After-school Snack Intake Among Canadian Children and Adolescents

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ABSTRACT

Objectives: The article describes the after-school (AS) snacking pattern of young Canadians and its relationship with the amount of energy consumed daily and at dinner.

Methods: We analyzed cross-sectional dietary data, measured by 24h recall, from 9,131 children and adolescents aged 4 to 18 years from the Canadian Community Health Survey, cycle 2.2 (2004). We evaluated AS snack intake; i.e., foods consumed Monday to Friday between 3:00 and 6:00 pm, excluding lunch and dinner. We also assessed the consumption frequency of AS snack items, the energy provided by AS snacks and total daily energy intake (TDEI) by age group and sex.

Results: Approximately 63% of respondents consumed AS snacks. AS snacks provided on average 1212[95%CI,1157-1268]kJ (290[95%CI,276-303]kcal), representing 13[95%CI,12-13]% of TDEI. Youth who consumed AS snacks contributing 1-418 kJ (1-99 kcal) reported lower TDEI than those who consumed no snack. Among AS snack consumers, TDEI was higher in groups consuming the highest amount of energy from AS snacks. Fruits were among the most frequently consumed food categories. However, the largest energy contributors were mostly foods that may be energy-dense and nutrient-poor, such as cookies, sugar-sweetened beverages and sweets.

Conclusion: Considering that the majority of children and adolescents consumed AS snacks, that these snacks provided about 13% of their TDEI, and that the majority of the most frequently consumed snacks were generally energy-dense, nutrient-poor foods, the AS time period presents an opportunity to promote healthy eating in order to improve diet quality and potentially influence TDEI among Canadian children and adolescents.

Key words: Energy intake; eating; food; child; youth; body mass index

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Can J Public Health 2012;103(6):e448-e452.

The high rates of overweight and obesity among Canadian children and youth and the quality of their diet are of concern.¹ Results from the Canadian Community Health Survey, Cycle 2.2, Nutrition (CCHS 2.2) show that most snacks consumed by Canadians are foods not included in the four food groups of Canada's Food Guide² and are generally high in energy, fats and/or sugars. Improving the diet quality of children and youth is a priority in Canada.¹

There is growing interest in Canada for supporting physical activity for children and youth in the after-school (AS) time period.³ Integrating the promotion of healthy eating into such interventions can help to improve the nutritional health of children and youth.⁴ Results of the analysis of the snacking habits of children attending elementary school in the United States raise some concerns regarding the quality of their snacks.⁵ However, in Canada, little is known about the AS snacking habits of children and adolescents.

In this article, we describe the snack intake of Canadian children and adolescents of different age groups and sexes, and assess the quality of snack choices. We also look at the relationship between the energy from AS snack intake and energy consumed daily and at dinner.

METHODS

Data are from CCHS 2.2 (2004). This survey provides the most recent data on food and nutrient intakes of individuals living in

the ten Canadian provinces. It excluded individuals in Canada's three northern territories and individuals either with no fixed address or living in institutions.⁶ Details on the survey design, sample and interview procedures have been published elsewhere.^{2,7} The original data were collected under the authority of the Statistics Act of Canada. The Statistics Canada CCHS 2.2 Share File, used in this work, contains data only from respondents who have agreed to have their information shared with the Survey Share Partners, including Health Canada.

This analysis includes school-aged boys and girls (aged 4 to 18). We assessed snacks consumed between Monday and Friday during the AS time period, excluding lunch and dinner. For the purposes of our analyses, the AS time period consists of the hours between 3 and 6 pm. This is determined to be the AS time period of most Canadian youth. Snacks consumed after dinner, but between 3:00 and 6:00 pm, were excluded. Dietary data were collected by 24-hour recalls. Respondents listed all foods and beverages consumed the day before the interview. Participants also identified the time at which the foods were consumed as well as the eating occasion. To maximize participant recall, the five-step Automated Multiple-Pass Method was used, about which details have already been pub-

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Conflict of Interest: None to declare.

