

**Awareness and use of Canada's Food Guide and their association with dietary behaviours
among Canadian adolescents: A cross-sectional analysis of the 2023 Canadian Health Survey
on Children and Youth**

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Preface

Approvals:

This study involved the secondary data analysis of the 2023 Canadian Health Survey on Children and Youth (CHSCY). Access to the data was provided by Statistics Canada.

Author contributions:

Virginie Desgreniers (VD) was the principal investigator and main author of this thesis and included article, with the help of her supervisors Dr. Claire Tugault-Lafleur (CTL) and Dr. Jean-Philippe Chaput (JPC). VD planned the analyses and went to the Ottawa-Outaouais Research Data Centre (ORDC) to execute them. Analyses and results were approved by CTL and JPC. VD was also responsible for interpreting the findings and drafting the thesis and article. She received help on the conception, analysis, and writing from her supervisors and her thesis advisory committee member Dr. Monique Potvin Kent (MPK). The final documents were approved by all co-authors before being submitted for examination.

Abstract

Canadian adolescents have suboptimal diets, requiring evidence on engagement with Canada's Food Guide (CFG). This cross-sectional study described CFG awareness and use among adolescents and assessed associations between use and fruit and vegetable (F&V) and sugary beverage intakes among 6,930 adolescents aged 12–17 years in the 2023 Canadian Health Survey on Children and Youth. Participants were dichotomised into CFG users and non-users. Survey-weighted, adjusted logistic regression models examined whether CFG use was associated with consuming F&V ≥ 5 times/day and sugary beverages ≥ 5 times/week. Most (84%) adolescents were aware of CFG and 46% reported having used CFG, mainly to assess how well they were eating (40%). CFG users had higher odds of eating F&V ≥ 5 times/day (aOR=1.43, 95% CI=1.14-1.80) and lower odds of consuming sugary beverages ≥ 5 times/week (aOR=0.83, 95% CI=0.69-0.99) compared to non-users. Greater use of CFG among adolescents was associated with healthier food choices, although engagement remained limited.

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1. Introduction

Food-based dietary guidelines (FBDGs) provide evidence-based recommendations to help the general population achieve a healthy diet. According to the World Health Organization (WHO), a healthy diet is rich in plant-based foods such as fruits and vegetables, legumes, nuts, and whole grains, and is limited in free sugars, salt, and high amounts of fat, especially saturated fat¹. A 2019 global review found most countries with FBDGs include key messages suggesting a diverse diet rich in a variety of fruits and vegetables (93% of countries with FBDGs), carbohydrates (66%), protein foods (especially animal-source foods, which are depicted in all food guides) (74%), dairy (59%), and legumes (56%), while limiting excessive amounts of salt (90%), sugar (84%), and fat (89%)². A recent systematic review found that there is a lack of FBDGs aimed specifically at children and youth, both of which are age groups with unique nutritional needs and challenges³.

In Canada, approximately one out of three children and youth aged 5-17 years have overweight or obesity and are at greater risk for many nutrition-related non communicable diseases including, but not limited to, asthma, prediabetes, type 2 diabetes, and heart diseases⁴⁻⁷. The prevalence of overweight and obesity among youth aged 12-17 years has plateaued over the past two decades at approximately 36%⁸. Adolescents represent a population of particular interest in public health as they are in the process of developing independent food choices while still being influenced by the constraints of school and home food environments⁹. In response to these public health challenges and concerns over dietary quality and food skills among Canadians, Health Canada released a Healthy

Eating Strategy in 2016, which included new initiatives such as restricting unhealthy food and beverage marketing to children and youth, new food label regulations, and a revised Canada's Food Guide (CFG) to support Canadians in making healthier food choices^{10,11}.

Since the first CFG version released in 1942, named Canada's Official Food Rules, CFG has evolved to offer general guidance for Canadians over the age of two years. It also serves as a valuable resource for health professionals and policy makers in developing policies, programs, and educational materials^{12,13}. However, more studies are needed to examine whether youth's use of CFG is associated with better dietary quality.

2. Background

2.1 Dietary habits of Canadian adolescents

Eating habits, which encompass a variety of behaviours such as food choices and beverage consumption, are an important predictor of academic achievement and overall health and well-being among youth^{14,15}. Dietary habits developed during childhood are influenced by family socioeconomic status and can shape eating behaviours that persist into adulthood¹⁶. These habits may also affect weight trajectories over the life course, particularly among females^{15–18}.

Studies suggest that the diets of Canadian adolescents are generally high in foods of poor nutritional quality, including those high in fat, sugar, and/or sodium^{19,20}. A cross-sectional study assessing the nutritional quality of children's food choices using the 2015 Canadian Community Health Survey (CCHS) observed 21-25% of children aged 4-8 to 14-18 years' daily intake came from foods that are not recommended by CFG and exceed two or more of the upper thresholds for sodium, total fat, or sugar²⁰. They also noted a decrease in the nutritional quality of the diets as the consumption of these foods increased. An earlier study drawing from the 2004 CCHS also noted children and adolescents had the highest intake—55% of total calories—of ultra-processed foods, which are high in salt, sugar, oils, fats, and other highly processed ingredients²¹. A high intake of ultra-processed foods is associated with adverse health outcomes, including increased overweight and obesity rates and cardiometabolic comorbidities among children and adolescents, as well as early mortality and mental health outcomes^{22,23}.

2.1.1 Fruit and vegetable intake among Canadian adolescents

Intake of fruits and vegetables is often used as an indicator of a healthy diet, especially as general guidance suggests increasing the amount of fruits and vegetables in the diet^{24,25}.

Studies since the beginning of the 21st century have consistently shown that most Canadian youth consume insufficient amounts of fruits and vegetables, and that adolescents are less likely to meet recommended intake levels compared to children^{26–28}.

For example, one large cross-sectional study reported only 10% of Canadian students in grades 6-12 met the 2007 CFG recommendations of fruits and vegetables; approximately 17% of students in grades 6-7 met the recommended six daily servings of fruits and vegetables, and less than 7% of students in grades 9-12 met the recommended seven daily servings of fruits and vegetables for girls and eight daily servings for boys²⁷.

Although population-based comprehensive dietary surveys have been inconsistent in Canada, a repeated cross-sectional analysis comparing intakes from the 2004 and 2015 CCHS suggests the fruit and vegetable intake of Canadian adolescents aged 14-18 years has decreased by approximately 0.4 daily servings for boys and by 0.8 servings for girls²⁸. According to this study, 97% of girls and 90% of boys aged 14-18 years consumed fewer than the recommended eight daily servings of fruits and vegetables in 2015. Another study comparing the 2004 and 2015 CCHS data found youth aged 13-17 years consumed on average 0.4 less daily servings of fruits and vegetables, but 0.1 more daily servings of dark green and orange vegetables and 0.2 more daily servings of whole fruits in the 2015 survey compared to the 2004 survey²⁹. Furthermore, analyses from the CCHS show a downward trend in fruits and vegetables consumption among Canadians; in 2017, 28.6% of

Canadians aged 12 and older reported eating fruits and vegetables five or more times per day, compared to 30% in 2016 and 31.5% in 2015³⁰.

2.1.2 Sugary beverage intake among Canadian adolescents

Sugary beverages are a key food group of concern among adolescents in Canada. Sugary beverages, which are causally linked to higher body mass index (BMI) z-scores and many chronic diseases, have been the focus of numerous health promotion strategies in Canada^{31–35}. A high intake of sugary beverages can negatively affect overall diet quality by displacing foods higher in nutritive value, therefore reducing intake of essential nutrients²⁶.

Sugary beverages include 100% fruit juice, regular soft drinks, energy drinks, fruit-flavoured drinks, sports drinks, milkshakes or ice cream sodas, chocolate milk or hot chocolate, sweetened coffee drinks or iced tea^{36–38}. Soft drinks and fruit drinks are among the top 10 foods CFG recommends limiting due to their energy-dense and low nutritional value. Youth aged 9-18 years have been found to consume the most sugar-sweetened beverages (SSBs)—all sugary beverages except for 100% fruit juice—out of all age groups in Canada^{26,33}. Although daily consumption of all beverages had decreased since the 2004 CCHS, SSBs still accounted for 36% of beverage calories, and juice for 10% of beverage calories according to the 2015 CCHS, the most recent comprehensive nationwide dietary survey in Canada³³. In Ontario, approximately 55% of youth aged 12-17 years consumed seven or more sugary beverages, 40% consumed seven or more SSBs, and almost 5% consumed one or more energy drink in the past week according to the 2019 Canadian Health Survey on Children and Youth (CHSCY)³⁶. Fruit juice intake has decreased mostly among female adolescents since the 2004 CCHS, but nevertheless remains higher than

whole fruit intake²⁸. Finally, one study observing the trajectories of beverage consumption in Canadian youth aged 10-11 years from 2013 to 2019, using data from the Monitoring Activities for Teenagers to Comprehend their Habits longitudinal study, similarly found that, although sugary beverage intake trended downward throughout the years, it remained elevated with an average of at least one sugary drink per day by the age of 18 years³⁹.

2.1.3 Age and gender considerations

Compared to children, adolescents are less likely to meet recommended intakes of fruits and vegetables, with a downward trend in the number of servings reported by adolescents 13 years and older according to research comparing 2004 and 2015 CCHS data^{27,28}. This downward trend is significant among girls²⁸. Furthermore, previous studies have reported that the consumption of sugary beverages, especially fruit juice, remains elevated among adolescents, and that younger children consume fewer sugary beverages than adolescents^{29,39}.

Gender also often influences how adolescents engage with health and nutrition behaviours, with girls showing increased dieting and weight-related behaviours and general concern over their appearance⁴⁰. There is a greater risk of engaging in unhealthy eating behaviours when trying to conform, and social media engagement and exposure to image-related content can particularly impact body dissatisfaction and eating behaviours in young adults⁴¹. Socially constructed body ideals and standards can influence the way in which individuals of all genders approach food choices; however, the desire to conform through dietary behaviours tends to be stronger among girls, which may contribute to

disordered eating behaviours or greater fruit and vegetable consumption compared to boys^{42–44}.

