

# A Nutritional Comparison of Foods and Beverages Marketed to Children in Two Advertising Policy Environments

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Childhood obesity is associated with children's exposure to food/beverage marketing. Policy options in this area are being sought in order to reduce childhood obesity rates on a population-level. We examined the nutritional quality of foods advertised to children during their preferred television viewing in Ontario (Canada), where advertising is self-regulated by industry, and in Quebec (Canada), where a child-directed advertising ban exists. A total of 428 children aged 10–12 years completed television viewing diaries for 7 days. Thirty-two television stations were recorded simultaneously between 6 AM and midnight. A content analysis of 90 h of English Ontario, French Quebec, and English Quebec children's preferred viewing was then undertaken. A total of 429 food and beverage advertisements were analyzed and their nutritional quality was assessed. Food advertisements in the Quebec French sample were statistically significantly higher in total fat, saturated fat and protein, and lower in carbohydrates and sugar per 100 g, and as a percentage of energy than food ads in the two English samples. A statistically significantly lower percentage of the Quebec French food advertisements were classified as either high fat, sugar or sodium and a smaller proportion of food ads were classified as "less healthy" compared to the Ontario and Quebec English samples. These results suggest that the Quebec advertising ban is influencing the macronutrient profile of advertised foods viewed by French Quebec children during their preferred viewing and that their promotions are marginally healthier than that viewed by the English samples.

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## INTRODUCTION

Within Canada, significant spikes in overweight/obesity levels have recently been described. Between 1978/1979 and 2004, overweight/obesity increased from 13 to 26% in children aged 6–11 years, and increased from 14 to 29% in 12–17 year olds (1). Currently, 26% of Canadian children aged 2–17 years meet the criteria for overweight or obesity (2). Poor food intake is a significant factor which causes childhood obesity. The food intake of Canadian children currently does not meet government recommended nutritional guidelines. Fruit, vegetable, and milk consumption fall below the suggested minimum, snacks account for 27% of average daily food intake, and 22% of calories consumed by 4–18 year olds are from the "other foods" category (i.e., noncore foods) which are not recommended by Canada's Food Guide (3).

The aetiology of childhood obesity is complex. One factor that has garnered the attention of public health advocates is the role played by food and beverage marketing. Multiple reviews of the literature have concluded that commercial food advertising aimed at children directly affects their food preferences, consumption patterns, and food purchase requests (4–6). It has

also been concluded that there is strong evidence that food and beverage marketing is associated with childhood obesity (6).

Children's exposure to food and beverage marketing on television is significant in developed countries such as the United States, the United Kingdom, Australia, New Zealand, and Canada (7–10). The majority of foods marketed to children on television are high in fat, sugar and sodium, in addition to being low in nutrients (11–14). Mathematical modeling has shown that restricting children's exposure to food marketing on television is a cost effective population based approach to childhood obesity prevention (15). Little research, however, has assessed the influence of various policy options with regards to food marketing directed at children, such as industry self-regulation and government imposed regulatory approaches including advertising bans. This research aims to contribute to this body of literature by comparing the healthfulness of foods and beverages advertised during the preferred television viewing of children living in two different television advertising policy environments. Canada is a good location to conduct such research because children within Quebec and those living

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in the rest of Canada are influenced by two different advertising policies.

In Canada, advertising is primarily self-regulated by industry under the direction of Advertising Standards Canada which administers the *Broadcast Code of Advertising to Children* (ASC is a national, not-for-profit, independent self-regulatory body that was founded by the advertising industry in 1957) (16). Within this self-regulatory system, 16 of the largest food and beverage manufacturers launched the *Canadian Children's Food and Beverage Advertising Initiative* (CAI) in 2007. By the end of 2008, 10 of the 17 member corporations had committed to advertise only "better for you" products, and the remainder had committed to completely eliminate food and beverage advertising to children under 12 years. In this initiative, each participating corporation independently developed its own definitions of "advertising directed primarily to children under 12 years of age," nutrition criteria, and viewership thresholds which range from 25–50% (17). The CAI has been criticized by public health advocates for nutritional standards that are poor (18) and for child viewership thresholds that are too high (18,19).

Since 1980, the province of Quebec, under the *Consumer Protection Act*, has prohibited commercial advertising directed at children under the age of 13 when children consist of 15% of viewership, and the product featured is exclusively designed for or appeals to children (20). For example, an advertisement for a child product such as "Sponge Bob Fruit Snacks" would not be allowed in Quebec when children consist of 15% of the viewership. The *Consumer Protection Act* does permit food and beverage advertisements in Quebec that are directed at children 13 years and older during peak child viewing. For instance, a fast food commercial featuring a man in his office would be permitted in Quebec during children's peak viewing, whereas a fast food advertisement featuring a child's meal would not be permitted. Research has shown that, 26% of advertisements featured during French children's preferred viewing in Quebec are for foods and/or beverages and that, despite the advertising ban, 30% of these advertisements are targeting children (21) suggesting that the monitoring of this ban needs to be strengthened.

