

The Landscape of Food and Beverage Advertising to Children and Adolescents on Canadian Television

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Preface

Student Contributions

All studies and work presented in this thesis were conducted in the OUTLIVE Lab at the University of Ottawa. Adena Pinto was the primary investigator and primary author of the articles and content included in this thesis. The study design and methodology was done in collaboration with Dr. Monique Potvin Kent, Dr. Marie-Hélène Roy-Gagnon, Dr. Lise Dubois, and Elise Pauzé. Data acquisition, data cleaning, and dataset development was done in collaboration with Elise Pauzé, Dr. Marie-Hélène Roy-Gagnon, and Rachel Mutata. Data analysis and interpretation was conducted by Adena Pinto with critical contributions from Dr. Marie-Hélène Roy-Gagnon and Elise Pauzé. All manuscript drafts were completed by Adena Pinto with critical revisions from Dr. Monique Potvin Kent, Dr. Marie-Hélène Roy-Gagnon, Dr. Lise Dubois, Elise Pauzé and Rachel Mutata. All authors reviewed and approved the final article manuscripts presented in this thesis.

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Abstract

Background: Canadian youth obesity, and comorbidities, have paralleled trends in consuming nutrient-poor foods marketed by the food industry. In Canada, food marketing is largely self-regulated by the food industry under the *Canadian Children's Food and Beverage Advertising Initiative (CAI)*.

Methods: Public television programming records benchmarked the volume of food advertising targeted to preschoolers, children, adolescents, and adults on Canadian television. Food advertising rates and frequencies were compared by age group, television station, month, food category, and company, using regression modelling, chi-square tests and principal component analysis.

Results: Food advertising rates significantly differed by all independent variables. Fast food companies dominated advertising during adolescent-programming while food and beverage manufacturers dominated advertising during programming to all other age groups. CAI signatories contributed more advertising during children's programming than non-signatories.

Conclusion: Failings of self-regulation in limiting food advertising to Canadian youth demonstrate the need for statutory restrictions to rectify youth's obesogenic media environments and their far-reaching health effects.

Description of chapters

This thesis follows a “thesis by article” style. Chapter 1 of this thesis describes the background of the problem, provides a review of the national and international literature and policies on food advertising as well as the contributions of our research to the existing literature. Chapter 2 provides a concise overview of the materials used, statistical analyses performed, and methodological challenges encountered while carrying out the research. Chapters 3 and 4 contain the two component articles of this thesis. Chapter 5 further discusses the findings and policy implications of the research conducted in both component articles.

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Abbreviations

ACMA	Australian Communications and Media Authority
CAI	Canadian Children’s Food and Beverage Advertising Initiative
CARU	Children’s Advertising Review Unit
CFBAI	Children's Food and Beverage Advertising Initiative
CPA	Consumer Protection Act
CTS	Children’s Television Standards
HEFSS	High in energy, saturated fats, sugars and/or sodium
HFSS	High in saturated fat, sugar and sodium
OfCom	Office of Communications
PCA	Principal component analysis
PC1	Principal component 1
PC2	Principal component 2
PC3	Principal component 3
SES	Socioeconomic status
SRC	Société Radio-Canada
TVA	Téléviseurs associés
UK	United Kingdom
UNCRC	United Nations Convention on the Rights of the Child
US	United States
USD	United States Dollar
WHO	World Health Organization

Chapter 1: Introduction

1.1 Background of the Problem

Overweight and obesity in childhood are well-recognized as a serious international public health crisis. The ongoing nutritional transition, in which patterns of dietary intake and energy expenditure have shifted with urbanization, has been accompanied by a rapid increase in the prevalence of overweight and obesity among children worldwide (1). It is estimated that 5% of children under 20 years old (approximately 108 million children) are experiencing obesity globally (2). In developed countries, however, the prevalence is substantially higher (3). In Canada, recent statistics reveal almost 30% of Canadian children, between 5 and 17 years old, are experiencing overweight or obesity (4). Canada's prevalence of childhood obesity has nearly tripled since the 1970's (5). Alarming, the rise in childhood obesity has also been associated with an increased prevalence of non-communicable diseases (e.g., type 2 diabetes, hypertension, and other cardiovascular risk factors) among children with obesity, which were previously exclusive to later-life (6). The estimated economic burden of obesity in Canada, which includes both direct costs of treating obesity and comorbidities as well as indirect costs of productivity loss, ranges from \$4.3 to \$7.1 billion annually (in 2008 and 2006 dollars, respectively) (7,8). In 2006, the direct cost of treating obesity was \$3.9 billion, which represented 4.1% of national healthcare expenditures (8). Furthermore, the economic burden of obesity comorbidities, which has been associated with unhealthy eating (i.e. not meeting Canada's food recommendations), was estimated at \$13.8 billion in 2014 (\$5.1 billion in direct health care costs, \$8.7 billion in indirect costs) (9). Ischemic heart disease and type 2 diabetes were substantial contributors with \$7.8 and \$3.8 billion in overall costs, respectively (9).

The medical consequences and corresponding economic implications of obesity and its comorbid conditions have prompted further investigation into the complex etiology of childhood obesity. Evidence suggests that while genetics remains a significant factor in the development of obesity, environmental factors are fundamental in promoting obesity in early life (10). In particular, the increased prevalence of obesity is attributed to environmental changes that promote unhealthy food intake and discourage physical activity (10). The contemporary environment encourages weight gain through an abundance of convenient, large portion-sized, energy-dense foods and lower physical activity demands of modern lifestyles (10). The resulting high energy intake and low energy expenditure contribute to the development of obesity by tipping the energy balance towards weight gain (10).

Dietary intake assessments of children in Canada demonstrate that Canadian children are not meeting Health Canada's recommended number of food group servings (in reference to the 2007 Eating Well with Canada's Food Guide) and, instead, are consuming excessive amounts of foods high in saturated fat, sugar, or sodium (11). In fact, less than 30% of children in Canada consume the recommended daily level of fruits and vegetables (i.e. at least five portions of fruit and vegetables per day) (12). Patterns of fruit and vegetable consumption among children, however, have been shown to differ substantially across Canada. For instance, children (aged 12-17 years) in Quebec consumed more fruit and vegetables than in the rest of the country where 38% of Quebecois children met the national recommended servings in 2017 (11). Newfoundland and Labrador, in contrast, had the lowest level of fruit and vegetable consumption. Less than 1 in 6 children (15%), from Newfoundland and Labrador, consumed the recommended servings of fruit and vegetables (11). The level of fruit and vegetable consumption also varies across socioeconomic levels. In particular, low income-education families reportedly consume fruit and

vegetables less frequently than high income-education families, likely due to disparities in food security (13,14). Indeed, children in food-insecure households have also been shown to consume fewer servings of fruits and vegetables compared to food-secure households (14).

As trends in consuming palatable foods with low nutritional value and high energy density (i.e. high in fat, sodium, or added sugar) have paralleled the rise in obesity prevalence, the association between unhealthy food preferences, dietary habits, and obesity is being recognized. Although individuals are driven towards excess weight gain, due to the increasing access to and availability of high energy-dense foods, humans are also predisposed to preferring foods with high energy density (15). Food preferences, however, can be adapted based on the context in which foods are eaten (15). Peer preferences and repeated exposure to foods are sufficient for normalizing food perceptions and influencing food choice among children and adolescents (1). By altering subjective food experiences, children can learn to enjoy low-energy and high nutrient-dense foods, which have been linked to preventing chronic disease (15). Furthermore, as concrete dietary habits and preferences are established during preschool years, and may persist into adulthood, the development of healthy eating habits while young is urged (16).

1.2 Television Food Advertising

Food and beverage companies capitalize on the malleability of taste preferences and specifically target children and adolescents through intense and persistent food marketing in various media and settings (17). According to the World Health Organization (WHO), marketing is “any form of commercial communication or message that is designed to, or has the effect of, increasing the recognition, appeal and/or consumption of particular products and services. It comprises anything that acts to advertise or otherwise promote a product or service” (18). Food

and beverage marketing, thus, comprises all promotional activities designed to enhance sales and consumption of food and beverage products and related services. Advertising, though only one form of marketing, is the most visible marketing communication tool and the primary channel used by the food industry to reach children and adolescents (19,20). Some examples of advertising include the placement of ads in broadcast media (i.e., TV or radio), print (e.g. newspapers), online (e.g. social media), and billboards (18).

Child-targeted food and beverage advertising uses elements of fantasy, animation, and other techniques such as licenced and spokescharacters (e.g. Tony the Tiger) and toys (e.g. Happy Meal) to attract children (21). Consequently, as children have a limited understanding of the persuasive and biased nature of food advertising, they view advertising as fun, entertaining, and truthful (21). While adolescents are more critical of advertising than young children, they are nevertheless vulnerable to the appeals of food advertising which feed into the typical insecurities of their age group, such as self-image, sexuality, and social status (21,22). These exploitative techniques, targeted at younger people, attempt to establish brand awareness and increase positive brand experiences and perceptions in order to develop brand preference and loyalty (21).

The purchasing power of children and adolescents, their influence on household food purchases, and their susceptibility to marketing influences make them a desirable target for manipulative advertising tactics, in efforts to create lifelong customers (21). Adolescents are directly responsible for contributing billions of dollars to the consumer market in both Canada and the United States (US) (23,24). Surveys on teen spending habits in the US reveal that food is their primary area of spending, which accounted for 25% of their overall budgets in 2020 (23). Children are also indirectly responsible for influencing billions of dollars spent on food by Canadian families. For instance, Canadian families spend an estimated 30% of their average

household food budgets on dining out (i.e. at sit-down restaurants, fast food restaurants, etc.) (25,26). Children reportedly have a say in which fast food restaurant the family selects 98% of the time (25). Canadian children are also said to influence their breakfast and lunch choices over 95% of the time (25). Likewise, a recent report by the US National Retail Federation finds that nearly 9 in 10 parents say their children (born in 1995 or later) influence their decisions on food and drink purchases (88%) and dining out (87%) (27). The power children exert over family food decision making is known to marketers as “kidfluence,” the “nag factor,” and “pester power” (21). Children begin exerting this power as early as 2 years old and often in the grocery store setting (21,28,29). It has been reported that children have more influence on parents’ food purchases than on any other product in the grocery store (28,30). Furthermore, food requests made in this environment are often for branded and advertised products (21,31). In fact, one study has shown that US families purchased child-targeted cereals which were advertised on television 13 times more frequently than non-advertised cereals (31).

The “cradle-to-grave” marketing strategy used by food companies strives to develop loyal customers by deliberately targeting and profiting from the most impressionable. Although data on food advertising expenditures is not publicly available in Canada, expenditure data from the US provides insights on how food corporations invest their advertising budgets on young people in North America. The food and restaurant industry is one of the largest advertising groups in the US, second only to the automotive industry (20). A tremendous amount of advertising expenditures, by the food and restaurant industry, is spent on targeting children and adolescents (20,32). In 2009, approximately USD\$1.8 billion was spent on food and beverage marketing to children (2-11 years old) and adolescents (12-17 years old), by 48 food and beverage companies (32). Of this, approximately USD\$1 billion was spent on children and

USD\$1 billion was spent on adolescents, with nearly USD\$264 million overlapping between both age groups (32). While advertising on digital media (i.e. websites and social media) is on the rise, television remains the dominant media channel used to target children and adolescents (33). In the US, 35% of all youth-directed food marketing expenditures was spent on television advertising, accounting for USD\$633 million in 2009 (32). Of this, USD\$375 million was spent to reach children and \$364 million was spent to reach adolescents (32).

1.3 Television Viewership in Canada

Although television is often viewed as a “dying media channel,” children and adolescents continue to consume a significant amount of conventional television content. In 2018, Canadian children (2-11 years old) and adolescents (12-17 years old) watched an average of 18 and 14 hours of traditional television per week, respectively, according to measured media data (34). Statistics Canada’s last measures of television viewership, collected in 2004, indicate that traditional television viewing continues to be popular with Canadian children (2-11 years old) and adolescents (12-17 years old) over time. In 2004, Canadian children watched an average of 14.1 hours of television per week, while adolescents watched an average of 12.9 hours of television per week (35). Regional differences in television viewing were also observed across Canada (35). For instance, children (aged 2-11 years old) in Newfoundland and Labrador watched the most television at an average of 14.9 hours per week, while adolescents (aged 12-17 years old) in Nova Scotia watched the most television at an average of 13.8 hours of television per week in 2004. Children and adolescents in Ontario and Quebec had comparable levels of viewing, at an average of 13 to 14 hours of television per week (35). These regional variations in television viewing may be explained by differences in children’s access to television in the household. A qualitative study on 80 Canadian families (over 200 people) conducted by the

Centre for Youth and Media Studies at the University of Montreal in 2011, found significant differences in children's (9-12 years old) household access to television in 5 major Canadian cities (36). Specifically, the study found that one-third of children interviewed from St. John's and Vancouver had televisions in their bedroom (36). In Montreal, 3 out of 5 (60%) children had televisions in their bedroom, while 4 out of 5 (80%) children interviewed from Toronto had televisions in their bedroom (36). In Calgary, however, none of the children interviewed had televisions in their bedrooms (36). Moreover, a nationally representative survey of 1,040 Canadian children (9 to 18 years old), conducted by yconic Market Research & Insights in 2014, found that traditional television was the most commonly used media channel and preferred method of watching shows among children across Canada (37). In fact, at least 7 out of 10 children reported watching television daily and traditional television was their preferred platform for watching their shows in 2014 (37).

Research also suggests television watching among children may vary significantly by socioeconomic status (SES) and household income level across Canada. Studies from the US and the Netherlands reveals children living in lower SES families and/or unsafe neighbourhoods spend more time watching television than higher SES families (38,39). One Canadian study also found that female children (4-5 years old) living in low SES neighbourhoods spend significantly more time watching television and movies than female children in high SES neighbourhoods (40). Despite substantial regional and socioeconomic variations in television viewing, traditional television remains a major media channel for food and beverage companies to reach all children and adolescents in Canada.

1.4 Review of International Research on Advertising to Children

Global research reveals that a handful of transnational corporations, most of which are headquartered in the US, are responsible for much of the child-targeted advertising across the world (41,42). For instance, Kelly et al. (2019) reveal that the following companies advertise heavily to children (2-18 year old) in over 12 different countries: Coca Cola, Nestle S.A, PepsiCo Inc., Mondelez International Inc., Unilever Group, McDonald's Corporation, Kellogg Company, Danone, Mars Inc, and Yum! Brand Inc (parent company of KFC, Pizza Hut and Taco Bell) (41). Other food companies that have also been reported to advertise frequently to children in Canada include: General Mills Canada Corporation, Kraft Canada Inc., Burger King Restaurants of Canada Inc., Parmalat Canada, Harvey's, Dairy Queen, Subway, Mr. Sub, and Tim Hortons (43). Importantly, these companies not only dominate the food industry, but have also monopolized international and Canadian youth advertising with hyper-palatable, ultra-processed foods such as sugary breakfast cereals, candy/chocolate, soft drinks, fast foods, and packaged snacks (44).

A large body of literature demonstrates that the foods and beverages advertised to children and young people on television is highly caloric and low in nutritional value (45–47). For instance, a systematic review by Cairns et al. (2013) reported that television-based food and beverage marketing directed at children predominantly promotes unhealthy foods such as sugary breakfast cereals, carbonated and sweetened juice beverages, fast food meals, and candy (48). This is particularly concerning as it has been shown that food advertising increases not only the preference but also the consumption of advertised foods and beverages among children (49). This type of advertising has also been associated with an increased risk of over-consumption and overweightness among children (50). A systematic review of 29 randomized controlled trials, by

Sadeghirad et al. (2016), found that children's (6-18 years old) exposure to unhealthy food marketing increased their dietary intake and preference for advertised products, as well as nutritionally poor, energy-dense foods and beverages, during or shortly after the advertisement aired (49). The impact of food advertising on food consumption, however, begins at a much younger age. Research reveals that preschool children's (3-5 years old) exposure to advertising for fast food restaurants and high-sugar breakfast cereals increases their consumption of advertised fast foods and breakfast cereals, respectively (51,52). Advertising and branding are so effective that even when nutritious foods and beverages are promoted, they rarely turn into healthy food choices. As evidenced by Boyland et al. (2015), children who were exposed to healthier fast food options developed a preference for fast food generally, instead of the promoted healthier option (53).

Ad expenditure data from the US also confirms that food companies spend more money promoting unhealthy foods and beverages to young people on television compared to healthy foods. In 2009, the highest ad spending by 48 companies was reported for fast food restaurants (\$154 million) and breakfast cereals (\$102 million), which accounted for 68% of child-directed (2-11 years old) television advertising expenditures (32). Among teen-directed television advertising, fast food restaurants (\$130 million) and soft drinks (\$62 million) promotions accounted for 52% of their total television advertising expenditures (32). A mere \$1.2 million and \$3.9 million was spend on advertising fruits and vegetables to children (0.3% of their overall advertising) and teens (1% of their overall advertising), respectively, in 2009 (32).

1.5 Review of Canadian Research on Advertising to Children

Research into food and beverage advertising on television has recently proliferated in Canada. In the mid-2000s, food advertising to children on television (measured on children's

specialty stations; during their preferred programming or viewing times; and/or by actual exposure) in Canada was most often nutritionally poor (i.e. advertised products were high in sugar, fat, and salt, and low in fibre) and ranged from 3 to 7 ads per hour of programming preferred by children or viewed by children (54–59). In 2006, comparisons of child-targeted food advertisements on television between the United Kingdom (UK) and Canada (Ontario and Quebec) revealed that Canada had a higher proportion of advertisements for “less healthy” foods (according to the UK Nutrition Profiling Model) targeted to children compared to the UK (55). Likewise, between 2007-2008, Kelly et al. (2010) reported that Canada had the third-highest proportion of unhealthy (i.e. non-core) food advertising on child-specialty stations out of 11 countries, and fast food meals were the most frequently advertised product (24%) (60). In 2011, an analysis of 27 television stations in Canada (Vancouver and Ontario) by Potvin Kent et al. (2014) revealed that children’s (2-11 years old) average exposure to food advertising decreased on child-specialty channels and increased on generalist stations from 2006 (54). The nutritional quality of food advertising, however, did not improve in Canada during this time. In 2009, Potvin Kent et al. (2018) reported nearly 9 in 10 food advertisements viewed by children in Canada (Ontario and Quebec) were classified as “less healthy” according to the UK nutrition profiling model (61). In 2011, children were most frequently exposed to fast food and breakfast cereal advertisements television in Canada (Toronto and Vancouver) (54).

Given the links established between food advertising, unhealthy food consumption, and elevated risk of nutrition-related chronic disease (e.g., obesity, diabetes, hypertension) (16,50), it is concerning that the volume and nutritional quality of food advertising on television in Canada has not changed in over 20 years. In fact, a global analysis by Kelly et al. (2019) revealed that among 22 countries, Canada had the highest rate of food and beverage advertising on children’s

specialty stations in 2017 (41). An average of 10.9 food and beverage advertisements were aired per hour, per channel (0.8 permitted food ads/hour and 9.7 non-permitted food ads/hour); the majority of which promoted breakfast cereals and candy (41). Consequently, Canada also had the highest rate of “unhealthy” foods (i.e. foods that are not permitted according to the WHO Europe Nutrient Profile Model) advertised during children’s peak viewing times, at 13.4 ads/hour (41).

Although Canadian research on food advertising to adolescents (aged 13-17 years old) is limited, trends observed in child-targeted advertising appears to be similar among adolescents, as evidenced by Czoli et al. (2020) (62). Their analysis of 31 television stations airing in Toronto found that food advertising directed at adolescents on television, in Canada, was predominantly unhealthy (62). Specifically, in 2016, adolescents were most often exposed to television promotions for fast food restaurants and beverages with free sugars (e.g., soft drinks, energy drinks, etc.), which accounted for 42% and 11% of their total food advertising exposure, respectively (62).

Rising concerns about the nutritional quality and volume of food and beverage advertising targeted to young people and their impact on child and adolescent health, have resulted in national and international calls to action to restrict the marketing of unhealthy foods and beverages to children. In particular, the WHO has urged countries to regulate the marketing of foods and non-alcoholic beverages to children which are high in fat, sugar, and salt (63). A set of 12 recommendations have been developed by the WHO, to assist governments in ensuring companies practice responsible marketing and limit unhealthy food and beverage advertising to children, by guiding the design of and/or strengthening current food marketing policies (63). These recommendations also underscore the importance of supporting research on marketing to children for effective national policy implementation and enforcement (63).

1.6 International Food Marketing Policy

Prominent international players with policies restricting marketing to children include Australia, Chile, Canada (Quebec), Sweden, the UK, and the US. These countries regulate food and beverage marketing to children under one of three major systems: government and industry coregulation, statutory regulations, or industry self-regulation.

1.6.1. Government and Industry Coregulation

In Australia, food marketing to children is regulated using a combination of government regulation and industry code (41). Australia's co-regulatory system for food marketing to children functions through the contributions of the government body – Australian Communications and Media Authority (ACMA), and several members of the advertising and food industry – Australian Association of National Advertisers, Free TV Australia, Australian Food and Grocery Council, and Australian Quick Service Restaurant Industry (64). Under the ACMA's *Children's Television Standards 2009* (CTS), commercial advertisements are permitted during children's viewing times; however, the CTS restricts the use of promotional characters of particular appeal to children (under 14 years old) in advertisements (e.g., licensed characters, celebrities, etc.) (65,66). Notably, each broadcaster is responsible for defining their "child-viewing times," under the CTS, which is not available to the public. The food and advertising industry's codes (i.e. *Commercial Television Industry Code of Practice*, *Responsible Children's Marketing Initiative*, and *Initiative for Responsible Advertising and Marketing to Children*) also aim to reduce children's exposure to unhealthy food and beverage advertisements. Within these self-regulatory initiatives, participating food companies are responsible for setting the criteria of "healthier dietary choices" for the foods advertised when 35% (or more) of the viewing audience is comprised of children under 12 years old (67,68). Australian research has reported that this system of co-regulation has not elicited meaningful changes in the volume or

nutritional quality of food advertising broadcast to Australian children (66,68–72). Within a system that uses a complaints-based process to monitor adherence to regulations, it is reportedly an “impossible task” to identify violations without obtaining broadcasters’ schedules of child-viewing times (66). Furthermore, the extant literature demonstrates that food companies and broadcasters are not compliant with the regulations in place nor effectively protect children from unhealthy food and beverage advertising (66,73,74). For instance, Kelly et al. (2019) found that an average of 6 food ads were broadcast per hour of programming (during children’s peak viewing times) on Australian child specialty stations, in 2011 (41). The majority of this food advertising was for unhealthy (i.e. non-core) foods and used persuasive child-appeals (which are prohibited by the CTS) (41).

1.6.2. Statutory Regulation

In Chile, Sweden and the United Kingdom, statutory regulation restricts food marketing to children. Sweden is well-known for, and often cited as, having one of the most restrictive national statutory advertising regulations in Europe (21). All commercial advertising on terrestrial television to children under 12 years old is banned under the Swedish *Radio and Television Act 1996* (21,75,76). Specifically, this *Act* states that commercial advertising on television should not be designed to attract the attention of children under 12 years old nor should advertisements be broadcast before, during, or after programs directed to children under 12 years old (64,76). Furthermore, characters or individuals who are of particular appeal to children (under 12 years old) are prohibited from appearing in televised commercial advertising (76). Despite strict regulation, children in Sweden continue to be exposed to food advertising. In 2008, Kelly et al. (2010) found that an average of 6 food ads was broadcast per hour on children’s specialty stations in Sweden (60). The majority of this advertising was for non-core foods and most often fast food (60). It is suggested that because these regulations apply only to

terrestrial television stations that are broadcast within Sweden, Swedish children are exposed to unhealthy food advertising from foreign satellite television stations (60,75).

The United Kingdom (UK) was the first country in the world to introduce statutory regulations and scheduling restrictions on food advertising to children (77,78). Food advertising to children, in the UK, is regulated by the government-approved broadcasting corporation – Office of Communications (OfCom) (41,79). In 2007, OfCom introduced statutory regulations which prohibited the advertising of foods that are high in saturated fat, sugar, and/or salt (which are defined by the UK’s Nutrient Profile Model) during and adjacent to programs targeted or appealing to children between 4 and 9 years old (79). In 2008, these restrictions were amended to programs appealing to children between 4 to 15 years old (79,80). Importantly, “programs appealing to children” are defined as programs where children under 16 years old comprise of at least 20% of the viewing audience (81). This child-viewing audience threshold has been criticized as being too high, especially when programs attract large adult audiences (81). In 2009, scheduling restrictions were included to prohibit this type of food advertising on all children’s specialty stations (79). While OfCom reported that there was a 34% reduction in advertisements for foods high in saturated fat, sugar and sodium (HFSS) after the implementation of its regulations (comparing 2005 to 2007/2008), independent researchers found an increase in HFSS food advertising exposure among children post-implementation (77,81,82). In particular, evaluations of the UK scheduling restrictions by Adams et al. (2012) found that more than 50% of the food advertisements children (4-15 years old) were exposed to, post-implementation (in 2009), were for HFSS foods (78). Although the nutritional quality of food advertising to UK requires improvement, the volume of food advertising broadcast to children in the UK, after regulatory implementation, is reportedly lower than in other countries. In fact, Kelly et al. (2019)

found that children in the UK are exposed to an average of only 3 ads per hour per channel during children's peak viewing times (approximately 3 and 8 food ads less than Australia and Canada, respectively) (41).

Chile is one of the most recent countries to introduce legislation on food advertising. In 2016, the Chilean government implemented the *National Law of Food Labeling and Advertising* (Law 20.606), which is monitored by the Ministry of Health, the National Council of Television (i.e. Television Nacional de Chile) and the National Consumers Service (83). The comprehensive law requires changes to front-of-package labelling and restricts food marketing to children under 14 years old in child-settings (e.g., schools and kiosks) and various media channels (83,84). Three phases of the law were put into effect for television regulations between 2016 and 2019. Phase 1 of the Law, effective in July 2016, prohibited food advertising of foods and beverages high in energy, saturated fats, sugars and/or sodium (HEFSS) and/or that used child-directed marketing appeals (e.g., animation, licensed characters) during programs either targeted to children or where >20% of the viewing audience consisted of children (83,84). Phase 2 of the Law (extension Law 20.869) was implemented in 2017, which amended regulations to restrict all HEFSS food advertising aired on broadcast television between 6 a.m. and 10 p.m. daily, regardless of program age (83–85). As a result, these regulations are reported to be the most stringent scheduling restrictions in the world (85). The third and final phase of the law was implemented in 2019, which tightened the nutrition thresholds introduced in Phase 1. For instance, the sugar content threshold for advertised products decreased from 22.5g of sugar/100g (in 2016) to 10g of sugar/100g (in 2019) (85,86). Evaluation of Phase 1 of the *National Law of Food Labeling and Advertising* has shown a decrease in the exposure of HEFSS food advertising to preschoolers (by 44%) and to adolescents (by 58%) on television in Chile, between 2016 and

2017; however, food advertisements were not entirely removed from their viewing (87). Of the food advertisements Chilean children were still exposed to, advertised foods were often high in sugar and/or energy (87). Although no studies, to date, have evaluated the impact of Phases 2 and 3 of the law, it is anticipated that the nutritional quality of food advertising and children's exposure to food advertising in Chile will improve (84,87).

1.6.3. Industry Self-Regulation

In the United States, food and beverage marketing to children is entirely self-regulated by industry (80). It has been suggested that while food marketers must adhere to state and federal consumer protection laws, these laws are seldom enforced (88). Instead, the US food industry has introduced a number of voluntary, self-regulatory initiatives since 2006, including the Children's Advertising Review Unit's (CARU) *Revised Self-Regulatory Program for Children's Advertising* and the 2007 *Children's Food and Beverage Advertising Initiative* (CFBAI) (80,89–91). Both programs are administered by the Council of Better Business Bureaus; however, industry is responsible for developing guidelines and nutritional criteria and for monitoring compliance (91). The CARU's *Self-Regulatory Program for Children's Advertising* provides guidance for all forms of child-targeted advertising (21). Similar to other nations' regulations, the program includes restrictions to prevent deceptive advertising and prohibits the use of toy premiums and promotional characters appealing to children (under 12 years old) during or adjacent to children's programming (90). With regard to food advertising, the CARU's guidelines also state that foods must be advertised within the context of a balanced meal; should not present snacks as meal-substitutions; should depict an appropriate serving size; and should not discourage consumption of fruits and vegetables or foods recommended by the United States Department of Agriculture's Dietary Guidelines for Americans and My Pyramid (64,88,90).

The CFBAI, in contrast, focuses specifically on food advertising to children (under 12 years old). To date, 19 large food and beverage corporations participate in the CFBAI and have committed to only advertise foods compliant with the Uniform Category-Specific Nutrition Criteria (developed by CFBAI-participating companies) or not advertise to children at all during certain programming (92). On television, these pledges are administered when children comprise at least 25-35% of the program's viewing audience (93). As with other self-regulatory programs, there has been little significant change in the volume or nutritional quality of food advertising to children on television in the US (94,95). Although reductions have been observed in food advertising to children by certain CFBAI companies, over 50% of US preschoolers' exposure and 80% of US children's exposure to food advertising came from CFBAI companies (94,95). CFBAI food advertisements viewed by children have also been revealed to be high in saturated fat, sugar and/or sodium content when compared to other (i.e. non-industry developed) nutritional standards (95,96). Furthermore, when children were exposed to healthier CFBAI advertisement's, children rarely recalled healthy food options and, instead, recalled the toy premiums (which violate CARU guidelines) (88).

Research has also demonstrated a shift in food and beverage advertising to older children, in the US, as a result of self-regulation (33,97). Between 2007 and 2011, children's (under 12 years old) exposure to food and beverage advertising on television decreased by 5%, while adolescent's (12-17 years old) exposure to television food advertising reportedly increased by 23% (97,98). Comparisons between 2014 and 2007 reveal that total food advertising exposure has increased from previous years for both age groups; however, adolescent's overall exposure to food and beverage advertising was reportedly higher than children's exposure (99). Where children viewed 5% more food-related ads in 2014 (compared to 2007), adolescents viewed 16%

more food-related ads (99). It has been suggested that the rise in adolescent's food advertising exposure results from food and beverage companies increasing their advertising to this older, yet vulnerable, age group (97,99).

1.7 Food Marketing Policy in Canada

In Canada, the regulation of food and beverage advertising to children (under 13 years old) varies by jurisdiction (59). Specifically, food advertising is largely self-regulated by industry across most of the country, with the exception of Quebec, which has statutory restrictions on commercial advertising to children under 13 years old (100,101).