2.2 Canada's Food Guide (CFG)

FBDGs provide recommendations for foods, food groups, and dietary patterns adapted to promote the overall health of their intended population by translating current scientific evidence. A 2019 global review reported that 90 countries had FBDGs, including seven in Africa, 17 in Asia and the Pacific, 33 in Europe, 27 in Latin America and the Caribbean, four in the near East, and two in North America—including CFG². Recent data suggests over 100 countries have now developed FBDGs⁴⁵.

CFG is a nationally recognized public health resource for evidence-based dietary guidelines to support healthy eating among Canadians. According to the 2012 CCHS, the 2007 CFG was the fourth most utilized resource for healthy eating⁴⁶. The 2019 release of the revised CFG was a significant shift from previous food-based dietary guidance, including a stronger focus on food skills and the integration of healthy lifestyle and eating behaviours. This was also the first version of CFG developed without input from the food and beverage industry to prevent conflicts of interest, despite industry stakeholders' attempts to include their interests during public consultation phases^{13,47}. Both the old and new versions of CFG include guidelines and/or recommendations for fruits and vegetables, grain products, and protein foods (named meat and alternatives in the 2007 CFG). However, the new CFG focuses on plate proportions rather than portion recommendations for Dietary Reference Intake (DRI) for each age and sex groups to facilitate interpretation for the Canadian population¹³. The 2019 CFG no longer considers milk and alternatives as a

separate food group, opting instead to include dairy products in the protein foods group¹². Moreover, while the 2007 CFG included 100% fruit juice in the fruits and vegetables food group, the 2019 CFG instead recommends limiting 100% fruit juice—now considered a sugary beverage—and opting for water as the preferred beverage⁴⁸. The 2019 CFG developed for the general population suggests filling half the plate with fruits and vegetables, one quarter of the plate with carbohydrates, and one quarter with protein foods. It emphasizes the importance of eating a variety of fruits and vegetables, whole grain foods, and a variety of protein foods, including plant-based proteins²⁵.

Canada's Dietary Guidelines elaborate on these healthy eating recommendations with specific directives regarding food choices⁴⁹. The first guideline suggests regularly consuming fruits and vegetables, whole grains, and protein foods, replacing saturated fats with unsaturated fats, and drinking primarily water. The second guideline suggests limiting processed or prepared foods, including sugary beverages, which are generally high in sodium, free sugars, or saturated fats. The third guideline emphasizes the need to foster food skills to support healthy eating.

Resources to assess Canadians' adherence to the 2019 CFG have recently been developed to promote CFG use among various age groups, including parents¹². For example, Health Canada released a "Teaching Canada's Food Guide" toolkit to support educators teaching CFG to children aged 4-11 years and developing food skills⁵⁰. However, no such age-adapted resources currently exist for adolescents; to date, Health Canada has only developed a brief summary of recommendations for adolescents, but there is limited evidence regarding the extent to which the targeted demographic utilizes this resource⁵¹.

Given the constantly evolving Canadian food environment, which renders ultra-palatable, low-nutrient foods readily accessible, there is a need for research and the development of tailored tools to support healthier eating among younger demographics^{11,52}.

2.3 Awareness, use, and perceptions of CFG

When looking at perceptions of CFG among the general Canadian population, a 2019 survey among 1,017 adults indicates that approximately three quarters of Canadians (74%) are aware of the 2019 CFG, and 49% believe the food guide is an important resource for eating behaviours⁵³. However, only 8% of adults reported choosing CFG as their preferred source of nutrition information after family and friends, general research, social media, cookbooks and magazines, and TV programs and documentaries. Two studies using focus groups of Canadian parents reported high awareness and positive perceptions of the 2019 CFG, although food prices, time constraints, household dietary preferences and picky eating, difficulty including children in the cooking phases, outside influences, and lack of skills and knowledge were identified as perceived challenges in trying to adhere to the guidelines^{54,55}. Another study comparing perceptions of CFG among parents reported high awareness of both the 2007 (94.5%) and 2019 (90.4%) CFGs, more favourable opinions concerning the usability and trustworthiness of the 2019 CFG, and a higher awareness of the plate proportion recommendations compared to the 2007 portion recommendations⁵⁶.

Few studies have examined awareness and use of the 2019 CFG among adolescents. One cross-sectional study examining awareness of CFG among Canadian children aged 10-17 years using a large sample (n=3,674) from the 2019 International Food Policy Study reported that 87% of participants had learned about CFG in school⁵⁷.

However, although youth seem to have a high awareness of CFG, 16% of those participants identified the wrong visual for the 2019 CFG. The study found that girls were significantly more likely than boys to have heard of CFG (OR = 1.61; 95% CI: 1.32-1.96). Similarly, older youth aged 14-17 years were more likely to report awareness of CFG compared to those aged 10-13 years (OR = 1.70; 95% CI: 1.39-2.07). In contrast, participants identifying as visible minorities were less likely to have heard of CFG compared to White participants, particularly Middle Eastern participants (OR = 0.26; 95% CI: 0.14-0.51), Latino (OR = 0.29; 95% CI: 0.15-0.56), South Asian (OR = 0.37; 95% CI: 0.24-0.55), and East/Southeast Asian (OR = 0.41; 95% CI: 0.30-0.56) participants. More recent and comprehensive research is needed to identify factors influencing awareness, comprehension, and implementation of CFG recommendations among adolescents across diverse regions and demographic groups.

Few studies have explored how Canadian youth perceive the usefulness and overall value of CFG. A qualitative study which aimed to assess knowledge and perceptions of the 2019 CFG among Canadian children aged 9-12 years (n=35) found that children had an overall positive perception of the food guide but demonstrated a lack of knowledge regarding certain food groups (i.e., plant-based proteins, highly processed foods, whole grain foods)⁵⁸. Children also reported many challenges related to CFG's recommendations to "Cook more often," "Eat meals with others," and "Enjoy your food." These included limited cooking skills, time constraints, food preferences, and negative feelings experienced at home. Furthermore, a recent study examined individual and sociodemographic factors and behaviours related to food and nutrition knowledge among

youth (n=968) with a survey consisting of 50 multiple-choice questions⁵⁹. The study reported that, on average, food and nutrition knowledge was poor among Canadian youth aged 13-19 years. However, knowledge scores were higher among those who used food, nutrition, and health mobile applications (i.e., a healthy eating resource). These findings highlight the need for research that informs the development of accessible, age-appropriate nutrition resources and supports for Canadian adolescents.

2.4 Food guide use and dietary intakes

Although several studies have examined awareness of CFG among Canadian youth and adults, few studies have researched the usefulness of CFG and whether it is associated with a better dietary quality⁶⁰⁻⁶². In one cross-sectional study examining awareness and use of the 2007 CFG among adults from the 2012 Alberta Survey, being aware of CFG (87% of participants) was associated with higher odds of consuming five or more daily fruit and vegetable servings⁶⁰. Univariate and multivariate results demonstrate the odds of being aware of CFG (univariate: OR = 2.1, 95% CI: 1.4-3.2 / multivariate: OR = 1.5, 95% CI: 1.0-2.5) and the odds of being familiar with specific recommendations of CFG such as food groups and serving sizes (univariate: OR = 1.6, 95% CI: 1.1-2.4 / multivariate: OR = 1.3, 95% CI: 0.9-2.0) were higher if participants reported consuming five or more daily servings of fruits and vegetables compared to those who reported consuming fewer than five daily servings. According to another study using data from the CCHS rapid response module on the Awareness and Usage of CFG, 84% of Canadians over the age of 12 had heard of CFG and 76% had looked through CFG, and men were less likely to have heard of CFG (OR = 0.64, 95% CI: 0.53-0.78) or to have looked through CFG (OR = 0.37, 95% CI: 0.31-0.45).

compared to women⁶². Participants who reported using CFG indicated that their primary reasons for doing so were to “choose foods,” “determine portions,” and for “other” unspecified purposes. Among those who had consulted CFG within the past six months, 24% reported having significantly improved their eating habits compared to one year prior. Furthermore, participants who consumed fewer than five daily servings of fruits and vegetables were significantly less likely to have consulted CFG in the past six months compared to those consuming five to ten daily servings (OR = 0.43; 95% CI: 0.34–0.55).

Studies have therefore reported an overall higher dietary quality for adult participants who are aware or have used CFG, but no study has examined this question in a younger age group. Adolescence is an important developmental period with unique nutritional needs and challenges, including increased autonomy over food choices, exposure to complex food environments, and rapid biological and social changes⁹. Given these unique challenges and the revisions introduced in the 2019 CFG, emphasizing fruit and vegetable intake and recommending water as the primary beverage, studies examining use and usefulness of the more recent CFG among the younger population are needed.

2.5 Gaps in the literature

Prior research examining fruit and vegetable consumption and sugary beverage intake among Canadian youth has largely relied on nutrition data collected more than a decade ago. Contemporary evidence on Canadian youth’s consumption of these key food groups is important to inform policy and health promotion efforts^{19,20}. Although there is limited research on associations between food and nutrition knowledge and dietary quality among

Canadian adolescents, research suggests adolescents with higher dietary self-efficacy may help achieve a better dietary quality^{63,64}.