Table 1. Sample Characteristics

Age Groups (Years)	All			After-school Snack* Consumers		
	Boys and Girls (n)	Boys (n)	Girls (n)	Boys and Girls (n)	Boys (n)	Girls (n)
All	9131	4636	4495	5453	2770	2683
4-8	2495	1272	1223	1605	800	805
9-13	3144	1605	1539	1984	1034	950
14-18	3492	1759	1733	1864	936	928

* After-school snacks are food items consumed Monday to Friday between 3:00 and 6:00 pm, excluding lunch and dinner.

lished.⁷ Information about children younger than age 6 was collected from their parents. Interviews for children aged 6 to 11 were conducted with parental help. The first 24-hour recall was used for this study. The energy content of the AS snacks was derived from Health Canada's Nutrient File 2001b, Supplement.⁸ Foods consumed as AS snacks were regrouped into categories using Health Canada's Bureau of Nutritional Sciences (BNS) food group classification⁹ with slight modifications. These modifications consisted of regrouping similar foods in broader categories, e.g., "commercial frozen dairy products" and "recipes of frozen dairy products".

We identified the food categories and food items most frequently consumed during the AS time period. Analyses were performed by the Dietary Reference Intakes age-sex categories: boys and girls combined ages 4 to 8 years (y), and boys and girls separate ages 9 to 13 y and 14 to 18 y. The food categories and food items contributing the most average total daily energy from consumers and non-consumers combined were also identified.

To account for the complex survey design, bootstrap weights were used to estimate confidence intervals.¹⁰ In accordance with Statistics Canada's release guidelines, an estimate was not reported if the number of sampled respondents was less than 30 or if the coefficient of variation for the estimate was higher than 33.3%.¹¹ Values presented in the article are estimates and [95% confidence intervals]. A difference between two estimates was considered statistically significant when the 95% confidence intervals did not overlap. For instance, this method was used to compare the frequency of consumption of different food items. T-tests, with Bonferroni correction, were used only to compare total energy intake and energy consumed at dinner between different groups of AS snack consumers, as shown in Figure 1. Significance level is defined as $p < 0.05$.

RESULTS

After-school snack consumers

Table 1 presents the sample characteristics. Overall, 63% of children and adolescents consumed AS snacks. The number of AS snack consumers was significantly higher among young children (68[65-71]% of 4-8 y children) than among adolescents (56[53-58]% of 14-18 y adolescents).

Energy consumed as AS snacks

On average, AS snacks provided 1212[1157-1268]kJ (290[276-303]kcal), which represents 13[12-13]% of total daily energy intake. Though the absolute amount of energy consumed as AS snacks increased with age (Table 2), the relative contribution of AS snacks to total daily energy intake was similar between age groups. For instance, it represented 12[11-13]% of total daily energy intake among 4-8 y children and 14[13-14]% among 14-18 y adolescents.

Figure 1. Energy intake by categories of energy consumed as after-school snacks, youth aged 4 to 18, Canada excluding Territories, 2004

* Significantly different than the 0 kJ category ($p < 0.05$).

After-school snack consumption and energy consumed daily and at dinner

Total daily energy intake was lower when AS snacks provided between 1 and 418 kJ (1 and 99 kcal) than when no snack was consumed (Figure 1). Among AS snack consumers, total daily energy intake was higher in groups who consumed the highest amount of energy from AS snacks. Similarly, the group who consumed AS snacks providing between 1 and 418 kJ (1 and 99 kcal) had lower energy intake at dinner than when no snack was consumed. No difference in energy intake at dinner was observed in the other groups.

After-school snacks the most frequently consumed

About half of the food categories listed as the most frequently consumed mainly included food items that are generally energy-dense and nutrient-poor (Table 3).

Analyses were also completed by food items. The frequency of consumption for each food item is presented as a percentage of all food items reported as AS snacks. These analyses provide more precision about what foods, among the most frequently consumed food categories, were reported most often. Among fruits, apples (3.5[2.9-4.1]%) and bananas (1.9[1.5-2.3]%) were the food items consumed most often. Water was also reported frequently (9.9[9.0-10.8]%). Regarding "other beverages", both fruit drinks (4.7[4.1-5.4]%) and regular soft drinks (3.3[2.7-4.0]%) were part of the most frequently consumed snacks. Among "sweet snacks", candies and gums (4.3[3.7-4.8]%) and popsicles and sherbet (2.0[1.6-2.4]%) were consumed most often. "Cookies", which includes cereal bars, was the most frequently consumed snack item (9.0[8.1-9.9]%) other than water. Of all types of milk, 2% milk was the most frequently reported (3.3[2.7-3.8]%). In the category "other breads", crackers and crisp breads (3.1[2.5-3.6]%) was the most popular item. Cheese