1.7.1 Quebec

Since 1980, all commercial advertising to children under 13 years old has been prohibited by law in Quebec, under the *Consumer Protection Act* (CPA) (58). Under Section 248 of the CPA, the advertising of any commercial goods designed for children, under the age of 13, or appealing to this age-group is banned in all media and child settings (58,64). The CPA is often cited as the most comprehensive approach to restricting marketing to children in the world (18,64,102). In contrast to Sweden's policy, Quebec extends its ban on all forms of marketing to children (under 13) beyond television (64). On television, specifically, advertising intended for children or of particular appeal to children is banned when children consist of at least 15% of a program's viewing audience (58,101). Three criteria must be assessed to determine if an advertisement is directed at children under 13 years old on television: 1) the appeal of the advertised goods; 2) the manner of presentation (i.e. is the ad childlike?); and 3) the time it is broadcast (children's peak-viewing times) (64,101). Importantly, advertised products (such as toys, candy, etc.) that are "designed to arouse the interest of children" are not permitted by the CPA even if children do not make up 15% of the television viewing audience (101). The Office

de la protection du consommateurs is responsible for enforcing the CPA and relies on a complaints-based process for enforcement (103). Some criticisms of the CPA include that peak viewing-times (when children make up 15% of the viewing audience) are outdated; there is a lack of monitoring (103); and that children in Quebec are still exposed to a high number of food and beverage ads that are directed at adolescents (13-17 years old) and adults, since the *Act* was not intended to limit such advertising (57,104). Nevertheless, studies have found that children in Quebec are exposed to marginally fewer food and beverage advertisements on television as a result of the CPA (57,58). Of the food and beverage advertisements viewed by children in Quebec, few ads are for breakfast cereals, candy, and snack foods, which are often targeted at children (57). Furthermore, research indicates a slight improvement in the healthfulness of the food and beverage advertising viewed by children in Quebec, as compared to other Canadian provinces (57). The CPA has been also associated with improvements in the power of food advertising directed to French-speaking children in Quebec, as reported by Potvin Kent et al. (2011) (59). Significantly less marketing appeals of “fun” and media characters/celebrities were used in food advertisements viewed by French-speaking children in Quebec, compared their English-speaking counterparts in 2009 (59).

1.7.2 Rest of Canada

The self-regulation of food marketing in Canada that exists in most of the country is comparable to the self-regulatory systems in Australia and the United States. In Canada (excluding Quebec) food and beverage marketing to children is regulated under the following industry-led, voluntary codes: the *Broadcast Code to Advertising to Children* (hereinafter referred to as the “Children’s Code”) and the *Canadian Children’s Food and Beverage Advertising Initiative* (CAI) (17,58). Both programs are administered and monitored by Ad Standards, a non-profit self-regulatory body comprised of advertisers, advertising agencies and

media organizations who aim to “maintain the integrity of Canadian advertising” (105). In order to operate an “over the air” broadcasting station in Canada, all television broadcasters must have a license from the Canadian Radio-television Tele-communications Commission (CRTC) (106). As a condition of their licensure, broadcasters must adhere to the Children’s Code and its Interpretation Guidelines, which are published by Ad Standards (107). Ad Standards’ Children’s Clearance Committee (comprised of industry and public representatives) are responsible for ensuring ads adhere to the Children’s Code and must approve all children’s commercials prior to broadcast (approved commercials carry a valid Ad Standards approval number) (108). Additional clearance is available for food advertisers, by Ad Standards’ Clearance Services, to ensure food and non-alcoholic beverages advertised to children comply with the federal regulations including the *Food and Drugs Act*, the *Food and Drug Regulations* and the Canadian Food Inspection Agency’s Food Labelling for Industry (109).

According to the Children’s Code, commercial advertising may not exceed more than 4 minutes per half-hour of children’s programming (or >8 minutes of advertising per hour of children’s programming) and a commercial message may not be repeated during a half-hour of children’s programming (110). The Children’s Code refers to children’s advertising as any paid commercial messages that are: (1) defined as being “child-directed” by the broadcaster and/or (2) carried during or adjacent to a children’s program (which broadcasters have defined as targeted to children under 12 years old) (110). Particular attention has also been made towards preschoolers (aged 0-5 years old). Advertising to preschoolers is not permitted under the Children’s Code (111). As children in Canada are not legally required to attend school until 5 or 6 years old, the Children’s Code explicitly states that commercial messages scheduled during school morning hours should be directed to adults, rather than children (110,112). With regard to

food and beverage advertising, the Children’s Code’s Interpretation Guidelines require depictions of advertised foods to be within the context of a balanced meal, be a reasonable serving size for a child, and snack foods must not be presented as substitutions for meals. Finally, advertisements should not disparage a healthy lifestyle nor discourage the consumption of foods recommended by *Canada’s Food Guide to Health Eating* (e.g., fruits or vegetables) (110).

In addition to the Children’s Code, a number of Canadian corporations have recognized their crucial role in fostering healthy media environments for Canadian children (113). In April 2007, the CAI was launched by Advertising Standards Canada (now re-branded as Ad Standards) and 18 leading Canadian food and beverage corporations who were committed to reforming the food and beverage advertising landscape to children in Canada (113,114). A few companies, however, have withdrawn their participation since the CAI’s inception. Currently, 16 large Canadian food and beverage corporations participate in the CAI (100). As part of this initiative, these food and beverage companies have voluntarily pledged to either refrain from unhealthy food and beverage advertising to children under 12 years old entirely, or advertise only “healthier” products that comply with the CAI’s Uniform Nutrition Criteria (implemented in December 2015), on various media channels (which includes television) (100). Similar to Australia and the US’ industry-led initiatives, CAI-participating companies define children’s advertising as commercial messages that are broadcast during television programs where children make up 25-35% of the viewing audience (17,100,114). See Table 1 for CAI-participating companies according to their pledges. In order to advertise “better-for-you” products to children, CAI-participating companies developed the Uniform Nutrition Criteria, in which they defined nutrient (e.g., sugar, fat, sodium, etc.) criteria and thresholds that constitute

“better-for-you” (115). Some examples of advertised products which comply with the CAI’s Uniform Nutrition Criteria include cereals such as General Mills Lucky Charms and Kellogg’s Froot Loops, which have 37g and 38g of sugar per 100g of cereal, respectively (100,116,117). Alarming, up to 58% of the CAI’s “better-for-you” products (including Lucky Charms and Froot Loops) fail to pass nutrition standards of many national governments (e.g., Denmark and the United Kingdom) (58,118).

Despite the CAI’s efforts to limit food and beverage advertising to children under 12 years old, studies have shown this self-regulatory program has elicited insufficient improvement in protecting Canadian children from unhealthy food and beverage television advertising (43,57,104). Critiques of the CAI report that CAI-participating companies are responsible for more food and beverage advertising during children’s preferred viewing than non-participating companies (58). Research has also observed minimal impact of the CAI on the practices of certain CAI-participating companies. In fact, companies such as Burger King, Parmalat and General Mills were found to increase their volume of advertising after the implementation of the CAI in 2011, compared to pre-implementation in 2006 (43). Even where reductions have been seen in children’s exposure to CAI-participating companies’ food advertisements, non-participating companies have filled in the gap by increasing their volume of advertising to children (43). Importantly, broadcasters and companies’ compliance with the Children’s Code and the CAI use a two-pronged approach: annual industry spot checks and consumer complaints (100,119). Significant differences have been reported in the literature between external researchers and industry-measured CAI compliance. For instance, in 2016, Ad Standards’ reported 100% compliance among CAI-participating companies, while Potvin Kent et al. (2018) found over 30 non-compliant food ads (104). Other criticisms levied at the CAI include child-

audience thresholds (i.e. the percentage of children comprising the viewing audience before the pledges apply) that are too high; low participation rates; narrow definitions of child-directed marketing; and the exclusion of adolescents from marketing restrictions (62,104).

Table 1. Companies participating in the CAI from 2018-2020 according to voluntary pledge.

2018-2020 Company Pledges	
Refrain from advertising all food and beverages to children under 12 years old	Advertise only "better-for-you" products to children under 12 years old
Coca-Cola Ltd.	Campbell Company of Canada
Ferrero Canada Ltd.	Danone Inc.
Hershey Canada Inc.	General Mills Canada Corporation
Kraft Heinz Canada	Kellogg's Canada
Maple Leaf Foods Inc.	McDonald's Restaurants of Canada Ltd
Mars Canada Inc.	Parmalat Canada
Mondelez Canada	
Nestle Canada	
PepsiCo Canada ULC	
Unilever Canada	

1.7.2 Canadian Legislation - Bill S-228

Improvements in child-targeted food advertising by statutory regulations (in Quebec and the UK), the WHO's recommendations of restrictive food policy adoption by Member States, and the inadequate effectiveness of the CAI in limiting unhealthy food and beverage advertising to children, led to the development of more stringent Canadian legislation—Bill S-228, *The Child Health Protection Act*. Former Senator Nancy Green Raine first introduced Bill S-228, to the Senate, in the fall of 2016 (120). The Bill sought to amend the *Food and Drugs Act* by prohibiting all unhealthy food and beverage marketing directed to children under 17 years old across all potential marketing media channels and child settings in Canada (120,121). In 2017, the age-limit of Bill S-228 was amended from children under 17 years old to children under 13

years old (121). The Bill passed its third reading (with minor amendments) in the House of Commons and was sent to the Senate in 2018 for its final vote (121–123). Intensive lobbying by the food and beverage industry, however, resulted in the Bill never being brought to final vote (121–123). As a result, the Bill effectively died on the Order Paper during the dissolution of Parliament in June 2019, prior to the 2019 Canadian federal election (122). If Bill S-228 was passed by the Senate, it would have been one of the most comprehensive laws designed to restrict food and beverage marketing to children. Proposed regulations (unpublished) for television advertising under Bill S-228 would have restricted unhealthy food and beverage advertising using marketing appeals designed for children under 13 years old, broadcast on programming intended for children, and/or broadcast on programs where children comprise at least 15% (or more) of the viewing audience (124). Regulations would have introduced strict nutrient thresholds for defining “unhealthy” food, which would have prohibited the advertising of foods and beverages whose added and total levels of sodium, free sugars and saturated fat content exceeded Health Canada’s nutrient content claims of “low in sodium,” “low in sugars,” and “low in saturated fatty acids” (124). These restrictions would have prohibited foods that exceed 140mg of sodium/100g, 5g of sugar/100g and 2g of saturated fatty acids/100g of foods and beverages (124,125). Products that would not have been allowed to advertise under these restrictions included most sugar-sweetened breakfast cereals and beverages, potato chips, chocolate and candies, etc. (126–128). Finally, Bill S-228 would have introduced independent evaluation of the policy’s impact (with a focus on older children) 5 years after implementation and annual monitoring of compliance with regulations (124,129), which are not currently employed in either the Canadian industry-led self-regulation or Quebec’s CPA. It should be noted that although adolescents and teenagers are vulnerable to marketing appeals and heavily

targeting by food and beverage advertisers (particularly by fast food corporations) (22,62,97), no existing or proposed food marketing policy protects this age group from food marketing. The proposed 5-year mandatory review of Bill S-228's impact on older children, however, acknowledges the importance of considering adolescents in future policy restrictions.

Despite the failure of Bill S-228, the Government of Canada continues to recognize and highlight the influence of food marketing on food choice and reducing children's exposure to food marketing. In December 2019, food marketing restrictions to children were included in the Prime Minister's mandate letter to the Minister of Health (130). Furthermore, research has also found public support, among Canadians, for statutory regulations that would ban the marketing of unhealthy foods and beverages to children (131,132).

1.8 Rationale of Thesis

Given that statutory regulations similar to Bill S-228 may be reintroduced in the current Parliamentary session, and given the harmful effects of unhealthy food advertising on child and adolescent health, it is necessary benchmark the current food and beverage advertising environment for policy makers. The existing Canadian literature, however, presents several critical knowledge gaps on the current state of television food advertising to Canadian preschoolers, children, and adolescents. Firstly, research has been limited in examining food advertising directed at Canadian preschoolers, adolescents, and adults; variations across the 12-month calendar year; and on Canadian television stations intended for general audiences. Secondly, no study to date had assessed the CRTC program logs data as a resource for monitoring food advertising to children in Canada nor for identifying instances of non-compliance among broadcasters or advertisers with the Children's Code. Finally, little to no research has investigated which companies advertised to preschoolers and adolescents, as well as

the discontinuity between the two self-regulatory Canadian advertising initiatives (i.e. the CAI versus the Children's Code). The main aim of this thesis was, therefore, to fill the abovementioned knowledge gaps in food and beverage television advertising directed to young people across Canada.

1.9 Specific Research Objectives and Hypotheses

The specific research objectives of this study were:

1. To identify the differences in the average rate (ads/hour) of food and beverage advertising during programs targeted to preschoolers (0-5 years old), children (6-12 years old), adolescents (13-17 years old) and adults (18 years and older), in Canada.
2. To identify differences in the frequency and proportion of food and beverage advertisements by food category (e.g., food and beverage products, fast food restaurant, retail outlets) between the programs targeted to the four age groups.
3. To identify the food and beverage companies that advertise to these four age groups and whether the volume of advertising differs between the age groups by food and beverage company.
4. To identify differences in the frequency and proportion of advertising between CAI-participating and non-participating companies during programs targeted to the four age groups.

It was predicted that:

1. Programs targeted to adolescents would have the highest rates of food and beverage advertising, while programs targeted to preschoolers would have the lowest rates, during the specified viewing time.
2. Programs targeted to adolescents would have highest frequency and proportion of fast food restaurant advertising than during programs targeted at the other three age groups.
3. Fast food restaurants producing kids' meals (e.g., King Jr. Meals, Happy Meal) or food companies that manufacture and promote products such as cereals, candy, and packaged snacks would advertise during programs targeted to Canadian children and adolescents at a higher frequency than those targeted to preschoolers or adults.
4. Programs targeted to preschoolers and children would have a greater frequency and proportion of food advertising from CAI-participating companies than non-participating companies.

Chapter 2: Materials and Methods Overview

The specific methods and statistical analyses employed in the two studies: “*Food and Beverage Advertising to Children and Adolescents on Television: A Baseline Study*” and “*The advertising practices of the Canadian food and beverage industry targeting preschoolers, children and adolescents on television: A cross-sectional study*” are presented in Chapters 3 and 4. A comprehensive overview of the materials, methodological challenges, and statistical analysis is provided in the present chapter.

2.1 Materials Overview

This thesis examined television programming and food advertising broadcast between 6 a.m. and midnight from January to December 2018. The selected timeframe for analysis was based on previous research which indicated that this period is when most young people (under 18 years of age) watch TV (57,133). Data was extracted from the CRTC television program logs, which were obtained from the Canada’s Open Government Portal, on July 4, 2019 (134). The program logs are publicly accessible records submitted by over 300 licensed Canadian television broadcasters (i.e. stations or networks), on a monthly basis, to the CRTC. As a condition of licensure with the CRTC, all licensees must report information of its monthly programming in accordance with the Television Broadcasting Regulations, 1987. This includes elements such as the station name and location; date, time, and duration of programming and advertising; program titles; and target age of programming. Any commercial advertising must, also, disclose the name of the advertiser or company selling goods and services (135).

We used “advertising spots” as the unit of observation, which consisted of any form of advertising content that promoted food-related products and services (135). Specifically, advertising consisted of commercial messages, giveaways, local advertising, merchandising,

solicitation messages, and sponsorship messages, which were derived from the “programming class ID” variable in the program logs. Other log variables used in the analysis were “log date”; “start time” and “end time”; “duration”; “call sign” or “log identifier” (i.e. a television station’s acronym); the “program title,” which provided both program titles and advertising companies and/or products; and “target audience” (i.e. the target age group for the television program, which was selected by each broadcaster).

In 2015, the CRTC developed the following four standard target age markers for programming: preschoolers (0-5 years old), children (6-12 years old), teenagers (13-17 years old) and adults (18 years and older) (136). For this thesis and the appended articles, we have referred to the “teenagers” age group as “adolescents.” Importantly, these age groups were standardized by the CRTC in order to monitor the level of children’s and youth (0-17 years old) programming in Canada (136). While licensed broadcasters are not required to report the target age of advertising material in the program logs, both the CRTC and *Broadcast Code for Advertising to Children* refer to children’s advertising (children under 12 years old) as any paid commercial messages airing during children’s programming or immediately adjacent to children’s or other programming (110,137). Therefore, the target age group of programs was applied to advertisements that were aired during or immediately following the program (i.e. during the period between the end of a program and prior to the next program).

A code of keywords was developed from data within the program/advertisement titles to categorize advertising as either food or non-food related and further classify food advertisements according to the food category, food subsidiary company, and whether or not the food company was CAI-participating. Food and beverage advertising consisted of promotions from food companies or that fell into the following categories: food and beverage products (excluding gum

and alcohol), diet services and related products, food delivery services and applications, meal kits and subscription services, restaurants (e.g., sit-down restaurants, diners, cafes, etc.), fast food restaurants (i.e. quick service restaurants where food is ordered from a menu board, purchased at a counter and taken by the customer to a table or elsewhere), retail-outlets (e.g., grocery stores, bakeries, farmer's markets, etc.), and unknown. Food advertisements were classified according to their individual subsidiary companies (e.g., Harvey's, Montana's, and St. Hubert, instead of their parent company Recipe Unlimited). Some food advertisements, however, have been listed under the following three parent companies, as broadcasters only reported the parent company names: MTY Food Group, Recipe Unlimited and Yum! Brands. Companies were then classified as CAI-participating or not-participating, based on their participation in the CAI in 2018.

2.2 Methodological Challenges

2.2.1 Data Format Change

In September 2018, the formatting of the CRTC program log files and variables changed. Specifically, program logs from January-August 2018 existed in a delimited format for all 300+ television stations, while data from September-December 2018 were provided as station-specific files in a fixed-width text format. To fix this issue and append the two formats of data into a full year dataset, we converted the call sign/log identifier (i.e. television station), program class and target age group variables to the numeric data format (of January-August 2018 data), using the Reference Tables developed by the CRTC (138). A full description of data processing is provided in Appendix A. A total of 293 numeric and character call signs were classified into 271 television stations, consisting of both child-specialty and non-child-specialty/generalist stations (i.e. stations whose programming is for general audiences). Notably, television stations were identified as child-specialty and non-child specialty stations using station-specific websites,

Wikipedia, and the CRTC Broadcasting Service List (138). Of all television stations that reported to the CRTC in 2018, 41 stations were excluded from all analyses: 1 station (BBC Kids) was discontinued in 2019, 1 station (VisionTV) had missing data on target age groups, and 39 television stations did not air advertisements.

2.2.2 Quality of Broadcasters' Reporting

In contrast to advertising viewership data licensed from Numerator (formerly known as Nielsen Media), which is commonly used in Canadian research on advertising to children, the CRTC program logs do not specifically define nor identify what constitutes food advertising nor do they specify what food category is promoted. In fact, broadcasters decide how much detail they report in the logs for advertisements beyond the advertiser's name. Consequently, the reporting quality of food advertising in the program logs was inconsistent. Four main forms of reporting were prevalent in our data: (1) Full company name (e.g. "A & W Food Services of Canada Limited"); (2) Full company name and food category (e.g. "A&W FOOD SERVICES OF CDA-Fast Food 3rd"); (3) Full company name and slogan (e.g. "A&W-MAMA BURGER-LAKE LOUISE"); and (4) Company acronym and slogan (e.g. A&/LAKE LOUISE).

For our first article, in Chapter 3, "*Food and Beverage Advertising to Children and Adolescents on Television: A Baseline Study*," we analyzed advertising on all 271 commercial television stations; however, the method used to categorize food advertising was challenged by poor quality of reporting by 71 broadcasters (including major networks such as CTV, V, and Discovery). This was rectified by comparing advertisement slogans with data from television stations which reported the advertiser and slogan completely and clearly. Where available, food advertisements were also viewed on YouTube, Facebook, and/or Vimeo to verify if they were in fact food advertisements. An example of this is the following advertisement title

“TD/YES/CHANGE/BO,” which was compared with the title “TIM HORTONS/YES FOR A CHANGE/BOY” and viewed on YouTube. This method enabled us to confirm that this was a Tim Hortons advertisement for Timmies Minis Kids’ Meals, which was broadcast in 2018.

We also performed sensitivity analyses to determine whether the exclusion of television stations with incomplete reporting impacted the magnitude of our estimates. Estimates after excluding these stations were consistent with the primary analyses. These stations were, therefore, retained for our first article. The analysis for our second article, in Chapter 4, “*The advertising practices of the Canadian food and beverage industry targeting preschoolers, children, and adolescents on television: A cross-sectional study,*” however, was restricted to 182 stations. We excluded the 71 television stations which had incomplete reporting of company names to be confident of the food companies that advertised to children in 2018. A list of television stations included in each component article is provided in Appendix B.

Importantly, advertisements by nine companies that produced and promoted both food and non-food products (e.g., pet food, cleaning products, cosmetics, etc.) and did not report the advertised product, were classified as “non-food” and omitted from the primary analyses. The impact of excluding and underestimating advertisements by these companies was measured using sensitivity analyses in both articles. These companies were Federated Cooperatives Limited, Hain-Celestial, J.M. Smucker, Loblaws Companies, Mars Inc., Nestle Canada, Shoppers Drug Mart, Unilever Canada, and Walmart Canada. All advertisement titles were reviewed individually to avoid or correct any misclassification of advertisement category or company, which proved to be highly time-consuming (final datasets were completed in March 2020).

2.2.3 Surplus of Adult Programming

The majority of programs on Canadian television stations in the 2018 logs were reported as being targeted to adults. In addition, over 300 food subsidiary companies advertised exclusively during programs targeted to adults. Given the abundance of programming and food companies targeting adults in 2018, compared to younger age groups, we were unable to explore differences in the frequency of company-specific advertisements using Pearson's chi-square or a correspondence analysis. In particular, we could not employ a chi-square due to violations of its assumptions (i.e. expected cell counts were less than 5) nor a correspondence analysis due to clustering of companies around the adult age group. This issue was addressed through the use of a principal component analysis (described below) which allowed us to identify patterns of company practices between target age groups while accounting for greater volume of programming (and thus advertising) targeted to adults.

2.3 Statistical Analysis

2.3.1. Research Objective 1: Target age group differences in food advertising rates

We used linear regression to explore the differences in average rates of food advertising between programs targeted to preschoolers, children, adolescents, and adults. Linear regression models the association between a continuous outcome (e.g. advertising rate) and one or more continuous or categorical explanatory variables (e.g., age group, month, etc.) by fitting a line of "best fit" through the data points (139). This method of analysis also allows for the comparison of two group means (equivalent to a two-sample t-test) (139). An one-way analysis of variance (ANOVA), which also compares group means, was initially used to examine differences in advertising rates between age groups, months, and television stations; however, regression was able to investigate the differences while taking into account covariates and interactions.

Specifically, linear regression modelled the associations between food advertising rate and target

age group, television stations, and month; identified significant interactions between target age group and month as well as target age group and television station ($p < 0.05$); and also estimated the magnitude of difference (i.e. how many ads/hour) between the average advertising rates of preschoolers, children, and adolescents and the reference group of adults, by month and television station, with 95% confidence intervals. Forward selection was used to build regression models while coefficient of determination, R-squared (R^2) and adjusted R-squared (adj. R^2), values and statistical significance ($p < 0.05$) was further used for variable inclusion and exclusion. Regression diagnostics were performed for the final models by examining residual plots. An extreme outlier was found in the children's age group (on the television station W Network in April) and was removed from all analyses. In the full regression model, the outlier presented a residual value of 60, which fell outside the general trend of the other data points (data points had residual values between ± 10 and mean square error was 1.94). The outlying data point also fell outside the recommended studentized residual value of ± 3.0 . The regression diagnostics further demonstrated that the outlier was not an influential observation (Cook's D of the outlier was below 1.0 and the R^2 value changed by less than 5% upon the outlier's removal).

2.3.2 Research Objective 2: Target age-group differences in food advertising categories

A chi-square test of independence was employed to identify differences in frequency and proportion of food advertisements between the four target age groups and the eight food categories (e.g., food/beverage products, fast food, retail, etc.). Chi square is used to test the potential association between two categorical variables (e.g. age group and food category) by demonstrating significant differences between observed and expected cell counts of data and identifying where those differences exist (140). All chi-square assumptions, for the test of independence, were fulfilled such that the categorical advertising data was nominal and was

presented as frequencies; each target age group and food category was mutually exclusive; each advertisement contributed to the data in only one cell; and all expected cell values exceeded 5.

2.3.3. Research Objective 3: Target age-group differences in food advertising companies

The combination of a principal component analysis and chi-square analysis was used to identify differences in the food companies that advertised to the four target age groups. Principal component analysis (PCA) is widely used as a variable reduction method to reduce the dimensionality of a large dataset while maintaining much of its variability (141,142). Our analysis used PCA component plots, which plotted companies on coordinate planes comparing principal components extracted from the dataset, to visualize patterns between food companies and target age groups. It should be noted that the data for our PCA was comprised of frequencies of food advertisements by each food company for each age group. Food companies were input as a single variable (akin to a “subjects” variable) for the PCA, whereas each target age group was standardized (by subtracting its mean number of food ads and dividing by its standard deviation) and input as four separate variables. As a result, each principal component was comprised of different groupings of standardized age groups, of which only three accounted for a meaningful amount of the total variance. In particular, principal component 1 compared all age groups (contributed 60% of total variation) ; principal component 2 contrasted preschoolers with adolescents (contributed 19% of total variation); and principal component 3 contrasted children with all other age groups (contributed 13% of total variation). Outlying companies for each of the principal components were identified, from the PCA plots, as the food companies that advertised the most each of the target age groups. The PCA allowed us to meaningfully reduce the comparison of 497 food companies between age groups to 14 highest advertising food companies. These 14 companies were subsequently compared using a chi square analysis to see

if the frequency and proportion of advertisements by these food companies significantly differed ($p < 0.05$) between the target age groups. All chi square assumptions were fulfilled in this analysis.

2.3.4. Research Objective 4: Target age-group differences by CAI participating status

A chi-square test of independence was also used to identify differences in frequency and proportion of food advertisements between the four target age groups and the two CAI participation statuses (i.e., CAI participating and non-participating companies). All chi-square test of independence assumptions (i.e., nominal frequency data, independent observations, mutually exclusive groups, and over 5 expected cell counts) were fulfilled.

Chapter 3: Food and Beverage Advertising to Children and Adolescents on Television: A Baseline Study

The following chapter is based on a collaborative peer-reviewed article titled “*Food and Beverage Advertising to Children and Adolescents on Television: A Baseline Study*” published in the International Journal of Environmental Research and Public Health. This manuscript focuses on the first 2 objectives of this thesis, which aimed to: (1) identify the differences in the average rate of food and beverage advertising during programs targeted to preschoolers, children, adolescents, and adults, in Canada; and (2) identify differences in the frequency and proportion of food and beverage advertisements by food category between the programs targeted to the four age groups.

The full article is presented in this chapter. The supplementary materials associated with this manuscript are available online at the following link: <https://www.mdpi.com/1660-4601/17/6/1999/s1>. Ethics approval was not required for this study.

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I, Ms. Adena Pinto, was the lead investigator responsible for all aspects of the methodology, data analysis (software use, resources, validation, data curation, formal analysis, and investigation), visualization, developing the original draft and manuscript revisions.

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Article

Food and Beverage Advertising to Children and Adolescents on Television: A Baseline Study

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Abstract: The progressive rise in Canadian child obesity has paralleled trends in unhealthy food consumption. Industry has contributed to these trends through aggressive food and beverage marketing in various media and child settings. This study aimed to assess the extent of food and beverage advertising on television in Canada and compare the frequency of food advertising

broadcasted during programs targeted to preschoolers, children, adolescents and adults. Annual advertising from 2018 was drawn from publicly available television program logs. Food and beverage advertisement rates and frequencies were compared by, target age group, television station, month and food category, using linear regression modelling and chi-square tests, in SAS version 9.4. Rates of food and beverage advertising differed significantly between the four target age groups, and varied significantly by television station and time of the year, in 2018. The proportion of advertisements for food and beverage products was significantly greater during preschooler-, child-, and adult-programming [5432 (54%), 142,451 (74%) and 2,886,628 (48%), respectively; $p < 0.0001$] compared to adolescent-programming [27,268 (42%)]. The proportion of advertisements promoting fast food was significantly greater among adolescent-programming [33,475 (51%), $p < 0.0001$] compared to other age groups. Legislation restricting food and beverage advertising is needed in Canada as current self-regulatory practices are failing to protect young people from unhealthy food advertising and its potential negative health effects.

Keywords: child obesity; food and beverage marketing; television advertising; food policy; nutrition policy

1. Introduction

Canadian child obesity has increased at an alarming rate, nearly tripling in the last three decades [1]. As of 2012, 30% of Canadian children, aged 5–17, had excess weight or obesity [2]. The progressive rise in childhood obesity, however, is not exclusive to Canada, and worldwide an estimated 108 million children (under 20 years old) suffer from obesity [3,4]. Health conditions,

previously only common in adults (e.g., Type 2 diabetes and cardiovascular disease), have also become increasingly prevalent among children with

obesity [5]. One major driver, increasing child and adolescent consumption and preference for foods high in sugar, sodium and saturated fats, is the food industry's aggressive food and beverage marketing in various media and settings [6]. The World Health Organization (WHO) defines marketing as “any form of commercial communication or message that is designed to, or has the effect of, increasing the recognition, appeal, and/or consumption of particular products and services” and also includes “anything that acts to advertise or otherwise promote a product or service” [7]. Food and beverage marketing, thereby, refers to the activities designed to promote food and beverage products and services [8].

Television continues to be a major source of food and beverage marketing to children and adolescents, as Canadian youth watch between 14 to 17 h of television per week [9]. Research shows television-based food and beverage marketing directed at children predominantly promotes unhealthy foods (e.g., sugary breakfast cereals, fast-foods, candy, etc.) [10,11]. A recent study, conducted by Kelly et al., revealed that among 22 countries, Canada had the highest rate of food and beverage advertising during children's viewing times. Approximately 11 food and beverage advertisements aired per hour, per channel; the majority of which promoted breakfast cereals, candy, and cakes, cookies and pastries [12]. Canadian studies have also shown that fast food is heavily advertised during programs viewed by children and adolescents [13–15]. This exposure to unhealthy food and beverage advertising has previously been associated with a higher intake of energy-dense, sweet and salty foods among those exposed [16–20]. Experimental evidence reveals child-oriented food and beverage television advertising also influences children's food requests and has been associated with increased pestering of parents to purchase advertised products,

otherwise known as “pester power” [20–22]. Adolescents and young adults, however, are autonomous in their spending habits and are a particularly valuable target for fast food marketing, due to their spending power [23].

The WHO has responded to concerns about the impact of food and beverage marketing practices on child and adolescent health, by urging countries to regulate and limit the marketing of foods and non-alcoholic beverages high in fat, sugar, and salt, directed at children [19,24,25]. In Canada, food and beverage marketing is largely self-regulated by Ad Standards Canada and the food industry [26,27]. All Canadian television broadcasters must adhere to the Broadcast Code for Advertising to Children, and its Code Interpretation Guidelines, which state that advertised foods must be within the context of a balanced meal, depict a reasonable serving size for a child, and must not portray snack foods as substitutions for meals nor discourage foods recommended by Canada’s Food Guide to Health Eating (e.g., fruits or vegetables) [27–29]. The Code and the Children’s Broadcast Advertising Clearance Guide also clearly indicate advertising to preschoolers is not permitted in Canada [27,28]. In 2007, the Canadian Children’s Food and Beverage Advertising Initiative (CAI) was launched, and currently comprises of 16 large Canadian food and beverage corporations who have voluntarily pledged to either refrain from advertising unhealthy food and beverages to children under 12 years old entirely, or advertise only what the companies define as “better-for-you” products. The latter must comply with the CAI’s Uniform Nutrition Criteria (implemented in 2015), on television and in other media [6,30–33]. Despite the CAI’s efforts to limit food and beverage advertising directed at children, under 12 years old, studies have shown this self-regulatory program has insufficiently protected Canadian children from unhealthy food and beverage advertising on television [13,34,35]. Critiques of the CAI report that CAI companies are responsible for more food and beverage advertising during children’s

viewing than non-CAI participating companies, and that up to 58% of its “better-for-you” advertised products (e.g., Froot Loops) fail to pass the nutrition standards of many national governments [14,36]. Other criticisms levied at the CAI include child-audience thresholds (i.e., the percentage of the viewing audience that must be children, under 12 years old, before the pledges are implemented) that are too high, low participation rates; and narrow definitions of child-directed marketing [35].