In the current study, it was hypothesized that, during their preferred viewing, French speaking children living in Quebec would be exposed to food advertisements that are lower in sugar and more healthful, compared to that viewed by English speaking children from Ontario and from Quebec, given that child directed products (such as candy and breakfast cereals aimed at children) cannot be advertised during children's peak viewing according to the *Consumer Protection Act* and given the weak nutritional standards set by the individual corporations in the CAI. It was also hypothesized that the Quebec English group would not benefit nutritionally from the advertising ban given their propensity to watch television broadcast from outside of Quebec where the advertising ban does not apply.

## METHODS AND PROCEDURES

Subjects, aged 10–12 years (and one 13 year old), were recruited from 18 elementary schools in two metropolitan regions, one in Ontario

and one in Quebec. The two cities were selected because they are adjacent to each other but in separate provinces with different language profiles and advertising policies. Also, because of their proximity, they have similar television station offerings though from different cable providers. Schools within the provinces were not randomly selected although principals were questioned regarding the socio-economic mix of their student body and a mix of schools representing all socio-economic levels was sought. All school boards with participating schools approved the study, parents' of subjects gave informed consent and all subjects gave verbal assent regarding their participation. In total, 225 English Ontario, 156 French Quebec, and 47 English Quebec children from grades 5 and 6 participated in the study. More girls (64%) participated in the study than boys (36%). The average age of the participants was 10.8 years and the Ontario English children ( $\bar{x} = 10.6$ ,  $s.d. = 0.7$ ) were statistically younger on average than the Quebec French children ( $\bar{x} = 10.9$ ,  $s.d. = 0.7$ ;  $F = 7.6$ ,  $P < 0.001$ ). Those subjects that agreed to participate in the study and returned completed questionnaires had parents that were more educated than the norm in Canada, as well as in the two cities where we collected the data. In total, 74% of the parents had a university degree while 26% has less than a university degree.

A child's language was defined as French if they attended a French language school while the language of all other children (either attending English or French immersion schools) was defined as English. All 428 children completed television viewing diaries for a 7-day period that were modeled on that developed by the Bureau of Broadcasting Measurement. Between March 26, 2009 and April 1, 2009, a week selected because it did not fall on school or national holidays, subjects were asked to record in their viewing diary, all television viewing including the program name, the station number and the time they were watching, at 30 min intervals. While subjects completed their television viewing diaries, 32 television stations of potential interest to English and French speaking children, were recorded by a third party contractor between 6 AM and midnight. The 32 television stations in French and English were selected for their potential interest to children aged 10–12 years based on our knowledge of children and their interests. Cable channels and channels originating in the United States were included. A multi-media recording server was used to record the stations and the recordings were then downloaded to a hard drive for later viewing.

The television viewing diaries of the English Ontario, French Quebec, and English Quebec subjects were analyzed to determine the 30 most frequently viewed hours of programming for each of the three groups. The viewing diaries vindicated our selection of television stations and we correctly captured 87.5 h of the children's preferred viewing. We inadvertently excluded two stations (2.5 h of programming) in our television station selection that fell within the 90 preferred hours of television. These were replaced with the next most popular programs.

A content analysis of the nonprogramming content in the 90 h of programming was then conducted by one research assistant who had completed 2 days of training. This analysis included documenting the day and time of the advertisement, the type of program and station on which it aired, the length of the advertisement, and the type of food/beverage product being promoted. To ensure reliability of coding, all food and beverage advertisements were reviewed by the research assistant twice. The main researcher reviewed a random 15% of this sample and intercoder agreement was 97%.

Food/beverage advertisements included advertisements, contests, and sponsorship announcements that were at least 5 s in length that featured a food, beverage, or restaurant. This length was selected given that the 30 s advertisement was not the norm. Advertisements varied in length between 5 and 45 s with an average of 22.9 s. Food categorization was based on the food categories used by Gantz *et al.* (7) and included candy and snacks, beverages, restaurants, grain products, fruits and vegetables, dairy products, meat, poultry, fish and alternatives, prepared foods, and other foods. Food categories were then reduced into the following seven categories: candy, snacks, beverages, restaurants, cereal, dairy, and other.

After the content analysis was completed, the nutrient information for each advertisement's featured food or beverage was collected. Nutrient information was systematically drawn from multiple sources including, in order of priority, company websites, direct contact with the corporation, nutrient labeling on products, and the Canadian Nutrient File. When gaps were encountered in this nutrient file, the USDA National Nutrient Database was referenced. When multiple food or beverage items were featured equally in the same advertisement, the nutritional information of all of the products was assessed and then averaged. When complete meals were depicted (i.e., a hamburger, fries, and drink), an average of the two main food items in the meal was computed (i.e., for the hamburger and fries portion only). Two featured restaurant meals were discontinued between the television taping and the nutritional content analysis. Nutritional information for a similar product by the same corporation was substituted in these cases.