Table 2. Energy Provided by After-school Snacks by Age Groups and Sex, Youth Aged 4 to 18, Canada Excluding Territories, 2004

Energy Provided by After-school Snacks (kJ)	
	Mean [95% CI]
Boys and girls	
4-8 years	967 [898-1036]
Boys	
9-13 years	1424 [1269-1579]
14-18 years	1058 [968-1149]
Girls	
9-13 years	1586 [1409-1763]
14-18 years	1294 [1153-1434]

Table 3. Food Categories the Most Frequently Consumed as After-school Snacks*, Youth Aged 4 to 18, Canada Excluding Territories, 2004

Food Category	Frequency [95% CI] (Weighted Estimates)
Fruits, raw, cooked, frozen and canned	11.6 [10.5-12.6]
Water, tea and coffee	11.5 [10.6-12.4]
Other beverages †	9.9 [8.9-10.8]
Sweet snacks, sugars, candies, etc. ‡	9.8 [8.9-10.7]
Cookies, biscuits and cereal bars	9.1 [8.2-10.0]
Milks	5.8 [5.1-6.6]
Other breads §	5.2 [4.5-5.9]
Fruit juices	3.7 [3.1-4.3]
Fried potatoes	3.3 [2.8-3.8]
Cheeses	3.2 [2.6-3.8]

Frequency of consumption for one food category is presented as percentage of all food categories reported as after-school snacks.

Because the 95% confidence intervals [95% CI] of the frequency of consumption of certain food categories are overlapping, the list does not present the exact ranking for frequency of consumption.

* All snacks consumed Monday to Friday between 3:00 and 6:00 pm, excluding lunch and dinner.

† Other beverages include fruit drinks, regular and diet soft drinks, and milk-based beverages such as chocolate milk and milkshakes.

‡ Sweet snacks, sugars, candies, etc. include confectionary, jams, and sugars added to food, such as syrups and white sugar.

§ Other breads include bagels, crackers, muffins, pancakes, croissants.

with 25% fat (1.9[1.5-2.3]%) and with 10-25% fat (1.1[0.8-1.5]%) were reported somewhat often. Overall, the analyses by food item showed that the majority of the most frequently consumed snacks are generally energy-dense, nutrient-poor foods.

There was no significant difference in the frequency of consumption of the different food categories and food items between sexes and age groups (data not shown).

After-school snacks contributing the most energy

The top energy contributors to the average energy provided by AS snacks in children and adolescents were assessed. Food categories contributing the most energy were those including mostly energy-dense, nutrient-poor foods (Table 4). Fruits and milks were the exception.

Analyses by food item showed that, among "sweet snacks", candies (including gums) (47[27-68]kJ) and popsicles and sherbet (37[26-48]kJ) were the top energy contributors. The largest energy contributors among the "other beverages" category were fruit drinks (49[42-56]kJ) and regular soft drinks (42[35-49]kJ). Cookies and cereal bars were, by far, the food item contributing the most energy among AS snack consumers, providing on average 111[96-126]kJ. Sandwiches (43[30-56]kJ) and pizza (27[16-38]kJ) were also among the largest energy contributors. The fruit contributing the most energy were apples (25[21-30]kJ) and bananas (18[14-22]kJ). Cakes (50[31-69]kJ) and pastries (18[12-25]kJ) were also relatively high energy contributors. Among "other breads", crackers and crisp

Table 4. Food Categories Consumed as After-school Snacks* Contributing the Most Energy on Average Among After-school Snack Consumers, Youth Aged 4 to 18, Canada Excluding Territories, 2004

Food Category	Mean Energy Contribution (kJ) [95% CI] (weighted estimates)
Sweet snacks, sugars, candies, etc. †	120 [95-144]
Other beverages ‡	117 [105-130]
Cookies, biscuits and cereal bars	117 [101-133]
Pizza, sandwich, hamburger and hot dog	97 [77-118]
Fruits, raw, cooked, frozen and canned	81 [72-89]
Cakes and pastries	79 [60-99]
Other breads§	71 [59-84]
Milks	68 [57-79]
Fried potatoes	59 [47-72]
Frozen dairy products	54 [43-66]

Because the 95% confidence intervals [95% CI] of the calorie contribution of certain food categories are overlapping, the list does not present the exact ranking of energy contributors.