The ineffectiveness of the CAI in Canada led to the development of more comprehensive and stringent legislation—Bill S-228, The Child Health Protection Act. This Bill, introduced in 2016, sought to amend the Food and Drugs Act by prohibiting unhealthy food and beverage marketing directed primarily at children under 13 years old, across all potential marketing media channels and child settings in Canada [37]. Bill S-228, however, died on the order paper during the dissolution of Parliament, prior to the 2019 Canadian federal election. Given that this Bill (or something similar) may be reintroduced in the current Parliamentary session, and given the deleterious effects of unhealthy food advertising on child and adolescent health, it is necessary to benchmark the current food and beverage advertising environment for policy makers. The current literature, however, is limited with respect to Canadian television food advertising directed at preschoolers and adolescents, across the 12-month calendar year, and on television stations intended for general audiences [6,12,13]. To assess the impact and effectiveness of new food and beverage marketing legislation, national and yearlong baseline data on the current state of television food advertising to children and other youth under 18, is needed.

The purpose of the current study was to benchmark the frequency of food and beverage advertising on television over a one year period and to examine differences in advertising, overall and by food category, between television programming targeted to preschoolers (0–5 years old),

children (6–12 years old), adolescents (13–17 years old) and adults (18 years and older). It was predicted that programs targeted to adolescents would have the highest rates of food advertising compared to other programs,

while programs intended for preschoolers would have the lowest rates of food advertisements. It was also hypothesized that programs targeted to adolescents would have greater proportions of fast-food restaurant advertisements than programs targeted to other age groups.

2. Materials and Methods

This baseline study performed an analysis on the Canadian Radio-television and Telecommunications Commission's (CRTC) television program logs, which are submitted by television broadcasters, and collected and published by the CRTC on the Government of Canada's open data portal [38]. These logs are open-access monthly television programming records which report elements of programming and advertising content including, but not limited to, the broadcast date, duration, program titles, and target age group of programs, for over 300 Canadian television stations, in compliance with the Television Broadcasting Regulations, 1987. Importantly, broadcasters are required to report the names of all individuals or companies promoting goods and services on Canadian television stations [39]. The study examined data on television programming and food advertising airing between 6 a.m. and midnight (when most young people under 18 are watching television) from January to December 2018 on 271 commercial stations. Of the television stations reported in 2018, one station (BBC Kids) that was discontinued in 2019, one station (VisionTV) that had missing data on target age groups and 39 television stations that did not air advertisements were excluded.

2.1. Measures

The unit of observation was “advertising spots” which the Television Broadcasting Regulations, refers to as programming content consisting of commercial messages and programming used for the promotion of stations, networks, or programs [39]. For this study, advertising comprised of commercial messages, giveaways, local advertising, merchandising, solicitation messages, and sponsorship messages, identified from the CRTC program logs’ “Programming Class ID” variable. Commercial message was defined as “an advertisement intended to sell or promote goods, services, natural resources or activities ... that is broadcast in a break within a program or between programs” [40]; local advertising referred to less than 12 min of advertising that is “of interest to the community or market served” [41]; giveaway referred to advertising where products are given free, for promotional purposes [42]; merchandising consisted of advertising material promoting the sale of goods [43,44]; solicitation messages was advertising involving “the sale or promotion of a product or service ... on behalf of another group” [45]; and finally, sponsorship messages consisted of advertising “when a community program acknowledges that it has received direct financial assistance” [46].

Within the program logs, pertinent variables associated with advertising spots included “log date,” which was the recorded date when advertisements and programs were aired; “start time” and “end time,” which referred to the recorded time of the day (in terms of hours, minutes, and seconds) when advertisements and programs were aired; “duration” consisted of the recorded length of the advertisement and programs (in terms of hours, minutes, and seconds); “call sign” or “log identifier,”

which identified television stations; and finally, the “program title,” which indicated the name of the broadcasted program or advertiser and the advertised product or service [39].

According to the CRTC, commercial messages airing on children’s programming are considered to be targeted to children (defined as children under 12 years of age) [29]. The “target age group” of advertisements aired during and immediately adjacent to television programs was, thus, determined from the target age group of television programs. Note that the target age group of every television program is selected by each broadcaster (i.e., the television station). They must classify each television program as targeting one of four age groups defined by the CRTC as preschoolers (0–5 years old), children (6–12 years old), adolescents (13–17 years old) and adults (18 years and older) [47].

Data from the program title (i.e., advertised product or company) was used to identify advertisements as food or non-food, and the food category. Food and beverage advertising included food-related promotions which comprised of the following food categories: food and beverage products (excluding gum and alcohol), diet services and related products (e.g., Weight Watchers), food delivery services and applications (e.g., Skip the Dishes), meal kits and subscription services (e.g., Hello Fresh), restaurants (e.g., sit-down restaurants, diners, cafes, etc.), fast food restaurants (i.e., quick-service restaurants where food is ordered from a menu board, purchased at a counter and taken to a table or elsewhere by the customer), retail-outlets (e.g., grocery stores, bakeries, farmer’s markets, etc.), and unknown. In cases where the advertised product was not specified, and companies manufactured both food and non-food products (e.g., Unilever Canada, Mars Inc. etc.), ads were classified as non-food and omitted from the analysis.

2.2. Data Handling

Television program logs, from January to December 2018, were downloaded from the Government of Canada’s Open data portal on July 4, 2019 and imported into SAS version 9.4 for

Windows (SAS Institute, Released 2013) [38,48]. As the formatting of the program log data changed in 2018, the television station, program class and target age group variables were converted to the numeric data format, using the Reference Tables provided by the CRTC, to append the two formats of data into a full year dataset [49]. A total of 293 numeric and character station codes were then classified into 271 stations (see Supplementary Table S1 for all included stations), consisting of both child-specialty stations (i.e., stations whose content is specifically intended/targeted at children under 18 years old) and non-child-specialty stations (i.e., stations whose content is not specifically intended/targeted at children under 18 years old) [50].

To identify food and non-food related advertisements, a code was created using keywords from the advertisement titles and applied to the full year dataset. Advertising titles were examined individually to prevent and correct misclassification of advertisements. Notably, any non-food ads that remained in the dataset, after extracting food ads, were deleted to obtain a full-year dataset consisting of only food and beverage advertisements and television programs. Food categories (mentioned above) were identified for each food advertisement using the same methodology, within the dataset containing only food advertisements and television programs. For example, from the advertisement title “GENERAL MILLS CANADA CORP” we identified the keyword “General Mills” and classified the advertisement as a food ad in the “food and beverage products” category.

2.3. Statistical Analysis

Descriptive statistics and regression modelling examined the association between target age group and rate of food and beverage advertising, on SAS version 9.4 (SAS Institute Inc., Cary, NC, USA) for Windows [48]. The rate of food and beverage advertising, defined as the average

number of food and beverage-related advertisements aired per hour of programming (n/hour), was calculated for each target age group at the month and television station level. The frequency of food and beverage television advertising by food category, defined as the number and proportion of advertisements from a specific food category, was also calculated and examined separately for each target age group. The effect of target age group on the average rate of food and beverage advertising was tested using simple and multiple linear regression models. A simple linear regression model observed the unadjusted effect of target age group on food advertising rates and tested differences in the annual age-specific rates of food advertising. Multiple linear regression models were fitted to determine the influence of target age group, television station, and month on food advertising rates and to test differences in the station- and month-specific food advertising rates between the four target age groups (using an ESTIMATE statement). A full regression model, including all 271 television stations, was fit to examine monthly differences in the rates of food advertising between the four target age groups. Age-specific monthly rates were also plotted to observe seasonal variations in advertising over the course of 2018. A specific regression model, containing 31 television stations (14 child-specialty stations and 17 of the top five non-child-specialty stations), was fit to examine significant differences in the station-specific rates of food advertising between the four target age groups. Notably, the top five non-child-specialty stations were determined by selecting five television stations with the highest food advertising rates for each target age group. The specific model excluded Disney XD, Citytv Montreal and Zeste, as each of these stations carried programming for only one target age group. Pearson's chi square analysis was used to test differences in the proportion of food and beverage advertisements of each of the food categories among the four target age groups. Statistical significance level was set at $\alpha < 0.05$, and significant results are reported using a 95% confidence interval and/or p -values less

than 0.05. A sensitivity analysis was conducted, by inputting advertisements from companies manufacturing both food and non-food products, which either lacked or had unclear advertised product information, into the chi square analysis and regression models, to determine whether our method and assumptions for handling unclear advertising data influenced the magnitude and direction of our estimates.

3. Results

3.1. Annual Results

In 2018, 6,344,557 food and beverage-related advertisements and 3,575,558 programs (i.e., TV series, films, etc.) were broadcasted on 271 Canadian television stations. As shown in Table 1, 96% of food advertising was broadcasted during programs targeted to adults (18 years and older), 3.1% was broadcast during programs targeted to children (6–12 years old), 1.0% was broadcast during programs targeted to adolescents (13–17 years old) and 0.2% was broadcast during programs targeted to preschoolers (0–5 years old). Across all stations, the average annual rates of food advertising differed between the age groups at 0.6 food ads per hour of programming targeted to preschoolers; 1.5 food ads per hour of programming targeted to children; 3.3 food ads per hour of programming targeted to adolescents; and 4.1 food ads per hour of programming targeted to adults.

Table 1. Annual frequency, average rate, and duration of food advertising by target age groups, across all Canadian television stations, in 2018.

	Frequency of Food Advertisements n (%)	Television Stations (n)	Total Food Advertising Duration (hours)	Total Programming Duration (hours)	Food Advertising Rate (n/hour) ¹		β ²	p-value
					Mean	Min-Max		
Preschoolers	10,123 (0.2)	65	60.0	61823.6	0.6	0–12.2	–3.5	<0.0001
Children	193,888 (3.1)	71	981.4	70983.7	1.5	0–77.1	–2.6	<0.0001
Adolescents	65,563 (1.0)	106	332.7	25814.2	3.3	0–21.5	–0.7	<0.0001
Adults	6,074,983 (95.7)	269	31954.4	1561240.5	4.1	0–19.0	Ref. ³	-

¹ Significant differences in annual food advertising rates (across all stations) between target age groups was determined by simple linear regression model. $R^2 = 0.139, p < 0.0001$. ² β for regression intercept is 4.08 where $p < 0.0001$. ³ Ref. = Reference.

A simple linear regression model estimated the unadjusted effect of the target age group on the average annual food advertising rate (Table 1). A significant regression equation was found with only 13.9% of the variation ($R^2 = 0.139, p < 0.0001$) explained by the target age group alone. In 2018, the average annual rate of food advertising was significantly lower when compared to programs targeted to adults, by 3.5 food ads per hour when programs were targeted to preschoolers ($\beta = -3.5, p < 0.0001$); by 2.6 food ads per hour when programs were targeted to children ($\beta = -2.6, p < 0.0001$); and by 0.7 food ads per hour when programs were targeted to adolescents ($\beta = -0.7, p < 0.0001$).

3.2. Monthly Advertising Rates

The average annual rates of food advertising, however, may mask seasonal variations found in food advertising rates across the year. As depicted in Figure 1, food advertising rates during programs targeted to preschoolers, children and adults were relatively consistent throughout the year. In April, however, a large peak was found in the food advertising rate during programs targeted to children, likely due to the station W Network, which aired 36 food ads (approximately 10 min) during and immediately following a single 28-min program targeted to children. This translated to a food advertising rate of 77 food ads per hour of programming (approximately 23 min of food advertising/hour) targeted to children. Conversely, large fluctuations in rates of food advertising were observed during programs targeted at adolescents, across the 12-month period. Among programs targeted to adolescents, the highest food advertising rate was observed in July (approximately 4 food ads/hr), likely due to the station YTV, which had 21 food ads per hour of

programming (approximately 9 min of food advertising/hour). Other peaks in food advertising during programs targeted to adolescents coincided with months with major commercialized holidays, including February, October and December (i.e., Valentine’s, Halloween, and Christmas, respectively).

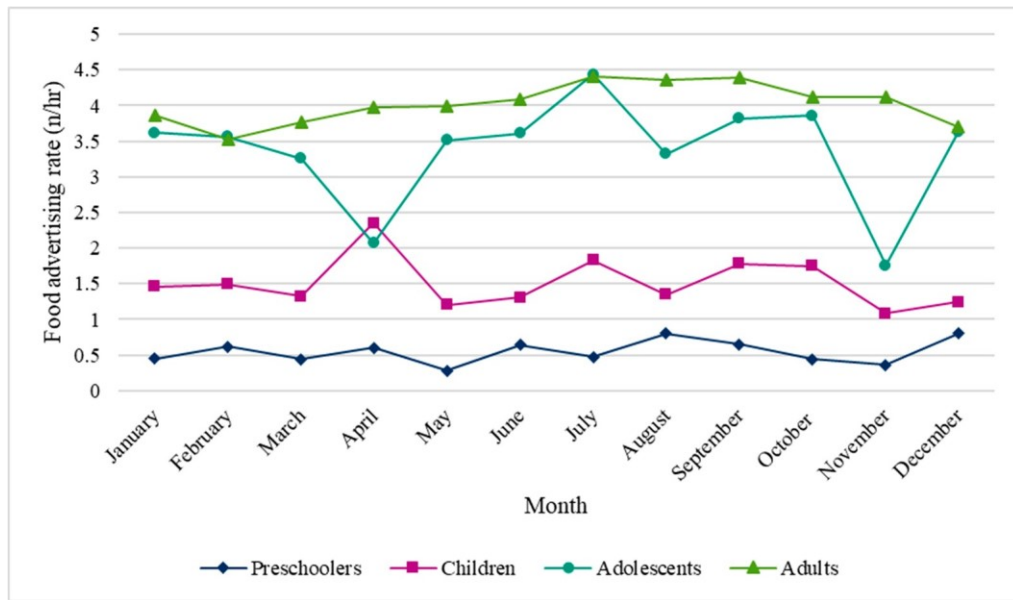


Figure 1. Monthly age-specific food advertising rates, in terms of food ads per hour of programming, on Canadian television stations, in 2018.

A full multiple linear regression model determined the influence of target age group, time of the year (i.e., month) and television station (all 271 stations) on food advertising rate. A significant regression equation was found with 91.0% ($R^2 = 0.910$, $p < 0.0001$) of the variation explained by target age group, month and television station. Significant interactions were found between target age group and television station, and between target age group and month, indicating the effect of the target age group on food advertising rates was modified by the television station and time of the year (i.e., month). Notably, the month of May was used as the reference due to its absence of, and distance from, major food-related holidays. Significant differences in food advertising rates

between May and other months were only found for adolescent-targeted programs. Among programs targeted to adolescents, compared to the month of May, the rate of food advertising was significantly lower in April and November by an average of 1.30 food ads per hour (95% CI = -1.76, -0.84) and 0.78 food ads per hour (95% CI = -1.26, -0.31), respectively, while television stations remain constant. Significant differences in monthly rates were not observed between other months or target age groups.

3.3. Station-Specific Advertising Rates

Rates of food advertising also varied substantially by television station (all station-specific rates are found in Supplementary Table S1). On child-specialty stations, the rates of food advertising were higher among programs targeted to adults compared to programs targeted to younger age groups, with the exception of ABC Spark, Nickelodeon, Teletoon (English), VRAK and YTV, which had higher rates of food advertising during programs targeted to children or adolescents (Table 2). Notably, only YTV had statistically significantly higher rates of food advertising during programs targeted to adolescents compared to programs targeted to adults.

Table 2. Average age-specific rates of food advertising (n/hr) across 15 Canadian child-specialty television stations ¹, in 2018.

Child Specialty Stations	Food Advertising Rate (n/hr) Mean (SD)			
	Program Target Age Group			
	Preschoolers	Children	Adolescents	Adults
ABC Spark	-	10.0(2.2)	10.9(1.6)	10.7(1.4)
Cartoon Network	-	3.5(1.2) *	1.9(1.8) *	8.8(2.6)
Disney Channel (English)	2.0(1.1) *	3.2(1.3) *	2.3(0.9) *	5.0(2.8)
Disney Channel (French)	0.0(0.0)	0.6(0.4)	-	0.8(0.8)
Disney Junior	0.0(0.0)	0.0(0.0)	-	0.0(0.0)
Disney XD	-	3.7(1.2)	-	-

Family Channel	1.0(1.3) *	2.4(1.3) *	5.4(2.1) *	5.7(2.3)
Family Jr.	0.0(0.0)	0.0(0.0)	0.0(0.0)	-
Nickelodeon	0.0(0.0)	4.5(2.2)	-	2.0(0.0)
Teletoon (English)	0.0(0.0) *	7.0(2.1) *	9.1(4.9)	8.7(2.4)
Télétoon (French)	-	1.3(0.5) *	3.2(1.8)	5.5(1.2)
Treehouse TV	0.0(0.0)	0.0(0.0) *	-	0.0(0.1)
VRAK	-	3.1(0.9)	3.1(0.8)	2.9(0.8)
YOOPA	0.0(0.0)	0.0(0.0)	-	0.0(0.0)
YTV	3.0(4.2) *	6.5(1.4) *	15.3(4.2) *	12.2(2.0)

¹ Hyphens indicate no programming was found on the television station for the target age group.

*Significant differences between food advertising rates during adult programming and the specified age group programming was found in specific multiple linear regression model at $p < 0.05$ level, using an ESTIMATE statement (supplementary tables S2 and S3, respectively).

Average rates of food advertising, however, were significantly higher during programs targeted to preschoolers, children and adolescents, on many non-child-specialty stations (Table 3). Among the top five non-child-specialty stations for preschoolers, OMNI Toronto had the highest food advertising rate during programs targeted to preschoolers, at 11 food ads per hour. The highest food advertising rate during programs targeted to children and adolescents was found on Citytv Toronto at 20 food ads per hour and on Lifetime at nearly 19 food ads per hour, respectively. Among programs targeted to adults, the highest rate was found on The Cooking Channel at 15 food ads per hour.

Table 3. Average food advertising rates (n/hr) among top five non-child-specialty Canadian television stations, per target program age group, in 2018.

Food Advertising Rate (n/hr) Per Program Target Age Group							
Preschoolers		Children		Adolescents		Adults	
Station	Mean (SD)	Station	Mean (SD)	Station	Mean (SD)	Station	Mean (SD)
OMNI Toronto	11.0(1.3)*	Citytv Toronto	20.0(0)*	Lifetime	18.8(0)*	The Cooking Channel	15.3(1.8)
Sportsnet One	7.1(0)*	W Network	17.7(24.2)	Citytv Vancouver	16.0(0)*	Zeste	12.1(2.1)
BBC Canada	6.9(2.0)	Showcase	11.5(2.4)*	Slice	12.5(2.9)*	Lifetime	11.8 (1.8)
Global Kelowna	4.1(0)*	Movie Time	10.5(2.7)	Adult Swim	9.2(2.2)	Food Network	11.6(2.3)
Nat Geo Wild	3.4(1.3)*	Yes TV Burlington	7.1(3.2)*	Cosmopolitan TV	9.1(5.3)	Citytv Montreal	11.0(1.3)

* Significant differences between food advertising rates during adult programming and the specified age group programming was found in specific multiple linear regression model at $p < 0.05$ level, using an ESTIMATE statement (supplementary tables S2 and S3, respectively).

A specific multiple linear regression model was fit to estimate the effect of target age group, television stations and months on food advertising rates between the four target age groups, across 31 television stations (specific model found in Supplementary Table S2). A significant regression equation was found with 89.6% of the variation ($R^2 = 0.896$, $p < 0.0001$) explained by target program age, television station, and month. Significant interactions were also found, in the specific regression model, between target age group and television station, and between target age group and month. Among child-specialty stations, statistically significant differences were found between food advertising rates during programs targeted to adults and programs targeted to younger people on Cartoon Network, Disney Channel English, Family Channel, Teletoon English and French, Treehouse TV, and YTV. For instance, on Disney Channel English, compared to programs targeted to adults, the rate of food advertising significantly decreased by 3.0 food ads/hour (95% CI = -4.37 , -1.63) when programs are targeted to preschoolers, by 1.8 food ads/hr

(95% CI = -3.15, -0.41) when programs are targeted to children and by 2.6 food ads/hr (95% CI = -3.99, -1.25) when programs are targeted to adolescents, while month remains constant. On YTV, compared to programs targeted to adults, the rate of food advertising significantly increases by 2.6 food ads/hr (95% CI = 1.09, 4.17) when programs are targeted to adolescents, but decreases by 9.2 food ads/hr (95% CI = -11.7, -6.62) and 5.6 food ads/hr (95% CI = -6.93, -4.32) when programs are targeted to preschoolers and children, respectively, while month remains constant.

Significant differences in food advertising rates between the four age groups were also observed for several non-child-specialty television stations (specific model in Supplementary Table S2). The rate of food advertising significantly increases by 5.4 food ads/hr (95% CI = 3.51, 7.29) on OMNI Toronto and 3.7 food ads/hr (95% CI = 0.22, 7.15) on Sportsnet One and significantly decreases on Global Kelowna by 4.0 food ads/hr (95% CI = -7.40, -0.51) when programs are targeted to preschoolers compared to when programs are targeted to adults, while month remains constant. On Citytv Toronto, Showcase and Yes TV Burlington, the food advertising rate significantly increases by 11.0 food ads/hr (95% CI = 7.60, 14.42), 2.8 food ads/hr (95% CI = 1.21, 4.44), and 4.8 food ads/hr (95% CI = 3.49, 6.10) when programs are targeted to children compared to when programs are targeted to adults, while month remains constant. On Lifetime, Citytv Vancouver and Slice, the food advertising rate significantly increases by 7.2 food ads/hr (95% CI = 3.78, 10.71), 7.3 food ads/hr (95% CI = 3.77, 10.71) and 3.4 food ads/hr (95% CI = 1.73, 4.99), respectively, when programs are targeted to adolescents compared to when programs are targeted to adults, while month is held constant.

Television food advertising also differed significantly between program target age groups by food category. Results of the Pearson's chi square analysis (Table 4) indicate the frequency and proportion of food and beverage advertising by food category, was significantly different ($\chi^2 =$

66128.1; $df = 21$; $p < 0.0001$) between program target age groups, in 2018. Among programs targeted to preschoolers and children, the majority of food advertising (53.7% and 73.5%, respectively) were promotions for food and beverages, which included items such as snack foods, candy, and breakfast cereals. Food advertising during programs targeted to adolescents had a significantly greater proportion of fast food restaurant advertisements (51.1%) than any other food category. Food advertising during programs targeted to adults were most frequently food and beverage products (47.5%), followed closely by fast food promotions (39.0%).

Table 4. Age-specific frequency and proportion of food advertising, by food category, on Canadian Table 2018.

Food Category	Frequency of Food Advertisements n (%) ¹				Chi Square Results (df)
	Program Target Age Group				
	Preschoolers	Children	Adolescents	Adults	
Food Delivery Services	0 (0)	193 (0.1)	164 (0.3)	26075 (0.4)	
Diet Products & Services	19 (0.2)	15 (0.01)	90 (0.1)	37894 (0.6)	
Fast Food	1267 (12.5)	39673 (20.5)	33475 (51.1)	2370025 (39.0)	
Food & Beverage Products	5432 (53.7)	142451 (73.5)	27268 (41.6)	2886628 (47.5)	X ² (21)
Retail Outlets	2390 (23.6)	6315 (3.3)	2024 (3.1)	376570 (6.2)	$p < 0.0001$
Restaurants	505 (5.0)	2676 (1.4)	1853 (2.8)	307821 (5.1)	
Meal Kits & Subscriptions	510 (5.0)	2565 (1.3)	689 (1.1)	68845 (1.1)	
Unknown	0 (0)	0 (0)	0 (0)	1125 (0.02)	
Total	10,123 (100)	193,888 (100)	65,563 (100)	6,074,983 (100)	

¹ Proportion of food advertisements by food category calculated within age-groups

3.4. Sensitivity Analysis

Results of the sensitivity analysis were consistent with the overall primary analysis. The inclusion of advertisements lacking or providing unclear reporting of advertised products by companies including, but not limited to, Unilever, J.M. Smucker, Mars Inc. and Nestle, did not

significantly alter the magnitude, direction of, or differences between food advertising rates and frequencies. In fact, the results of our sensitivity analysis indicate food advertising rates are influenced by program target age group, television station, time of the year (i.e., month), and food category to the same degree as when unclear advertisements were omitted from the analysis.

4. Discussion

This study adds to the body of literature examining television food advertising directed at children and adolescents, by benchmarking the current television food advertising environment in Canada. As hypothesized, programs targeting preschoolers had the lowest average rates of food advertising across all television stations examined, while, contrary to what was hypothesized, programs targeting adults had the highest average rates of food advertising across most of the examined Canadian television stations, even child-specialty stations. Nevertheless, programming targeted at youth under 18 years had sizeable annual levels of food and beverage advertising as programs directed at preschoolers, children and adolescents had 0.6 ads/hr, 1.5 ads/hr, and 3.3 ads/hr on average, respectively. The average rates of food advertising for children found in our study are lower when compared to previous Canadian studies, which observed between 3–11 food ads per hour per television station [11,33,51]. These differences, however, could be explained by the use of differing methodologies. In particular, previous studies have examined food advertising rates either during all programming on child specialty stations or during programming where children aged 2–11 constituted a large share of the audience (>35%). Our study, by contrast, analyzed food advertising during programming that was classified as targeted to children, or other age groups, by the broadcaster and no criteria for this categorization is publicly available.

4.1. Variability among Stations

Our study found that average rates of food advertising varied significantly by television station, in Canada. Non-child specialty stations had especially high average rates of food advertising during programs targeted to youth under 18 years, such as City TV Toronto and Lifetime, which had an average of 20 food ads per hour of programming targeted to children and 19 food ads per hour of programming targeted to adolescents, respectively. Child-specialty stations, conversely, had significantly lower rates of food advertising during programming directed at youth under 18, with the exception of ABC Spark, Nickelodeon, Teletoon (English), VRAK and YTV. These child-specialty stations, particularly Nickelodeon, Teletoon and YTV, have previously been reported as having high rates of food advertising in Canada [12,13,15,35]. Importantly, as YTV is offered in most expanded basic TV packages across Canada, its high level of food advertising is likely due to the greater access to, and viewership of, this station. It has been reported that YTV and Teletoon are the most preferred television stations among children and adolescents (9–15 years old) across Canada (excluding Quebec), while VRAK and Teletoon are particularly popular among children and adolescents (9–18 years old) in Quebec [52]. Some child-specialty television stations, however, do confer protection to certain age groups and not others (e.g., Disney Channel French, YOOPA), while some stations protect all ages (e.g., Family Jr, Disney Jr) as they do not advertise food-related products and services at all.

4.2. Food Advertising Violations

Despite the low rates of food advertising among preschooler-targeted programming found in our study, the majority of child-specialty stations and several non-child-specialty stations (i.e., general audience stations), advertise during programming classified as targeted at preschoolers,

which is a clear violation of the Code's preschooler advertising regulations. Moreover, the Code explicitly states that a station or network may not carry more than 8 min of commercial advertising per hour of children's programming [27]. This clause was violated by W Network, who aired almost three times the allowed duration of food advertising during child-targeted programs in April 2018. These results point to a need for systematic surveillance of the Code to ensure company and broadcaster compliance.

4.3. Food Advertising to Adolescents

Food advertising during adolescent-targeted programming is also a growing concern in Canada. Between 2006 and 2011, Potvin Kent et al. found a significant increase (67%) in the frequency of advertising to adolescents, by 18 CAI companies alone [13]. Our results found the rates of food advertising during adolescent-targeted programming to be alarmingly similar to rates during adult-targeted programming. This is concerning as adolescents are not immune to the effects of food marketing [53]. In fact, not only are adolescents less likely to be critical of food advertising than adults, but this age group is also highly targeted due to their purchasing power [17,53]. Food companies strategically advertise to adolescents, as evidenced by the elevated rate of food advertising during adolescent-programming in July 2018 (i.e., summer vacation); the time during which they are more likely to be watching television. Food advertising to this age group is also likely to be less healthy compared to other age groups. As hypothesized, the proportion of fast food advertising was highest during adolescent-targeted programming, compared to all other food categories and other target age groups. One plausible explanation for this result could be related to adolescents' increased autonomy in terms of purchasing fast food [54]. Since fast food is affordable for adolescents, it has been suggested that purchasing fast food becomes "a form of

self-expression for teenagers as they struggle to assert their autonomy apart from their family's food identity" [54]. Adolescents, thus, are a highly profitable demographic for fast food companies. In fact, data on food advertising expenditure to youth, in the United States, has revealed fast food companies spend more on advertising to reach adolescents compared to children [55].

Food and beverage product advertisements, on the contrary, are more common in younger children (aged 12 or younger) due to "pester power." As younger children are unlikely to possess the ability to purchase food outside the home, they contribute to household food purchases through parental requests, which can be exploited by food and beverage manufacturers. Our study demonstrates Canada's industry-led food advertising initiative (i.e., the CAI) is failing, evident from the persistent high rates of food advertising to children under 12, despite its introduction over a decade ago. Previous research has also shown that CAI companies continue to advertise to children under 12, despite their pledges to abstain from advertising when children make up 25–35% of the viewing audience [35]. Moreover, the CAI fails to capture the breadth of food companies advertising to children under 12 years old. Of the 16 food companies currently participating in the CAI, only one fast food company (i.e., McDonald's) participates.

4.4. Fast Food Advertising

The abundance of fast food advertisements broadcast during programming targeted to youth under 18, observed in our study, is alarming and mirrors what has been repeatedly seen in other Canadian studies on food marketing [13–15]. Most recently, a study found a 25% increase in fast food advertising between 2011 and 2016 across 31 stations broadcasted in Toronto, Canada's largest broadcast market [56]. Fast food advertisements have previously been associated with an increase in fast food consumption, and an increased risk of obesity in children [21,57–60].

Specifically, studies have found children preferred foods when they thought foods were from familiar fast food brands (e.g., McDonald's) [61,62]. Other experimental research has shown that fast food advertisements promoting healthy meals increased children's general preference for fast food, but not for healthier options [63]. As regular consumption of fast food has also been found to increase one's risk of metabolic syndrome, cardiovascular disease, and developmental diabetes, the volume of fast food advertising during programming targeted at youth under 18, in Canada, is cause for concern [64].

4.5. Strengths & Limitations

The main strength of this study is that it is a broad assessment of the Canadian food advertising landscape using the most comprehensive public advertising data available in Canada. This study is the first to investigate and benchmark food advertising rates on nearly all Canadian commercial television stations over a one-year period; assess food and beverage advertising during programming targeted to preschool children and adults, an area of research relatively non-existent; analyze seasonal variations in food advertising; and finally, one of the first to use publicly available data (i.e., CRTC TV program logs) to examine children's potential exposure to food advertising. Furthermore, this study is one of the first to examine food advertising rates using regression modelling, thereby, enabling us to investigate a greater number of factors that impact the effects of target age on food advertising rates. Our sensitivity analysis also increases the confidence in our data handling assumptions and the robustness of our study findings.