The nutritional information for all foods and beverages was converted to 100 g servings to facilitate comparisons. Liquids were first converted to 100 ml portions and then were converted to 100 g servings by multiplying by the appropriate specific gravity (density) of commonly consumed foods (22). In order to calculate the energy content of foods, the Atwater general factor system was used (23). Each food advertisement was then categorized according to two different nutritional criteria to assess nutrition quality. First, foods and beverages depicted in the advertisements were categorized based on whether they met the criteria for "high fat," "high saturated fat," "high sugar," "high sodium," "low fiber," "high fat or high sugar," and "high fat, sugar, or sodium" as per the method used by Powell *et al.* (14). A food or beverage was classified as "high fat" if >35% of its total energy was derived from fat, "high saturated fat" if >10% of its calories was derived from saturated fat, and "high sugar" if >25% of energy was derived from sugar as per the upper limits of the Acceptable Macronutrient Distribution Range for children aged 4–18 years (24). "Low fiber" was defined as a food or beverage with <1.15 g per serving, while "high sodium" was defined as >380 mg per serving as per Powell *et al.* (14) who derived these cut-offs from the Dietary Reference Intakes (24). Foods were classified as "high fat or high sugar" if they met either the "high fat" or "high sugar" cut-off and were defined as "high fat, sugar or sodium" if they met the "high fat," or "high sugar" or "high sodium" criteria. Secondly, each food ad was categorized using the UK Nutrient Profile Model, a three step model developed by the Food Standards Agency in the United Kingdom. This model has shown good convergent, discriminate, and construct validity (25) and there is a high level of dependence between the model's categorization and decisions made by nutrition professionals (26). This model allocates points based on the nutritional content of 100 g of the food/beverage while considering energy, saturated fat, total sugar, sodium, fruit, vegetable and nut content, fiber, and protein. It identifies foods/beverages as "less healthy" when foods score four points or more and beverages score one point or more. Those foods and beverages that did not fall into the "less healthy" category, was defined as "healthier" in this study.

All data was inputted and analyzed using PASW Statistics 17.0 (SPSS, 2009). The nutritional data for all food and beverage advertisements were weighted according to the number of times they were aired and by the number of children who viewed each advertisement as per the method used by Powell *et al.* (14). To compare the nutrition of the foods/beverages featured in each advertisement, first, we compared the mean macronutrient differences per 100 g of every food/beverage between the three groups. One-way ANOVAs were calculated to assess group mean differences and were followed-up with *post hoc* tests adjusted for multiple comparisons using the Bonferroni adjustment. When variances were not equal, the Brown–Forsythe test of equality of means was undertaken and *post hoc* analyses with the Dunnett C correction were completed. Next we examined the differences in the mean macronutrients as a percentage of energy between the three groups by calculating ANOVAs as per the above method. Lastly, we compared macronutrients according to nutrient recommendations across the three groups and we compared the relative healthfulness of the food advertisements according to the UK Nutrient

Profile Model by conducting nonparametric  $\chi^2$  analyses to determine expected group membership.

## RESULTS

### Children's preferred television viewing

Children's specialty stations accounted for the majority of the 30 h of preferred programming for each group: 87%, 62%, and 93% for English Ontario, French Quebec, and English Quebec viewers respectively. The preferred programming of children within the French Quebec group did not overlap with either English group, however, 30% of the Ontario English preferred programming fell within the preferred programming of the Quebec English group for a total of 9 h. Further detail of children's preferred viewing has already been described elsewhere (21).

### Total number of advertisements

In the 90 h content analysis, there were a total of 1,809 advertisements including 449 (25%) food/beverage advertisements and 104 distinct food/beverage products. **Table 1** lists the distinct food and beverage products and the number of times that each food/beverage item was advertised in each of the three groups' 30 h of preferred viewing. Note that in **Table 2**, as well as in subsequent tables, the total number of analyzed food/beverage advertisements is 427 rather than the 449 indicated above. This reduction reflects that the nutritional content of 22 food/beverage advertisements was not coded, as no specific food or beverage product was featured during these advertisements (i.e., the advertisement was for a brand). In the English Ontario sample, seven of these advertisements featured dine-in restaurants while three featured fast food restaurants. In the French Quebec sample, one advertisement featured a fast food restaurant while two featured a supermarket chain. Finally, in the English Quebec sample, eight advertisements were for dine-in restaurants while only one was for a fast food restaurant.