Canada's food environment has changed in the past decades, encouraging an obesogenic diet through the availability of ultra-processed foods, increased food marketing, and social media environments that can promote disordered eating behaviours and exposure to unhealthy food products^{11,41,52}. Nutrition misinformation is rampant online, with social media influencers exerting their broad reach to promote unhealthy foods and beverages or advice based on lived experience rather than scientific evidence^{65,66}. This complex environment makes it increasingly difficult for youth to seek out reliable healthy eating resources such as CFG. These limitations, along with limited research on the topic of food and nutrition knowledge among Canadian adolescents, highlight the need for more current, high-quality research to better understand trends and predictors of healthier dietary behaviours among Canadian adolescents. Although a handful of studies have reported an association between awareness and use of CFG and a better diet quality among adults, most included small sample sizes^{60–62,67,68}. No study, to our knowledge, has yet examined the association between Canadian adolescents' awareness and use of CFG and food choices. Only one cross-sectional study has studied the awareness of the 2019 CFG among Canadian youth⁵⁷. Although the sociodemographic profile was found to be similar to the national Canadian profile, nonprobability-based sampling was used⁵⁷. Research using a nationally representative sample will enhance our understanding of how Canadian adolescents use a nationwide tool designed to provide accessible information about healthy eating¹³. Thus, studies examining awareness and use of CFG among

adolescents are needed to inform future policy and health promotion efforts, inform targeted public health strategies, and ensure equitable access to nutrition education and guidance. Furthermore, such studies would likely contribute to the existing literature focused on factors influencing healthy eating behaviours⁶⁹⁻⁷¹.

3. Objectives

This study aimed to describe awareness and use of CFG among Canadian adolescents aged 12-17 years and to examine whether use of CFG was associated with the consumption of fruits and vegetables and sugary beverages.

The **first objective** was to describe awareness and use of CFG among Canadian adolescents aged 12-17 years by sociodemographic characteristics. **Hypothesis 1:** This objective was exploratory due to limited literature on this topic; no prespecified hypotheses were formulated.

The **second objective** aimed to examine whether use of CFG was associated with intakes of fruits and vegetables and sugary beverages among Canadian adolescents. **Hypothesis 2:** It was hypothesized that use of CFG would be associated with healthier food choices.

4. Component article

The following article will be adapted and submitted in 2026.

Use of Canada's Food Guide and Healthier Dietary Behaviours Among Adolescents: Insights from the Canadian Health Survey on Children and Youth

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4.1 Abstract

Background: Evidence indicates that Canadian adolescents have nutritionally suboptimal diets, and there is a need for nationally representative data on how young Canadians engage with Canada's Food Guide (CFG) and how use may be associated with food choices. This cross-sectional study described awareness and use of CFG among Canadian adolescents and assessed associations between use of CFG and fruit and vegetable (F&V) and sugary beverage intakes. **Data and methods:** Using nationally representative data from the 2023 Canadian Health Survey on Children and Youth, participants (n=6,930 adolescents aged 12-17 years) were classified as "CFG users" or "non-CFG users". Survey-weighted, covariate-adjusted logistic regression analyses examined whether CFG use was associated with consuming F&V ≥ 5 times/day or sugary beverages ≥ 5 times/week. **Results:** Most (84%) adolescents were aware of CFG, but fewer than half (46%) reported having used CFG, mainly to assess how well they were eating (40%). CFG users had higher odds of eating F&V ≥ 5 times/day (aOR=1.43, 95% CI=1.14-1.80) and lower odds of consuming sugary beverages ≥ 5 times/week (aOR=0.83, 95% CI=0.69-0.99) compared to non-CFG users. **Conclusion:** Greater use of CFG among adolescents was associated with healthier food choices, although overall engagement with CFG remained limited.

4.2 Article

4.2.1 Background

Food-based dietary guidelines

Food-based dietary guidelines (FBDGs) provide evidence-based recommendations to help the general population achieve a healthy diet. A 2019 global review found most countries with FBDGs include key messages suggesting a diverse diet rich in a variety of fruits and vegetables, carbohydrates, protein foods, dairy, and legumes, while limiting excessive amounts of salt, sugar, and fat². Developed for Canadians aged two years and older, Canada's Food Guide (CFG) is a nationally recognized public health resource for evidence-based dietary guidelines to support healthy eating. The 2019 CFG suggests filling half the plate with fruits and vegetables, one quarter of the plate with carbohydrates, and one quarter with protein foods. It emphasizes the importance of eating a variety of fruits and vegetables, whole grain foods, and a variety of protein foods, including plant-based proteins. It also recommends choosing water as the preferred beverage^{25,48}.

Dietary Food choices among adolescents

Analyses indicate Canadian adolescents' diets are generally characterized by a high intake of low-nutritional-quality foods rich in fat, sugar, and/or sodium, alongside insufficient consumption of fruits and vegetables^{19,20}. Intake of fruits and vegetables is often used as an indicator of a healthy diet, especially as general guidance suggests increasing the amount of fruits and vegetables in the diet^{24,25}. National survey data consistently indicate that most Canadian adolescents do not consume adequate amounts of fruits and vegetables and are less likely than children to meet recommended intake levels^{26–28}.

Sugary beverages include 100% fruit juice, regular soft drinks, energy drinks, fruit-flavoured drinks, sports drinks, milkshakes or ice cream sodas, chocolate milk or hot chocolate, sweetened coffee drinks or iced tea; sugar-sweetened beverages include all sugary beverages except for 100% fruit juice^{36–38}. Canadians aged 9-18 years have been found to consume the most sugar-sweetened beverages compared to other age groups^{26,33}. Analyses indicate that sugar-sweetened beverages still accounted for 36% of beverage calories, and juice for 10% of beverage calories³³. Soft drinks and fruit drinks are among the top foods CFG recommends limiting, especially among adolescents, due to their energy-dense and low nutritional value^{72–74}.

Adolescents represent a population of particular interest as they are in the process of developing independent food choices while still being influenced by the constraints of school and home food environments⁹. Dietary habits developed during childhood have an impact on dietary habits maintained during adulthood^{15–18}. They are also an important predictor of academic achievement and overall health and well-being¹⁴.

Awareness and use of CFG among adolescents

Health Canada has developed resources to assess adherence to the 2019 CFG and to promote its use, such as a toolkit to support health educators working with children^{12,40}. However, no such age-adapted resources currently exist for adolescents; to date, Health Canada has only developed a brief summary of recommendations for adolescents, and there is limited evidence regarding its utility⁵¹. Research examining the usefulness of CFG has primarily focused on adults, and most studies reported associations between awareness or use of CFG and healthier food choices^{60–62}. Among these studies, most

participants who were aware of CFG reported frequently selecting foods to promote health, but approximately one third reported consuming at least five daily portions of fruits and vegetables; however, participants who reported having consulted CFG in the past six months had lower odds of consuming five or less daily servings of fruits and vegetables, and higher odds of consuming at least ten daily servings.

Few studies have examined awareness and use of CFG among younger Canadians, and none has independently assessed its associations with food choices among adolescents. Although adolescents reported awareness of CFG, there remains a lack of research exploring how this awareness translates to use or how it relates to dietary behaviours⁵⁷. This gap is important given evidence suggesting that greater dietary self-efficacy among adolescents may contribute to better diet quality^{63,64}. Globally, a study reviewing FBDGs targeting children and adolescents found that only 41 of the included 92 FBDGs were specific for children or adolescents³. A recent systematic review examining adolescents' eating behaviours suggests they were influenced by individual, social, community, and macrosystem (e.g., social media, mass media) factors rather than formal guidance⁷⁵. There is a lack of research on adolescents' use of FBDGs.

Given the generally inadequate diet quality among Canadian adolescents and the challenges associated with finding evidence-based resources, there is a need for research exploring usage patterns of CFG to support healthier eating among younger demographics^{11,52}. The objectives of this study were to describe awareness and use of CFG among Canadian adolescents aged 12-17 years and to examine whether use of CFG is

associated with the consumption of fruits and vegetables and sugary beverages, with the hypothesis that greater use of CFG would be associated with healthier food choices.

4.2.2 Data and methods

Data

This cross-sectional study drew on data from the 2023 Canadian Health Survey on Children and Youth (CHSCY), a large nationally representative survey with the goal of collecting information on the physical and mental health status of children and adolescents in Canada to inform public health policies and programs⁷⁶. The survey randomly sampled from each age group and geographical stratum, excluding the Canadian Territories, First Nation reserves and other Aboriginal settlements, foster homes, and institutions. Data collection occurred between March 2023 and March 2024. Questionnaires were either self-completed online or over the phone with a Statistics Canada interviewer. Consent was obtained from both the adolescent and their parents or guardians for participants aged 12 to 14 years, and only from the adolescent for those aged 15 years and older. Parents or legal guardians completed a separate questionnaire from the adolescent, answering questions such as annual household income⁷⁷.

Access to the data was granted through a Statistic Canada microdata access application and adherence to rigorous security protocols. All analytical outputs were reviewed and approved by Statistics Canada analysts and the vetting committee to ensure participant confidentiality. The data were accessed through the Ottawa-Outaouais Research Data Centre (ORDC) in Ottawa, Canada.

Of the 133,068 children and youth selected for the 2023 CHSCY, 69,522 completed the survey. The eating habits questionnaire was administered only to participants aged 12-17 years, for whom the response rate was 38.1%⁷⁸. This study used data from a sub-sample of 30,620 adolescents aged 12-17 years who were asked questions related to awareness and use of CFG, as well as eating habits. Among these participants, 8,410 responded to the CFG module as well as questions relating to fruit and vegetable and sugary beverage intake. Of the 8,410 eligible participants, 1,480 (17.6%) were excluded because of missing data on daily physical activity and screen time, resulting in a final analytical sample of 6,930 Canadian adolescents aged 12-17 years (Appendix A).