Despite these strengths, we have likely underestimated the rates of food advertising on television in Canada, as the CRTC program logs do not consistently report the food advertising company and/or advertised food product or service clearly. Moreover, rates of food advertising

during programs targeted to younger age groups are likely underestimated due to the fact that broadcasters are required to select only one of the four target age groups for each program, while food advertisements carried during these programs may cut across more than one target age group. It is also known that younger children, particularly those of preschool years, actively and passively watch programs intended for other age groups. As such, although stations indicate the program and corresponding food advertisements as targeted to one age group, this does not mean that only the reported target age group views, or is influenced by, the food advertisements.

The reproducibility of our study's results is also impacted by the availability and changes of 2018⁰s TV program logs. During our analysis, we observed differences in the number of station files downloaded on different dates (hence the reported date of download in the methods section above). We also found that average rates of food advertising differ depending on the calculation. For example, the average food advertising rate during child-targeted programming calculated from the annual total of child-targeted food advertisements and total child-targeted $\mu = \frac{\Sigma \text{child-targeted food ads in 2018}}{\Sigma \text{child-targeted programs in 2018}}$ was different from the mean rate of food advertising during child-targeted programming which was calculated by averaging the food advertising rates across all stations and $\mu = \frac{\Sigma \text{child-targeted advertising rates across all stations and months}}{\text{number of child-targeted food advertising rates in 2018}}$. The latter is preferred as it incorporates variance from television stations and months and, thereby, provides more insight into the variations in average food advertising rates. Finally, as there are no published criteria on how broadcasters classify the target age group of their programming, the validity of this classification is unknown.

We are unable to determine actual exposure to food advertising on television, from our analysis, as young people may be watching programming ostensibly only intended for older age groups or using other personalized viewing services offered by television service providers (e.g.,

pay-per-view and/or video on demand). Nevertheless, this research provides insights on children's potential exposure to food and beverage marketing on television as well as Canadian broadcasting practices and their protection of young people from food and beverage advertising, or lack thereof. While we were unable to conduct a nutritional analysis of advertised foods (due to the quality of the data), the high prevalence of fast food advertisements indicates the nutritional quality of food advertising is likely poor. Previous research has also shown that the foods advertised on television in Canada are high in fat, sugar and salt [30,48].

Future research should investigate the advertising of food and beverage companies, which accounted for a large share of food advertisements, and should benchmark the volume and rates of advertising by company. Research combining data licensed from Numerator (a company that licenses data on actual exposure to television programming and advertising) and CRTC program log data is necessary to examine whether the targeted audience reported by broadcasters are consistent with the children and adolescents' actual exposure to these programs and advertisements. The CRTC program log data should also be systematically examined for consistency of target age classification of programs, across and within television stations. Furthermore, future studies will need to consider the large fluctuations in rates of food and beverage advertising we observed across the year.

5. Conclusions

In Canada, food and beverage products and services remain heavily advertised during television programs targeted at young people, despite the food and advertising industry's voluntary, self-regulatory codes and initiatives. The current consumer complaint-based process used by Ad Standards Canada, to restrict non-compliant food advertisements, also fails to identify

the overt violations by numerous television broadcasters in Canada. More stringent and restrictive legislation, such as Bill S-228 – The Child Health Protection Act, is needed to protect young people from the far-reaching health effects of food and beverage advertising. Federal intervention will enable children across Canada to reap the benefits of food advertising restrictions currently experienced by children in Quebec.

Supplementary Materials: The following are available online at <http://www.mdpi.com/1660-4601/17/6/1999/s1>, Table S1: Average age-specific food advertising (n/hr) across 271 Canadian television stations in 2018, Table S2: Specific multiple linear regression model testing the effect of target program age, television station and month on rate of food advertising across 31 Canadian television stations in 2018, and Table S3: Station-specific food advertising rate comparisons between target age groups.

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Chapter 4: The advertising practices of the Canadian food and beverage industry targeting preschoolers, children, and adolescents on television: A cross-sectional study

Chapter 4 is based on a collaborative article titled “*The advertising practices of the Canadian food and beverage industry targeting preschoolers, children, and adolescents on television: A cross-sectional study*” submitted to the journal *Applied Physiology, Nutrition and Metabolism*. This manuscript focuses on the last 2 objectives of this thesis, which aimed to: (1) identify food and beverage companies that advertise, and how frequently they advertise, during programs targeted to preschoolers, children, adolescents, and adults in Canada; and (2) identify differences in the frequency and proportion of advertising between CAI-participating and non-participating companies during programs targeted to the four age groups.

The full article is presented in this chapter. Supplementary materials and confirmation of submission of this article are provided in Appendices C and D of this thesis, respectively. Ethics approval was not required for this study.

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All authors significantly contributed to the development of this article.

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Ms. Elise Pauzé contributed to the data interpretation and critical manuscript revisions.

Dr. Marie-Hélène Roy-Gagnon contributed to the study methodology, data analysis, interpretation of results and critical manuscript revisions.

Dr. Lise Dubois provided input to the study methodology and critically reviewed the draft manuscript.

I, Ms. Adena Pinto, was the lead investigator responsible for all aspects of data analysis (dataset development, data analysis, interpretation of results), draft manuscript preparation and integrating revisions.

4.1. Linking previous manuscript

In Chapter 3, the manuscript identified the average annual rates of food advertising during programs targeted to preschoolers, children, adolescents, and adults. Adult-targeted programming was found to have the highest rate of food advertising in 2018, while programming targeted to preschoolers had the lowest rate. It also identified differences in the volume of food advertising by food category between the age groups. Whereas fast-food advertising dominated adolescent-targeted programming, food and beverage advertising dominated programs for all other age groups. In the present chapter, we identified the specific food companies that targeted each of the four age groups and assessed the impact of the Canadian food industry's self-regulatory program (i.e. the CAI) designed to limit the amount of unhealthy food advertising to children in Canada. Notably, the analysis was restricted to 89 fewer television stations due to poor data reporting quality by 71 broadcasters (i.e. the full company name was not clearly stated) and the absence of food advertising by 18 commercial stations.

4.2 Article Submitted to *APNM*

The advertising practices of the Canadian food and beverage industry targeting preschoolers, children, and adolescents on television: A cross-sectional study

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Abstract:

Background: The food industry plays a detrimental role on children's food preferences and nutritional health. In Canada, only companies participating in the self-regulatory Children's Food and Beverage Advertising Initiative (CAI) commit to limiting unhealthy food marketing to children.

Methods: We analyzed food advertising from 182 Canadian television stations in 2018. A principal component analysis explored patterns of advertising by 497 food companies and their targeting of preschoolers, children, adolescents, and adults. Chi-square analyses tested differences in the volume of advertising between target age groups by heavily advertising food companies and by CAI-participating and non-participating companies.

Results: In 2018, Maple Leaf Foods, Boulangerie St-Méthode, Exceldor Foods, Goodfood Market and Sobeys advertised heavily during preschooler-programming. General Mills, Kellogg's, the Topps Company, Parmalat, and Post Foods advertised heavily during child-programming, while Burger King, McDonald's, General Mills, Kellogg's and Wendy's advertised heavily during adolescent-programming. CAI-participating companies were responsible for over half of the food advertising broadcasted during programs targeted to children (55%) while non-participating companies accounted for a larger share of food advertisements airing on programs targeting preschoolers (21%), adolescents (41%) and adults (42%).

Conclusions: Statutory food marketing restrictions are needed to induce significant food advertising changes, level the playing field, and promote healthy child development across Canada.

Keywords: Food marketing; childhood obesity; advertising; television, nutrition policy; food companies.

Novelty:

- Advertising from fast-food restaurant chains dominated television programming targeted to adolescents in 2018.
- Advertising from breakfast cereal, candy, and snack manufacturers dominated television programming targeted at children in 2018.

Introduction

Childhood is a critical period for developing the foundation for lifelong health and wellbeing (Gluckman et al., 2015; Irwin et al., 2007). Excess weight in childhood that extends into adulthood has been reported to impact one's quality of life and achievements in education and employment over the life-course, in addition to increasing rates of cardiovascular disease, Type 2 diabetes and hypertension (Bancej et al., 2015; Ebbeling et al., 2002). In Canada, childhood obesity affects over 30% of children aged 5-17 years old (Roberts et al., 2012). The current nutritional environment has been described as obesogenic as children are bombarded by marketing for unhealthy food and beverages that are high in sugar, fat, and salt (Reisch et al., 2013; Smith et al., 2019). Multiple systematic reviews have illustrated the influential role of food marketing on children's food preferences, purchases, requests, consumption and risk of obesity (Andreyeva et al., 2011; Boyland et al., 2015; Cairns et al., 2013; Dalton et al., 2017; Longacre et al., 2017; McGinnis et al., 2006; Norman et al., 2016; Sadeghirad et al., 2016; Smith et al., 2019). The health impacts of food marketing and the far-reaching health effects of unhealthy

diets has prompted the World Health Organization (WHO) to endorse a set of recommendations to reduce the marketing of foods high in saturated fats, trans fats, free sugars, or sodium to children (WHO, 2010). The WHO has also urged governments around the world to adopt these recommendations at a national level (WHO, 2010).

Despite concerns over the volume and nutritional quality of foods being marketed to Canadian children, an attempt to introduce federal statutory restrictions to food marketing in Canada was defeated (Mulligan et al., 2020), Bill S-228 (The Child Health Protection Act), which sought to restrict unhealthy food and beverage advertising to children under 13 years old in various media and settings, was intentionally prevented from going to a final vote in the Senate by industry lobbying (Crowe, 2019; Robertson & Curry, 2019; Senate of Canada, 2017). What remains in Canada at the national level, is self-regulation of food and beverage marketing to children as dictated by the advertising and food industries (Ad Standards, 2010, 2018b; Mulligan et al., 2018; Prowse, 2017). The Canadian Children's Food and Beverage Advertising Initiative (CAI), which launched in 2007, is a voluntary program led by 16 food and beverage corporations who have committed to improve the healthfulness of food marketing to children in Canada (Advertising Standards Canada, 2009). Ten CAI-participating companies have pledged not to advertise directly to children under 12 years old on television as well as in other media and in settings such as schools (Ad Standards, 2018b). The remaining six companies have pledged to only advertise foods that comply with the CAI's Uniform Nutrition Criteria (developed by the CAI-participating companies and introduced in 2015) (Ad Standards, n.d.). Each corporation also establishes their own child audience thresholds (i.e. the proportion of the viewing audience of children under 12 years old that must be met before pledges apply), which range from 25 to 35% (Ad Standards, 2018b; Pinto et al., 2020; Monique Potvin Kent et al., 2018). Both CAI-

participating and non-participating companies must also adhere to the Broadcast Code for Advertising to Children (hereafter referred to as the Children's Code), which outlines the permitted level of advertising and depiction of foods and beverages advertised during children's programming in broadcast media (Ad Standards, 2010). Specifically, the Children's Code allows no more than 8 minutes of advertising per hour of children's programming (which is defined by the broadcaster as directed to children under 12 years old) and prohibits any advertising to children of preschool age (0-5 years old) (Ad Standards, 2010, 2017). Advertised foods must also be presented in serving sizes appropriate for children and must not portray snacks as replacements for meals nor discourage foods in line with Canada's Food Guide to Health Eating (e.g. fruits and vegetables) (Ad Standards, 2010).

These voluntary and self-regulatory initiatives, however, have been ineffective in protecting children from unhealthy food advertising on television in Canada (Kent et al., 2011; Pinto et al., 2020; Monique Potvin Kent et al., 2014, 2018). In particular, research has demonstrated that the CAI has had little impact on the advertising practices of some participating companies. For instance, some CAI-participating companies advertised more frequently on Canadian child specialty television stations between 6 am and midnight in 2011, after the introduction of the CAI, compared to 2006, before the introduction of the self-regulatory pledges (Monique Potvin Kent et al., 2014). Research also reveals a clear dichotomy between CAI compliance evaluated and reported by industry and university researchers. For example, Potvin Kent et al. (2018) identified over 30 instances of non-compliance of the CAI in 2016, while Ad Standards reported 100% compliance during the same year (Monique Potvin Kent et al., 2018). Other criticisms raised against the CAI include their unreasonably high child audience thresholds and the healthfulness of advertised products which fail to pass the nutrition standards of other nations

(Monique Potvin Kent et al., 2018). Although CAI-participating companies are responsible for more advertising to children in Canada, research also shows any modest decreases in food advertising by CAI-participating companies has been replaced with unhealthy food advertising by non-participating companies (Monique Potvin Kent et al., 2014). In fact, companies that often advertise to children on television have reportedly chosen not to participate in the CAI (Monique Potvin Kent et al., 2014). Companies manufacturing soft drinks, breakfast cereals, candy and chocolate, snack foods and several fast-food companies have consistently been reported to advertise heavily to children and adolescents, nationally and/or internationally despite participation in self-regulatory initiatives (Cairns et al., 2013; Federal Trade Commission, 2012; Kelly et al., 2019; McGinnis et al., 2006; M. Potvin Kent & Wanless, 2014; Monique Potvin Kent et al., 2014, 2018).

It is apparent that advertising by food companies who deliberately target children varies and non-compliance with industry-led programs is present (Federal Trade Commission, 2012; Kelly et al., 2019; M. Potvin Kent & Wanless, 2014; Monique Potvin Kent et al., 2014, 2018). However, there is no available research that has examined which food companies advertise heavily to Canadian preschoolers and adolescents on television. This study aimed to identify which food companies advertise during television programs specifically targeted to preschoolers, children, adolescents and/or adults in 2018. To help assess the impact of the CAI, this study also sought to identify differences in the volume of advertising between CAI and non-participating companies during programs aimed at preschoolers and children. It was hypothesized that fast-food restaurant chains that produce kid's meals (e.g. Happy Meal, King Jr. Meals) and food companies that manufacture items such as sugary cereals, candy and packaged snacks, would advertise more frequently during programs targeted to children and adolescents than during

programs targeted to other age groups. It was also predicted that CAI-participating companies would be responsible for more advertising during programs targeted to preschoolers and children compared to non-participating companies.

Materials & Methods

We conducted a cross-sectional analysis of the Canadian Radio-television and Telecommunications Commission's (CRTC) television program logs. Program logs are open-access monthly television programming records. All Canadian television broadcasters are required to report elements of programming and advertising in compliance with the Television Broadcasting Regulations, 1987, as a condition of their CRTC licensure (Pinto et al., 2020). Our study analyzed data across 182 commercial television stations which broadcasted food advertising between January 1st and December 31st, 2018 from 6 a.m. to midnight and reported food company names in full (i.e. no abbreviations or acronyms). All television stations included in our analysis are provided in Table S1. In 2018, 273 commercial television stations reported advertising in the CRTC logs. Of these, we excluded 71 stations with incomplete and/or unclear reporting of food company names, 18 stations that did not broadcast food advertising, 1 station with missing target age data and 1 station that was discontinued in 2019.

The program logs and their data handling have been described in detail elsewhere (Pinto et al., 2020). In brief, our study examined advertising spots including any food-related commercial messages, giveaways, local advertising, merchandising, solicitation messages and sponsorship messages. Advertisements promoting food and beverage products, fast food restaurants, sit-down restaurants, food delivery services, food retailers, dieting products, and meal kits were

considered food-related advertisements (Pinto et al., 2020). The targeted age group of advertisements was inferred from that of the programs during which they aired. The target age group of programs is selected and reported by broadcasters as one of the following audience categories: preschoolers (0–5 years old), children (6–12 years old), adolescents (13–17 years old) or adults (18 years and older).

For our analysis, food companies referred to individual subsidiary companies (e.g. KFC, Taco Bell, and Pizza Hut instead of Yum! Brands); however, among cases where only the parent organization was reported, food advertisements were reported under one of the following parent organization names: MTY Food Group, Recipe Unlimited, and Yum! Brands. Advertisements by nine companies that manufactured both food and non-food products (i.e. Mars Inc., Unilever Canada, Nestle Canada, Loblaws Companies, Hain-Celestial, Federated Cooperatives Ltd., J.M. Smucker, Shoppers Drug Mart and Walmart Canada.) and did not specify the advertised product were excluded from the primary analysis. Finally, food companies were classified as to whether they participated in the CAI in 2018 (Ad Standards, 2018b).

Statistical Analysis

Age-specific frequencies of advertisements were calculated for each food and beverage company to describe differences in advertising across age groups. Principal component analysis (PCA) was performed to identify food and beverage companies with similar patterns of advertising across age groups. We standardized the frequency of food advertisements by food company by subtracting the mean number of food ads and dividing by the standard deviation of food ads for each age group, to normalize the data for the PCA. The four target age groups were inputted as

four separate variables in the PCA. Pearson's chi-square was used to test differences in the frequency and proportion of advertisements broadcasted by the 14 most heavily advertised food companies among target age groups identified in the PCA as well as compare the volume of advertising by CAI-participating and non-participating companies. Statistical significance level was set at $\alpha < 0.05$ and significant results were reported with exact p-values. We performed a sensitivity analysis to assess our treatment of unclear advertising data by including advertisements from companies that manufacture both food and non-food products with missing product information in the PCA and chi-square analyses. All descriptive statistics and PCA were conducted using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA) for Windows (SAS Institute Inc., 2013). PCA visualization was conducted in R version 3.6.2 (R Foundation for Statistical Computing, Vienna, Austria) using RStudio version 1.2.5033 (RStudio, Boston, MA, USA) and ggplot2 and ggrepel packages (R Development Core Team, 2019; R Studio Team, 2019; Slowikowski, 2019; Wickham, 2016).

Results

Descriptive Statistics

In 2018, 497 subsidiary food companies were responsible for 5,039,488 food advertisements broadcasted from 6am to midnight across 182 Canadian television stations. An additional 2,037 food advertisements were broadcast by unknown subsidiary companies. All subsidiaries that advertised in 2018, and their age-specific ad frequencies, are provided in the supplementary materials (Table S2¹). Of the 497 known subsidiary food companies, 120 advertised during

¹ Supplementary data are available with the article through the journal Web site at

preschooler-targeted programming, 121 advertised during child-targeted programming, 153 advertised during adolescent-targeted programming, and all 497 advertised during adult-targeted programming. Of those same companies, there were 184 sit-down restaurant subsidiaries, 162 food and beverage manufacturing subsidiaries, 94 food retailer subsidiaries, 48 fast food subsidiaries (including the parent company Yum!Brands), 4 meal kit subsidiaries, 2 diet product subsidiaries, 2 fast food/restaurant parent companies (i.e. MTY Food Group and Recipe Unlimited) and 1 food delivery subsidiary.

Principal Components Analysis

The PCA identified food subsidiary companies that had similar patterns of advertising with respect to target age groups. Three principal components accounted for 93% of the variability among food companies (eigenvectors and scree plot available in supplementary Table S3² and Figure S1²). Principal component 1 (PC1) reflected all target age groups and explained 60.4% of the variability in the food companies. Principal component 2 (PC2) reflected advertising to preschoolers compared to adolescents and explains an additional 19.1% of the variability. Finally, principal component 3 (PC3) reflected the advertising to preschoolers, adolescents and adults compared to children, and contributed to 13.1% of the overall variation. Visualization of component loadings is provided in supplementary Figures S2² and S3².

As illustrated in the PCA plots (Figures 1 and 2), food advertisements by General Mills, McDonald's Canada, Tim Hortons, Burger King and Kellogg's were heavily broadcasted during programs targeted to each of the four age groups (i.e. PC1) in 2018. High scores for PC2 indicated that Maple Leaf Foods, Boulangerie St-Méthode, Exceldor Foods, Goodfood Market

and Sobeys advertised heavily during programs targeted at preschoolers, while low scores for PC2 indicated that Burger King, McDonald's Canada, General Mills, Kellogg's and Wendy's advertised heavily during programs targeted to adolescents (Figure 1). Finally, high scores for PC3 revealed that General Mills, Kellogg's, Topps Company, Parmalat, and Post Foods advertised heavily during programs targeted to children compared to all other age groups. In both PCA plots, we observed a distinct clustering of companies around the origin point (0,0), which demonstrated no appreciable differences in the volume of advertisements between the target age groups by these food companies.

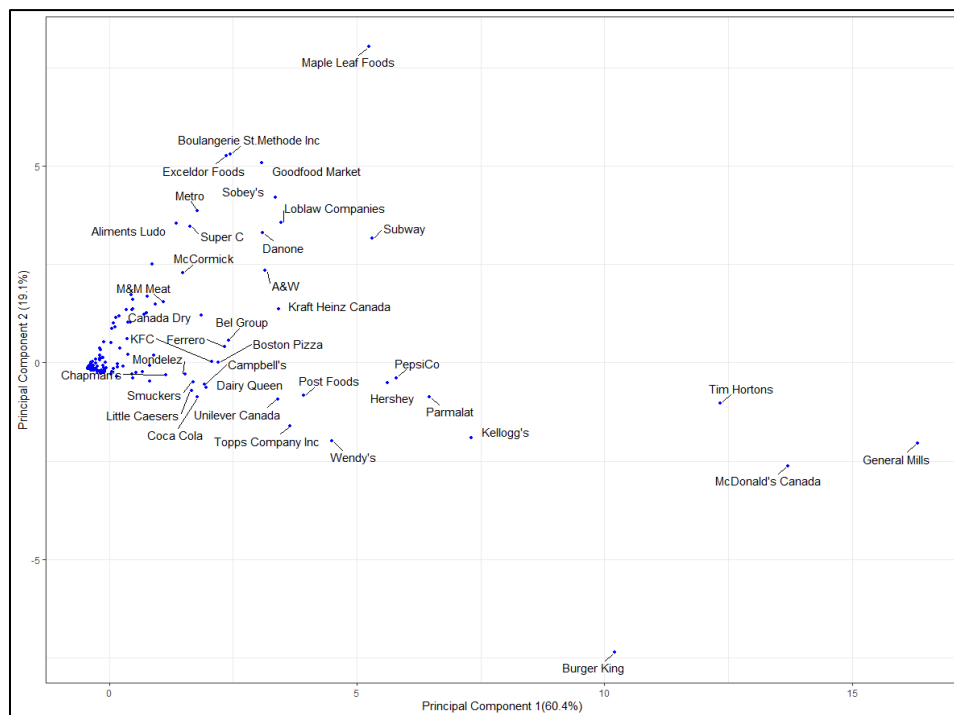


Figure 1. Distribution of food companies between principal component 1 and principal component 2.

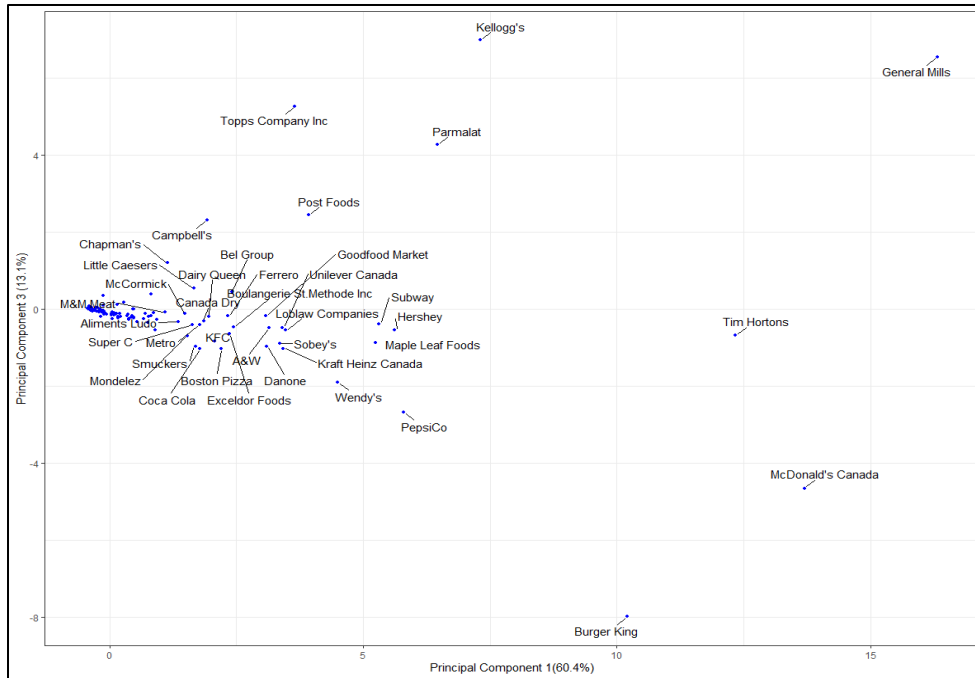


Figure 2. Distribution of food companies between principal component 1 and principal component 3.

The 14 companies identified in the PCA, and included in the chi-square analysis, accounted for 47% of the overall food advertising in 2018. Results of the chi-square test ($\chi^2 = 352826.0$; $df = 39$; $p < 0.0001$) revealed that the number of advertisements promoting these 14 food companies significantly differed between target age groups. Among all food companies (Table 1), those advertising the most per age group were Maple Leaf, which contributed 7% of the food advertisements broadcasted during programs targeted to preschoolers; General Mills, which contributed 17% of the food advertisements broadcasted during programs targeted to children; Burger King, which contributed 20% of the food advertisements broadcasted during programs targeted to adolescents; and Tim Hortons, which accounted for 8% of the food advertisements broadcasted during programs targeted to adults. Notably, only the Topps Company (a manufacturer of candy) advertised more frequently during programs targeted to younger people, aged 17 or younger, in 2018, compared to adult programming. Over 95% of the food

advertisements by the Topps Company were broadcasted during programs targeted at children in 2018.

Table 1. Age-specific frequency and proportion* of food ads by the 14 top advertising food companies, airing from 6 am to midnight on 182 Canadian television stations in 2018.

Company	Food Advertisements			
	Target Age Group			
	Preschoolers n (%)	Children n (%)	Adolescents n (%)	Adults n (%)
Boulangerie St-Méthode	434 (4.3)	518 (0.3)	43 (0.1)	15178 (0.3)
Burger King	11 (0.1)	2795 (1.5)	7831 (19.7)	89020 (1.9)
Exceldor Foods	428 (4.2)	38 (0.0)	26 (0.1)	20274 (0.4)
General Mills	348 (3.4)	33082 (17.3)	3586 (9.0)	224980 (4.7)
Goodfood Market	434 (4.3)	1840 (1.0)	144 (0.4)	29900 (0.6)
Kellogg's Canada	62 (0.6)	22575 (11.8)	528 (1.3)	116902 (2.4)
Maple Leaf Foods	695 (6.9)	2112 (1.1)	519 (1.3)	42175 (0.9)
McDonald's Canada	224 (2.2)	7330 (3.8)	4379 (11.0)	410902 (8.6)
Parmalat Canada	131 (1.3)	16367 (8.6)	973 (2.5)	93581 (2.0)
Post Foods	57 (0.6)	9655 (5.1)	520 (1.3)	85428 (1.8)
Sobeys	385 (3.8)	965 (0.5)	438 (1.1)	56736 (1.2)
Tim Hortons	232 (2.3)	11871 (6.2)	2294 (5.8)	403213 (8.4)
The Topps Company Inc.	18 (0.2)	15754 (8.3)	466 (1.2)	222 (0.0)
Wendy's	20 (0.2)	2466 (1.3)	1808 (4.6)	146682 (3.1)
Other companies [†]	6644 (65.6)	63595 (33.3)	16157 (40.7)	3065534 (63.9)
Total	10123 (100)	190963 (100)	39712 (100)	4800727 (100)

*Proportion of food ads calculated within target age groups

[†]All companies and age-specific ad frequencies are found in Table S2¹.

CAI-participating vs. Non-participating companies

Overall in 2018, CAI-participating companies were responsible for significantly less food advertisements ($\chi^2=15163.1$; $df = 3$; $p < 0.0001$) during programs targeted to preschoolers (24%), adolescents (41%) and adults (42%) compared to non-participating companies. CAI-participating companies, however, were responsible for more than half of the food advertising broadcasted during programs targeted to children (55%) compared to non-participating companies in 2018 (Figure 3).

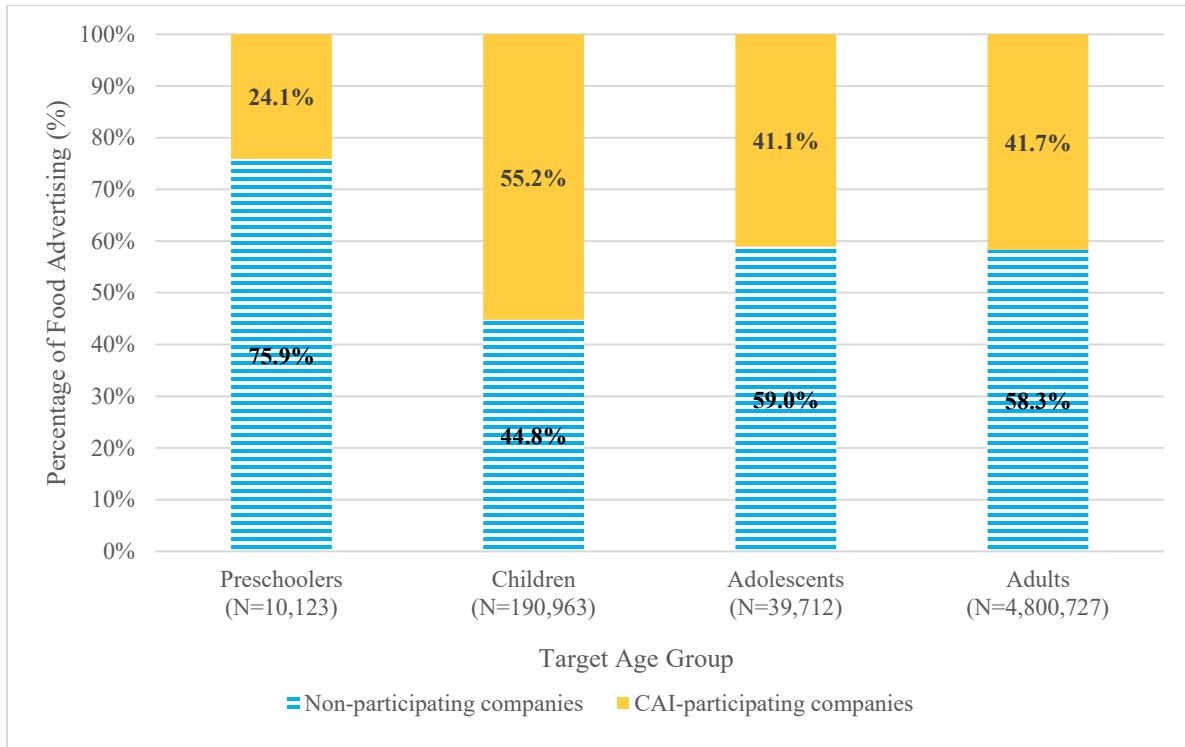


Figure 3. Age-specific distribution of food advertising airing between 6am and midnight on 182 Canadian television stations in 2018 by CAI participation.