### Macronutrients per 100 g of food

As outlined in **Table 2**, the mean total fat in grams per 100 g of each food and beverage advertisement differed statistically significantly across all three groups ( $F(2, 3471) = 61.1, P < 0.001$ ). *Post hoc* tests revealed that the food/beverage advertisements in the preferred Quebec French viewing were statistically significantly higher in total fat than the advertisements viewed by the Ontario English group ( $\bar{x} = 6.5, \text{s.d.} = 8.4; P < 0.05$ ) and the Quebec English group ( $\bar{x} = 7.1, \text{s.d.} = 8.2; P < 0.05$ ). Although food advertisements viewed by all three groups contained few trans fats, the advertisements in the preferred Quebec French viewing ( $\bar{x} = 0.2, \text{s.d.} = 0.6$ ) were statistically significantly higher in trans fats than the advertisements viewed by the Ontario English group ( $\bar{x} = 0.1, \text{s.d.} = 0.3; P < 0.05$ ) and the Quebec English group ( $\bar{x} = 0.1, \text{s.d.} = 0.3; P < 0.05$ ). The food and beverage advertisements also differed in saturated fat across the three groups ( $F(2, 3471) = 40.3, P < 0.001$ ). In fact, advertisements viewed by the French Quebec group were statistically significantly higher in saturated fat ( $\bar{x} = 5.1, \text{s.d.} = 8.1$ ) compared to the Ontario English ( $\bar{x} = 3.1, \text{s.d.} = 5.3; P < 0.05$ ) and the Quebec English ( $\bar{x} = 3.3, \text{s.d.} = 5.1; P < 0.05$ ) food/

**Table 1 Foods/Beverages advertised during children's preferred 90 h of television**

Ontario English		Quebec French		Quebec English	
Product/Brand	No.	Product/Brand	No.	Product/Brand	No.
<i>Candy</i>					
Baby Bottle Pop	2	Dentyne	2	Baby Bottle Pop	4
Hershey's Bliss	1	Juicy Fruit	1	Hershey's Bliss	1
Hubba Bubba products	4	Kinder Bueno	1	Hubba Bubba products	7
Hubba Bubba Glop	5	Kit Kat Senses	5	Hubba Bubba Glop	7
Juicy Fruit	3	Mini Eggs	2	Juicy Fruit	1
Lindt Gold Bunny	1	Oh Henry	1	Lindt Gold Bunny	1
Ring Pop	2	Smarties	1	Ring Pop	4
Smarties	2	Trident Xtra Care Gum	2	Smarties	4
Total number	20		15		29
<i>Snacks</i>					
Bear Paws Minis	2	Lays Classic (chips)	2	Bear Paws Minis	3
Fruit by the Foot	2	Leclerc Cookies	7	Fruit by the Foot	4
Gushers Fruit Flavored Snacks	2	Oreo Cookies	1	Gushers Fruit Flavored Snacks	2
Oreo Cookies	6	Quaker Crispy Minis	2	Oreo Cookies	10
Smart Pop	2	Special K Mocha Bar	2	Quaker Chewy Bars	2
Quaker Chewy Bars	2	Triscuits	2	Rice Krispies Squares Bars	12
Rice Krispies Squares Bars	3			Sponge Bob Fruit Snacks	9
Sponge Bob Fruit Snacks	10				
Total number	29		16		42
<i>Beverages</i>					
Alexander Keith's beer (alcohol)	1	100% Cranberry Juice Blend	1	Cheetah Power Surge	1
Chocolate milk (l)	3	Coors Light beer (alcohol)	1	Coca-Cola	1
Coca-Cola	1	DanActive	5	Orange juice (l)	1
Orange juice (l)	2	Nescafe Riche	1	Red Bull	1
Pepsi	2	Pepsi	3	Skinny Cappuccino	1
Skinny Cappuccino	2	Kiwi Bay wine (alcohol)	1	Yoplait Yop	4
Yoplait Yop	4	Yellow Dune wine (alcohol)	1		
		Yoplait Yop	13		
Total number	15		26		9
<i>Restaurants</i>					
Chuck E Cheese	4	Burger King : BK Burger Shots	1	Chuck E Cheese	5
Dairy Queen	1	Harvey's: Angus Mushroom Melt	4	Harvey's: Angus Mushroom Melt	1
Harvey's: Angus Mushroom Melt	1	La Cage aux Sports: Wings	1	McDonald's: Happy Meal	12
Kelsey's	2	McDonald's: Big Mac Wrap	1	Montana's	1
McDonald's: Happy Meal	8	St Hubert: Super Quart	2	Pizza Hut	3
Montana's	1	Subway	1	Subway	1
Pizza Hut	1	Tim Horton's: Chicken Wrap	4	Tim Horton's: Coffee	1
Subway	2			Wendy's: The Baconator	1
Tim Horton's: Coffee	1				
Wendy's: The Baconator	1				
Total number	22		14		25

Table 1 Continued on next page

Table 1 (Continued)