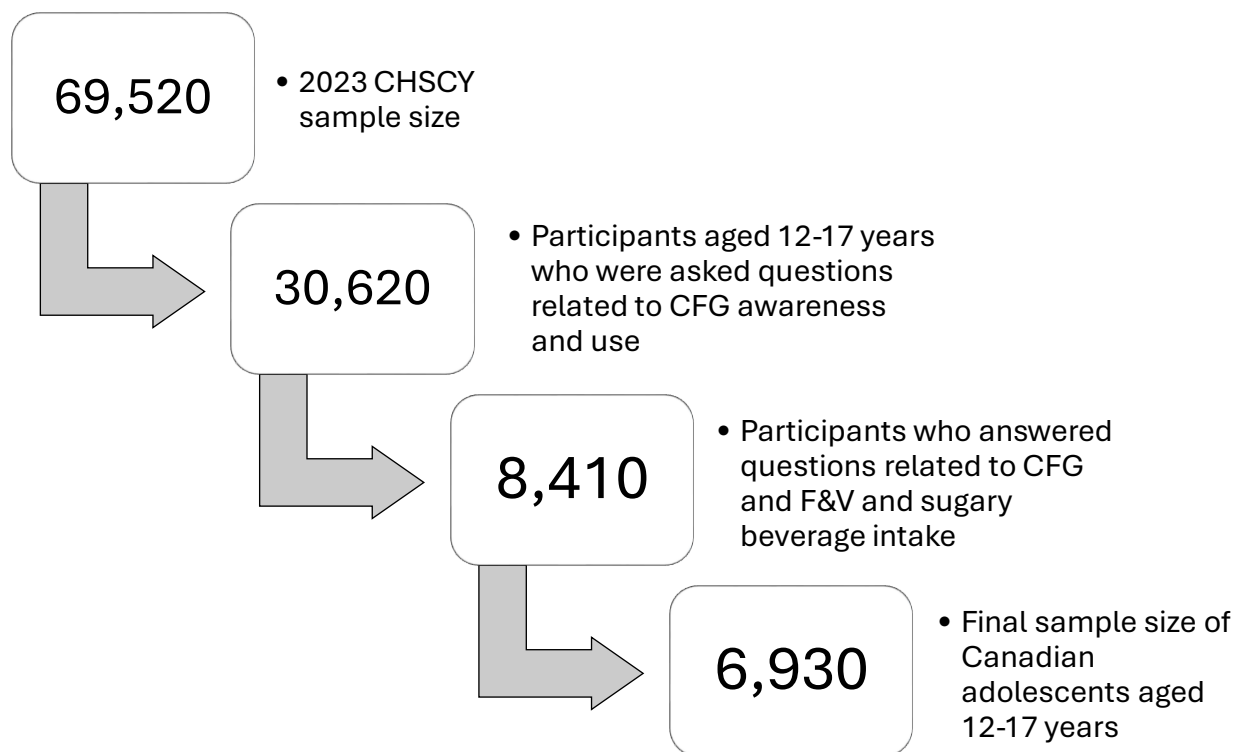


Figure 1: Flowchart of participant selection and exclusion process from the 2023 Canadian Health Survey on Children and Youth (CHSCY).

Independent variables: awareness and use of CFG

Awareness and use of CFG were assessed using two items. Participants were first asked, “Have you ever seen or heard of Canada’s Food Guide?” (yes/no). Those who responded “yes” were subsequently asked, “Have you ever used information from Canada’s Food Guide?” (yes/no). Responses were dichotomised (yes/no) to indicate CFG awareness and use. Participants were classified as “CFG users” if they reported any use of CFG, and as “non-users” if they were unaware of or had not used CFG. Participants who reported using CFG were further asked, “What did you use the information for?” to assess purposes of use, with response options including “to choose foods for [you/you and other household members],” “to determine how much [you/you and other household members] need to eat every day,” “to plan meals or to help with grocery shopping,” “to assess how well [you/you and other household members] are eating,” “other,” and “none of the above.” Participants could choose to select more than one response. Response options “other” and “none of the above” were grouped for this analysis due to small cell frequencies.

Dependent variables: intake of fruits and vegetables and sugary beverages

Fruit and vegetable intake was assessed using five items adapted from the fruit and vegetable dietary intake module from the Behavioral Risk Factor Surveillance System from the Centers for Disease Control and Prevention in the US⁷⁹. Adolescents were asked, “In the past 30 days, how many times did you eat the following fruits and vegetables?” and reported the frequency of consumption for fruits, dark green vegetables, orange-coloured vegetables, starchy vegetables, and other vegetables. For each item, respondents indicated intake frequency using daily, weekly, or monthly units. Intake was categorized

consistent with prior analyses (<5, 5–10, and >10 times/day)³⁰. Due to small cell counts in the highest category, the variable was dichotomised as <5 versus ≥5 times per day.

Intake of sugary beverages was assessed using six items by asking respondents, “In the past 30 days, how many times did you drink the following beverages?” and reported using daily, weekly, or monthly frequency units of consumption for regular soft drinks, energy drinks, fruit flavoured or sports drinks, 100% fruit juice, chocolate milk or hot chocolate, and sweetened coffee drinks or iced tea. Sugary beverages included in this analysis were supported by the literature^{36–38}. After initial exploratory analyses, participants were dichotomised into two groups based on the median daily frequency of sugary beverages (0.7 times per day), i.e., those falling below or above a sugary beverage intake of five times per week (i.e., 0.714 times per day).

Covariates

Covariates were selected *a priori* and assessed for relevance and statistical significance within each model, and were removed only if they reduced model fit significantly^{33,57}.

Socio-demographic variables such as age, gender, ethnicity, BMI z-score, household income, education, and food security were included in the exploratory models^{57,61,80–82}.

Health-related behaviours, including daily physical activity, sleep duration, and recreational screen time were also examined because of their associations with diet quality and their potential relevance to awareness and use of CFG^{61,83,84}. Province and rurality were included as geographic determinants of dietary intake; however, detailed geographic distributions could not be reported due to Statistics Canada vetting guidelines for the 2023 CHSCY^{85–87}.

Statistical analyses

All analyses were performed using the R statistical software (version 4.2.3) and conducted at the $\alpha=0.05$ level of statistical significance⁸⁸. Weighted sampling probabilities provided by Statistics Canada were applied to ensure representativeness of the covered population. Missing data patterns were explored, and missing values for categorical variables were retained by assigning them to distinct “unknown” categories to minimize data loss and preserve the analytical sample. Analyses considered power and ensured the minimum cell count as determined by Statistics Canada (Appendix A).

For the first objective, descriptive statistics including proportions, means, and respective 95% confidence intervals were used to characterize awareness and use of CFG across sociodemographic groups. Differences between groups were assessed using chi-square tests for categorical variables and t-tests for continuous variables, and no post hoc analyses were conducted to evaluate differences in the magnitude of associations. For the second objective, survey-weighted, covariate adjusted logistic regression models were used to assess the relationship between use of CFG and intake of fruits and vegetables and sugary beverages.

Exploratory analyses were performed to assess associations and included re-categorization of variables and the identification of outliers using percentiles and visual inspections (Appendix A). Categorical (Rao-Scott adjusted chi-square test) and continuous (t-test) analyses assessed predictors and bivariate associations, such as differences between adolescents aware and unaware of CFG. All variables were evaluated as both continuous and categorical variables whenever possible (i.e., age, sleep duration, BMI,

household income, screen time, daily physical activity time). All covariates were assessed for distribution and linearity, and initial checks evaluated categorical variables for appropriate groupings.

Total and individual sugary beverage consumption was explored. The “all sugary beverages” category stands for adolescents who reported consuming any combination of sugary beverages five times or more per week. This category is not equal to the sum of individual beverage types consumed at that frequency; instead, total intake across all beverage types was calculated and then dichotomised (≥ 5 times/week vs < 5 times/week). For example, a participant may consume various sugary beverages that collectively total five or more times per week, but may not meet the threshold for any single beverage type. Such participants would be included only in the “all sugary beverages” category and not in any specific beverage category. Sports and energy drinks were combined into one category due to small cell frequencies.

Age groups were created by grouping participants aged 12-13 years and those aged 14-17 years. Due to the small sample of adolescents identifying as non-binary ($n=1.5\%$), a two-category gender variable (“girls+” and “boys+”) derived by Statistics Canada was used, for which non-binary respondents were distributed into the “girls” and “boys” categories (denoted by “+”) to ensure confidentiality, which also permitted sufficient sample size for analysis. Similarly, due to small cell sizes, ethnicity was recoded into a dichotomous variable, with all participants identifying as non-White grouped into a single BIPOC category (i.e., Black, Indigenous, and People of Colour). Finally, household income and parental education were consolidated into broader categories, consistent with

classifications used in prior research. Skewed continuous variables were transformed to meet linearity assumptions: screen time was square-root transformed in the fruit and vegetable model, and physical activity time was log transformed in the fruit and vegetable model and square root transformed in the sugary beverage model.

The initial models consisted of all variables with known scientific and clinical importance; subsequent models excluded non-significant variables using likelihood ratio tests and backward elimination for model selection, and these variables were reintroduced into the models until a suitable final model was selected. Decisions regarding variable retention were based on each variable's contribution to overall model fit. Household income and sleep duration were not significant predictors in the models and were therefore excluded, as their inclusion reduced model fit. Model diagnostics were conducted to ensure appropriate model fit and stability. Model fit was assessed using the Hosmer-Lemeshow test, the condition index, likelihood ratio tests, and the R squared values. Covariates that did not significantly reduce model fit were kept in the statistical models even if they were not statistically significant. Confounding and collinearity were assessed in the exploratory analysis as well as with the variance inflator factor (VIF), the condition index, and the standard error values. Sensitivity analyses were conducted by removing outliers to evaluate changes in the model coefficients, where a 10% change was considered meaningful. Extreme outliers were identified using distributional and diagnostic assessments and excluded in sensitivity analyses. As these observations were subsequently deemed plausible, primary analyses retained the full sample.

Interaction was assessed in both the regression models examining associations

with intake of fruits and vegetables and sugary beverages by including interaction terms between use of CFG and the relevant covariates age and gender. Only the interaction between use of CFG and age groups in the fruit and vegetable intake model was significant (Appendix B); age-stratified results are shown in Figure 1.

4.2.3 Results

Participants were typically between the ages of 14-17 years (67%), were White (66%), reported a higher parental education (post-secondary = 83%), had a secure food security status (78%), reported a yearly household income of more than \$80,000 (81%), and resided in an urban setting (84%) (Table 1). A little over 60% of adolescents met the Canadian sleep duration recommendations and had a BMI z-score placing them in the ‘normal’ range. The mean screen time was 4.9 hours/day, and the mean moderate-to-vigorous physical activity time was 28.7 minutes/day. Nearly 80% of adolescents reported consuming fruits and vegetables fewer than five times per day, while approximately half (49%) reported consuming sugary beverages five times or more per week.