Among the CAI-participating companies, all ten companies who pledged to abstain from advertising directly to children under 12 years old on television, when children make-up 25-35% or more of the viewing audience, broadcasted food and/or beverage advertisements during programs that broadcasters have identified as targeted to preschoolers and children (Table 2).

Table 2. Age-specific frequency and proportion of food advertising airing between 6am and midnight on 182 Canadian television stations in 2018 by CAI company.

Companies who have pledged not to advertise to children under 12 years old	Food Advertisements			
	Target Age Group			
	Preschoolers n (%)	Children n (%)	Adolescents n (%)	Adults n (%)
Coca-Cola Ltd.	4 (0.2)	421 (0.4)	640 (3.9)	89780 (4.5)
Ferrero Canada Ltd.	97 (4.0)	2208 (2.1)	383 (2.4)	83420 (4.2)
Hershey Canada Inc.	131 (5.4)	5566 (5.3)	1407 (8.5)	162381 (8.1)
Kraft Heinz Canada	184 (7.6)	1295 (1.2)	543 (3.3)	123292 (6.2)

Maple Leaf Foods Inc.	695 (28.8)	2112 (2.0)	519 (3.2)	42175 (2.1)
Mars Canada Inc.	5 (0.2)	941 (0.9)	245 (1.5)	48832 (2.4)
Mondelez Canada	27 (1.1)	447 (0.4)	321 (2.0)	87369 (4.4)
Nestle Canada	10 (0.4)	63 (0.1)	34 (0.2)	32340 (1.6)
PepsiCo Canada ULC				278661
	104 (4.3)	466 (0.44)	1073 (6.6)	(13.9)
Unilever Canada	49 (2.0)	3490 (3.3)	1027 (6.3)	106399 (5.3)
Total	1306 (54)	17009(16)	6192 (38)	1054372 (53)
Companies who pledged to advertise "healthier" products only to children under 12 years old				
Campbell Company of Canada	29 (1.2)	7233 (6.9)	162 (1.0)	26634 (1.3)
Danone Inc.	317 (13.1)	769 (0.7)	450 (2.8)	67936 (3.4)
General Mills Canada Corporation				224980
	348 (14.4)	33082 (31.4)	3586 (22.0)	(11.3)
Kellogg's Canada	62 (2.6)	22575 (21.4)	528 (3.2)	116902 (5.9)
McDonald's Restaurants of Canada Ltd.	224 (9.3)	7330 (7.0)	4379 (26.9)	410902
				(20.6)
Parmalat Canada	131 (5.4)	16367 (15.5)	973 (6.0)	93581 (4.7)
WhiteWave Foods*	0 (0)	1045 (1.0)	30 (0.2)	3253 (0.2)
Total	1111 (46)	88401 (84)	10108 (62)	944188 (47)
All CAI-participating companies	2417 (100)	105410 (100)	16300(100)	1998837 (100)

*WhiteWave Foods is a subsidiary company of Danone Inc.

Sensitivity Analysis

The inclusion of broadcasted advertisements with absent product information, by 9 companies who manufacture both food and non-food products, generated considerable differences in the PCA results for three companies: Unilever Canada, J.M. Smucker and Walmart Canada. Specifically, PC1 scores for these three companies increased, which suggested that they were more heavily advertised across programs for each of the target age groups, in 2018. Unilever Canada shifted from the 16th highest company for PC1 to the 6th highest; Walmart shifted from 67th highest company for PC1 to 16th highest; and J.M. Smucker shifted from 33rd highest company for PC1 to 18th highest. Notably, Unilever Canada's score also advanced for PC2, shifting from the 8th highest advertising company during adolescent-programming to the 6th

highest. No substantial differences were identified for other food companies nor did the proportion of advertising attributed to CAI-participating versus non-participating companies change

Discussion

Overall, our study illustrates the wide variability in advertising practices by Canadian food companies that targeted younger people (17 years and under) on television in 2018. Although we identified 497 Canadian food subsidiary companies, youth-targeted television food advertising is saturated by a select group of companies. Specifically, preschooler-targeted advertising is dominated by meat/poultry producers and supermarket chains, while child- and adolescent-targeted advertising are dominated by sugary cereal and snack manufacturers and large fast-food chains, respectively. These findings are in line with the existing body of Canadian and international literature on children's food advertising (Czoli et al., 2020; Kelly et al., 2019; Pinto et al., 2020; Monique Potvin Kent et al., 2014); however, we are the first to identify the companies that target Canadian preschoolers and adolescents on television. Even as advertising in digital media is increasing (Federal Trade Commission, 2012), our results indicate that Canadian food companies continue to use traditional television to advertise extensively during programs targeted to preschoolers, children, and adolescents in 2018. Previous research investigating food advertising using measured viewership data has also found that traditional broadcast television remains a major source of food advertising exposure among young people in Canada (Czoli et al., 2020; Monique Potvin Kent et al., 2018).

Big Food

Findings from this study demonstrate that a large proportion of food and beverage television advertising in Canada is produced by a handful of large multinational corporations. This is consistent with international research, which has also shown that a few trans-national food corporations are responsible for much of the television food advertising targeted to children and adolescents globally (Kelly et al., 2019). Similar to our study, McDonald's, General Mills, Kellogg's, Post Foods and Restaurant Brands International (the parent company of Tim Hortons, Burger King, and Popeyes) were identified as being among the companies advertising the most during children's peak television viewing times across 22 countries (Kelly et al., 2019; Monique Potvin Kent et al., 2014). Although not apparent in our study, companies such as Danone Inc., Mars Inc., and Nestle S.A. have been reported to advertise heavily during children's peak viewing times, internationally (Kelly et al., 2019). Our results also differed from previous Canadian research, which found the subsidiaries Mr. Sub, KFC, Pizza Hut, Taco Bell and Harvey's advertised substantially to children and adolescents on television, in 2011 (Monique Potvin Kent et al., 2014). For KFC, Pizza Hut and Taco Bell, this may be the case because some of their advertising in the current study was likely classified under their parent company Yum! Brands. This may also be the case for Harvey's, which may have some ads classified under its parent company Recipe Unlimited.

As hypothesized, the majority of food companies that advertised heavily during television programs targeted to children and adolescents in 2018 were large fast food chains producing kids' meals (i.e. McDonald's, Burger King and Wendy's) as well as manufacturers of sugary cereals, candy and packaged snacks (i.e. General Mills, Kellogg's, Post Foods, and the Topps Company). The Topps Company, in particular, placed 95% of its food ads on child-targeted

programs. The differences in the age-specific proportions of advertising by some of these companies also demonstrate that their advertising is disproportionately higher during programs targeted to children and adolescents compared to adults. For instance, the proportion of food ads by General Mills and Kellogg's during child targeted programs was 4 and 5 times higher than their advertising during adult-targeted programming, respectively. Of note, the proportion of food ads by Burger King broadcasted during adolescent-targeted programming was 10 times higher than that broadcast during adult-targeted programming.

Our findings lend support to other findings in the literature which reveal that large trans-national companies monopolize the media channel primarily used to reach young people (i.e. television) (Kelly et al., 2019; Monique Potvin Kent et al., 2014). The playing field, however, is not level. The observed variations in advertising practices reveal some companies are not overtly advertising to children by placing ads on preschooler and children's programming while others are advertising heavily during such programming. In particular, our results indicate that products by General Mills, Kellogg's, and Post Foods saturate the food advertising broadcasted during children's programs while Coca Cola, Mars Inc., Dominos Pizza, Johnsonville, Baskin Robbins, Harvey's, Popeye's and Mondelez, have limited their advertising during these programs. While these companies may still reach children when they are watching programs targeted at older age groups, it is clear that federal regulation, which restricts food advertising to children on television, could help to level the playing field between companies (Nestle, 2012; Monique Potvin Kent et al., 2017).

Impact of the CAI

Currently, the only national policy regarding the restriction of unhealthy food and beverage marketing to children under 12 years in Canada, is the voluntary industry-led self-regulatory CAI. Preschoolers are also protected by the Broadcast Code for Advertising to Children (i.e. the Children's Code) which states that advertising, of any kind, is not permitted to this age group (0-5 years old) (Ad Standards, 2010, 2017). Contrary to our hypothesis, CAI-participating companies are doing a better job than non-participating companies at limiting or refraining from broadcasting advertisements during programs targeted to preschoolers. Less than 1 in every 4 food ads broadcasted during preschooler-programming came from CAI-participating companies in 2018. These results, however, further confirm the ineffectiveness of the Children's Code in protecting preschoolers from commercial advertising, as any advertising to this age group is prohibited, regardless of CAI-participation (Ad Standards, 2017; Pinto et al., 2020). Our results also demonstrated that, as predicted, CAI-participating companies advertise more during programs that broadcasters deem to be targeted to children than non-participating companies. Taken together, these results replicate past Canadian research that has consistently demonstrated the ineffectiveness of the CAI in protecting children (aged 6-12 years old) from unhealthy food and beverage advertising on television (Kent et al., 2011; Pinto et al., 2020; Monique Potvin Kent et al., 2014, 2018).

Despite their commitments, the 10 CAI companies that pledged to not advertise to children under 12 entirely (when children comprise 25-35% or more of the viewing audience) are all responsible for advertising during programs that were targeted to preschoolers or children. These companies were also responsible for more than half of all the CAI advertisements broadcasted during programs targeted to preschoolers. Among these ten companies, Maple Leaf

Foods advertised the most on programming targeted to preschoolers while Hershey Canada, Unilever Canada, Maple Leaf Foods and Ferrero Canada advertised the most on programming targeted to children between the ages of 6 and 12.

The 6 remaining CAI companies, that pledged to only advertise healthier foods, are responsible for the majority of all the CAI advertising (84%) broadcasted during programs targeted to children. These 6 CAI-participating companies have committed to advertise only healthier food products which meet the nutrient content requirements they established themselves when children make up 25-35% or more of the audience. Some criticism has been levied at the definition of “healthier” as defined by the CAI common nutrition criteria (Monique Potvin Kent et al., 2018). For instance, sugary breakfast cereals such as Chocolate Lucky Charms (35g of sugar/100g) and Froot Loops (38g of sugar/100g), produced by General Mills and Kellogg’s, respectively, are listed among products permitted for advertising to children (Ad Standards, 2018b; General Mills, 2020; Kelloggs, 2020). Notably, these two companies were found to have advertised the most among CAI-participating companies and all companies during programming intended for children aged 6 to 12 in 2018. While the analyzed CRTC data does not specify which products were advertised, previous research has shown that products advertised to children by CAI-participating companies are less healthy than those advertised by non-participating companies (Monique Potvin Kent et al., 2018).

Our results also show that the voluntary nature of the CAI is problematic. For instance, of the 497 subsidiary food companies identified as advertising in our sample, only 16 participate in the CAI. Over 100 of the Canadian food subsidiary companies that advertised during programs targeted to preschoolers and children in 2018, have opted not to participate in the CAI. The number of fast-food companies that were found to heavily advertise to younger people (9

companies) also draws particular attention to the lack of fast-food corporations that participate in the CAI, especially given the fact that fast food restaurant promotions predominate the food advertising that is broadcasted on children's specialty stations (Monique Potvin Kent et al., 2014, 2018). McDonald's is the only fast-food company that currently participates in the CAI and has committed to advertising only "healthier" food products to children under 12 years old on television (Ad Standards, 2018b). Although Tim Hortons and Wendy's were found to advertise highly to all age groups, including children and adolescents, on television, these companies have chosen not to participate in the CAI since its inception. This predominance of fast food advertising on television is concerning given that menu items for children sold by large fast food restaurant chains in Canada, are nutritionally poor and contain excessive amounts of sodium and added sugars (Scourboutakos et al., 2014; Semnani-Azad et al., 2016). These findings, in addition to the associations established between fast-food advertising and risks of obesity among children (Andreyeva et al., 2011; Smith et al., 2019), leads one to conclude that federal regulation of fast food advertising to children in Canada is required.

The exclusion of adolescents in the CAI's target age restrictions further underlines the limited scope of the CAI. We found CAI-participating companies PepsiCo and Coca Cola placed more food ads during adolescent-targeted programming than either preschooler- or child-targeted programs, in 2018. In addition, the proportion of McDonald's ads during adolescent-targeted programming was more than double that during preschooler- or child-targeted programs. It is evident that CAI-participating companies are able to target impressionable young people by shifting their advertising to those who fall outside of the CAI's target age restriction. This is problematic as the available literature suggests that adolescents, while more critical of advertising than younger children, are nevertheless vulnerable to advertising appeals which

target their developmental concerns (e.g. popularity, appearance) (Story & French, 2004). The foods that are advertised to adolescents are most often of poor nutritional quality (Czoli et al., 2020; Pinto et al., 2020). This is concerning as poor nutrition in adolescence has been associated with an increased risk of chronic disease in later life (e.g. obesity, coronary heart disease, osteoporosis) (Neumark-Sztainer et al., 2002). Adolescents are targeted by companies due to their purchasing power as adolescents contribute billions of dollars to the consumer market annually (Federal Trade Commission, 2012; Lapierre et al., 2017; Pinto et al., 2020). Advertising expenditure data from the United States reveals most television advertising to adolescents was spent by quick service/fast food restaurants (\$130 millions) and carbonated beverage companies (\$62 million), in 2009 (Federal Trade Commission, 2012). Likewise, Canadian research has reported that fast-food and sugary beverages (e.g. soft drinks, energy drinks, juices) were the two food categories to which Canadian adolescents were the most exposed on television in 2016 (Czoli et al., 2020).

Broadcasting Codes

The results of our study illustrate the incoherence between advertising and food industry-led self-regulation in Canada. Although both the Broadcast Code for Advertising to Children (Children's Code) and the CAI aim to guide advertisers and broadcasters on the permitted levels of advertising during children's programming on television, both initiatives have diverging definitions on what constitutes child-targeted programming and advertising. In particular, the Children's Code defines children's programming according to the broadcaster's target age identification, while the CAI defines children's programming according to child audience measures (Ad Standards, 2010, 2018b). These inconsistencies make it difficult to monitor and

hold advertisers or broadcasters accountable for non-compliance. In our study, we identified 120 food subsidiary companies who aired food advertising during programs targeted to preschoolers, despite the Children’s Code restriction on advertising to preschoolers. Ad Standards, however, have not reported any instances of non-compliance regarding advertising to preschoolers in their 2018 Complaints Report (Ad Standards, 2018a). As aforementioned, our results revealed that all 10 CAI-participating companies who have committed to abstain from advertising directly to children (under 12 years old) when they constitute 25-35% or more of the viewing audience aired advertisements during television programs that broadcasters have identified as preschooler- or child-targeted. Although these ads are not definitive cases of non-compliance with the CAI, due to differences in defining ‘child-directed advertising’, research using audience viewership data has also identified that many of these CAI-participating companies continue to advertise to children even on programs where their pledges to refrain from advertising would apply (Monique Potvin Kent et al., 2018). These instances of non-compliance, however, are rarely reported by industry review (Ad Standards, 2018a; Monique Potvin Kent et al., 2018). The discrepancy between industry-led and externally conducted monitoring of compliance stresses the need for independent monitoring and further emphasizes the ineffectiveness of self-regulation in limiting food advertising to children.

Strengths and Limitations:

To our knowledge, this is the first study to comprehensively investigate all food companies that specifically advertised to preschoolers, children, adolescents, and adults on television in Canada. The use of publicly available data allowed us to examine differences in advertiser practices using a full year of advertising data across 182 Canadian television stations. Notably, the use of a PCA,

which is novel to this field of research, also enabled us to explore food company advertising practices while accounting for the higher volume of advertising during adult-targeted programs. We are also the first to identify the food companies that advertise to preschoolers and adolescents on television in Canada. Finally, no study to date has evaluated the frequency of advertising by CAI-participating companies during broadcaster-defined children's programming. As such, our study is the first to identify the discontinuity between broadcast and food advertising self-regulatory frameworks that concern advertising to children in Canada.

Our analysis, however, has a few limitations. First, as broadcasters self-select the target age group of programs, the results of our study can only be interpreted in terms of potential exposure. In other words, we do not know if children actually saw these advertisements. It is plausible, if not likely, that children and adolescents are watching programs that broadcasters have identified as targeting older audiences. Likewise, as we were unable to assess program viewership, we cannot assert that the food advertisements broadcasted during programs targeted to children and preschoolers by the 10 CAI-participating companies who pledged to abstain from advertising to children under 12 are definitive cases of non-compliance. We were also unable to examine the commitments of CAI-participating companies who pledged to advertise only "healthier" products, as we could not conduct a nutritional analysis of the food and beverage products that were specifically promoted. Finally, due to the quality of reporting by broadcasters, our findings may not be representative of food advertising across all Canadian television stations and the advertising frequency attributed to many companies is likely underestimated. For instance, major network stations including CTV, V, Discovery and TSN did not adequately report the names of food companies and were, therefore, excluded from our analyses. Some advertisements by the nine companies producing food and non-food products, including some participating in the CAI

(e.g. Mars Inc., Nestle Canada, Unilever Canada), were also excluded due to inadequate reporting.

Conclusion:

Our study contributes to the existing body of literature which demonstrates Canada's voluntary self-regulatory programs are insufficiently protecting young people from food and beverage advertisers on television (Czoli et al., 2020; Pinto et al., 2020; M. Potvin Kent & Wanless, 2014; Monique Potvin Kent et al., 2011, 2014, 2018). Federal statutory restrictions and independent monitoring of food marketing to children in Canada is necessary to hold the advertising and food industry accountable for non-compliance and to elicit change in advertising practices by food and beverage corporations.

Conflict of Interest Statement

EP received a small honorarium from the Stop Marketing to Kids Coalition (a group of non-governmental health organizations) for offering technical expertise, in 2018. EP is also supported by Office of Nutrition Policy and Promotion for contract work related to food marketing to children, outside of the submitted work. MPK has previously completed a small paid contract for the World Health Organization-Europe Office. AP received salary support from Health Canada to conduct this research, in 2019. This funder played no role in the conceptualization of this study; the analysis or interpretation of the data; the preparation of the manuscript; or the decision to publish it.

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Chapter 5: Discussion

5.1 Overall Findings

In Canada, recent efforts to bring about meaningful change in children's media environments through statutory regulation (i.e. Bill S-228 – *The Child Health Protection Act*) have been effectively opposed and defeated by the food industry (143). What remains is a voluntary self-regulatory system adopted by Canadian food and beverage industry, known as the *Canadian Children's Food and Beverage Advertising Initiative (CAI)*. This collaborative initiative led by 16 large Canadian food and beverage corporations and administered by Ad Standards (the non-profit self-regulatory body comprised of advertisers, advertising agencies and media organizations) outlines: company-specific definitions of children's advertising across various media channels, signatory pledges to either refrain from advertising foods entirely or advertise only healthy food products to children, and nutritional thresholds for advertising products to children. Although this system aims to foster healthier food environments for children, we observed that the CAI, in addition to the *Broadcast Code for Advertising to Children* (Children's Code), fails to protect young people in Canada from food and beverage advertising on television.

In fact, our results showed that traditional broadcast television remained a significant source of commercial food and beverage advertising among Canadian preschoolers, children, and adolescents in 2018. Annual rates of food advertising during programs targeted to preschoolers, children, and adolescents ranged from 0-11 ads/hour, 0-20 ads/hour, and 0-19 ads/hour, respectively. As predicted, television programs targeted to preschoolers had the lowest average rate of food advertising, at 0.6 food ads per hour/station, in 2018; however, any broadcaster that advertised during preschooler-targeted programs was in violation of the

Children's Code. Although we hypothesized that programs targeted to adolescents would have the highest average rate of food advertising during the specified viewing time, programs targeted to adolescents had the second highest rate of food advertising on television in 2018, at 3.3 food ads per hour/station. This rate, however, was second only to the rate during adult-targeted programs (i.e. 4.1 food ads per hour/station) by less than 1 ad per hour/station. Fast food advertisements, as predicted, accounted for a greater proportion of food advertising during adolescent-targeted programs, compared to all other food categories and age groups. More than 2 in every 4 food ads broadcast during programs targeted to adolescents were fast food restaurant promotions. We found, as hypothesized, that fast food restaurant chains producing kids' meals (e.g., McDonalds, Burger King, Tim Hortons and Wendy's) advertised the most during adolescent and child targeted programs. These companies, however, monopolized the food advertising broadcast during adolescent-targeted programs more than any other age group. Advertising during children's programming, on the other hand, was dominated by candy, cereal, and snack food manufacturers (e.g. General Mills, Kellogg's, the Topps Company, etc.) more so than every other age group, which we also anticipated. Cereal and snack food manufacturers (e.g. General Mills and Kellogg's) also advertised more during adolescent-targeted programs than preschooler- or adult-targeted programs. Finally, advertisements by CAI signatories, as we predicted, accounted for the majority of food advertising during child-targeted programming. Nearly 3 in every 5 food ads broadcast during children's programming were from CAI-participating companies. In contrast, over 75% of food advertising broadcast during preschooler's programming originated from companies not participating in the CAI, which was the opposite of what we predicted.

5.2 Broadcast Code for Advertising to Children

Findings from our two studies demonstrate that the *Broadcast Code for Advertising to Children* (i.e. the Children's Code) has failed in protecting preschoolers and children from food advertising on television in Canada. We observed wide variability in broadcasters and food companies' advertising practices to young people in 2018. Although some industry members appear to be doing well in abstaining from or limiting advertising to preschoolers and children (e.g., Family Jr, CBC, etc.), several broadcasters and food companies are doing poorly. In particular, television stations that broadcast programs for all audiences (otherwise known as non-child-specialty stations or generalist stations) often had higher rates of food advertising to preschoolers and children compared to child-specialty stations. This is in line with existing Canadian literature that has found higher rates, and increases in the volume, of food and beverage advertising targeted to children on generalist stations (54,56). Television stations of note, in our first study, were generalist stations originating in Toronto which had the highest advertising rates of food advertising for preschoolers and children at 11 and 20 food ads/hour, respectively. Potvin Kent et al. (2014) also found an increase in the average number of food advertising spots viewed by children on generalist television stations in Toronto by nearly 44% after the implementation of the CAI in 2011, as compared to before its implementation in 2006 (54).

We also found advertisements on generalist stations to be particularly problematic due to overt violations of restrictions outlined in the Children's Code. The most prominent of these was the violation of the restriction on preschooler programming by 39 television stations, that broadcast advertising during programs targeted to preschoolers. Of these, 91% were generalist stations, while the remaining 9% included six child-specialty stations, consisting of local stations

from the following major networks: Société Radio-Canada (SRC), CBC Television, Télévision associée (TVA) and Global TV. Notably, several local SRC and TVA stations originated in Quebec, where the *Consumer Protection Act's* (CPA) restrictions would apply. We also identified a violation of the scheduling restriction in the Children's Code (i.e. no more than 8 minutes of advertising per hour of children's programming), on the generalist station W Network. In April 2018, W Network aired nearly 3 times the permitted rate of advertising during children's programming, at 23 minutes of food ads/hour.

Although the Children's Code is administered by Ad Standards, and adherence to it is a condition of CRTC licensure, neither Ad Standards nor the CRTC have reported these broadcasters' instances of non-compliance in annual compliance checks nor the CRTC's Compliance and Evidence Decisions (100,144–146). While the content of commercial messages targeted to children are precleared by Ad Standards' Children's Advertising Clearance Committee for their compliance with the Children's Code (110,147,148), it is unclear if any enforcing body has been assigned to monitor compliance once advertisements have aired or with the Children's Code's scheduling restrictions (149). In fact, the only evidence of non-compliance with the scheduling restrictions of the Children's Code, reported by Ad Standards, was a result of consumer complaints in April 2014 (150). The responsibility for monitoring compliance with the Children's Code, once ads have been precleared for broadcast (147), appears to fall on television viewers who are likely unaware of the target audience designation by broadcasters. Viewers may also have a limited technical capacity to seek out target age definitions for themselves (i.e., access to data, software, etc.). Without knowing the broadcasters' definitions of a program's target audience, it is an arduous, if not impossible, task for viewers to identify violations of scheduling and preschooler restrictions in the Children's Code. As a result, broadcasters'

compliance with the scheduling restrictions in the Children's Code is rarely, if at all, monitored or enforced.

5.3 Canadian Food and Beverage Advertising Initiative

While we were unable to evaluate company compliance with all elements of the CAI, due to lack of audience viewership data, results from our second study expose significant shortcomings in the CAI's restrictions and guidelines. The main weaknesses we identified were in its voluntary approach and inadequate child-marketing definitions. Almost 90% of the food companies that advertised during preschooler and/or children's programming on Canadian television stations in 2018 have eschewed participation in the CAI. Some of these companies, which were found to advertise frequently during programs targeted to preschoolers and/or children, included Burger King, Wendy's, Tim Hortons, and the Topps Company (a candy manufacturer). Any improvements made by some CAI-participating companies in reducing their volume of food advertising is, thereby, offset by food companies that have chosen not to participate (43,151). Furthermore, voluntary participation of food companies in the CAI is also unlikely to improve the healthfulness of food advertising to children in Canada. Although we were unable to determine the nutritional quality of advertised foods, it is plausible that non-participating companies (especially fast food chain restaurants) broadcast less healthy foods more frequently to children than CAI-participating companies in 2018, as they are not subject to the standards of the CAI's Uniform Nutrition Criteria (104). Consequently, if CAI-participating companies' advertising spots are replaced by nutritionally poor food advertisements from non-participating companies, the CAI may inadvertently lead to a worsening of the healthfulness of children's food advertising landscape on television in Canada.

Findings in our second study also demonstrated the weakness of the CAI's definitions of "children's advertising". On television, specifically, CAI pledges apply only when children (under 12 years old) comprise 25-35% or more of a program's viewing audience. However, CAI-participating companies are also subject to advertising restrictions outlined in the Children's Code, which we discovered had a dissonant definition of "children's advertising" compared to the CAI. Whereas the CAI defines "children's advertising" using audience viewership composition, the Children's Code defines "children's advertising" as any advertisements broadcast during programs that a broadcaster has defined as child-targeted. Upon defining "children's advertising" in accordance with the Children's Code, in our second study, we revealed how narrowly CAI-companies define "children's advertising." The use of high child-audience thresholds, set by CAI-participating companies, make it easier for signatories to meet their pledges. In fact, Ad Standards' reported 100% fulfillment of each companies' pledge for advertising on television in 2018. In the same year, however, we found all 10 CAI-companies who pledged to refrain from advertising to preschoolers and/or children were responsible for 16% and 9% of all food advertising aired during programs broadcasters defined as targeted to preschoolers and children, respectively. Furthermore, defining children's advertising based on the intended audience of programs, as determined by broadcasters, also revealed how poorly CAI-companies comply with the Children's Code. In 2018, all CAI (and over 100 non-participating companies) violated the restriction of advertising to preschoolers. Ad Standards' annual audits of CAI compliance, however, do not monitor compliance with the Children's Code once ads have been precleared and, as a result, overlook any violations of the scheduling or preschooler restrictions by CAI-participating companies.

The CAI's child-audience thresholds have been further criticized for being too high for certain channels and types of programming (43,54,104,152). On children's specialty stations, modest improvements in the volume of certain types of food advertising (e.g. fast food, chocolate, juice) by CAI-participating companies have been reported since the implementation of the CAI (54). However, as thresholds require the proportion of child viewers to be higher than the proportion of children in the general population (77), the CAI's use of high child-audience thresholds is particularly problematic for family programming or children's programming broadcast on generalist television stations (54,77). As programs broadcast on generalist stations garner higher viewership from adults, the proportion of child-viewers required to meet the high audience thresholds is diluted by the larger share of adult viewers. A greater number of child-viewers are, thus, needed to meet existing thresholds of programs on generalist television stations before pledges apply (54). A study by Harris et al. (2013) also revealed that reducing the child marketing thresholds of the US' *Children's Food and Beverage Advertising Initiative's* (CFBAI), a comparable self-regulatory program to the CAI, from 35% to 20% would protect children from over half (52-53%) of food advertising that they would otherwise be exposed to with existing thresholds (153). Further expanding the CFBAI's definition of children's advertising to thresholds of 20% or more and/or a share of 100,000 or more child viewers was found to protect children from an abundance (70-71%) of food advertising (153). It is suggested that food companies participating in self-regulatory initiatives like the CAI or the CFBAI, circumvent their pledges by establishing high thresholds and placing advertising that can reach children on family programming or generalist stations instead of on children's programming or child-specialty stations (43,153-155). This is likely the case in 2018 since, as mentioned before,

most Canadian generalist television stations had higher rates of advertising during programs targeted to preschoolers and children compared to such programming on child-specialty stations.

5.4 Other programs - Canadian Beverage Association

While the CAI and the Children's Code are the two main self-regulatory programs that pertain to food marketing in Canada, other Canadian industry interest groups have also attempted to regulate their members' advertising of foods and beverages to children, under 12 years old. Of note is the Canadian Beverage Association (CBA) who has developed voluntary guidelines, similar to the CAI, to prevent the marketing of non-alcoholic beverages by its members to children in Canada. On television, CBA members have committed to limit advertising of its covered products (e.g. sugar-sweetened beverages) and refrain from advertising caffeinated energy drinks during programs where 35% or more of the audience consists of children under 12 years old (156–158). Despite these restrictions, our second study found that one CBA member was responsible for advertising energy drinks during programs that broadcasters had defined as targeted to children. In particular, Red Bull broadcast 72 advertisements for energy drinks during child-targeted television programs in 2018. The advertising of caffeinated energy drinks is concerning as this type of advertising to children under 12 years old is not permitted by Health Canada's regulations (104,159). Although we are unable to determine whether these ads are non-compliant with CBA restrictions due to our definition of children's advertising, research by Potvin Kent et al. (2018) have also reported advertising by CBA members (i.e. Red Bull) when children, under 12 years old, comprised 35% or more of the program's viewing audience (104). Notably, while the CBA is responsible for developing food advertising guidelines, no group has been assigned to measure compliance of members' commitments nor have penalties been

established for non-compliance (160). As such, our findings further highlight the ineffectiveness of industry self-regulation in altering signatories' food advertising behaviours to children.

5.5 Shortcomings of Canadian Self-Regulation

The abundance of food and beverage advertising broadcast to Canadian preschoolers, children, and adolescents on traditional television in 2018, found in our studies, demonstrates the ineffectiveness of industry self-regulation in Canada. Several pitfalls in this system of regulation include voluntary participation, narrow advertising restrictions, discordance between regulatory programs, reliance on consumer complaints, and absence of penalties for non-compliance.

5.5.1 Compliance and Enforcement

A major failing of this system of regulation is the lack of independent monitoring and penalties for non-compliance by industry bodies. Although the advertising and food industry have assumed responsibility for developing and administering self-regulatory programs to guide the design and approval of advertising to children, neither Ad Standards, the food industry nor the CRTC comprehensively monitors food advertisements targeted to children once they are pre-cleared and broadcast on television. It should be noted that individual compliance reports by CAI-participating companies are reviewed by Ad Standards' for adherence to their pledges and their placement of advertising targeted to children in various media (100). Ad Standards' also performs secondary audits of compliance through spot checks (100); however, there are flaws in their approach to spot-checking. For instance, Ad Standards' annual audit of CAI compliance on television in 2018 was restricted to 42 hours of child-programming from 3 child-specialty stations (YTV, Teletoon, and Nickelodeon) (100). This narrow window of monitoring inadequately identifies instances of non-compliance by CAI-participating companies. As evidenced by Potvin Kent et al. (2018), Ad Standards' spot check missed 31 non-compliant ads

which were broadcast on one of 27 Canadian television stations in May 2016 (104). Among cases of non-compliance that are identified in Ad Standards' audits, such as in the 2017 Compliance Report, violations of CAI pledges are often attributed to factors outside the control of CAI-participating companies (161).