Ontario English		Quebec French		Quebec English	
Product/Brand	No.	Product/Brand	No.	Product/Brand	No.
<i>Cereal</i>					
Cinnamon Toast Crunch	1	Diamond Shreddies	1	Cinnamon Toast Crunch	1
Frosted Flakes	3	Special K 5 Grains	1	Froot Loops	1
Honey Bunches of Oats	1			Frosted Flakes	4
Honey Nut Cheerios	2			Honey Nut Cheerios	1
Honeycomb	4			Honeycomb	2
Mini Wheats	2			Multigrain Krispies	1
Multigrain Krispies	1				
Special K 5 Grains	2				
Total number	16		2		10
<i>Dairy</i>					
Black Diamond Cheestrings	6	Activia (yogurt)	3	Black Diamond Cheestrings	6
Danino (yogurt)	1	Boursin Cuisine	1	Danino (yogurt)	1
Fun Cheez	1	Butter (l)	1	Fun Cheez	1
Milk (l)	13	Danino (yogurt)	6	Kraft Singles Cheese Slices	1
Philadelphia Cream Cheese	2	Milk (l)	1	Milk (l)	22
		Natrel Milk	1	Philadelphia Cream Cheese	2
		Mini Babybel (cheese)	4		
		P'tit Quebec Cheese	4		
		Silhouette 0+	6		
		Yoplait Yoptimal (yogurt)	3		
Total number	23		30		33
<i>Other</i>					
Eggo Waffle Original	1	Bagel-fuls Original	1	Delissio Deluex Pizza	2
Europe's Best Frozen Fruit	2	Chicken (l)	4	Eggo Waffle Original	4
High Liner Seafood	1	Eggo Waffle Original	1	Europe's Best Frozen Fruit	2
Kraft Dinner Original	11	Europe's Best Frozen Fruit	1	Kraft Dinner Original	12
Michelina's Entrees	1	Exceldor Chicken	1	Maple Leaf Fresh Sure Chicken	1
Mott's Fruitsations	2	Hellmann's ½ Fat Mayo	1	Michelina's Entrees	1
Naturegg Omega Pro	1	IGA	2	Mott's Fruitsations	2
Wonder + (bread)	3	Maple Leaf Bologna	1	Naturegg Omega Pro	3
		Maple Leaf Ham	1	Wonder + (bread)	5
		Michelina's Entrees	2		
		Mott's Fruitsations	1		
		Naturegg Omega Pro	1		
		McCain Superfries	1		
		Toscana Pizza Grilled Vegetable	1		
Total number	22		19		32
Grand total	147		122		180

(l) = non-brand specific advertisement by an industry association.

beverage advertisements. Significant differences in carbohydrate ( $F(2, 3471) = 98.2, P < 0.001$ ), sugar ( $F(2, 3471) = 127.2, P < 0.001$ ), fiber ( $F(2, 3471) = 7.4, P < 0.001$ ) and energy

( $F(2, 3471) = 21.1, P < 0.001$ ) per 100g were also apparent across the three groups. The Quebec French food and beverage advertisements were statistically significantly lower in

**Table 2 Nutrients per 100 g of food/beverage advertisements viewed during children's preferred 90 h of television**

	Ontario English, $\bar{x}$ (s.d.)	Quebec French, $\bar{x}$ (s.d.)	Quebec English, $\bar{x}$ (s.d.)	Total sample, $\bar{x}$ (s.d.)	<i>F</i> (2, 3,471)	<i>P</i>
<i>All foods/beverages</i>						
Total fat (g)	6.5 (8.4)	10.6 (13.5)	7.1 (8.2)	8.1 (10.7)	61.1	0.001
Saturated fat (g)	3.1 (5.3)	5.1 (8.1)	3.3 (5.1)	3.8 (6.5)	40.3	0.001
Trans fat (g)	0.1 (0.3)	0.2 (0.6)	0.1 (0.3)	0.2 (0.4)	11.1	0.001
Protein (g)	5.5 (6.0)	7.4 (7.3)	5.4 (5.6)	6.2 (6.5)	38.7	0.001
Carbohydrate (g)	42.2 (33.9)	26.9 (26.3)	43.4 (33.9)	36.7 (32.2)	98.2	0.001
Sugar (g)	23.8 (22.8)	12.6 (15.9)	26.9 (24.6)	20.2 (21.7)	127.2	0.001
Sodium (mg)	269.4 (252.6)	259.2 (307.3)	287.1 (272.4)	268.5 (277.2)	2.0	0.139
Fiber (g)	1.7 (2.8)	1.4 (2.6)	1.3 (2.1)	1.5 (2.6)	7.4	0.001
Energy (kcal)	266.3 (149.1)	234.7 (177.0)	279.9 (151.3)	256.8 (161.2)	21.1	0.001
Number (%)	137 (100.0)	119 (100.0)	171 (100.0)	427 (100.0)		