Table 1. Survey-weighted sample characteristics and Canada's Food Guide awareness and use, overall and by subgroup (n=6,930)

Variable	Category	Sample Estimate (95% CI)	Aware of CFG Estimate (95% CI)	p-value	Used CFG Estimate (95% CI)	p-value
All participants		100	83.5 (79.7-87.4)		46.4 (43.1-49.7)	
Age group	<i>14–17 years</i>	66.9 (63.4-70.5)	86.5 (81.4-91.7)	p<0.001	46.7 (42.6-50.9)	p=0.69
	<i>12–13 years</i>	33.1 (30.7-35.4)	77.5 (70.8-84.2)		45.8 (40.1-51.5)	
Gender†	<i>Boys +</i>	51.6 (48.6-54.6)	80.5 (75.0-85.9)	p<0.001	39.5 (35.3-43.8)	p<0.001
	<i>Girls +</i>	48.4 (45.4-51.5)	86.8 (80.6-93.0)		53.7 (48.4-59.0)	
Parental education‡	<i>≤ High school</i>	14.1 (12.3-15.8)	73.9 (63.0-84.7)	p<0.001	41.1 (31.7-50.4)	p=0.09
	<i>Post-secondary</i>	83.3 (79.6-87.0)	85.1 (80.8-89.5)		47.1 (43.5-50.7)	
Food security status‡	<i>Insecure</i>	20.7 (18.6-22.7)	79.5 (70.3-88.8)	p=0.009	42.0 (34.9-49.1)	p=0.07
	<i>Secure</i>	77.7 (74.0-81.3)	84.6 (80.0-89.1)		47.4 (43.6-51.3)	
Sleep duration (guideline recommendation) ‡	<i>Not met¶</i>	35.1 (32.4-37.9)	83.8 (76.5-91.2)	p=0.76	45.7 (39.9-51.6)	p=0.64
	<i>Met¶</i>	63.0 (59.7-66.2)	83.4 (78.3-88.4)		46.9 (42.7-51.1)	
BMI z-score‡	<i>Thin</i>	3.2 (2.3-4.0)	79.0 (69.2-88.7)	p=0.67	...	p=0.09
	<i>Normal</i>	60.3 (57.0-63.7)	83.6 (81.7-85.6)		47.8 (43.4-52.3)	
	<i>Overweight</i>	14.1 (12.4-15.7)	83.1 (79.8-86.4)		44.1 (35.4-52.8)	
	<i>Obesity</i>	6.5 (5.8-7.2)	82.7 (78.7-86.7)		41.0 (34.1-47.9) ^E	
Ethnicity‡	<i>White</i>	66.4 (63.8-69.0)	84.4 (80.6-88.2)	p=0.09	44.3 (41.3-47.3)	p=0.08
	<i>BIPOC</i>	30.6 (27.4-33.7)	81.4 (71.5-91.3)		49.5 (41.2-57.8)	

Table 1. Survey-weighted sample characteristics and Canada's Food Guide awareness and use, overall and by subgroup (n=6,930)

Variable	Category	Sample Estimate (95% CI)	Aware of CFG Estimate (95% CI)	p-value	Used CFG Estimate (95% CI)	p-value
Household income	< \$40,000	4.2 (3.2-5.2)	70.7 (51.4-90.1)	p=0.01	38.8 (24.0-53.6)	p=0.66
	\$40,000–59,999	7.0 (5.4-8.6)	80.1 (59.2-101.1)		48.0 (29.7-66.2)	
	\$60,000–79,999	8.3 (7.0-9.6)	84.1 (68.2-99.9)		47.8 (34.6-61.0)	
	≥ \$80,000	80.6 (77.1-84.0)	84.5 (80.2-88.7)		46.5 (43.0-50.0)	
Rurality	Urban	83.7 (79.8-87.7)	83.6 (79.0-88.2)	p=0.72	47.0 (43.1-50.8)	p=0.14
	Rural	16.3 (15.1-17.4)	83.1 (76.6-89.6)		43.5 (38.2-48.8)	
Screen times‡	Mean (h/day)	4.9 (4.8-5.0)	4.9 (4.8-5.0)	p=0.17	4.8 (4.5-5.0)	p=0.09
Physical activity (MVPA)¶	Mean (min/day)	28.7 (27.1-30.2)	29.4 (27.6-31.2)	p=0.005	29.2 (26.4-31.9)	p=0.57
Fruit & veg intake	< 5 times/day	79.4 (75.8-83.0)	82.9 (78.5-87.3)	p=0.05*	44.2 (40.6-47.8)	p<0.001
	≥ 5 times/day	20.6 (18.5-22.7)	86.3 (76.5-96.1)		55.0 (46.7-63.4)	
Sugary beverage intake	< 5 times/week	51.5 (48.3-54.6)	84.6 (78.6-90.5)	p=0.15	49.1 (44.2-54.0)	p=0.02
	≥ 5 times/week	48.5 (45.7-51.4)	82.6 (76.9-88.2)		43.6 (39.0-48.2)	

Values are weighted estimates (95% confidence intervals). Estimates represent percentages unless otherwise indicated; screen time and physical activity are presented as means. Estimates are weighted to account for the complex survey design of the CHSCY. †Does not use CFG' and 'Not aware of CFG' categories are omitted; values can be derived by subtraction from totals.

CFG = Canada's Food Guide. CI = confidence interval. Data presented as % (95% CI: lower-upper) unless otherwise indicated.

P-values based on Rao-Scott adjusted chi-square tests for categorical variables, accounting for the complex survey design, and survey-weighted t-tests for continuous variables.

* Significance based on unrounded values.

† A two-category gender variable ("girls+" and "boys+") derived by Statistics Canada, in which individuals reporting non-binary gender identities were reassigned to either the "girls" or "boys" categories.

‡ Unknown values for each variable, indicated as % (95% CI) of total sample: parental education = 2.7 (1.9-3.4) ; food security status = 1.7 (1.3-2.0) ; sleep duration recommendation = 1.9 (1.4-2.3) ; BMI category = 16.0 (14.1-17.8) ; ethnicity = 3.0 (2.0-4.1)

§ Screen time: normally distributed — mean reported in hours per day.

¶ Physical activity: right-skewed distribution — mean reported in minutes per day.

... = Suppressed due to unreliable estimate (quality grade F). Please be warned that these estimates and confidence do not meet Statistics Canada's quality standards. Conclusions based on these data will be unreliable and may be invalid.

^E = Use the estimate with caution (grade E).

Source: Statistics Canada, 2023 CHSCY

Awareness and use of CFG

While most adolescents were aware of CFG (84%), slightly less than half (46%) reported having used CFG (Table 1). Awareness of CFG was significantly more common among adolescents who reported a higher daily intake of fruits and vegetables (86% vs. 83%), identified as girls rather than boys (87% vs. 81%), were older (87% vs. 78%), were food secure (85% vs. 80%), reported a higher daily physical activity time (mean = 29.4 min/d vs. 25.0 min/d), and whose parents had a post-secondary education compared to those whose parents had an education of high school or less (85% vs. 74%). Awareness of CFG also differed significantly across household income categories. Use of CFG was significantly more common among CFG users who reported a higher daily intake of fruits and vegetables (55% vs. 44%), reported a lower weekly intake of sugary beverages (49% vs. 44%), and identified as girls (54% vs. 40%) compared to non-CFG users. Although not statistically significant, BIPOC participants reported being aware less often compared to White participants (81% vs. 84%; $p=0.09$), but reported higher use of CFG than White participants (50% vs 44%; $p=0.08$).

Figure 2 presents the reported uses of CFG among adolescents who reported using CFG. The most frequently reported purpose was to assess how well they are eating (40%). CFG users also used the guide to choose foods (32%), to determine portions (31%), to plan meals or help with grocery shopping (27%), and for other uses (33%). Significant gender differences were found for all categories except “to plan meals” and “other uses,” with girls reporting using CFG to assess how well they are eating, choose foods, and determine portions more often than boys.