Consumer complaints are also an integral component of Ad Standards' monitoring of compliance to CAI commitments (100). This is similarly the case for the Children's Code. As mentioned before, once advertisements are precleared for broadcast by the Ad Standards' Clearance Committee, monitoring compliance with the Children's Code is highly dependent on consumer complaints (150,162). The consumer complaints mechanism, however, lacks transparency and results in little-to-no meaningful change in advertising practices in Canada, which is also reported in other countries with similar self-regulatory programs (e.g. Australia and the US) (66,88). It has also been suggested that unless viewers can be reasonably confident that there are infringements to regulations, the cumbersome consumers complaint process serves to deter complaints rather than deter violations (64,163). Moreover, there are no penalties for non-compliance to food advertising restrictions, in either the CAI or the Children's Code, beyond modifying the offending advertisements or stopping the ad from running. The lack of public visibility of broadcasters' target age designation or program audience composition, however, results in too few offending food ads (if any) being pulled from children's exposure. Even then, research suggests that by the time non-compliant advertisements are pulled from stations, children have already seen it and its effects have likely set in (88).

Another notable discovery of non-compliance, from our use of the CRTC logs, was that 71 stations (including mostly major networks owned by Bell Media like CTV, TSN, Discovery, and V) failed to report the name of advertisers clearly and/or clearly. For example, company

names of food advertisements reported in program logs by these stations appeared as two letters (e.g. “A&”, “GE”, etc.). Disclosing the names of advertisers, however, is a condition of CRTC licensure and required by law under the *Broadcasting Act*. In fact, under section 10 of *Act’s Television Broadcasting Regulations, 1987*, broadcasters must record “...in the case of a commercial message, the name of the person selling or promoting goods, services, natural resources or activities...” in their program logs (135). While the CRTC is responsible for administering and enforcing these regulations (164), no CRTC Compliance or Enforcement broadcasting decisions, between 2018-2020, have acknowledged these infringements (144–146). Although these logs are integral for the CRTC to monitor the amount of, and expenditure on, Canadian children’s programming and other youth programming (136), poor reporting quality prevents researchers, the public and the CRTC from effectively and comprehensively evaluating programming and advertising broadcast to children in Canada and identifying any broadcasters’ and advertisers’ breaches of regulatory requirements. Given that the CRTC states that it may revoke an offending broadcaster’s license after a number of violation notices (165,166), it is concerning that no researcher or governing body, to date, has evaluated broadcasters’ compliance with the Children’s Code nor the *Television Broadcasting Regulations, 1987*. The lack of monitoring and the “slap on the wrist” approach to addressing violations results in weakly enforced advertising regulations and insufficient improvements in the volume of food advertising to children (163).

5.5.2. Adolescents

Another major failing of Canada’s system of self-regulation, is the exclusion of adolescents (aged 13-17 years old) from food advertising restrictions. Industry proponents supporting marketing to children often claim that advertising serves as a critical-thinking tool

and that adolescents are more skeptical of advertising messages than younger children (167,168). Adolescents, however, are uniquely vulnerable to, and are targets of, unhealthy food marketing due to their level of emotional and physical development, purchasing power, and transition to becoming autonomous decision-makers (21,22,169). In our studies, we discovered similar patterns of food advertising between adolescents and adults. This is concerning given that research has demonstrated significant differences in adolescent and adult brains (170). Adolescence, in particular, is characterised by impulsivity, risk-taking behaviours, anxieties, and exaggerated emotional reactivity compared to adulthood (170,171). Consequently, these vulnerabilities present opportunities for marketers to develop adolescent-targeted appeals which play into their developmental concerns (21). As suggested by Harris et al. (2012), emotionally-arousing appeals of unhealthy food advertising, similar to those used by the alcohol and tobacco industry, undermines adolescents' skepticism by promoting impulsivity and unhealthy eating behaviours (171). Indeed, the limited Canadian marketing research that has been conducted on this age group shows that food advertising in which adolescents are exposed are predominantly unhealthy (e.g. fast food and sugary beverages) (62). We also found that fast food restaurant chains, most of which do not self-regulate, dominated all food advertising broadcast during programs targeted to adolescents on television.

Placing the onus on adolescents to make informed food choices and resist the appeals of unhealthy food marketing unfairly puts this age group at risk of nutrition-related health conditions associated with unhealthy dietary behaviours (e.g. obesity, type 2 diabetes, hypertension). The existing research has shown that Canadian adolescents engage in poor eating habits such as skipping breakfast and eating at fast food restaurants at least once a week or more. Furthermore, over 30% of adolescents' diets consist of foods that are not recommended by the

2007 Eating Well with Canada's Food Guide and exceed its sodium, sugar, and fat thresholds (172,173). Poor nutrition among adolescents emphasizes the need for their diets and food decisions to be positively supported. In fact, the age cut off for exclusively protecting children under 12 years old and not those over 12 years old, in both the CAI and the Children's Code's restrictions, disregards the heightened vulnerability shared by all youth under 18 years old, as described in the UN Convention on the Rights of the Child (UNCRC) and by the Supreme Court of Canada (174,175). Specifically, the UNCRC and the Supreme Court of Canada's ruling *R. v. D.B.* recognize that all youth (under 18 years old) present a lower level of maturity and judgement than adults due to their age (175). As these attributes are necessary to resist falling prey to manipulative marketing strategies, restrictions to protect children from unhealthy food marketing should also be extended to adolescents.

5.5.3 Health Inequity

Canadian research has shown that overweight and obesity in childhood is significantly associated with income level (176–178). In fact, the prevalence of overweight and/or obesity are reportedly higher among children living in low income households than high income households (176,177). Diet-related behaviours among children in low income households may play a role in their heightened risk of overweight or obesity. Particularly, Canadian children from lower income-education households have been shown to have dietary patterns that are less healthy and eat fruit and vegetables less frequently than children from higher income-education households (13,14,179). Given the known influence of unhealthy food advertising on children's food preferences and consumption, the ineffectiveness of self-regulation on limiting the rates of food advertising to children on television may contribute to existing health inequities in Canada. Specifically, research conducted in the US has shown children from low socioeconomic status

(SES) households watch television more frequently and are exposed to more food advertising than high SES households (180,181). Although this area of research is limited in Canada, one study has shown that preschool children (particularly females) from low SES neighbourhoods spend more time watching television than their counterparts in high SES neighbourhoods (40). It is, therefore, plausible that low SES children are also exposed to more food advertising than high SES children in Canada, given that we found Canadian television stations with the highest rates of advertising, and/or non-permitted advertising, during programs targeted to preschoolers or children (e.g. Citytv, Omni, Global, etc.) were offered in basic television packages (182,183). Combined with the fact that most food advertising during these programs was from ultra-processed food manufacturers (e.g. The Topps Company, Kellogg's, and General Mills), the high rates of food advertising on widely available television stations may increase consumption of non-nutritious foods among children from low SES households. Research from the US and Canada has also indicated that children in lower-income neighbourhoods experience a "double dose" of food marketing (184,185). Not only are children from lower-income neighbourhood exposed to significantly more advertising for unhealthy foods (e.g. fast foods and sugar-sweetened beverages) on television, but their environments are also saturated with this type of advertising (e.g. on billboards, in schools, and proximity to fast food restaurants) (180,181,186–188). Taken together, the high volume of child-targeted unhealthy food marketing that persists on basic Canadian generalist television stations and in low SES environments, may contribute to disparate health conditions of low-SES children in Canada by worsening their eating habits and exacerbating their risks of nutrition-related chronic disease (184).

5.6 Policy Implications - The Food Marketing Policy Canada Needs

Overall, findings from our studies illustrate the need for a cohesive and comprehensive food marketing policy across Canada. Although Canada is a member state committed to adopting the WHO's recommendations on the marketing of foods and beverages to children (189), the existing voluntary industry-led, self-regulatory food marketing initiatives fail to meet the WHO's outlined recommendations. For instance, Canada's self-regulatory initiatives do not: use government as the key stakeholder in policy development (recommendation #6); have an objective compliance monitoring system (recommendation #10); or utilize academic research to guide their regulations (recommendation #11) (63,129). Indeed, the initiatives are problematic in the way they are currently implemented. The number of industry codes and initiatives in Canada, each with their own restrictions, dissonant definitions of children's advertising, and weak compliance measures has resulted in modest, if any, improvements in the volume of food advertising targeted to children in Canada (17,54,104,154,190).

As an adopter of the Ottawa Charter for Health Promotion, which highlights the importance of promoting healthy environments for healthy development, it is Canada's responsibility to protect children and other youth from obesogenic food marketing (17). To this end, statutory regulation which restricts all unhealthy food advertising to children in various media and child-settings across Canada is needed. As restrictions on the commercial marketing of foods and beverages to children were included in the Prime Minister's 2019 mandate letter to the Minister of Health (130), it is plausible that a bill similar to Bill S-228, *The Child Health Protection Act*, may be reintroduced in Canada. This body of work, however, reinforces the need to modify the proposed restrictions in the failed bill and its framework (which was designed to implement regulations and evaluate the bill's impact) (124).

Proposed regulations for Bill S-228 have recommended prohibiting food advertising targeted to children under 13 years old using similar regulations to Quebec's CPA (124). In particular, food advertising that would have been prohibited on television, by Bill S-228, were any advertisements that used appeals designed for children under 13 years old, was broadcast during their intended programs (i.e. programs rated C), and where children comprised 15% or more of the viewing audience (124). Age restrictions on food marketing, however, should be extended to include adolescents aged 13-17 years old. While adolescents are developmentally different from children, they too require supportive media environments that foster healthy development (191). In addition, research on the CPA has revealed a substantial amount of Quebec children's exposure to unhealthy food advertising is derived from adolescent-targeted advertisements (104). Research has also shown that marketing appeals used in adolescent-targeted food advertising are only marginally different from child-targeted appeals (22). Wider and stricter age restrictions are, therefore, key to effectively protect children and other vulnerable young people in Canada from the adverse effects of unhealthy food marketing. Proposed scheduling restrictions developed in 2017 for Bill S-228 (i.e., prohibiting unhealthy food advertising on weekdays between 6 am to 9 am and 3 pm to 9 pm, and on weekends from 6 am to 9 pm) (129), should be reconsidered and expanded (e.g., beyond the 9 p.m. cut-off) to include times that adolescents are most likely watching television and are, thereby, more likely to be exposed to food advertising. Anticipated evidence measuring the impact of Chile's scheduling restrictions (implemented in 2017), prohibiting unhealthy food advertising between 6 am to 10 pm daily (83–85), may further reinforce the need for scheduling restrictions on unhealthy food advertising in Canada.

Secondly, Bill S-228's regulations proposed restricting foods whose total and added sugar, sodium, and saturated fat content exceeded Health Canada's nutrient content claims of "low in sugar," "low in sodium," and/or "low in saturated fatty acids" (i.e., exceeds 100mg sodium/100g, 5g sugar/100g, and/or 2g saturated fatty acids/100g) (63). Although these nutrient criteria thresholds may incentivise food reformulations by industry (124), it is essential that regulations account for the power of branding on food preferences. In particular, restrictions should consider prohibiting advertisements with branded labels and logos from companies that are associated predominately with unhealthy foods (e.g. fast food restaurants), as research has shown that branded healthy advertisements increase children's preference for brands rather than promoted healthier choices (53). For example, fast food companies may advertise healthier products such as salads; however, the branding results in a liking for their restaurant and not salads. If branding is not restricted, advertising of healthy foods by certain companies may inadvertently lead to an increase in individuals purchasing companies' unhealthy foods. Regulations may also consider subsidizing advertising for food marketers that advertise whole foods, in line with Canada's Health Eating Food Guide, to children. As whole food producers (e.g. farmers) have limited advertising budgets, due to the low mark-up for their products, advertising subsidies will help make nutritious foods more visible to children. This type of advertising not only promotes healthy eating habits among children but may also, as described by Harris et al. (2015), attenuate the health disparity among low-income children, resulting from pervasive unhealthy food marketing (180).

Similar to broadcasting regulations and industry self-regulation, proposed marketing restrictions under Bill S-228 are only applicable to Canadian stations (100,110,124,129). Canadian children are potentially exposed to unhealthy food advertising permeating from

American and other foreign broadcast television stations, who may or may not utilize simultaneous substitution (i.e. when a television provider temporarily replaces the signal of one channel to another to replace non-Canadian advertisements with Canadian advertisements). It is, therefore, necessary to ensure that all television stations and advertisers broadcasting in Canada are subject to food marketing restrictions, which is also urged by the WHO (recommendation #8) (63).

Finally, as proposed by Bill S-228, independent monitoring of compliance by non-industry affiliated groups, and penalties (e.g., fines, license suspension, etc.) for non-compliance are essential to elicit meaningful change in Canadian children's food marketing landscape and to enforce marketing regulations (124,129). In fact, marketing recommendation #10 by the WHO urges member states to develop monitoring frameworks to ensure compliance to regulations, which are administered by parties free of conflict of interest (63). Developing and implementing an objective monitoring process will better protect children from the effects of viewing unhealthy food ads, as the public does not need to be exposed to advertising nor recognize an ad as non-compliant (which is a highly sophisticated task) to deal with offending ads.

5.7 Contributions of this Thesis and Generalizability

Our benchmarking of food advertising across almost all Canadian commercial television stations by target age group, television station, month, food category, and food company presents a unique opportunity to monitor the impact of statutory restrictions that has not been undertaken before. Specifically, due to financial constraints of purchasing food advertising data from Numerator (formerly known as Nielsen Media), Canadian research on food marketing to children has never, to date, reported the rates of food advertising across almost all commercial television stations across a 12-month period. Our research provides the baseline data and describes the

tools necessary to monitor food advertising and measure changes resulting from food marketing policy, using the publicly available CRTC television program logs.

Our estimates of television food advertising are generalizable across all provinces with the exception of Quebec. Although television stations (including community- and province-specific stations) are often broadcast nationally, and advertisements that are broadcast in one province may be seen in another, we cannot generalize all estimates of food advertising to Quebec due to differences in policy contexts on advertising to children. Nevertheless, we can generalize the rates of advertising we observed during preschooler- and child-targeted advertising on Quebec-based French-language stations throughout Quebec, as these advertisements were broadcast to local Quebec markets.

5.8 Strengths and Limitations

5.8.1 Strengths

Large Dataset

A major strength of our study was the use of the CRTC television program logs to benchmark the volume and/or rates of food advertising broadcast in Canada. The hundreds of CRTC licensees required to submit logs on a monthly basis allowed us to reveal the significant seasonal and station variations of food advertising in Canada, which have not been observed in prior research. In fact, as the existing Canadian literature on food marketing to children has focused on child-specialty stations and few generalist stations in a few markets (e.g. Toronto, Vancouver, Montreal), our data provided us with the opportunity to reveal high rates of food advertising on generalist television stations across Canada, which have not been previously analysed. Our use of the CRTC logs also identified several violations of the Television Broadcasting Regulations, 1987 by CRTC licensees, which have not been addressed before. Although this was not an

objective of our study, these findings provided further insights into the inherent flaws in this system of regulation. The amount of data reported in the logs also enabled us to investigate rates and volumes of food advertising among programs targeted at preschoolers, adolescents, and adults, which was relatively non-existent in the literature.

Methodological Rigour

Our research is the first, to our knowledge, to utilize the CRTC logs as a resource to measure food advertising to children on television in Canada. As such, we have created a *de novo* method to use this type of data and have not been influenced by previous methods to classify food advertising. We utilized a data-driven approach for data coding and classification, which meant that food advertisements were classified according to categories that emerged from the data rather than imposing traditional (and potentially non-existing) categories onto our data. To maximize the reliability of coding and estimates, we replicated and re-ran our coding quarterly. Given the large size of our dataset and the length of our codes, this ensured that any errors in the original code were caught and that that our datasets and estimates were replicable. Importantly, as over six million advertisements were grouped by identical titles and each title was coded and classified individually, it is possible that some food advertisements have been misclassified, especially among stations that had poor data reporting. Our sensitivity analyses, however, confirmed that our estimates were robust, which was likely due to the size of the dataset and the number of stations that clearly reported advertising data (i.e. 182 stations). In fact, testing the misclassification of over 1000 advertisements and/or excluding 89 stations did not create significant differences in the advertising patterns we observed.

The statistical methods used in our studies (Chapters 3 and 4) are also novel to this field of research. In Chapter 3, the use of linear regression models to estimate differences in food

advertising rates between age groups, allowed us to account for the effects of other covariates on food advertising rates. Model interactions, in particular, enabled us to examine significant rate differences between age groups at television station and month level. In Chapter 4, the use of a principal component analysis (PCA) allowed us to examine similar patterns of advertising by nearly 500 food companies, while accounting for the higher volume of advertising broadcast during adult-targeted programming. In fact, the PCA demonstrated meaningful variations of advertising practices by food companies, which was otherwise impossible to observe using Chi-square tests and correspondence analyses.

Definition of Children's Advertising

Another major strength of this study is our definition of children's advertising. Using broadcasters' definitions of child advertising enabled us to identify violations with the Broadcast Code for Advertising to Children (Children's Code) which has never been evaluated by researchers before. Our analysis of the Children's Code further enabled us to demonstrate flaws in the consumer-complaints system of monitoring compliance. We were also the first to use this definition to evaluate the impact of the CAI, which revealed loopholes in the CAI's child audience thresholds. Finally, the available information in the program logs also allowed us to expand the traditional definition of children's advertising beyond paid commercial messages, to include promotional messages such as giveaways, sponsorship messages, local advertising and more. As such, we were able to comprehensively examine most potential sources of television food advertising to children.

5.8.2 Limitations

Reporting Quality

Although we have maximized the use of the available information in the CRTC logs, this data source has not been designed for academic research purposes. As such, the quality and content of reporting severely restricted our ability to conduct certain analysis. For instance, as reporting advertised products is not a requirement of the logs, we were restricted to analyzing a few broad categories of food ads (e.g. food products instead of cookies, soft-drinks, vegetables, etc.). Our inability to collect nutritional information on advertised products also hindered our ability to analyze the healthfulness of food advertisements in Canada. As a result, we were unable to monitor broadcasters' compliance with clauses in the Children's Code which outline the permitted depiction of foods and types of foods to children (e.g. fruits and vegetables). We were also unable to evaluate the practices of CAI companies that pledged to advertise only "healthy" food to children.

The reporting quality of the program logs also limits the comparability of our findings to past and future years of the CRTC logs. Notably, as the CRTC standardized the mutually exclusive target age groups in 2015, program logs cannot be compared before and after 2015. We also observed that certain companies utilize advertising campaigns or slogans specific to the year of broadcast (2018 in our case) to report advertised foods. As a result, the impact of new policy can only be confidently evaluated from the CRTC logs, using estimates from stations that clearly reported advertisers' names and the type of foods advertised, instead of campaigns or slogans. This means that only the estimates we found for the 182 stations (in Chapter 4) who clearly reported advertisers' names in 2018, can be compared after the implementation of policy. This may present selection bias as a number of television stations that were found to report

poorly predominantly came from the major networks owned by Bell Media (e.g., CTV, Discovery, TSN, MTV, MuchMusic, V, etc.) (192). Estimates from our second study (Chapter 4) are, therefore, not generalizable to these stations. Nevertheless, this limitation implies that we provided conservative estimates of the advertising practices by food companies as we have underestimated the volume of advertising by these companies.

Potential Exposure

Broadcasters are also subjective in their identification of target age of programming in the logs. As such, it is plausible that the same show on two different stations was targeted at different age groups. Due to time/resource constraints of this thesis, we could not determine if all stations carrying the same program reported the same target age (e.g. is SpongeBob on YTV targeted to a different age group than SpongeBob on Nickelodeon?). Moreover, as there is no publicly available framework guiding broadcasters' decisions on target age identification, it is possible that certain programs that are intended for a specific age group are not being viewed by that age group. For this reason, we can only interpret our results in terms of potential exposure as children have been reported to view programs, and be exposed to food advertising, that is targeted at older age groups (i.e. cross-viewing). Our data also does not measure the levels of food advertising broadcast to children during non-linear television viewing (e.g., on-demand and pay-per-view services). The CRTC logs also does not cover products or brands that are promoted during television programs (e.g., product placement in a TV show or advertising that can be seen during a sports broadcast).

It should also be noted that our analysis included commercial television stations that broadcast across Canada including in Quebec which is subject an advertising policy that likely impacted annual rates of food advertising. As we identified in Chapter 3, some French-language

or Quebec-based stations, had lower rates of food advertising broadcast during programs targeted to preschoolers or children as compared to their English counterparts (e.g., Teletoon English vs. Teletoon French, SRC Ottawa vs. SRC Montreal). This has also been demonstrated in the existing research in which some children in Quebec are exposed to fewer food advertisements as a result of the CPA (57,58). It is, thereby, plausible that the inclusion in our analysis of stations broadcast in Quebec may have lowered annual rates of food advertising targeted to children. This implies that the exclusion Quebec-based stations would result in higher annual rates of food advertising targeted to children and preschoolers in the rest of Canada, where food advertising is self-regulated by industry. Finally, the CRTC program logs are only required and reported by Canadian broadcasters and does not cover programming nor advertising from American or other foreign television stations that are broadcast in Canada. Taken together, we have likely underestimated children's potential exposure to foods advertising on television in Canada in 2018.

Non-compliance

Since we were unable to measure the objective audience viewership of television programs, using the CRTC data, we cannot contend that ads broadcast by companies participating in self-regulatory initiatives that use child-audience thresholds are true cases of non-compliance. Hence, the 10 CAI companies (who committed to abstain from advertising to children and preschoolers) and the CBA members who advertised products during programs targeted to preschoolers and children, may be meeting their pledges. Other research, however, has shown that these companies still advertise during program when their pledges would apply (43,104).

5.9 Future Research

While conducting this research, we discovered multiple opportunities to use the CRTC logs fill critical knowledge gaps in the extant Canadian literature on food advertising to children. For instance, future research using the CRTC logs should compare the annual rates of advertising broadcast to preschoolers, children, and adolescents between: (1) French and English markets, (2) Quebec-based and non-Quebec based stations, and (3) food and non-food advertising. Limitations pertaining to our use of the CRTC logs also identified opportunities for future research using Numerator data to assess the validity of broadcasters' subjective target age definitions. As the Children's Code has not been evaluated beyond our studies, audience viewership data should also be used to evaluate the broadcasters and advertisers' compliance with this Code's nutrient-related restrictions. Future research should also consider the fluctuations in advertising rates that we observed over the year, illustrated in Chapter 3. As the month of May has traditionally been used to represent food advertising across the year (due to its lack of and distance from major holidays), researchers should consider our findings that this month presents lower than average food advertising rates for preschoolers and children.

5.10 Conclusion

This thesis contributes to the growing body of knowledge that demonstrates the ineffectiveness of voluntary industry-led self-regulation on protecting young people from the ill effects of food advertising in Canada (43,54,58,59,104). We have been able to replicate findings of previous Canadian studies which reveal that any modest improvements resulting from industry self-regulation in food marketing to children is overshadowed by weak restrictions and loopholes (43,104). We have also been able to explore novel areas of self-regulation, use different

definitions of children's advertising, employ advanced statistical techniques, and introduce free and unconventional sources of data to this field of research.

Given the undeniable health consequences of food advertising to preschoolers, children, and adolescents, at this critical stage of development, our research lends support to the calls for federal policy regulations on food marketing. It is time for the Government of Canada to intervene in fostering healthy media environments for young people. Comprehensive statutory restrictions, banning the marketing unhealthy foods to all young people in various media and all relevant settings, will contribute to addressing the urgent public health need to improve the dietary habits of young people and reduce the prevalence of childhood obesity in Canada. These regulatory directions should also provide parents, young people, and communities with the tools necessary to encourage better nutrition for all young people across the country.

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Appendix A - Data Processing

Television program logs, from January to December 2018, were downloaded from the Government of Canada's Open Data portal on July 4, 2019. As the program logs from 2018 existed in two different text formats (fixed-width and pipe-delimited), the data was imported using different methods to merge files into a full year dataset. Notably, program log files from September 2018 to December 2018 ($n_{\text{files}}=1230$), in the fixed-width text format, needed to be converted to UTF-8 encoding to correctly import data containing special characters (e.g., é, è, ç) for French-language stations. This data was then imported into SAS using a macro code, which specified variable lengths according to the Data Dictionary STAR2, provided by the CRTC. Program logs from January 2018 to August 2018 ($n_{\text{files}}=8$), in the pipe (|) delimited format, were also imported into SAS using a macro code, and assigned variable names according to the Data Dictionary STAR2, for compatibility. Within each macro, the target audience age of "programs" and "program first segments" were applied to the subsequent advertisements using a retain statement. The television station, program class and target age group variables were converted to the numeric data format, using the Reference Tables provided by the CRTC, to append the two formats of data into a full year dataset. The 293 numeric station codes were then classified into 271 stations, using the CRTC Reference Tables.

To identify food and non-food related advertisements, a code was created using keywords from the advertisement titles and applied to the full year dataset. Advertisements were grouped by title and each title was examined individually to prevent and rectify any misclassification of advertisements across food categories and companies. Any non-food ads that remained in the dataset, after extracting food ads, were deleted to obtain a full-year dataset consisting of only food and beverage advertisements and television programs. Food advertisements were classified

according to the eight food categories that emerged in the data (i.e., fast food restaurants, food and beverage products, meal delivery, etc.). Subsidiary food companies were identified from the company name or branded advertised product reported in the advertisement title and confirmed with company websites. CAI signatories, and their voluntary pledges, were identified from the companies' CAI Participant Commitment reports and the 2018 CAI Compliance Report, provided by Ad Standards.

SAS summary datasets (i.e. "proc summary") were created from the full-year dataset to obtain measures of advertising relevant to research objectives 1, 3 and 4. To obtain the rates of food advertising during programming targeted to each of the age groups for objective 1 (Chapter 3), a summary dataset was created containing food advertisements and programming at the target age group, month and television station level. For research objective 3 and 4 (Chapter 4), summary datasets containing only food advertisements were created at the target age group and food company level, to obtain age- and company-specific frequencies of food advertisements. Importantly, all proc summary datasets included the "completetypes" and "nway" options to include missing values for television stations and food companies that did not carry advertising or programming for any of the target age groups, at the highest level of tabulation. The summary dataset for research objective 3 was also transposed for the PCA to input each of the target age groups as separate variable in the PCA.

