obese vs. normal weight		0.10 (0.06, 0.14)	< 0.001
Obese vs. overweight		0.08 (0.04, 0.12)	< 0.001
Obese vs. missing		0.09 (0.04, 0.13)	< 0.001
Parental status	10.10, $p = 0.002$		
No children vs. one or more children		0.08 (0.03, 0.13)	0.002
Student status	3.84, $p = 0.15$		
Current living situation	114.93, $p < 0.001$		
Residence at school, university, or college vs. parent(s)/guardian(s)		0.31 (0.25, 0.37)	< 0.001
Residence at school, university, or college vs. other		0.25 (0.19, 0.31)	< 0.001
Cooking skills	47.66, $p < 0.001$	-0.04 (-0.05, -0.03)	< 0.001

complete their education. A considerable strength of this study is the age range (16 to 30 years), as this is typically a period of transitions and a critical time in which long-term health habits become established (Nelson et al. 2008).

Conclusions

The current findings indicate that a substantial proportion of the meals consumed by youth and young adults are either prepared outside the home or consist of ready-to-eat/box food prepared at home. The findings highlight an ongoing trend away from “home cooked” meals to more processed foods, most likely in response to growing time pressures and lifestyle changes, particularly among young people. As a result, there is growing emphasis on dietary recommendations that highlight basic patterns of food preparation and eating, rather than a nutrient-specific focus. Most notably, dietary guidelines from Brazil explicitly recommend avoiding processed food and food prepared outside the home, with a similar focus in proposed changes to Canada’s Food Guide (Ministry of Health of Brazil 2015; Government of Canada 2017). Increasing food preparation skills may be an important component of reducing processed food intake, in conjunction with policies and nutrition standards to improve the dietary quality of pre-packaged and restaurant foods.

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