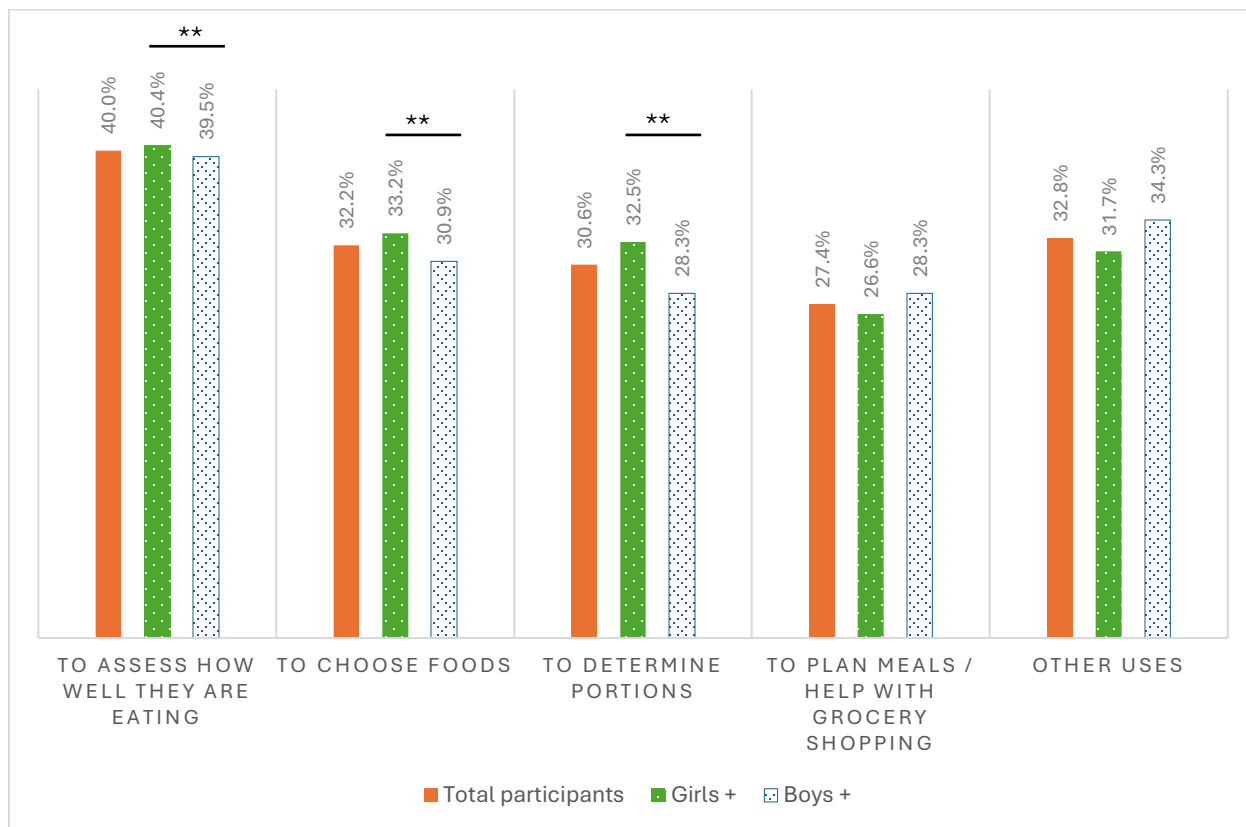


Figure 2: Adolescent-reported uses of Canada's Food Guide: Survey-weighted proportions of CFG users, overall and by gender, 2023 Canadian Health Survey on Children and Youth (n = 6,930)

** $p < 0.01$ based on Rao-Scott adjusted chi-square tests.

Figure 3 displays the survey-weighted proportion of adolescents consuming sugary beverages by beverage type. Close to half of adolescents surveyed (49%) consumed sugary beverages of any type five times or more weekly. All ages combined, adolescents more often consumed 100% fruit juice five times or more weekly (14%), followed by sports and energy drinks (7%). Younger participants were more likely to consume 100% fruit juice (15%), hot chocolate or chocolate milk (7%), and sports and energy drinks (6%) five times or more weekly, while older participants were more likely to consume 100% fruit juice

(13%), sweetened coffee drinks and iced tea (8%), and sports and energy drinks (8%) five times or more weekly.

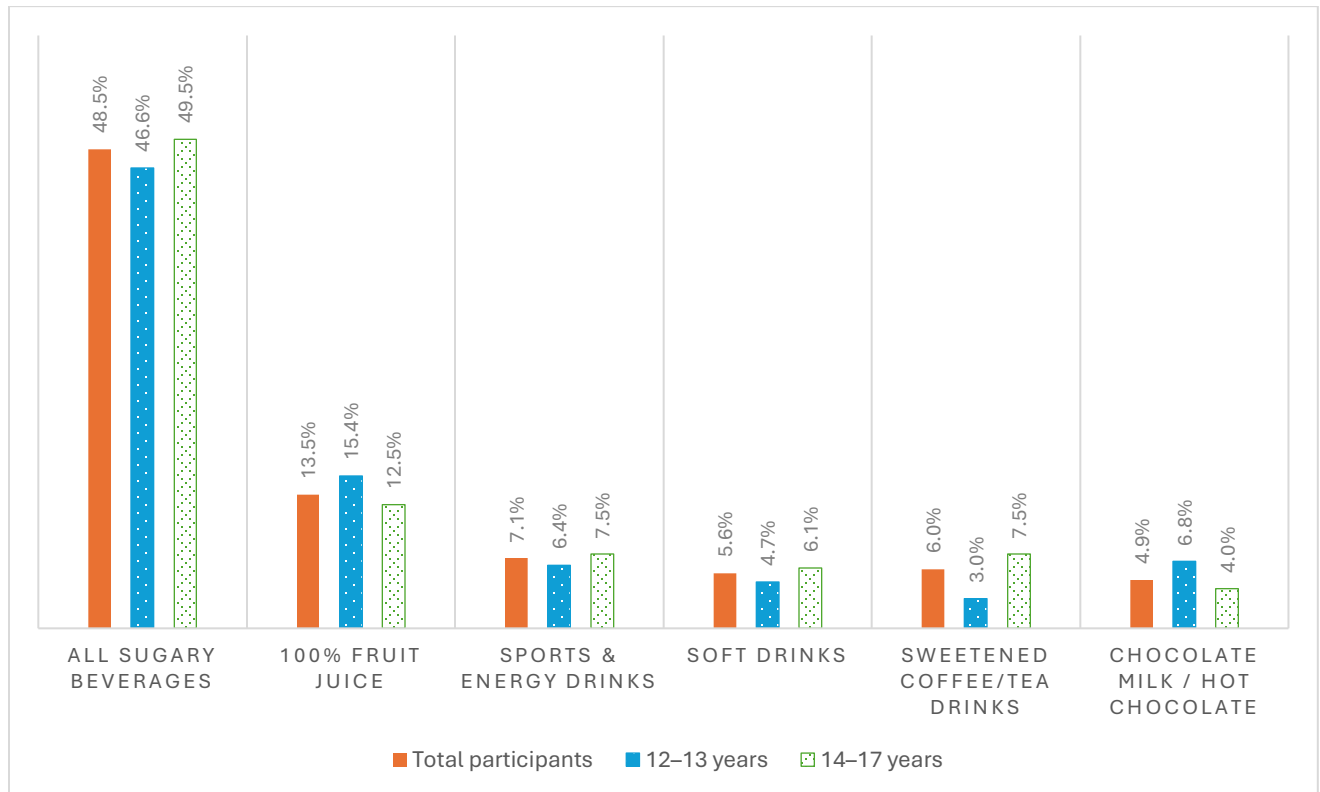


Figure 3: Proportion of Canadian adolescents consuming sugary beverages ≥ 5 times/week, by sugary beverage type and age group ($n=6,930$). Source: Statistics Canada, 2023 CHSCY. Statistical significances between groups were not assessed at this time.

Associations between CFG use and food choices

Regression results are displayed in Figure 4. Models shown are (1) use of CFG and intake of fruits and vegetables, with and without interaction between use of CFG and age groups, and (2) use of CFG and intake of sugary beverages. Models were not stratified if no significant interaction was found (e.g., gender). The models explained approximately 20% of the variance in fruit and vegetable intake ($\text{pseudo-}R^2 = 0.20$) and 19% of the variance in sugary beverage consumption ($\text{pseudo-}R^2 = 0.19$).

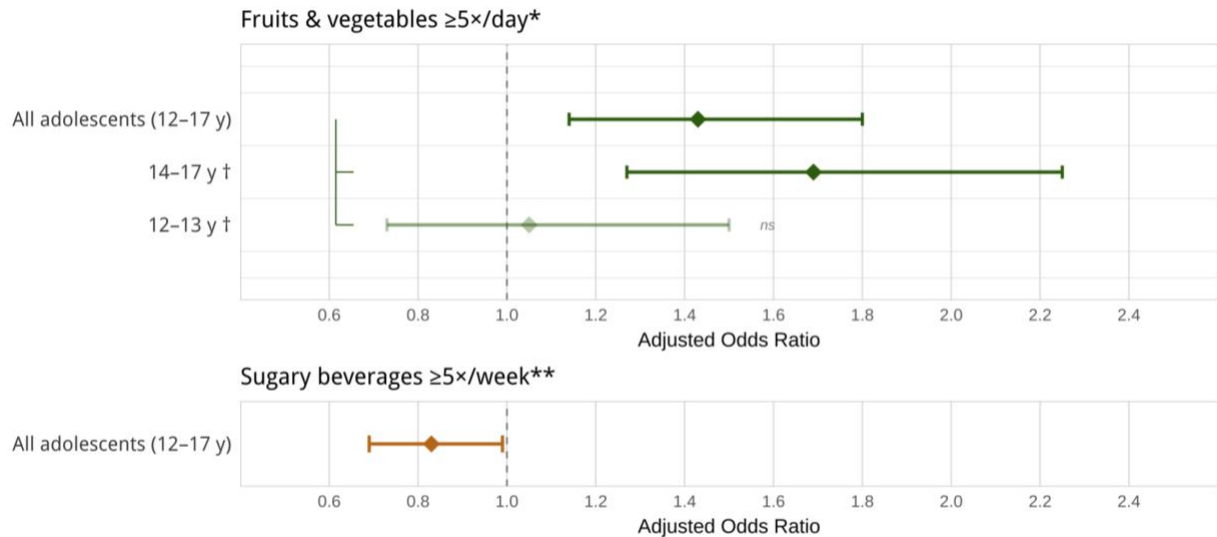


Figure 4: Association between use of Canada's Food Guide and dietary outcomes.

aOR = adjusted odds ratio; CI = 95% confidence interval. Reference line indicates no association (aOR = 1.0); the faded estimate (12–13 y) is non-significant.

* Adjusted for age, gender, BMI-z score, parental education, ethnicity, food security status, rurality, screen time (sqrt), and physical activity (log). Models shown include the primary analysis without interaction term and analyses stratified by age group; model coefficients are provided in Appendix B.

** Adjusted for BMI-z score, parental education, food security status, rurality, province, screen time, and physical activity (sqrt)

† Model stratified by age due to significant age × CFG use interaction for the fruit and vegetable outcome ($p < 0.05$).

As shown in Figure 4, CFG users had 43% higher odds of eating fruits and vegetables ≥ 5 times/day compared to non-CFG users (aOR=1.43, 95% CI=1.14–1.80) after adjusting for relevant covariates (i.e., age, gender, BMI z-score, parental education, ethnicity, food security status, rurality, daily screen time, and daily physical activity time). A significant interaction was found between CFG use and age group categories (Appendix B); 14-17-years-old CFG users had 69% higher odds of eating fruits and vegetables ≥ 5 times/day (aOR = 1.69, 95% CI=1.27-2.25) compared to non-CFG users. However, no association was found among 12-13-year-olds in the stratified analyses (aOR=1.05, 95% CI=0.72-1.50).