Appendix B – List of Television Stations Included in Each Article

Television Station Name	
Article #1 (n=271)	Article #2 (n=182)
A.Side TV ABC Spark AMI-TV ATN Aastha TV ATN DD Sports ATN Punjabi 5 ATN South Asian Television Aboriginal Peoples Television Adult Swim All TV Animal Planet Asian Television Network ATN BBC Canada BBC Earth BC News 1 BNN Book Television Bravo! CASA CBC Calgary CBC Charlottetown CBC Edmonton CBC Fredericton CBC Halifax CBC Montreal CBC News CBC News Networks CBC Ottawa CBC Regina CBC St. John's CBC Toronto CBC Vancouver CBC Windsor CBC Winnipeg CBC Yellowknife CHEK Media CMT CTS Burlington CTS Calgary	A.Side TV ABC Spark ATN Aastha TV ATN Punjabi 5 ATN South Asian Television Aboriginal Peoples Television Adult Swim All TV Asian Television Network ATN BBC Canada BBC Earth BC News 1 CASA CBC Calgary CBC Charlottetown CBC Edmonton CBC Fredericton CBC Halifax CBC Montreal CBC News CBC News Networks CBC Ottawa CBC Regina CBC St. John's CBC Toronto CBC Vancouver CBC Windsor CBC Winnipeg CBC Yellowknife CMT CTS Burlington CTS Calgary CTS Edmonton CTV Lloydminster CTV Two CTV Two Dawson Creek Cartoon Network Channel Zero Hamilton Citytv

<p> CTS Edmonton CTV Ottawa CTV Winnipeg CTV 2 Alberta CTV 2 Atlantic CTV Atlantic (Moncton, NB) CTV Atlantic (Saint John, NB) CTV Atlantic (Halifax, NS) CTV Atlantic (Sydney, NS) CTV Calgary CTV Edmonton CTV Kitchener CTV Lethbridge CTV Lloydminster CTV Montreal CTV News Channel (Toronto, ON) CTV Northern Ontario CTV Prince Albert CTV Red Deer CTV Regina CTV Saskatoon CTV Sault St Marie CTV Sudbury CTV Thunder Bay CTV Timmins CTV Toronto CTV Two CTV Two Barrie CTV Two Dawson Creek CTV Two London CTV Two Pembroke CTV Two Vancouver CTV Two Vancouver Island CTV Two Windsor CTV Yorkton CablePulse 24 Toronto Canal D Canal Vie Cartoon Network Channel Zero Hamilton Citytv Citytv Montreal Citytv Toronto </p>	<p> Citytv Montreal Citytv Toronto Citytv Calgary Citytv Edmonton Citytv Northern BC Citytv Vancouver Citytv Winnipeg Cosmopolitan TV Cottage Life Crime + Investigation D TOUR DejaView Disney Channel Disney Channel French Disney XD Diy Network Documentary Channel FPTV (Festival Portuguese Tele FX FXX Fairchild TV Fairchild TV 2 HD Family Channel Fight Network Food Network Game TV Games+ Global Edmonton Global Calgary Global Durham/Oshawa Global Halifax Global Kelowna Global Kingston Global Lethbridge Global Lloydminster Global Montreal Global Peterborough Global Prescott Global Regina Global Saskatoon Global Thunder Bay Global Toronto Global Vancouver </p>
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Citytv Calgary	Global Winnipeg
Citytv Edmonton	H2
Citytv Northern BC	HGTV
Citytv Vancouver	HIFI
Citytv Winnipeg	Historia
Comedy	History Television
Comedy Gold	ICI Explora
Community Focus TV	ICI RDI
Cosmopolitan TV	Ici Montreal
Cottage Life	Ici Radio-Canada Télé
Crime + Investigation	Le Canal Nouvelle
DTOUR	Leafs TV
Daystar Canada	Lifetime
DejaView	MOI&cie
Discovery	Makeful TV
Discovery Science	Mediaset Italia
Discovery Velocity	Movie Time
Disney Channel	NBA TV
Disney Channel French	NTV(Newfoundland Television) S
Disney Junior	Nat Geo Wild
Disney XD	National Geographic Channel
Diy Network	Nickelodeon
Documentary Channel	OMNI Regional
E!	Omni Calgary
ESPN Classic	Omni Edmonton
FPTV (Festival Portuguese Tele	Omni Toronto
FX	Omni Vancouver
FXX	One: the Body, Mind & Spirit
Fairchild TV	Outdoor Life Network
Fairchild TV 2 HD	Prise 2
FaithTV	Rewind
Family Channel	SRC Rimouski, Quebec
Family Jr	SRC Edmonton
Fashion Television Channel	SRC Moncton
Fight Network	SRC Montreal
Food Network	SRC Ottawa
Game TV	SRC Quebec City
Games+	SRC Regina
Global Edmonton	SRC Rivière-du-Loup
Global Calgary	SRC Saguenay
Global Durham/Oshawa	SRC Sherbrooke
Global Halifax	SRC Toronto
Global Kelowna	SRC Trois-Rivières

Global Kingston	SRC Vancouver
Global Lethbridge	SRC Winnipeg
Global Lloydminster	Saskatchewan Communications Ne
Global Montreal	Showcase
Global Peterborough	Silver Screen Classics
Global Prescott	Slice
Global Regina	Smithsonian Channel
Global Saskatoon	Sportsnet 360
Global Thunder Bay	Sportsnet East
Global Toronto	Sportsnet One
Global Vancouver	Sportsnet Ontario
Global Winnipeg	Sportsnet Pacific
Gusto TV	Sportsnet West
H2	Séries+
HGTV	TFO
HIFI	TV5 Quebec
Historia	TVA Carleton
History Television	TVA Gatineau
ICI Explora	TVA Montreal
ICI RDI	TVA Quebec City
Ici Montreal	TVA Rimouski
Ici Radio-Canada Télé	TVA Rivière-du-Loup
Investigation	TVA Saguenay
Investigation Discovery	TVA Sherbrooke
Le Canal Nouvelle	TVA Sports
Leafs TV	TVA Trois Rivières
Lifetime	TVA Rouyn-Noranda
Love Nature	Talent Vision
MOI&cie	Telelatino
MTV Canada	Teletoon English
MTV2	Teletoon French
Makeful TV	The Cooking Channel
Max HD	The Independent Film Channel C
Mediaset Italia	The Oprah Winfrey Network
Miracle Channel	The Weather Network
Movie Time	Treehouse TV
MuchMusic	Télé-Quebec Montreal
MusiquePlus MP	TéléMag
NBA TV	UnisTv Montreal
NTV(Newfoundland Television) S	Univision Canada
Nat Geo Wild	Unknown
National Geographic Channel	V Gatineau
New Tang Dynasty (NTD) Televis	V Rivière-du-Loup

Nickelodeon	V Val-d'Or
OMNI Regional	W Network
Odyssey	Wild Tv
Omni Calgary	YOOPA
Omni Edmonton	YTV
Omni Toronto	Zee Cinema Canada
Omni Vancouver	Zeste
One: the Body, Mind & Spirit	Zing
OutTV Vancouver	ZoomerMedia Limited
Outdoor Life Network	addikTV
Prise 2	fyi
RDS Info	ici ARTV
RDS, Réseau des sports	travel + escape
Rewind	Évasion
SRC Rimouski, Quebec	
SRC Edmonton	
SRC Moncton	
SRC Montreal	
SRC Ottawa	
SRC Quebec City	
SRC Regina	
SRC Rivière-du-Loup	
SRC Saguenay	
SRC Sherbrooke	
SRC Toronto	
SRC Trois-Rivières	
SRC Vancouver	
SRC Winnipeg	
Saskatchewan Communications Ne	
Showcase	
Silver Screen Classics	
Slice	
Smithsonian Channel	
Space	
Sportsman Canada	
Sportsnet 360	
Sportsnet East	
Sportsnet One	
Sportsnet Ontario	
Sportsnet Pacific	
Sportsnet West	
Super Channel	
Séries+	

TFO
TNS 1
TRC, the Rural Channel
TSN - The Sports Network
TSN 2
TSN 3
TSN 5
TV5 Quebec
TVA Carleton
TVA Gatineau
TVA Montreal
TVA Quebec City
TVA Rimouski
TVA Rivière-du-Loup
TVA Saguenay
TVA Sherbrooke
TVA Sports
TVA Trois Rivières
TVA Rouyn-Noranda
TVOntario
Talent Vision
Telelatino
Teletoon English
Teletoon French
The Beautiful Little Channel
The Cooking Channel
The Independent Film Channel C
The Oprah Winfrey Network
The Weather Network
Treehouse TV
Télé-Quebec Montreal
TéléMag
UnisTv Montreal
Univision Canada
Unknown
V (Network)
V Gatineau
V Interactios Inc. Quebec City
V Montreal
V Rivière-du-Loup
V Saguenay
V Sherbrooke
V Trois-Rivières

V Val-d'Or
VRAK
W Network
Wild Tv
YOOPA
YTV
Z
Zee Cinema Canada
Zee Premier Canada
Zeste
Zing
ZoomerMedia Limited
addikTV
fyi
ici ARTV
travel + escape
Évasion

Appendix C – Supplementary Material for Component Article 2

Table S1. List of Canadian television stations included in the analysis

Television Station Name
A.Side TV
ABC Spark
ATN Aastha TV
ATN Punjabi 5
ATN South Asian Television
Aboriginal Peoples Television
Adult Swim
All TV
Asian Television Network ATN
BBC Canada
BBC Earth
BC News 1
CASA
CBC Calgary
CBC Charlottetown
CBC Edmonton
CBC Fredericton
CBC Halifax
CBC Montreal
CBC News
CBC News Networks
CBC Ottawa
CBC Regina
CBC St. John's
CBC Toronto
CBC Vancouver
CBC Windsor
CBC Winnipeg
CBC Yellowknife
CMT
CTS Burlington
CTS Calgary
CTS Edmonton
CTV Lloydminster
CTV Two
CTV Two Dawson Creek
Cartoon Network
Channel Zero Hamilton
Citytv

Citytv Montreal
Citytv Toronto
Citytv Calgary
Citytv Edmonton
Citytv Northern BC
Citytv Vancouver
Citytv Winnipeg
Cosmopolitan TV
Cottage Life
Crime + Investigation
D TOUR
DejaView
Disney Channel
Disney Channel French
Disney XD
Diy Network
Documentary Channel
FPTV (Festival Portuguese Tele
FX
FXX
Fairchild TV
Fairchild TV 2 HD
Family Channel
Fight Network
Food Network
Game TV
Games+
Global Edmonton
Global Calgary
Global Durham/Oshawa
Global Halifax
Global Kelowna
Global Kingston
Global Lethbridge
Global Lloydminster
Global Montreal
Global Peterborough
Global Prescott
Global Regina
Global Saskatoon
Global Thunder Bay
Global Toronto
Global Vancouver
Global Winnipeg

H2
HGTV
HIFI
Historia
History Television
ICI Explora
ICI RDI
Ici Montreal
Ici Radio-Canada Télé
Le Canal Nouvelle
Leafs TV
Lifetime
MOI&cie
Makeful TV
Mediaset Italia
Movie Time
NBA TV
NTV(Newfoundland Television) S
Nat Geo Wild
National Geographic Channel
Nickelodeon
OMNI Regional
Omni Calgary
Omni Edmonton
Omni Toronto
Omni Vancouver
One: the Body, Mind & Spirit
Outdoor Life Network
Prise 2
Rewind
SRC Rimouski, Quebec
SRC Edmonton
SRC Moncton
SRC Montreal
SRC Ottawa
SRC Quebec City
SRC Regina
SRC Rivière-du-Loup
SRC Saguenay
SRC Sherbrooke
SRC Toronto
SRC Trois-Rivières
SRC Vancouver
SRC Winnipeg

Saskatchewan Communications Ne

Showcase

Silver Screen Classics

Slice

Smithsonian Channel

Sportsnet 360

Sportsnet East

Sportsnet One

Sportsnet Ontario

Sportsnet Pacific

Sportsnet West

Séries+

TFO

TV5 Quebec

TVA Carleton

TVA Gatineau

TVA Montreal

TVA Quebec City

TVA Rimouski

TVA Rivière-du-Loup

TVA Saguenay

TVA Sherbrooke

TVA Sports

TVA Trois Rivières

TVA Rouyn-Noranda

Talent Vision

Telelatino

Teletoon English

Teletoon French

The Cooking Channel

The Independent Film Channel C

The Oprah Winfrey Network

The Weather Network

Treehouse TV

Télé-Quebec Montreal

TéléMag

UnisTv Montreal

Univision Canada

Unknown

V Gatineau

V Rivière-du-Loup

V Val-d'Or

W Network

Wild Tv

YOOPA
 YTV
 Zee Cinema Canada
 Zeste
 Zing
 ZoomerMedia Limited
 addikTV
 fyi
 ici ARTV
 travel + escape
 Évasion

Table S2: Age-specific frequency and proportion of television food advertisements by all Canadian subsidiary companies in 2018.

Food Subsidiary Company	Food Advertisements			
	Target Age Group			
	Preschoolers n (%)	Children n (%)	Adolescents n (%)	Adults n (%)
7 Eleven	3 (0.03)	17 (0.01)	200 (0.5)	1644 (0.03)
A&M Gourmet Foods	0 (0)	0 (0)	0 (0)	530 (0.01)
A&W	233 (2.3)	1573 (0.82)	160 (0.4)	110037 (2.29)
AB World Foods	0 (0)	66 (0.03)	0 (0)	1835 (0.04)
ATCO Blue Flame	0 (0)	0 (0)	0 (0)	477 (0.01)
Ach Foods	10 (0.1)	24 (0.01)	33 (0.08)	13695 (0.29)
Agropur	117 (1.16)	488 (0.26)	64 (0.16)	18597 (0.39)
Aji Sushi	0 (0)	0 (0)	0 (0)	144 (0)
Aki Sushi	0 (0)	0 (0)	0 (0)	3 (0)
Aliment Bouchard Inc.	2 (0.02)	0 (0)	2 (0.01)	140 (0)
Aliments Asta	0 (0)	0 (0)	0 (0)	1 (0)
Aliments Carrieres	1 (0.01)	0 (0)	8 (0.02)	202 (0)
Aliments Fondue Paysanne	0 (0)	0 (0)	0 (0)	163 (0)
Aliments Ludo	290 (2.86)	117 (0.06)	1 (0)	6419 (0.13)
Aliments Ouimet	210 (2.07)	392 (0.21)	2 (0.01)	1294 (0.03)
Aliments Ultima Foods	20 (0.2)	0 (0)	20 (0.05)	1995 (0.04)
Aliments du Quebec	0 (0)	0 (0)	1 (0)	727 (0.02)
Anchors Fish & Chips	0 (0)	1 (0)	0 (0)	15 (0)
Apetito Canada	0 (0)	57 (0.03)	0 (0)	2062 (0.04)
Apna Taste	0 (0)	0 (0)	0 (0)	102 (0)
Archibald Microbrasserie	0 (0)	0 (0)	0 (0)	58 (0)
Arla Foods	0 (0)	43 (0.02)	19 (0.05)	5762 (0.12)
Arz Group	0 (0)	0 (0)	0 (0)	294 (0.01)
Ashton Casse-Croute	0 (0)	0 (0)	0 (0)	565 (0.01)
Au Vieux Duluth	1 (0.01)	1 (0)	1 (0)	2605 (0.05)

Aurora Importing	146 (1.44)	0 (0)	0 (0)	2663 (0.06)
BC Dairy Association	6 (0.06)	0 (0)	4 (0.01)	5114 (0.11)
BC Tree Fruits Cooperative	0 (0)	0 (0)	0 (0)	811 (0.02)
Barbies Restaurant	3 (0.03)	0 (0)	1 (0)	1184 (0.02)
Baskin Robbins	0 (0)	12 (0.01)	0 (0)	253 (0.01)
Baton Rouge	0 (0)	0 (0)	0 (0)	222 (0)
Bel Group	117 (1.16)	3703 (1.94)	418 (1.05)	57847 (1.2)
Ben & Florentine	1 (0.01)	2 (0)	11 (0.03)	920 (0.02)
Big Ben's Fish & Chips	0 (0)	0 (0)	0 (0)	250 (0.01)
Biscuits St.Michel	0 (0)	0 (0)	0 (0)	246 (0.01)
Bistro La Seigneurie	0 (0)	0 (0)	0 (0)	308 (0.01)
Bistro Ophelia Inc	0 (0)	0 (0)	2 (0.01)	118 (0)
Bistro XYZ	0 (0)	0 (0)	0 (0)	1088 (0.02)
Bold Pizzeria	0 (0)	0 (0)	0 (0)	6 (0)
Bolton Alimentari	98 (0.97)	94 (0.05)	69 (0.17)	13707 (0.29)
Bonduelle	0 (0)	0 (0)	42 (0.11)	2419 (0.05)
Boon Burger	0 (0)	0 (0)	0 (0)	70 (0)
Booster Juice	0 (0)	0 (0)	0 (0)	42 (0)
Boston Pizza	93 (0.92)	1096 (0.57)	945 (2.38)	53311 (1.11)
Boucherie Bari	0 (0)	0 (0)	0 (0)	168 (0)
Boucherie Begin	0 (0)	0 (0)	0 (0)	137 (0)
Boucherie Carrier Inc.	0 (0)	0 (0)	0 (0)	112 (0)
Boucherie Charcuterie Gas	0 (0)	0 (0)	0 (0)	46 (0)
Boucherie Clement Jacques	0 (0)	0 (0)	0 (0)	97 (0)
Boucherie Davis Lte.	0 (0)	0 (0)	0 (0)	98 (0)
Boucherie L. Ouellet	0 (0)	0 (0)	0 (0)	137 (0)
Boucherie Lenoir et Leblanc In	0 (0)	0 (0)	0 (0)	29 (0)
Boucherie Raymond et Andre	0 (0)	0 (0)	0 (0)	20 (0)
Boucherie St.Hilaire	0 (0)	0 (0)	0 (0)	207 (0)
Boucherie du Centre	0 (0)	0 (0)	0 (0)	52 (0)
Boucherie du Lac	0 (0)	0 (0)	0 (0)	217 (0)
Boulangerie Chicoutimi Nord	4 (0.04)	3 (0)	0 (0)	202 (0)
Boulangerie Gagne-Pain	0 (0)	0 (0)	0 (0)	80 (0)
Boulangerie Patisserie Le	0 (0)	0 (0)	0 (0)	70 (0)
Boulangerie St.Methode Inc	434 (4.29)	518 (0.27)	43 (0.11)	15178 (0.32)
Boîte à Grains	0 (0)	0 (0)	3 (0.01)	294 (0.01)
Brar Flour Mills	0 (0)	0 (0)	0 (0)	2396 (0.05)
Brasserie Daniel Lapointe	6 (0.06)	0 (0)	2 (0.01)	1654 (0.03)
Brasserie Fleurimont	0 (0)	0 (0)	0 (0)	573 (0.01)
Brasserie La Seigneurie	0 (0)	0 (0)	0 (0)	83 (0)
Brasserie Lac Brompton	0 (0)	0 (0)	0 (0)	800 (0.02)
Brasserie Lucille	0 (0)	0 (0)	0 (0)	539 (0.01)

Brownstone Restaurant	0 (0)	0 (0)	0 (0)	4 (0)
Buffet Continents	0 (0)	0 (0)	1 (0)	170 (0)
Buffet Royale	0 (0)	0 (0)	0 (0)	44 (0)
Burger King	11 (0.11)	2795 (1.46)	7831 (19.72)	89020 (1.85)
Burnbrae Farms	154 (1.52)	376 (0.2)	102 (0.26)	8411 (0.18)
Burrito Boyz	0 (0)	0 (0)	0 (0)	208 (0)
Buy Low Foods	0 (0)	0 (0)	0 (0)	805 (0.02)
C&C Supermarket	0 (0)	0 (0)	0 (0)	135 (0)
C-Lovers Fish & Chips	0 (0)	0 (0)	0 (0)	430 (0.01)
COBS Bread	0 (0)	0 (0)	0 (0)	471 (0.01)
Caesarstone Canada	0 (0)	0 (0)	0 (0)	11 (0)
Café Aux Delices	0 (0)	0 (0)	0 (0)	137 (0)
Café Bistro L'Anse Aux Coques	0 (0)	0 (0)	0 (0)	162 (0)
Café Central	0 (0)	0 (0)	0 (0)	54 (0)
Café Hollywood	0 (0)	0 (0)	0 (0)	18 (0)
Café Resto Service	0 (0)	0 (0)	0 (0)	147 (0)
Café de la Brulerie	0 (0)	0 (0)	0 (0)	58 (0)
Calgary Co-Op	0 (0)	0 (0)	0 (0)	1901 (0.04)
California Almonds	0 (0)	0 (0)	0 (0)	25 (0)
CampbellSoup	29 (0.29)	7233 (3.79)	162 (0.41)	26634 (0.55)
Canada Bread	1 (0.01)	487 (0.26)	46 (0.12)	10231 (0.21)
Canada Dry	141 (1.39)	1274 (0.67)	265 (0.67)	58670 (1.22)
Casa Mia Restaurant	0 (0)	0 (0)	0 (0)	180 (0)
Cataldi	89 (0.88)	0 (0)	0 (0)	1156 (0.02)
Catelli Foods	0 (0)	0 (0)	0 (0)	558 (0.01)
Cavendish Farms	25 (0.25)	32 (0.02)	34 (0.09)	6802 (0.14)
Central Station Pub	0 (0)	0 (0)	0 (0)	40 (0)
Chapman's Ice-cream	21 (0.21)	4001 (2.1)	62 (0.16)	32709 (0.68)
Chef Hung Noodle	0 (0)	0 (0)	0 (0)	38 (0)
Chef Tony Restaurant	0 (0)	0 (0)	0 (0)	3 (0)
Chef's Plate	30 (0.3)	717 (0.38)	480 (1.21)	8295 (0.17)
Chez Greco	0 (0)	0 (0)	0 (0)	606 (0.01)
Chicken Farmers of Canada	0 (0)	0 (0)	0 (0)	3808 (0.08)
Choco Mango	0 (0)	0 (0)	0 (0)	48 (0)
Chocolat Favoris	0 (0)	0 (0)	0 (0)	579 (0.01)
Churrasqueira Martins	0 (0)	0 (0)	0 (0)	1165 (0.02)
Clearwater Seafoods	0 (0)	0 (0)	0 (0)	427 (0.01)
Clover Leaf	0 (0)	2 (0)	0 (0)	3820 (0.08)
Coca Cola	4 (0.04)	421 (0.22)	640 (1.61)	89780 (1.87)
Coco Rico	0 (0)	0 (0)	0 (0)	22 (0)
Conagra Brands	6 (0.06)	801 (0.42)	88 (0.22)	37624 (0.78)
Continental Seafood Restaurant	0 (0)	0 (0)	0 (0)	33 (0)
Cooke's Fine Foods	0 (0)	0 (0)	0 (0)	85 (0)

Copa Café	0 (0)	0 (0)	0 (0)	385 (0.01)
Cora's	0 (0)	0 (0)	0 (0)	31 (0)
Cordon Bleu Restaurant	100 (0.99)	0 (0)	4 (0.01)	130 (0)
Crabby Joe's Restaurant	0 (0)	0 (0)	0 (0)	87 (0)
CrispyFood	0 (0)	0 (0)	0 (0)	968 (0.02)
Crossroads Farmers Market	0 (0)	0 (0)	0 (0)	919 (0.02)
Crumbuns Bakeshop Café	0 (0)	0 (0)	0 (0)	47 (0)
Cuba's Restaurant	0 (0)	0 (0)	0 (0)	42 (0)
Cucina Foods Inc	0 (0)	0 (0)	12 (0.03)	1015 (0.02)
D'Angelo Brands	0 (0)	0 (0)	0 (0)	124 (0)
Dairy Farmers of Canada	40 (0.4)	91 (0.05)	0 (0)	124 (0)
Dairy Queen	11 (0.11)	1888 (0.99)	294 (0.74)	102134 (2.13)
Danone	317 (3.13)	769 (0.4)	450 (1.13)	67936 (1.42)
Dare Foods	27 (0.27)	807 (0.42)	357 (0.9)	24437 (0.51)
Deerview Meats	0 (0)	0 (0)	0 (0)	105 (0)
Delices de la Foret Valli	0 (0)	0 (0)	0 (0)	134 (0)
Deluxe Meats	0 (0)	0 (0)	0 (0)	76 (0)
Direct Plus Food	0 (0)	0 (0)	0 (0)	123 (0)
Dixie Lee Fried Chicken	0 (0)	0 (0)	0 (0)	149 (0)
Dolce Pane	0 (0)	0 (0)	0 (0)	21829 (0.45)
Dolly's Fish Market	0 (0)	0 (0)	3 (0.01)	91 (0)
Dominos Pizza	0 (0)	0 (0)	0 (0)	69 (0)
Don Rosario Restaurant	1 (0.01)	0 (0)	0 (0)	22 (0)
Dong Suh Coffee	0 (0)	0 (0)	0 (0)	78 (0)
Donut King & Coffee	0 (0)	0 (0)	0 (0)	185 (0)
Downtown Business Association	0 (0)	0 (0)	0 (0)	81 (0)
Dr.Oetker	7 (0.07)	21 (0.01)	153 (0.39)	18183 (0.38)
Dutch Mill Country Market	0 (0)	0 (0)	0 (0)	175 (0)
East Side Marios	0 (0)	0 (0)	0 (0)	6399 (0.13)
Edo Japan	0 (0)	0 (0)	0 (0)	2019 (0.04)
Egg Farmers of Canada	144 (1.42)	441 (0.23)	152 (0.38)	18150 (0.38)
Egg Producers of PEI	0 (0)	0 (0)	0 (0)	335 (0.01)
Elegance Cuisine	0 (0)	0 (0)	0 (0)	217 (0)
Eleveurs de Porcs du Quebec	9 (0.09)	22 (0.01)	0 (0)	1230 (0.03)
Epicerie Boucherie	0 (0)	0 (0)	0 (0)	4 (0)
Epicerie Frenette	0 (0)	0 (0)	0 (0)	278 (0.01)
Epicerie Pierre Dube	0 (0)	0 (0)	0 (0)	36 (0)
Erabliere Chalet	0 (0)	0 (0)	0 (0)	179 (0)
Erabliere Le P'tit	0 (0)	0 (0)	0 (0)	3 (0)
Euro Marche	0 (0)	0 (0)	0 (0)	1 (0)
Europa Catering	0 (0)	0 (0)	0 (0)	729 (0.02)
Europe Hungarian Restaurant	0 (0)	0 (0)	0 (0)	197 (0)

Exceldor	428 (4.23)	38 (0.02)	26 (0.07)	20274 (0.42)
ExcelsiorFoods	122 (1.21)	0 (0)	26 (0.07)	11662 (0.24)
FGF Brands	0 (0)	0 (0)	0 (0)	1048 (0.02)
Federated Co-operatives Limite	0 (0)	0 (0)	0 (0)	4994 (0.1)
Ferrero	97 (0.96)	2208 (1.16)	383 (0.96)	83420 (1.74)
Food Basics	0 (0)	3 (0)	2 (0.01)	1529 (0.03)
Foodland Ontario	12 (0.12)	171 (0.09)	15 (0.04)	2681 (0.06)
Franki's Pizzeria	0 (0)	0 (0)	0 (0)	299 (0.01)
Fraser Valley Poultry Farm	0 (0)	0 (0)	0 (0)	764 (0.02)
Fresh Slice Pizza	0 (0)	0 (0)	0 (0)	12 (0)
Freson Bros Supermarket	0 (0)	0 (0)	0 (0)	79 (0)
Fromagerie Bergeron Inc	0 (0)	0 (0)	0 (0)	687 (0.01)
Fromagerie Blackburn	0 (0)	0 (0)	0 (0)	141 (0)
Fromagerie Des Basques Inc	0 (0)	0 (0)	0 (0)	246 (0.01)
Fromagerie Guitare	0 (0)	0 (0)	0 (0)	79 (0)
Gasthaus on the Lake	0 (0)	0 (0)	0 (0)	165 (0)
GeneralMills	348 (3.44)	33082 (17.32)	3586 (9.03)	224980 (4.69)
Georgia Main Food Group	0 (0)	0 (0)	0 (0)	151 (0)
Gigi Importing	117 (1.16)	0 (0)	0 (0)	7513 (0.16)
Giro Restaurant	0 (0)	0 (0)	33 (0.08)	1589 (0.03)
Globe Wholesale Meats	0 (0)	0 (0)	22 (0.06)	1063 (0.02)
Gold Court Abalone Restaurant	0 (0)	0 (0)	0 (0)	1002 (0.02)
Golden Paramount Seafood	0 (0)	0 (0)	0 (0)	291 (0.01)
Goodfood	434 (4.29)	1840 (0.96)	144 (0.36)	29900 (0.62)
GourmetWarehouse	0 (0)	0 (0)	0 (0)	99 (0)
Grace Foods	0 (0)	0 (0)	0 (0)	377 (0.01)
Grec Baie-Jolie	0 (0)	0 (0)	0 (0)	248 (0.01)
Greco Foods	0 (0)	0 (0)	0 (0)	22 (0)
Greco Pizza	6 (0.06)	4 (0)	1 (0)	306 (0.01)
Grilly's Restaurant	0 (0)	0 (0)	0 (0)	1120 (0.02)
Group Sportscene	0 (0)	0 (0)	0 (0)	166 (0)
Hain-Celestial	5 (0.05)	5 (0)	7 (0.02)	2889 (0.06)
HallesBoucherie	1 (0.01)	2 (0)	0 (0)	244 (0.01)
Hana Sushi	0 (0)	0 (0)	0 (0)	268 (0.01)
Harvey's	0 (0)	0 (0)	0 (0)	10821 (0.23)
Hay Caramba	0 (0)	0 (0)	50 (0.13)	1942 (0.04)
Healthy Berries	0 (0)	0 (0)	0 (0)	289 (0.01)
Heartland Food	0 (0)	0 (0)	0 (0)	2906 (0.06)
Hell's Chicken	0 (0)	0 (0)	0 (0)	30 (0)
Hello Fresh	46 (0.45)	8 (0)	44 (0.11)	21630 (0.45)
Hershey	131 (1.29)	5566 (2.91)	1407 (3.54)	162381 (3.38)
Highland Farms	52 (0.51)	0 (0)	0 (0)	11227 (0.23)
Hill & Knowlton Strategies	0 (0)	0 (0)	0 (0)	1 (0)

Humpty's Restaurant	0 (0)	0 (0)	0 (0)	1726 (0.04)
IGA	0 (0)	50 (0.03)	45 (0.11)	4848 (0.1)
IHOP	0 (0)	0 (0)	0 (0)	1885 (0.04)
Ingrigue Bistro	0 (0)	0 (0)	0 (0)	25 (0)
Intermarche	0 (0)	0 (0)	0 (0)	156 (0)
International Cheese	0 (0)	0 (0)	0 (0)	1612 (0.03)
Italian Supermarket	0 (0)	0 (0)	0 (0)	454 (0.01)
Italpasta	0 (0)	0 (0)	14 (0.04)	1277 (0.03)
JNK Food	0 (0)	0 (0)	0 (0)	416 (0.01)
Jack Astors	0 (0)	1 (0)	0 (0)	310 (0.01)
Jack Links Canada	0 (0)	0 (0)	0 (0)	99 (0)
Jacks Chicken	0 (0)	0 (0)	0 (0)	464 (0.01)
Japan Food	0 (0)	0 (0)	0 (0)	2675 (0.06)
Japanese Village	0 (0)	0 (0)	0 (0)	199 (0)
Jelly Belly	0 (0)	108 (0.06)	4 (0.01)	3365 (0.07)
Jennie's Diner	0 (0)	0 (0)	6 (0.02)	4054 (0.08)
Jenny Craig	0 (0)	6 (0)	5 (0.01)	11892 (0.25)
Jim Pattison	0 (0)	0 (0)	9 (0.02)	1613 (0.03)
Joey Restaurants	0 (0)	168 (0.09)	0 (0)	351 (0.01)
Johnsonville	0 (0)	0 (0)	0 (0)	575 (0.01)
Johnvince Foods	20 (0.2)	0 (0)	0 (0)	8765 (0.18)
Juan Meat Market	0 (0)	0 (0)	24 (0.06)	702 (0.01)
Jungle Jim's Eatery	0 (0)	0 (0)	0 (0)	68 (0)
KFC	72 (0.71)	905 (0.47)	580 (1.46)	81050 (1.69)
KIND	0 (0)	0 (0)	0 (0)	238 (0)
Kam Yen Jan Sausage	0 (0)	0 (0)	0 (0)	34 (0)
Kami Pizzeria	0 (0)	0 (0)	0 (0)	461 (0.01)
Kelloggs	62 (0.61)	22575 (11.82)	528 (1.33)	116902 (2.44)
Kelly O'Bryans Restaurant	0 (0)	0 (0)	0 (0)	614 (0.01)
Kelly's Nutrition	0 (0)	0 (0)	0 (0)	176 (0)
Kelsey's	0 (0)	0 (0)	0 (0)	1804 (0.04)
Kins Market	0 (0)	0 (0)	0 (0)	321 (0.01)
Kitcho Japanese Restaurant	0 (0)	0 (0)	0 (0)	123 (0)
Kraft Canada	184 (1.82)	1295 (0.68)	543 (1.37)	123292 (2.57)
Kung Fu Fish	0 (0)	0 (0)	0 (0)	166 (0)
Kwality Sweets & Restaurant	0 (0)	0 (0)	0 (0)	1099 (0.02)
L'Unique Sushi	0 (0)	0 (0)	0 (0)	1 (0)
La Coop Fédérée	0 (0)	0 (0)	0 (0)	867 (0.02)
La Federation des producteur a	102 (1.01)	75 (0.04)	134 (0.34)	4975 (0.1)
La Maison des Viandes	0 (0)	0 (0)	7 (0.02)	471 (0.01)
La Maison du Bootlegger	0 (0)	0 (0)	0 (0)	494 (0.01)
La Mexicanada Restaurant	0 (0)	0 (0)	14 (0.04)	421 (0.01)
La Patisserie	0 (0)	0 (0)	0 (0)	45 (0)