* All snacks consumed Monday to Friday between 3:00 and 6:00 pm, excluding lunch and dinner.

† Sweet snacks, sugars, candies, etc. include confectionary, jams, and sugars added to food, such as syrups and white sugar.

‡ Other beverages include fruit drinks, regular and diet soft drinks, and milk-based beverages such as chocolate milk and milkshakes.

§ Other breads include bagels, crackers, muffins, pancakes, croissants.

bread was the top energy contributor, providing on average 33[25-40]kJ. Overall, the analyses by food item showed that lots of sweet foods were among the largest contributors of energy, such as cookies and bars, chocolate bars, cakes, candies, popsicles and sherbet.

The energy contributions of different food categories and food items consumed as AS snacks were similar between sexes and age groups (data not shown).

DISCUSSION

The AS time period provides an opportunity to both improve the diet quality and help influence total daily energy intake of Canadian children and adolescents. Our analyses show that a large portion of reported intake of AS snacks consisted of generally energy-dense, nutrient-poor foods. Moreover, high intake of AS snacks seemed to be associated with high total daily energy intake. Considering that two thirds of children and adolescents consumed AS snacks in Canada, interventions to improve the quality of snack intake during this time period could reach a wide portion of this population.

Our data suggest that AS snack choices could be improved to better follow the guidance in *Eating Well with Canada's Food Guide*. Canada's Food Guide recommends limiting foods high in calories, fat, sugar or salt (sodium), such as cakes and pastries, chocolate and candies, cookies and granola bars, doughnuts and muffins, ice cream and frozen desserts, french fries, potato chips, sweetened drinks, etc.¹² As shown by our analyses, apart from fruits and water, the food categories that were most frequently reported (Table 3) as AS snack choices are foods that are recommended to be limited in the diet. In addition, the food categories that were the top energy contributors to the average AS snack intake are also mainly foods one should limit. Our data show that cookies and cereal bars have an important place in the snacking habits of young Canadians. These food items were both the most frequently consumed and the largest energy contributors among AS snack consumers. Other examples of snack choices that were reported both frequently and as top energy contributors included candies, fruit drinks, soft drinks, chocolate and cakes. On the other hand, fruits and milk were snacks frequently reported to be consumed among children

and adolescents and these are recommended in Canada's Food Guide. Their consumption frequency was high enough that, although they provide relatively low energy, they were main energy contributors to the average AS snack intake. Because of their popularity and positive contribution to a healthy pattern of eating, their consumption as AS snacks should be encouraged. Considering that AS snacks represented about half of daily snacks² and 13% of total daily energy intake – a relatively important contribution to diet – better AS snack choices, such as foods recommended in Canada's Food Guide, may improve diet quality among children and adolescents.

Our results show that, apart from the group consuming 1 to 418 kJ (1 to 99 kcal) as AS snacks, lower energy intake from AS snacks was associated with lower total daily energy intake (Figure 1). This may suggest that lower energy intake from AS snack consumption helps to minimize high total daily energy intake. In addition, apart from the group consuming 1 to 418 kJ (1 to 99 kcal) as AS snacks, AS snack intake did not seem to influence energy consumption at dinner. In fact, we observed no compensation at dinner for the amount of energy ingested as AS snacks for most of the groups. While we acknowledge that our analyses do not permit adjustment for potential confounders, such as energy expenditure and consumption time of snack, lunch and dinner, our findings are consistent with evidence showing that the energy yielded by snacks is not compensated for in the subsequent meal and leads consistently to higher total daily energy intake.¹³ Reviews report mixed results on the effects of snack intake on energy intake, however the wide variations in the definitions used for “snacks” could explain this inconsistency.^{14,15} At the same time, portion size served at one eating occasion is positively associated with total daily energy intake.¹⁵ Considering the aforementioned evidence, we find it surprising that consuming AS snacks containing below 418 kJ (100 kcal) may influence energy intake at dinner and throughout the day. While further evidence is needed, consuming lower energy from AS snacks may help limit total daily energy intake.