After adjusting for relevant covariates (i.e., BMI z-score, parental education, food security status, rurality, province, screen time, and daily physical activity time), CFG users

had 17% lower odds of consuming sugary beverages ≥ 5 times/week (aOR=0.83, 95% CI=0.69-0.99) compared to non-CFG users (Figure 4).

4.2.4 Discussion

The objectives of this study were to examine awareness and use of CFG in a large nationally representative sample of adolescents and to explore whether use of CFG was associated with dietary choices. This study highlighted high levels of awareness (84%) but low levels of use (46%) of CFG among Canadian adolescents in 2023, four years after the publication of the most recent version of CFG. Adolescents who reported having used CFG mainly used it to assess how well they are eating. Awareness and use of CFG varied by gender, with girls more likely than boys to report both awareness of and engagement with CFG. Use of CFG was associated with dietary choices in the expected direction: adolescents who reported using CFG had higher odds of meeting a higher fruit and vegetable intake and lower odds of frequent sugary beverage consumption. A significant interaction between use of CFG use and age group was observed. In stratified analyses, CFG use was significantly associated with fruit and vegetable intake among older adolescents, whereas no statistically significant association was observed among younger adolescents.

Despite limited research on awareness and use of CFG among adolescents, existing evidence suggests most young Canadians are aware of CFG. A cross-sectional study of 3,674 Canadian youth from the 2019 International Food Policy Study Youth Survey aged 10-17 years showed that 85% of youth aged 10-17 years reporting being aware of CFG, having mostly learned about it in school⁵⁷. There was higher awareness among older participants aged 14-17 years compared to those aged 10-13 years and among girls compared to boys.

In contrast, visible minorities were less likely to have heard of CFG compared to White participants. However, although youth seem to have a high awareness of CFG, 16% of those participants identified the wrong visual for the 2019 CFG. Similarly, national data using the CCHS' Rapid Response revealed comparable patterns, with 84% of Canadians aged 12 years and older reporting being aware of CFG, and 76% of those reported having looked through it⁶². Consistent with existing literature, findings from this study demonstrated most (84%) adolescents were aware of CFG, with higher awareness levels among girls compared to boys (87% vs. 81%), and, although not statistically significant, lower awareness levels among BIPOC participants compared to White participants (81% vs. 84%). However, findings from this study showed BIPOC participants reported higher use of CFG than White participants (50% vs 44%), although these differences were likewise not statistically significant. The 2019 CFG is more easily adaptable to diverse cultures than past versions and is available in more than 30 languages⁸⁹. In 2021, immigrants and permanent residents accounted for the largest share of the population in the past 100 years (23%), while Indigenous Peoples represented the youngest population (28% under the age of 25 years in 2021) and the fastest-growing group (9.4% growth between 2016 and 2021)^{90,91}. Efforts to address health decline among immigrants and refugees and support adaptation to new food environments suggest that adolescents from diverse cultures may have used CFG for this purpose⁹²⁻⁹⁵. Finally, among users, CFG was most commonly used to assess how well they are eating, to choose foods, and for other uses, aligning with previous research on its practical applications⁶².

This study identified significant associations between use of CFG and food choices. Adolescents who reported having used CFG had higher odds of eating fruits and vegetables at least five times per day, and lower odds of consuming sugary beverages five times or more per week compared to non-CFG users. Food choices were overall suboptimal, with nearly 80% consuming fruits and vegetables less than five times per day and approximately half of adolescents consuming sugary beverages five times or more weekly. These findings are consistent with prior research demonstrating similar positive associations between awareness or use of CFG and healthier food choices among adults, as well as existing literature reporting low fruit and vegetable intake and high consumption of sugary beverages among adolescents^{19,20,60–62}. The observed associations suggest that engagement with CFG may support healthier dietary choices, or alternatively, that those who make healthier food choices are more likely to engage with CFG. The effect sizes for both models were meaningful; however, the association with sugary beverage intake was smaller (aOR = 0.83, 95% CI: 0.69–0.99) than that observed for fruit and vegetable intake (aOR = 1.43, 95% CI: 1.14–1.80). Previous research indicates stronger cooking and food skills and higher food literacy, more commonly reported among females, is positively associated with fruit and vegetable intake^{20,96,97}. In this study, girls reported having used CFG significantly more than boys, which may help explain the stronger association for fruits and vegetables. While the magnitude of association for sugary beverage intake was small, such differences are nevertheless meaningful at the population level given the high prevalence of consumption and the importance of diet-related risk factors in chronic disease prevention.

Results from this study highlighted an interaction between use of CFG and age regarding the association between use of CFG and fruit and vegetable intake. While there was no association among younger adolescents, those aged 14-17 years had higher odds of eating fruits and vegetables five times or more daily. The findings of this study suggest older adolescents may be particularly responsive to, or capable of applying, dietary guidance from healthy eating resources. This is especially relevant given that adolescents are generally less likely than younger children to meet recommended fruit and vegetable intake levels^{27,28}.

The sugary beverage most often consumed five times or more weekly was 100% fruit juice, reported by 14% of 12–17-year-olds, including 15% of 12–13-year-olds and 13% of 14–17-year-olds. Fruit juice has recently been considered a sugary beverage in the literature more consistently due to the free sugar content, and is categorized as such in multiple resources, including the 2019 CFG^{36,74,98,99}. A sensitivity analysis did not find the association significant when excluding fruit juice from sugary beverages (Appendix C). Consumption of fruit juice, along with other sugary beverages, has been consistently elevated in the literature^{29,39}. A high intake of sugary beverages can negatively affect overall diet quality by displacing foods higher in nutritive value, therefore reducing intake of essential nutrients²⁶.

Canada's rapidly evolving food environment, with the availability of ultra-processed foods and increased food marketing geared towards youth, encourages an obesogenic diet and makes it increasingly difficult to identify trustworthy healthy eating resources^{11,41,52,100}. Social media environments can promote disordered eating behaviours, nutrition

misinformation, and exposure to unhealthy food products^{65,66}. Among those who reported having used CFG, most reported having used it to assess how well they are eating, expressing an interest in seeking out resources that will aid them in adopting healthier food choices. Prior studies have reported overall positive perceptions of CFG among parents and children aged 9-12 years, but highlight children's limited knowledge of guidelines, such as recommended food group plate proportions, and challenges to following the guidelines, such as lack of cooking skills^{56,58}. The public health relevance of this study is substantial: nearly half of adolescents reported using CFG, and the remaining non-users represent an important target for intervention. Small shifts in dietary behaviours across a population of this size can translate into meaningful long-term reductions in chronic disease burden.

Strengths and limitations

Due to its cross-sectional design, weaknesses of this study include not being able to measure incidence of awareness and use of CFG among Canadian adolescents or determine causal relationships—adolescents making healthier food choices may be more likely to seek out and use CFG compared to adolescents consuming less fruits and vegetables and more sugary beverages. Only 28% of total respondents answered questions relating to CFG and consumption of fruits and vegetables and sugary beverages, and it is unknown whether those who did not answer the module on CFG were aware of CFG. This study design is susceptible to nonresponse bias when individuals who choose not to participate in the survey or not to answer part of the survey questions differ systematically from those who do, and recall or social desirability biases when participants inaccurately report their true eating habits; these may affect the accuracy and generalizability of the

findings. Furthermore, the survey assessed frequency of consumption rather than portion sizes consumed, which may have contributed to differences arising from variations in how intake was defined. Finally, most participants were in the higher brackets for income and parental education, had a normal BMI z-score, and lived in urban geographical zones; although analyses were survey-weighted to account for differences, findings may differ with a different sample. Nevertheless, to our knowledge, this is the first study examining the association between use of CFG and food choices among Canadian adolescents and describing awareness and use of CFG among a nationally representative sample. Findings also include additional information on Canadian adolescents' fruit and vegetable and sugary beverage intake.

Conclusion

Most adolescents were aware of CFG, but less than half reported having used it; nevertheless, use of CFG was associated with healthier food choices. Empowering adolescents with nutrition knowledge and practical skills should be a key objective in efforts to support healthier eating patterns, especially as national strategies regularly exclude older adolescents and school food policies do not necessarily lead to behavioural changes that will improve diet quality outside of school^{4,100}. A recent systematic review found that there is a lack of food-based dietary guidelines specifically designed for children and youth, despite these groups having unique nutritional needs and challenges³. Future research should investigate current perceptions of CFG, including its relevance, accessibility, and usability, as well as barriers to its use, and should investigate how engagement with CFG influences lifestyle and dietary behaviours.

What is already known on this subject?
• Studies have reported that awareness and use of CFG have been associated with healthier food choices among adults, but none have studied this topic among adolescents. Studies that have examined adolescents' knowledge and perceptions of CFG found that most, especially older adolescents, were aware of CFG. • Canadian adolescents generally have a suboptimal diet consisting, among other diet quality indicators, of low fruit and vegetable and high sugary beverage intakes.
What does this study add?
• This study used recent data from a large, nationally representative sample to present up-to-date analyses of Canadian adolescents' intake of fruits and vegetables and sugary beverages in relation to use of CFG. • Most adolescents were aware of CFG, but fewer than half reported having used it. Compared to those who did not, adolescents who reported having used CFG had higher odds of eating fruits and vegetables five times or more daily and lower odds of consuming sugary beverages five times or more weekly. Future research should investigate adolescents' current perceptions of CFG and how engagement with CFG is associated with lifestyle and dietary behaviours.

5. General discussion

5.1 Awareness and use of CFG

Consistent with the findings from this study, prior research indicates that most adolescents are aware of CFG. A cross-sectional study of 3,674 Canadian children aged 10–17 years from the 2019 International Food Policy Study reported that 87% of youth had learned about a version of CFG in school, although only 30% reported learning about the 2019 CFG⁵⁷. Similarly, 84% of Canadians aged 12 and older in the CCHS rapid response module reported awareness of CFG⁶². Still in line with existing literature, awareness was higher among girls than boys, and, although not statistically significant, lower among BIPOC participants compared to White participants^{57,62}. However, our findings—while not statistically significant—showed BIPOC participants reported higher CFG use than White participants (50% vs 44%). Furthermore, 46% of adolescents reported having used CFG. Although this may constitute awareness rather than use of CFG, an earlier study reported that 76% of participants had looked through CFG⁶². Among those who reported having used CFG, the most common reasons were to guide food choices, determine portion sizes, and for other unspecified purposes. Our findings show similar uses, with most participants using CFG to assess how well they are eating, to choose foods, and for other uses.