**Table 3 Nutritional content of food/beverage advertisements viewed during children's preferred 90 h of television**

	Ontario English, $\bar{x}$ (s.d.)	Quebec French, $\bar{x}$ (s.d.)	Quebec English, $\bar{x}$ (s.d.)	Total sample, $\bar{x}$ (s.d.)	<i>F</i> (2, 3,471)	<i>P</i>
<i>All food/beverages</i>						
Total fat (%)	21.8 (21.7)	29.5 (23.8)	24.0 (20.6)	25.0 (22.6)	45.1	0.001
Saturated fat (%)	10.3 (13.2)	14.4 (14.7)	11.1 (12.3)	11.9 (13.8)	32.6	0.001
Protein (%)	11.1 (10.9)	17.1 (17.8)	11.4 (12.0)	13.4 (14.3)	75.0	0.001
Sugar (%)	37.8 (27.2)	30.3 (29.6)	38.9 (25.8)	35.2 (28.1)	33.0	0.001
Carbohydrate (%)	59.4 (30.7)	50.7 (29.6)	57.0 (29.2)	55.8 (30.3)	31.8	0.001
Sodium (mg) per serving	171.8 (230.1)	155.4 (258.5)	184.0 (241.0)	167.7 (242.8)	3.1	0.044
Fiber (g) per serving	1.0 (1.3)	0.9 (1.4)	0.8 (1.1)	0.9 (1.3)	5.6	0.006
Number (%)	137 (100.0)	119 (100.0)	171 (100.0)	427 (100.0)		

carbohydrates per 100 g ( $\bar{x}$  = 26.9, s.d. = 26.3) than both the Ontario English ( $\bar{x}$  = 42.2, s.d. = 33.9;  $P$  < 0.05) and Quebec English groups ( $\bar{x}$  = 43.4, s.d. = 33.9,  $P$  < 0.05). The Quebec French food and beverage advertisements were statistically significantly lower in sugar ( $\bar{x}$  = 12.6, s.d. = 15.9) than both the Ontario English ( $\bar{x}$  = 23.8 s.d. = 22.8;  $P$  < 0.05) and Quebec English groups ( $\bar{x}$  = 26.9, s.d. = 24.6;  $P$  < 0.05). The Ontario English sugar per 100 g was also statistically significantly lower than the food advertisements in the Quebec English preferred viewing. The food/beverage products in the Ontario English ( $\bar{x}$  = 1.7, s.d. = 2.8) viewing were also statistically higher in fiber than the Quebec French ( $\bar{x}$  = 1.4, s.d. = 2.6;  $P$  < 0.05) and Quebec English ( $\bar{x}$  = 1.3, s.d. = 2.1;  $P$  < 0.05) groups. Finally, *post hoc* analyses also revealed that the Quebec French food and beverage advertisements were statistically significantly lower in energy per 100 g ( $\bar{x}$  = 234.7, s.d. = 177) when compared to the Ontario English group ( $\bar{x}$  = 266.3, s.d. = 149,  $P$  < 0.05) and the Quebec English group ( $\bar{x}$  = 249.9, s.d. = 151.3,  $P$  < 0.05).

#### Macronutrients as a percentage of energy

We also examined the percentage of energy from total fat, saturated fat, protein, sugar, and carbohydrate for each food/beverage advertisement. As shown in **Table 3**, when all 427 food/beverage advertisements were examined, on average, 25% of

energy was derived from total fat, 12% from saturated fat, 13% from protein, 56% from carbohydrates, and 36% from sugar. There were significant macronutrient differences as a percentage of energy in the food and beverage advertisements shown during English Ontario, French Quebec, and English Quebec preferred viewing. The Quebec French food and beverage advertisements were statistically significantly higher in average total fat as a percentage of energy ( $\bar{x}$  = 29.5%, s.d. = 23.8%) than the Ontario English ( $\bar{x}$  = 21.8%, s.d. = 21.7%;  $P$  < 0.05) and Quebec English ( $\bar{x}$  = 24.0%, s.d. = 20.6%;  $P$  < 0.05) food/beverage advertisements. The Quebec French food and beverage advertisements were statistically significantly higher in average saturated fat as a percentage of energy ( $\bar{x}$  = 14.4%, s.d. = 14.7%) than the Ontario English ( $\bar{x}$  = 10.3%, s.d. = 13.2%;  $P$  < 0.05) and Quebec English ( $\bar{x}$  = 11.1%, s.d. = 12.3%;  $P$  < 0.05) food/beverage advertisements. The Quebec French food and beverage advertisements were also statistically significantly higher in protein as a percentage of energy ( $\bar{x}$  = 17.1%, s.d. = 17.8%) than both the Ontario English ( $\bar{x}$  = 11.1%, s.d. = 10.9%;  $P$  < 0.05) and Quebec English ( $\bar{x}$  = 11.4%, s.d. = 12.0%;  $P$  < 0.05) food/beverage advertisements. The French Quebec food and beverage advertisements were statistically significantly lower in average sugar as a percentage of energy ( $\bar{x}$  = 30.3%, s.d. = 29.6%) than the Ontario English ( $\bar{x}$  = 37.8%, s.d. = 27.2%;  $P$  < 0.05)