Considering the observed association between energy consumed from AS snack intake and total daily energy intake, one may presume that AS snacking habits can potentially influence body weight. However, our analyses did not aim to extensively evaluate the possible association between AS snack intake and body weight. AS snacks being one component of the energy balance equation, a more in-depth analysis, including longitudinal studies, is necessary to understand the effects of AS snack intake on body weight.

Many factors can influence the choices of snacks reported by Canadian youth. Although this study did not assess these influencing factors, one could suppose that ease of transport of some food products as well as their cost and level of acceptability among youth might have an impact. Another possible influencer is the knowledge of youth and their parents with regard to how to make healthy choices. Understanding these factors would better inform the development of interventions aiming at improving AS snack choices among Canadian children and adolescents.

Healthy eating interventions aimed at influencing AS snack quantity and quality could benefit a large proportion of children and adolescents. However, because there were more AS snack consumers among children aged 4 to 8, this age group may benefit most from such interventions. Nonetheless, there was no significant difference in snack choices between age groups.

One possible limitation to the study is the use of one-day 24h dietary recalls to assess food intake. This method describes food intake at one point in time; it does not assess usual food intake. However, the large number of participants and the statistical method used to make the sample nationally representative improve the accuracy of the dietary intake data. The use of this method is also generally associated with some under-reporting, even when the Automated Multiple-Pass Method is used. In this survey, calorie under-reporting was estimated at 10%.¹⁶ However, this may not affect the results related to food choices, but rather the analyses using energy intake.

Considering that 1) the majority of children and adolescents consumed AS snacks, 2) these snacks provided about 13% of their total daily energy intake, and 3) the majority of the most frequently consumed snacks were foods generally low in nutrients and high in energy, the AS time period can provide opportunities to promote healthy eating in order to improve diet quality and influence total energy intake among children and adolescents in Canada. Further research on the factors influencing AS snack choice is warranted.

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Received: May 22, 2012

Accepted: September 3, 2012

RÉSUMÉ

Objectifs : Décrire la prise de collations après l'école (CAE) et son association avec l'apport énergétique total (AET) et lors du souper.

Méthode : Nous avons analysé les données nutritionnelles transversales, mesurées par des rappels de 24 heures, venant de 9 131 enfants et adolescents âgés de 4-18 ans ayant participé à l'Enquête sur la santé dans les collectivités canadiennes, cycle 2.2 (2004). Les CAE étaient les aliments consommés sur semaine entre 15 h et 18 h, excluant le dîner et le souper. Nous avons évalué la fréquence de consommation des aliments-collations, l'énergie qu'ils fournissent, ainsi que l'AET par groupe d'âge et par sexe.

Résultats : Environ 63 % des jeunes consommaient des CAE. Ces collations fournissaient en moyenne 1 212 kJ [IC de 95 % : 1 157-1 268] (290 kcal [IC de 95 % : 276-303]), soit 13 % [IC de 95 % : 12-13] de l'AET. Les jeunes dont la prise de CAE fournissait 1-418 kJ (1-99 kcal) présentaient un apport énergétique total inférieur aux non-consommateurs de CAE. Parmi les consommateurs de CAE, l'AET était supérieur chez ceux qui présentaient un plus grand apport énergétique provenant des CAE. Les fruits faisaient partie des catégories d'aliments les plus fréquemment consommées. Toutefois, les aliments riches en énergie, comme les biscuits, les boissons sucrées et les sucreries, étaient les principales sources de calories.

Conclusion : Étant donné que la majorité des jeunes consommaient des CAE, que ces dernières représentaient environ 13 % de leur AET, et que la majorité des aliments-collations les plus fréquemment cités étaient généralement riches en énergie et pauvres en nutriments, le temps après l'école pourrait être l'occasion d'améliorer la qualité de la diète et d'influencer l'AET des jeunes Canadiens.

Mots clés : apport énergétique; aliments; manger; enfants; jeunes; indice de masse corporelle