La Piazza Allegra	0 (0)	0 (0)	0 (0)	272 (0.01)
Lady York Foods	140 (1.38)	0 (0)	39 (0.1)	4372 (0.09)
Lal Mahal Rice	0 (0)	0 (0)	0 (0)	1095 (0.02)
Laras	0 (0)	0 (0)	0 (0)	376 (0.01)
Lassonde Industries	0 (0)	0 (0)	1 (0)	45 (0)
Lavazza	0 (0)	19 (0.01)	5 (0.01)	6647 (0.14)
Le Kiu	0 (0)	0 (0)	0 (0)	666 (0.01)
Leclerc Foods	0 (0)	0 (0)	6 (0.02)	15 (0)
Lee Kum Kee	0 (0)	0 (0)	0 (0)	244 (0.01)
Leo Pizza Restaurants	0 (0)	0 (0)	0 (0)	53 (0)
Les Producteurs de Lait du Que	68 (0.67)	287 (0.15)	75 (0.19)	17089 (0.36)
Limestone Organiz Creamery	7 (0.07)	0 (0)	0 (0)	778 (0.02)
Lindt Canada	0 (0)	90 (0.05)	71 (0.18)	6895 (0.14)
Little Caesars	9 (0.09)	3372 (1.77)	322 (0.81)	61418 (1.28)
Little Miss Chief	0 (0)	0 (0)	0 (0)	81 (0)
Little Texas Roadhouse Bar and	0 (0)	0 (0)	0 (0)	1078 (0.02)
Loblaw Companies	347 (3.43)	2013 (1.05)	497 (1.25)	59668 (1.24)
M&M Meat	146 (1.44)	855 (0.45)	74 (0.19)	27546 (0.57)
MTY Food Group	17 (0.17)	1 (0)	36 (0.09)	14514 (0.3)
Magasin Berchicci	0 (0)	0 (0)	45 (0.11)	1012 (0.02)
Magyar Kepek Restaurant	0 (0)	0 (0)	0 (0)	483 (0.01)
Magyar Restaurant	0 (0)	0 (0)	0 (0)	2 (0)
Mandarin Restaurants	0 (0)	13 (0.01)	13 (0.03)	4104 (0.09)
Manitoba Egg Farmers	0 (0)	0 (0)	0 (0)	1040 (0.02)
Manitoba Pork Council	0 (0)	0 (0)	0 (0)	46 (0)
Mannarich Food Inc	0 (0)	0 (0)	0 (0)	4 (0)
Maple Leaf Foods	695 (6.87)	2112 (1.11)	519 (1.31)	42175 (0.88)
Maple Lodge Farms	2 (0.02)	71 (0.04)	81 (0.2)	7411 (0.15)
Marche Caron	0 (0)	0 (0)	0 (0)	52 (0)
Marche Public De La Mitis	0 (0)	0 (0)	0 (0)	80 (0)
Marche du Monde	2 (0.02)	1 (0)	1 (0)	336 (0.01)
Marches Bonanza	0 (0)	0 (0)	45 (0.11)	2035 (0.04)
Marini Foods	0 (0)	0 (0)	21 (0.05)	1895 (0.04)
Mars Inc	5 (0.05)	941 (0.49)	245 (0.62)	48832 (1.02)
Mary Brown's	0 (0)	0 (0)	0 (0)	414 (0.01)
Maurya's Fine Indian Cuisine	0 (0)	0 (0)	0 (0)	216 (0)
Maxi	105 (1.04)	40 (0.02)	16 (0.04)	395 (0.01)
Maxim Resto	0 (0)	0 (0)	0 (0)	1236 (0.03)
Maxims Bakery	0 (0)	0 (0)	0 (0)	268 (0.01)
McCain Foods	19 (0.19)	1035 (0.54)	91 (0.23)	18212 (0.38)
McClellan Berry Farm	0 (0)	0 (0)	0 (0)	255 (0.01)

McCormick	207	(2.04)	1036	(0.54)	96	(0.24)	26374	(0.55)
McDonalds Canada	224	(2.21)	7330	(3.84)	4379	(11.03)	410902	(8.56)
Metro Richelieu	321	(3.17)	289	(0.15)	48	(0.12)	16321	(0.34)
Mexiglu Restaurant	0	(0)	0	(0)	0	(0)	6	(0)
Mike's Meats Inc	0	(0)	0	(0)	0	(0)	21	(0)
Millstream Foods	0	(0)	0	(0)	0	(0)	420	(0.01)
Miss Fresh Inc	0	(0)	0	(0)	1	(0)	2859	(0.06)
Mizkan America Inc.	0	(0)	2	(0)	0	(0)	637	(0.01)
Moliciero	0	(0)	0	(0)	0	(0)	1269	(0.03)
Molisana Imports	0	(0)	0	(0)	3	(0.01)	265	(0.01)
Mondelez	27	(0.27)	447	(0.23)	321	(0.81)	87369	(1.82)
Mondhani Yogurt	0	(0)	0	(0)	0	(0)	101	(0)
Montana's BBQ & Bar	0	(0)	0	(0)	0	(0)	8445	(0.18)
Montego Resto-Club	14	(0.14)	0	(0)	5	(0.01)	1404	(0.03)
Moon Wok Chinese Restaurant	0	(0)	0	(0)	0	(0)	647	(0.01)
Mrakovic Fine Foods	0	(0)	0	(0)	0	(0)	183	(0)
Mrakovic Meat & Deli	0	(0)	0	(0)	0	(0)	15	(0)
Mucho Burrito	0	(0)	1	(0)	5	(0.01)	3182	(0.07)
Naked Chocolate	1	(0.01)	0	(0)	0	(0)	96	(0)
Nanak Foods	0	(0)	0	(0)	0	(0)	323	(0.01)
Nestle Canada	10	(0.1)	63	(0.03)	34	(0.09)	32340	(0.67)
Newport Fish Importers	0	(0)	0	(0)	0	(0)	112	(0)
Nicosia	0	(0)	0	(0)	0	(0)	522	(0.01)
Nilgiris Restaurant	0	(0)	0	(0)	0	(0)	1236	(0.03)
No Frills	0	(0)	0	(0)	0	(0)	407	(0.01)
Northern Venture	0	(0)	0	(0)	0	(0)	3	(0)
Nosso Talho Inc.	0	(0)	0	(0)	0	(0)	1980	(0.04)
O'Reilly's Irish Pub	0	(0)	0	(0)	0	(0)	124	(0)
OMG Steak House	0	(0)	0	(0)	0	(0)	104	(0)
Ocean Brands	0	(0)	0	(0)	0	(0)	293	(0.01)
Ocean Choice International	0	(0)	0	(0)	0	(0)	94	(0)
Old Fashion Foods Ltd.	0	(0)	0	(0)	0	(0)	158	(0)
Ole Smokes Coffee	0	(0)	0	(0)	0	(0)	950	(0.02)
Olivieri	24	(0.24)	80	(0.04)	17	(0.04)	8647	(0.18)
Olymel	120	(1.19)	70	(0.04)	33	(0.08)	10415	(0.22)
Opa! Of Greece	0	(0)	0	(0)	0	(0)	555	(0.01)
Original Joe's	0	(0)	0	(0)	0	(0)	257	(0.01)
Overwitea Food Group	0	(0)	122	(0.06)	8	(0.02)	15487	(0.32)
Oxford Foods	0	(0)	57	(0.03)	0	(0)	3589	(0.07)
Padamandi Restaurant	0	(0)	0	(0)	0	(0)	1620	(0.03)
Panago	0	(0)	0	(0)	0	(0)	7174	(0.15)
Paolo's Café	0	(0)	0	(0)	0	(0)	4	(0)
Papa John's	0	(0)	0	(0)	0	(0)	404	(0.01)
Parmalat	131	(1.29)	16367	(8.57)	973	(2.45)	93581	(1.95)

Patisserie Fidelice	0 (0)	0 (0)	3 (0.01)	359 (0.01)
Peak of the Market	0 (0)	0 (0)	0 (0)	201 (0)
PepsiCo	104 (1.03)	466 (0.24)	1073 (2.7)	278661 (5.8)
Perfetti Van Melle	0 (0)	85 (0.04)	17 (0.04)	844 (0.02)
Perkins Restaurant and Bakery	0 (0)	0 (0)	0 (0)	685 (0.01)
Petro Canada	0 (0)	0 (0)	0 (0)	54 (0)
Piatto Pizzeria	0 (0)	0 (0)	0 (0)	90 (0)
Piggy's Restaurant	0 (0)	0 (0)	0 (0)	828 (0.02)
Pinty's Delicious Foods	0 (0)	0 (0)	0 (0)	2453 (0.05)
Pizza 73	0 (0)	0 (0)	0 (0)	330 (0.01)
Pizza Delight	26 (0.26)	8 (0)	0 (0)	6041 (0.13)
Pizza Hotline	0 (0)	0 (0)	0 (0)	31 (0)
Pizza Hut	37 (0.37)	38 (0.02)	51 (0.13)	35159 (0.73)
Pizza La Difference	0 (0)	0 (0)	0 (0)	19 (0)
Pizza Maximum	0 (0)	0 (0)	0 (0)	187 (0)
Pizza Nova	0 (0)	0 (0)	0 (0)	483 (0.01)
Pizza Pizza	4 (0.04)	41 (0.02)	14 (0.04)	1906 (0.04)
Pizzapro	1 (0.01)	3 (0)	2 (0.01)	374 (0.01)
Pizzaville Inc	0 (0)	0 (0)	0 (0)	4 (0)
Plaisirs Gastronomiques Inc.	0 (0)	0 (0)	0 (0)	2417 (0.05)
Popeyes	4 (0.04)	0 (0)	0 (0)	3403 (0.07)
Post Foods	57 (0.56)	9655 (5.06)	520 (1.31)	85428 (1.78)
Potenza Meats	0 (0)	0 (0)	2 (0.01)	62 (0)
Prince Restaurant	0 (0)	0 (0)	0 (0)	3 (0)
Producteurs Pommes du Quebec	0 (0)	0 (0)	1 (0)	263 (0.01)
Provigo	12 (0.12)	11 (0.01)	0 (0)	55 (0)
Purdy's Chocolate	0 (0)	0 (0)	0 (0)	54 (0)
Purity Dairy	0 (0)	0 (0)	0 (0)	193 (0)
Qoola Fresh Yogurt	0 (0)	0 (0)	0 (0)	163 (0)
Ralph's Texas Bar & Steakhouse	0 (0)	0 (0)	0 (0)	27 (0)
Recipe Unlimited	4 (0.04)	25 (0.01)	3 (0.01)	32168 (0.67)
Red Bull	0 (0)	72 (0.04)	53 (0.13)	17169 (0.36)
Red Lobster	7 (0.07)	1036 (0.54)	227 (0.57)	26036 (0.54)
Restaurant & Bistro Pilsen Inc	0 (0)	0 (0)	3 (0.01)	218 (0)
Restaurant Amici	0 (0)	0 (0)	0 (0)	346 (0.01)
Restaurant Demers Inc.	0 (0)	0 (0)	0 (0)	78 (0)
Restaurant L'Auguste	0 (0)	0 (0)	0 (0)	73 (0)
Restaurant L'Eau a la Bouche	0 (0)	0 (0)	0 (0)	4 (0)
Restaurant La Cuisine Inc.	5 (0.05)	1 (0)	0 (0)	284 (0.01)
Restaurant Le Gourmet	0 (0)	0 (0)	0 (0)	26 (0)
Restaurant Le Milsa	0 (0)	0 (0)	1 (0)	180 (0)

Restaurant Le Patrimoine	0 (0)	0 (0)	0 (0)	5 (0)
Restaurant Le Principal	0 (0)	0 (0)	0 (0)	439 (0.01)
Restaurant Le Sushi Shack	0 (0)	0 (0)	0 (0)	13 (0)
Restaurant Le Tournesol	0 (0)	0 (0)	0 (0)	10 (0)
Restaurant Les Jardins	0 (0)	0 (0)	0 (0)	10 (0)
Restaurant Maman Fournier	0 (0)	0 (0)	0 (0)	314 (0.01)
Restaurant Normandin	0 (0)	0 (0)	0 (0)	3151 (0.07)
Restaurant Pacini Chicoutimi	1 (0.01)	2 (0)	0 (0)	236 (0)
Restaurant Pastali Inc	3 (0.03)	0 (0)	0 (0)	204 (0)
Restaurant Poivre Noir	0 (0)	0 (0)	0 (0)	108 (0)
Restaurant St. Pub	0 (0)	0 (0)	0 (0)	233 (0)
Restaurant Thomas Tam	2 (0.02)	13 (0.01)	0 (0)	228 (0)
Restaurant dans L'Espace	0 (0)	0 (0)	1 (0)	520 (0.01)
Restaurants Geral Inc	0 (0)	0 (0)	0 (0)	57 (0)
Resto-Bar Dauphin	0 (0)	0 (0)	0 (0)	161 (0)
Resto-Bar L'Ambiance	0 (0)	0 (0)	0 (0)	90 (0)
Resto-Bar L'Atelier Inc	0 (0)	0 (0)	0 (0)	75 (0)
Resto-Bar La Veranda	0 (0)	0 (0)	0 (0)	45 (0)
Resto-Bar Le Tremblay	0 (0)	0 (0)	0 (0)	114 (0)
Resto-Motel Bon Voyage	0 (0)	0 (0)	0 (0)	4 (0)
Resto-Pub Le Panache	0 (0)	0 (0)	0 (0)	2 (0)
Resto Le Parmesan	0 (0)	0 (0)	0 (0)	964 (0.02)
Ricky's All Day Grill	0 (0)	0 (0)	0 (0)	1323 (0.03)
Rideau Carleton Buffet	0 (0)	0 (0)	0 (0)	26 (0)
Robin's Diner	0 (0)	0 (0)	0 (0)	9854 (0.21)
Rocky Mountain Chocolate Facto	0 (0)	0 (0)	0 (0)	25 (0)
Rotisserie Fusey	0 (0)	0 (0)	0 (0)	1240 (0.03)
Royal BBQ	0 (0)	0 (0)	0 (0)	234 (0)
Royal Fine Dining	0 (0)	0 (0)	0 (0)	987 (0.02)
Royal Pizza	0 (0)	0 (0)	0 (0)	151 (0)
Safeway	0 (0)	0 (0)	0 (0)	434 (0.01)
Saigon Maxim Ltd.	0 (0)	0 (0)	0 (0)	480 (0.01)
Saigon Star Restaurant	0 (0)	0 (0)	0 (0)	672 (0.01)
San Antonio Fish Market	0 (0)	0 (0)	0 (0)	621 (0.01)
Sanj Food	0 (0)	0 (0)	0 (0)	280 (0.01)
Saputo	8 (0.08)	241 (0.13)	36 (0.09)	3853 (0.08)
Sarajevo Grill and Meat	0 (0)	0 (0)	0 (0)	646 (0.01)
SaskMilk	0 (0)	0 (0)	0 (0)	12 (0)
Sasso Pizza	0 (0)	0 (0)	0 (0)	303 (0.01)
Save on Foods	17 (0.17)	0 (0)	1 (0)	10080 (0.21)
Scores Restaurants	38 (0.38)	12 (0.01)	9 (0.02)	2028 (0.04)
Scott's Inn Restaurant	0 (0)	0 (0)	0 (0)	609 (0.01)
Sea Harbour Restaurant	0 (0)	0 (0)	0 (0)	128 (0)

Searay Foods	0 (0)	0 (0)	0 (0)	225 (0)
Second Cup	0 (0)	0 (0)	0 (0)	16 (0)
Shan Food	0 (0)	0 (0)	0 (0)	227 (0)
Shing Hing Food	0 (0)	0 (0)	0 (0)	63 (0)
Shoppers Drug Mart	0 (0)	0 (0)	0 (0)	94 (0)
Siderno Quality Meat	0 (0)	0 (0)	1 (0)	62 (0)
Skip the Dishes	0 (0)	193 (0.1)	117 (0.29)	22391 (0.47)
Smartfood	0 (0)	0 (0)	0 (0)	203 (0)
Smokey Joe's	0 (0)	0 (0)	0 (0)	127 (0)
Smuckers	40 (0.4)	615 (0.32)	767 (1.93)	59866 (1.25)
Sobey's	385 (3.8)	965 (0.51)	438 (1.1)	56736 (1.18)
Southside Pizzeria	1 (0.01)	0 (0)	0 (0)	481 (0.01)
Special Chicken Restaurant	0 (0)	0 (0)	0 (0)	84 (0)
St.Germain Bakery	0 (0)	0 (0)	0 (0)	55 (0)
St.Hubert	121 (1.2)	61 (0.03)	106 (0.27)	23480 (0.49)
Starbucks	8 (0.08)	52 (0.03)	74 (0.19)	15545 (0.32)
State & Main	0 (0)	0 (0)	0 (0)	347 (0.01)
Steak Supreme Restaurant	0 (0)	0 (0)	0 (0)	67 (0)
Storck Canada	57 (0.56)	239 (0.13)	349 (0.88)	36992 (0.77)
Stratos Pizzeria	0 (0)	0 (0)	1 (0)	87 (0)
Subway	335 (3.31)	3699 (1.94)	367 (0.92)	167023 (3.48)
Summer Fresh	0 (0)	0 (0)	6 (0.02)	2753 (0.06)
Sun Ming Hong	0 (0)	0 (0)	0 (0)	5 (0)
Sun Rype	0 (0)	0 (0)	1 (0)	600 (0.01)
Sun Wah Foods	0 (0)	0 (0)	0 (0)	76 (0)
Sunny Group	0 (0)	0 (0)	0 (0)	2415 (0.05)
Super C	291 (2.87)	278 (0.15)	68 (0.17)	17065 (0.36)
Surati Sweet Mart	0 (0)	0 (0)	0 (0)	137 (0)
Swirls Ice Cream	0 (0)	0 (0)	0 (0)	1 (0)
Swiss Chalet	0 (0)	0 (0)	0 (0)	10394 (0.22)
TI Foods	0 (0)	0 (0)	0 (0)	175 (0)
Taco Bell	0 (0)	0 (0)	0 (0)	2354 (0.05)
Tacos La Mexicana	0 (0)	0 (0)	1 (0)	173 (0)
Tai Foong International	0 (0)	0 (0)	0 (0)	4 (0)
Tandoori Flame	0 (0)	0 (0)	0 (0)	132 (0)
Tasty BBQ Seafood Restaurant	0 (0)	0 (0)	0 (0)	2090 (0.04)
Tea India	0 (0)	0 (0)	0 (0)	2950 (0.06)
Tetley	10 (0.1)	52 (0.03)	115 (0.29)	8298 (0.17)
Thai Express	2 (0.02)	0 (0)	0 (0)	812 (0.02)
Thai House Cuisine	0 (0)	0 (0)	0 (0)	998 (0.02)
Thai Zone	0 (0)	0 (0)	0 (0)	24 (0)
The Chopped Leaf	0 (0)	0 (0)	0 (0)	3 (0)
The Deluxe Chinese Restaurant	0 (0)	0 (0)	0 (0)	135 (0)

The Jammery	0 (0)	0 (0)	0 (0)	324 (0.01)
The Keg Restaurants	1 (0.01)	44 (0.02)	5 (0.01)	3207 (0.07)
The Little Potato	0 (0)	0 (0)	0 (0)	1518 (0.03)
The Rail Coal Fire Bistro	0 (0)	0 (0)	0 (0)	947 (0.02)
The Rustic Chef	0 (0)	0 (0)	0 (0)	1052 (0.02)
The Sweet Gallery	0 (0)	0 (0)	0 (0)	16 (0)
Thistle Farm	0 (0)	0 (0)	0 (0)	66 (0)
Tiki Ming	0 (0)	0 (0)	0 (0)	272 (0.01)
Tim Hortons	232 (2.29)	11871 (6.22)	2294 (5.78)	403213 (8.4)
Timothy's Cafes	0 (0)	0 (0)	0 (0)	386 (0.01)
Tokaj Restaurant	0 (0)	0 (0)	0 (0)	281 (0.01)
Toku Japanese Restaurant	0 (0)	0 (0)	0 (0)	2 (0)
Top Pizza Restaurant	0 (0)	0 (0)	0 (0)	1436 (0.03)
Topps Company Inc	18 (0.18)	15754 (8.25)	466 (1.17)	222 (0)
Toujours Mike's	85 (0.84)	0 (0)	40 (0.1)	2359 (0.05)
Touro Churrascaria	0 (0)	0 (0)	33 (0.08)	1618 (0.03)
TreRose Bakery	0 (0)	0 (0)	60 (0.15)	2034 (0.04)
Trigo Bakery	0 (0)	0 (0)	0 (0)	91 (0)
Triple A Cheese	0 (0)	0 (0)	0 (0)	1515 (0.03)
Trukkers Restaurant	0 (0)	0 (0)	0 (0)	21 (0)
Ultima Foods	0 (0)	0 (0)	8 (0.02)	6795 (0.14)
Uncle Bill	0 (0)	0 (0)	0 (0)	308 (0.01)
Unico Foods	52 (0.51)	0 (0)	7 (0.02)	1591 (0.03)
Unilever Canada	49 (0.48)	3490 (1.83)	1027 (2.59)	106399 (2.22)
Unknown	110 (1.09)	4 (0)	2 (0.01)	1921 (0.04)
Vallee Framboise	1 (0.01)	0 (0)	0 (0)	54 (0)
Van Fortune Terrace Restaurant	0 (0)	0 (0)	0 (0)	1 (0)
Van Houtte Coffee	80 (0.79)	57 (0.03)	11 (0.03)	374 (0.01)
Vern's Pizza	0 (0)	0 (0)	0 (0)	818 (0.02)
Very Fair Seafood Restaurant	0 (0)	0 (0)	0 (0)	190 (0)
Vielle Fromagerie	0 (0)	0 (0)	0 (0)	95 (0)
Walmart Canada	2 (0.02)	921 (0.48)	151 (0.38)	13155 (0.27)
WeightWatchers	19 (0.19)	9 (0)	85 (0.21)	26002 (0.54)
Wendy's	20 (0.2)	2466 (1.29)	1808 (4.55)	146682 (3.06)
Weston Bakeries	0 (0)	180 (0.09)	104 (0.26)	8249 (0.17)
White Goose Bistro	0 (0)	26 (0.01)	0 (0)	520 (0.01)
White Spot Ltd.	0 (0)	0 (0)	2 (0.01)	1336 (0.03)
White Wave Foods	0 (0)	1045 (0.55)	30 (0.08)	3253 (0.07)
Windy's Ice Cream Diner	0 (0)	0 (0)	0 (0)	1 (0)
Wing Wah Mooncake	0 (0)	0 (0)	0 (0)	105 (0)
Woori Supermarket	0 (0)	5 (0)	0 (0)	108 (0)
Yin Yan Sushi	0 (0)	0 (0)	2 (0.01)	220 (0)
Yu Fei Yu Roast Fish	0 (0)	0 (0)	0 (0)	276 (0.01)

Yum Brands	32 (0.32)	1969 (1.03)	133 (0.33)	31420 (0.65)
Yummy Market	0 (0)	0 (0)	0 (0)	99 (0)
Yuzu Sushi	0 (0)	50 (0.03)	44 (0.11)	678 (0.01)
Z&Y Shanghai Cuisine	0 (0)	0 (0)	0 (0)	314 (0.01)
ZIBO	0 (0)	0 (0)	0 (0)	106 (0)
Total	10123 (100)	190963 (100)	39712 (100)	4800727 (100)

Table S3. Eigenvectors for principal component analysis of food ads to four target age groups, by 497 subsidiary food companies.

Target Age Group	Components		
	1	2	3
Preschoolers	0.396445	0.886537	-.085345
Children	0.500643	-0.185209	0.829560
Adolescents	0.515354	-0.416965	-0.512069
Adults	0.571488	-0.076739	-0.205748

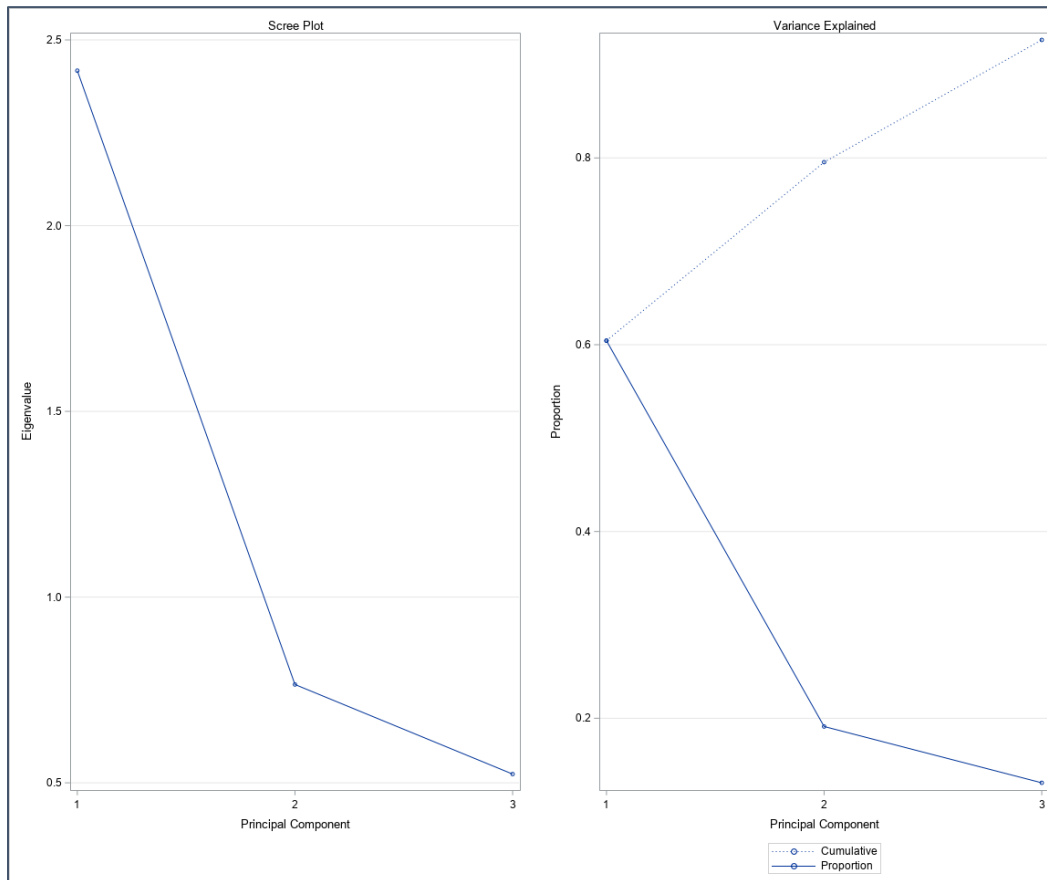


Figure S1. Scree plot of principal component analysis of television ads broadcast to four target age groups, by 497 subsidiary food companies.

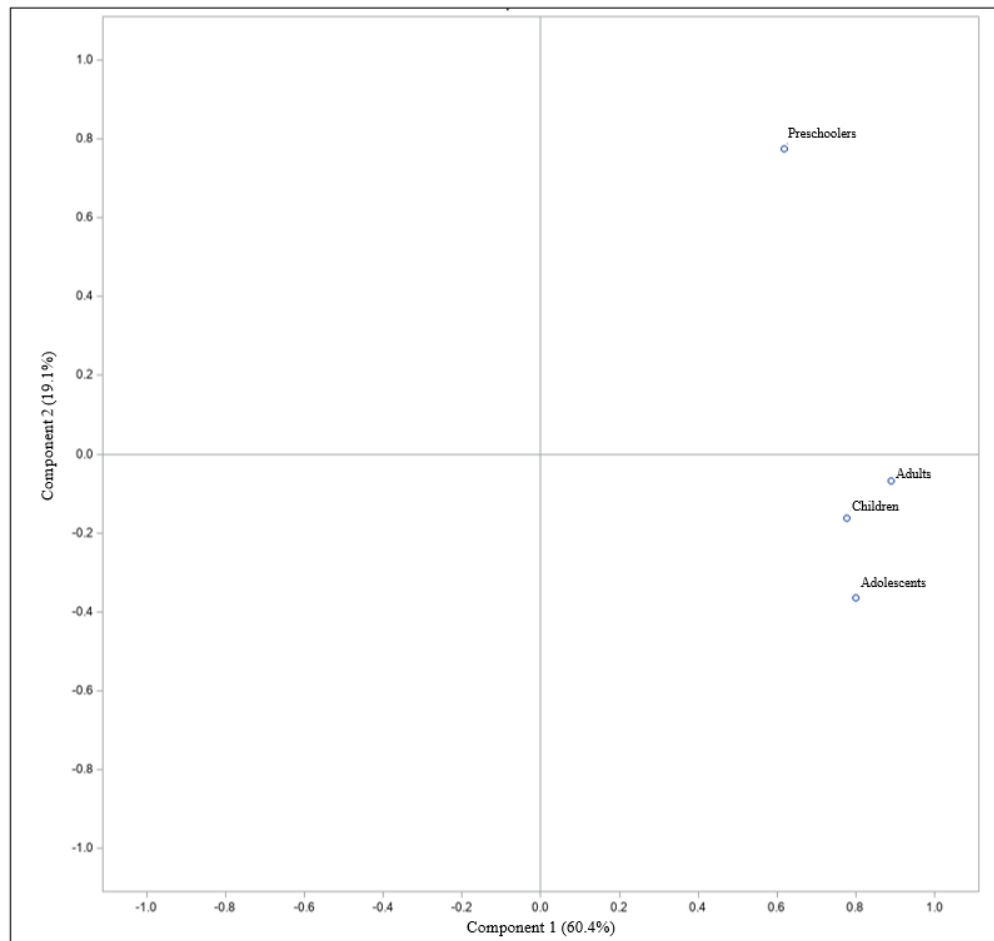


Figure S2. Component pattern plot between principal components 1 and 2 and standardized age variables

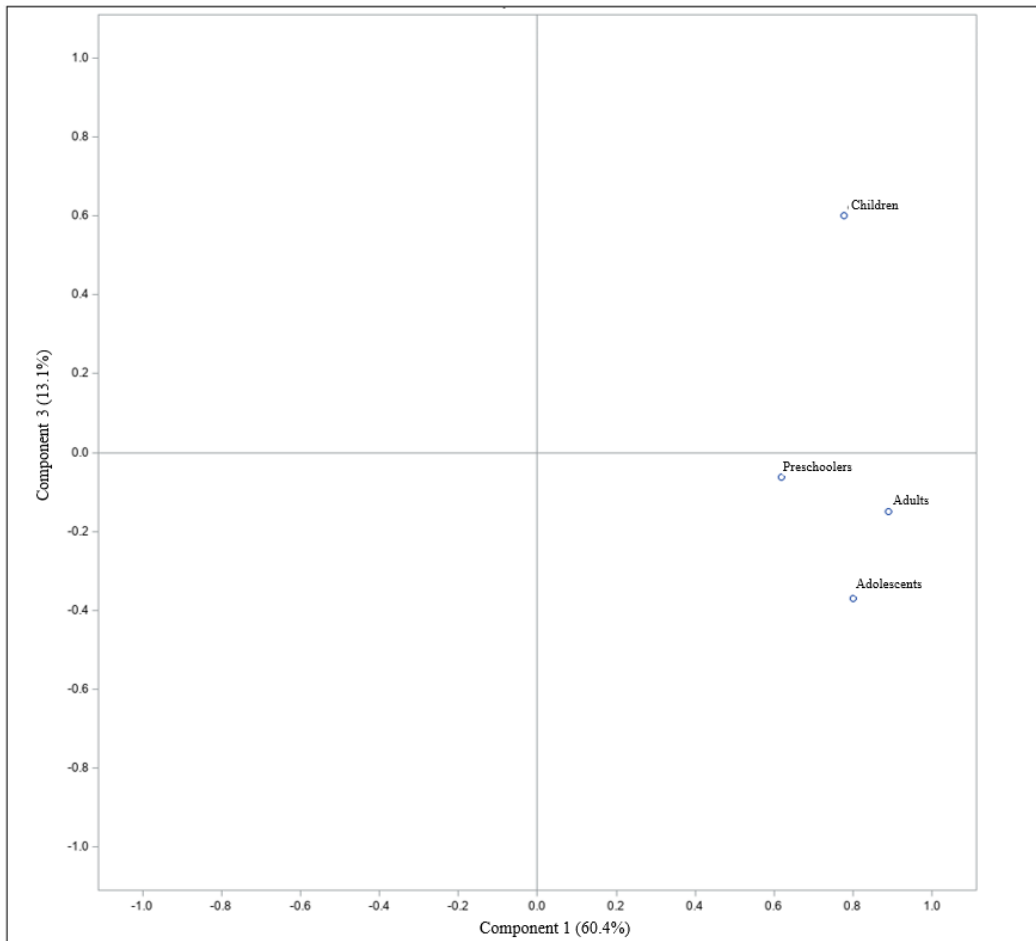



Figure S3. Component pattern plot between principal components 1 and 3 and standardized age variables

Appendix D – Submission Confirmation for Component Article 2

7/16/2020

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