**Table 4** Nutritional content of food/beverage advertisements viewed during children's preferred 90 h of television according to recommendations

	Ontario English, %	Quebec French, %	Quebec English, %	Total sample, %	$\chi^2$ (df = 2)	P
<i>Nutrition recommendations</i>						
High fat	32.9	37.5	39.1	35.6	10.1	0.006
High saturated fat	33.5	64.3	37.1	45.5	293.7	0.001
High sugar	61.5	48.9	66.6	57.7	68.0	0.001
High sodium	20.2	11.2	22.4	17.2	53.5	0.001
Low fiber	74.8	75.3	78.9	75.6	3.9	0.143
High fat or high sugar	78.0	75.5	85.6	78.3	23.8	0.001
High fat, sugar, or sodium	89.8	81.0	96.6	87.7	100.4	0.001
<i>UK nutrient profile model</i>						
Less healthy	68.3	60.6	68.9	65.5	22.2	0.001
Healthier	31.7	39.4	31.1	34.5		

and Quebec English ( $\bar{x}$  = 38.9%, s.d. = 25.8%;  $P$  < 0.05) food and beverage advertisements. Lastly, the French Quebec food and beverage advertisements were statistically significantly lower in average total carbohydrates as a percentage of energy ( $\bar{x}$  = 50.7%, s.d. = 29.6%) than the Ontario English ( $\bar{x}$  = 59.4%, s.d. = 30.7%;  $P$  < 0.05) and Quebec English ( $\bar{x}$  = 57.0%, s.d. = 29.2%;  $P$  < 0.05) food and beverage advertisements.

#### Macronutrients according to nutrient recommendations

When all food and beverage advertisements were examined (Table 4), 36% were considered high fat, 46% were categorized as high in saturated fat, 58% were classified as high sugar, 17% were high in sodium, and 76% were low in fiber. In total, 78% of all advertisements were high in fat or high in sugar, whereas 88% were high fat, sugar or sodium. When group differences were examined, a statistically significantly higher number of the Quebec French advertisements emerged as high fat and high saturated fat compared to the Ontario English and Quebec English food and beverage advertisements ( $\chi^2$  = 10.1,  $P$  = 0.006;  $\chi^2$  = 293.7,  $P$  < 0.001). With regards to sugar, a statistically significantly smaller number of Quebec French advertisements (49%;  $\chi^2$  = 68.0,  $P$  < 0.001) were categorized as high sugar compared to the English Ontario (62%) and English Quebec sample (67%). Statistically significantly fewer French Quebec advertisements (11%;  $\chi^2$  = 53.5,  $P$  < 0.001) were also categorized as high sodium compared to the English Ontario (20%) and English Quebec sample (22%). Statistically significantly fewer French Quebec advertisements were also classified as high fat, sugar, or sodium (81%;  $\chi^2$  = 100.4,  $P$  < 0.001) than the English Ontario (90%) or English Quebec food/beverage advertisements (97%).

#### The marketing of "healthier" vs. "less healthy" foods

In total, just over a third (35%) of all 427 food/beverage advertisements were classified as "healthier" while the remainder (65%) were classified as "less healthy" as per the UK Nutrient Profile Model. As described in Table 4, the Ontario English and Quebec English groups had statistically significantly

greater numbers of "less healthy" foods and beverages than the Quebec French food/beverage advertisements ( $\chi^2$  = 22.2,  $P$  < 0.001).

#### DISCUSSION

This study is the first, to our knowledge, to compare the nutritional quality of foods advertised to children during their preferred viewing in two advertising policy environments; one where advertising is self-regulated by industry (in Canada excluding Quebec) and one where there is a legislated child directed advertising ban (in Quebec). We had hypothesized that foods advertised during the preferred viewing of Quebec French children would be lower in sugar compared to foods advertised during the preferred viewing of English children from Ontario and Quebec given that products specifically designed for children are not permitted during peak child viewing in Quebec. In fact, the food and beverage advertisements in the preferred viewing of the French Quebec sample were statistically significantly different than that seen in the preferred viewing of both English samples. The French Quebec advertisements featured food and beverage products that were statistically significantly higher in total fat, saturated fat, and protein per 100 g, and as a percentage of energy. The French Quebec advertisements also featured food and beverage products that were statistically significantly lower in sugar, and carbohydrates per 100 g and as a percentage of energy and lower in energy per 100 g compared to the advertisements seen in both English groups' television viewing.

In terms of the overall healthfulness of the foods and beverages advertised during each groups' preferred 30 h of viewing, our results showed that a statistically significantly higher number of advertisements in the French Quebec group met the threshold for high fat and high saturated fat, and a statistically significantly lower number met the threshold for high sugar and high sodium compared to the two other English groups. The French Quebec advertisements also had a statistically significantly lower percentage of ads that were considered high fat, sugar, or sodium (81%) compared to the Ontario English (90%) and Quebec

English groups (97%) suggesting that the French Quebec advertisements are marginally healthier as predicted in our hypothesis. This finding was confirmed when the UK Nutrient Profile Model classification was considered, as a statistically significantly greater number of the food/beverage advertisements viewed by the Quebec French were classified as “healthier” compared to the advertisements viewed by the two English groups.

Although the purpose of this study was not to compare the two nutritional systems of classification (i.e., the macronutrient cut-offs for high fat, sugar, or sodium and the UK Nutrient Profile Model), two observations can be made about these findings. First, the results between the two classification systems diverged by ~20%, however, in both cases the majority of foods and beverages were classified as less healthy regardless of the system used. Discrepant results may have resulted since the Nutrient Profile Model awards points for fruit, vegetable and nut content, fiber content, and protein which is not considered when using the macronutrient cut-offs for high fat, sugar, or sodium. Second, the fact that both categorization systems described that the majority of foods and beverages advertised to children in Ontario and Quebec as less healthy, suggests that these foods would either, benefit from reformulation, or that they should not be marketed to children given their poor nutritional profile.

#### Policy implications

Our research suggests that, regardless of the advertising policy environment, children aged 10–12 years in Ontario and Quebec are viewing significant amounts of food and beverage advertising and, that overall, the nutritional quality of food advertisements seen on television is not in line with recommended nutritional guidelines. These results emphasize the need for policy in this area, as per Recommendation 1 of the recently endorsed WHO recommendations on the marketing of foods and beverages to children (27), which explicitly aims to reduce the impact of the marketing of foods and beverages to children. Quebec’s *Consumer Protection Act* was developed in 1978 before childhood obesity was a concern, and it was not designed to limit the marketing of foods high in fat, sugar, and salt.

Second, our results emphasize that banning commercial advertising “directed at the child,” when children consist of 15% of the viewership, and when the product featured is exclusively designed for children or appeals to children, as in the Quebec law, does not limit the frequency of advertised food and beverage products viewed by children. It does seem to have some minor influence on the healthfulness of these advertisements, however, the majority of advertisements viewed by children still remain unhealthy. Currently, the impact of advertisements which are not “directed at the child” (i.e., a fast food advertisement directed at a teen/adult) is unclear although recent publications on branding suggest that children recognize, understand, and are influenced by branding from as early as 2 years onwards (28–30). When designing policy aimed at limiting food marketing to children, it may be necessary to include marketing that is not specifically directed at the child.

Our research also demonstrates the influence of cross-border marketing. Originally, we hypothesized that the effect of the Quebec advertising ban would not extend to Quebec English subjects given their leaning to watch English television programming from outside of Quebec. This hypothesis was supported. The WHO has recently recommended that states need to cooperate to reduce cross-border marketing (27) and our results point to the need for a national policy in Canada regarding the marketing of foods and beverages high in fat, salt, and sugar.

Last, our results show that self-regulatory policies designed, implemented, and evaluated by industry are not protecting English speaking children in Canada from high rates of nutritionally poor food advertising on television. Currently, in Canada (outside Quebec) advertising is self-regulated and 19 large food, beverage, and restaurant chains have committed to advertise “better for you” products or to completely eliminate food and beverage advertising to children. Not all food and beverage corporations have signed on to this initiative, and our results suggest that this self-regulatory system in Canada needs to be expanded and strengthened.

#### Strengths and limitations

Strengths of our study include direct measurement of children’s preferred viewing, the simultaneous television taping for 7 days, our broad definition of advertising, and the rigorous application of two different nutritional criteria. Our results are limited by the smaller number of English Quebec children that determined their group’s preferred viewing, and by the nonrandom selection of the children that may not have been representative of children living in Ontario and Quebec. It is possible that another group of children may have been watching different television shows, however, our sample of children was watching television drawn from nine stations at a variety of times on various days which provided us with a sufficiently good picture of what 10–12 year old children are viewing on television. Our results are also limited by the potential nonrepresentativeness of our 7 day television taping. While the taping was conducted 1 week prior to the Easter holiday, less than 1% of the food and beverage advertisements were holiday specific. Lastly, our definition of children’s preferred viewing was not consistent with Quebec’s 15% viewership threshold or the varying viewership thresholds cited by the 16 corporations participating in the CAI. While such a discrepancy does not alter our results or preclude us from drawing policy implications, our results cannot be viewed as an evaluation of the *Consumer Protection Act* or the CAI.

As has been shown with other populations of children in other countries, the diet viewed in advertisements on television by children in Canada in these two advertising policy environments is less than healthy and reflects a need for stronger regulations that focus specifically on the marketing of foods and beverages. Recent movement on this issue in the United Kingdom, where food marketing to children up to age 16 has been banned, is encouraging, although research and policy needs to extend past the realm of television, given the extensive media environments and settings where children are targeted by food and beverage marketing.

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## DISCLOSURE

The authors have no conflict of interest to declare.

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