5.2 Use of CFG and food choices

The regression analyses identified significant associations between use of CFG and food choices, with adolescents who reported using CFG demonstrating higher odds of consuming fruits and vegetables five or more times per day and lower odds of consuming

sugary beverages five or more times per week compared to non-users. These findings are consistent with existing literature suggesting that engagement with healthy eating resources is associated with improved dietary behaviours. For instance, a cross-sectional study including 968 students aged 13–19 years found that, although overall food and nutrition knowledge was low, scores were higher among those who reported using food, nutrition, and health-related mobile applications⁵⁹. Together, these findings support the notion that engagement with nutrition resources, including CFG, may play a role in promoting healthier eating patterns among adolescents, while also highlighting the need for accessible, age-appropriate nutrition education tools.

Adolescence represents a critical developmental period characterized by increased autonomy and unique nutritional challenges, and the results of this study further corroborate existing evidence that diet quality remains suboptimal in this population⁹. In this study, nearly half of adolescents reported consuming sugary beverages five or more times per week, while most reported consuming fruits and vegetables less than five times per day, aligning with prior research documenting low fruit and vegetable intake and high consumption of sugary beverages among adolescents. Notably, 100% fruit juice was the most consumed sugary beverage, reported by 14% of participants, including 15% of younger adolescents (12–13 years) and 13% of older adolescents (14–17 years). Fruit juice has recently been considered a sugary beverage in the literature more consistently due to the free sugar content^{36,74,98,99}. Even so, a sensitivity analysis excluding fruit juice from the sugary beverage variable did not meaningfully alter results, suggesting that the observed associations are robust (Appendix C). Overall, these findings underscore the importance of

promoting effective nutrition guidance tools such as CFG, while also highlighting the need for continued efforts to improve dietary behaviours among Canadian adolescents.

5.3 Age differences

This study highlighted important distinctions according to age, especially regarding the association between use of CFG and fruit and vegetable intake; the age interaction demonstrated older CFG users (14-17 years old) had significantly higher odds of eating fruits and vegetables five times or more daily compared to non-CFG users. Children and adolescents typically consume less than the recommended servings of fruits and vegetables, and studies suggest there is a downward trend in the number of servings of fruits and vegetables reported by Canadians aged 13 and over in the 2015 CCHS compared to the 2004 survey^{26,28,29}. Considering that adolescents are less likely to meet recommended intake levels compared to children, and that the downward trend in fruit and vegetable intake was notable among adolescent girls, these findings suggest efforts to tailor resources and interventions according to age might increase awareness and use of CFG to encourage healthier food choices^{27,28}. Older adolescents reported being aware of CFG significantly more than younger adolescents, but this did not translate to reporting having used CFG more than younger adolescents. We should therefore aim to increase use and knowledge of CFG guidelines, as awareness was already high among all participants.

Intake of sugary beverages was presented by age group in this analysis to highlight age differences between each beverage category, even though consumption remains elevated across both age groups, with fruit juice being the more popular drink. Although

fruit juice intake has decreased since the 2004 CCHS, it remained higher than whole fruit intake in the 2015 CCHS²⁸. Previous studies have reported that the consumption of sugary beverages, and especially fruit juice, remains elevated among adolescents, and that younger children consume less sugary beverages than adolescents^{29,39}.

Furthermore, younger adolescents consumed chocolate milk and hot chocolate five times or more weekly more often than older adolescents (7% vs. 4%), and older adolescents consumed sweetened coffee and tea drinks five times or more weekly more often than younger adolescents (8% vs. 3%). These findings are also consistent with studies that have reported that milk consumption is typically higher among younger age groups and coffee and tea consumption increases at around the age of 14^{39,101}.

5.4 Gender differences

The findings of this study also indicate notable gender differences in both awareness and use of CFG, with girls reporting higher levels of awareness and engagement compared to boys. However, as there was no interaction between use of CFG and gender in the regression models, the reported associations did not differ based on gender. Existing literature suggests that girls are often more concerned with how they are perceived, which can contribute to increased attention to dieting and weight-related behaviours⁴⁰. This may help explain why girls are more likely to seek out healthy eating resources such as CFG, or to retain and utilize this information when it is introduced. Furthermore, although food skills are generally low among all young adults, females have reported higher food skills, and are more involved in the preparation of food than males^{96,97}. Findings from this study

support these results, as, compared to boys, girls reported using CFG to choose foods, to determine portions, and to assess how well they are eating significantly more.

5.5 Strengths and limitations

This study is the first study to examine awareness and use of CFG using a large, nationally representative sample, as well as examining associations with food choices. Using survey weights improves the findings' generalizability across Canada. The study used recent data to present up-to-date analyses of Canadian adolescents' intake of fruits and vegetables and sugary beverages in relation to awareness and use of CFG. Furthermore, the presented analyses considered and included covariates based on equity factors (i.e., socioeconomic covariates).

Due to its cross-sectional design, weaknesses of this study include not being able to determine causal relationships (e.g., possibility of reverse causation) or to measure incidence of awareness and use of CFG among Canadian adolescents. This study design is also susceptible to nonresponse and recall biases, which may affect the accuracy and generalizability of the findings. Nonresponse bias can occur when individuals who choose not to participate in the survey differ systematically from those who do—participants who chose not to answer survey questions such as food intake or daily physical activity time may differ from participants included in this sample. Furthermore, the self-reported nature of this survey can lead to recall and social desirability biases. Recall bias can occur if participants inaccurately report their true eating habits in the questionnaire, which might lead to misclassification or measurement error. Participants may have overreported

consumption of socially desirable foods, such as fruits and vegetables, and underreported consumption of less desirable items, such as sugary beverages. This reporting bias may have influenced the observed associations. Furthermore, the survey assessed dietary intake based on frequency of consumption rather than the amount of portions consumed, which may influence results based on differing intake definitions. Only 28% of total respondents answered questions relating to CFG and consumption of fruits and vegetables and sugary beverages, and it is unknown whether those who did not answer the module on CFG were aware of CFG, which would influence findings on the proportion of participants who were aware of and used CFG. It is possible that participants included in this study were more aware of CFG and made healthier food choices than those who were not included.

Findings were also limited by the survey questions. For example, the survey did not ask adolescents to report on usage frequency of CFG and did not specify the 2019 CFG even though the new Food Guide had been circulating for multiple years at the time of distribution of the survey. Residual confounding by unmeasured factors can also distort the observed relationships due to unidentified confounders. Finally, children and youth living on First Nations reserves and other Indigenous settlements, in foster homes and not eligible for the Canada child benefit, and in institutions were excluded from the survey by Statistics Canada.

5.6 Relevance

This study examined discrepancies in CFG awareness and use in a large sample of Canadian adolescents and examined the relationship between CFG use with dietary

quality indicators, namely fruits and vegetables and sugary beverages. Previous research indicates recent use of CFG is associated with higher odds of consuming the recommended servings of fruits and vegetables in Canadian adults⁶². As it stands, there is a lack of research on any link between CFG use and diet quality among Canadian adolescents. Current research indicates Canadian adolescents lack food and nutrition knowledge, which is essential to be able to apply CFG's recommendations^{58,59}. Although one study described Canadian youth's awareness of the 2007 and 2019 CFG, the surveys used in that study were conducted less than one year after the release of the 2019 CFG and might not showcase current awareness of CFG⁵⁷. These studies demonstrate a need for more current research on Canadian adolescents' awareness and use of CFG in a nationally representative sample.

Given the lack of studies on CFG awareness and use and their association with diet quality or dietary behaviours among Canadian adolescents, as well as the lack of recent studies examining Canadian adolescents' intake of fruits and vegetables and sugary beverages, more research is needed to understand factors influencing diet quality. Furthermore, any differences in CFG awareness and use among sociodemographic subgroups highlight disparities that should be taken into consideration in future public health policies. As this is the first study examining the association between use of CFG and food choices among Canadian adolescents and describing awareness and use of CFG among a nationally representative sample, the findings may help inform future policies and government initiatives.

Social media environments can contribute to body image dissatisfaction, increased drive for thinness, disordered food choices, and increased dieting in healthy young adults from exposure to image-related content and behaviours such as selfie-taking⁴¹. Findings from a 2024 cross-sectional study showed that when Canadian adolescents were exposed to food marketing on social media, exposure levels were high, with most promoted products being ultra-processed foods and sugar-sweetened beverages and marketing techniques such as appealing graphic effects designed to attract this demographic⁵². Health Canada proposed regulations in 2023 prohibiting food and drink advertisements to children under the age of 13 unless these products meet specified nutrition criteria—these were however never implemented. Advertising unhealthy food products to children under age 12 therefore remains self-regulated by the food and beverage industry^{102,103}. In any case, this approach did not protect adolescents even though they are a population of concern due to their high intake of sugar-sweetened beverage, and they would have remained targets in many ultra-processed foods and sugar-sweetened beverage advertisements^{31–33,52}. It has also been shown that self-regulation of unhealthy food and beverage marketing by the industry is largely ineffective in promoting healthier food environments in Canada^{104,105}. Recently, national policy efforts have been concentrated on implementing the National School Food Policy across provinces to improve access to nutritious foods for children and youth by funding provincial school food programs¹⁰⁶. Globally, a systematic review and meta-analysis found that school food environment policy interventions can improve dietary behaviours within and outside of school environments, but another systematic review found general low compliance with policies among schools

in European and Western Pacific countries^{107,108}. While the Canadian school food policies have proved fruitful in increasing diet quality during school hours among students, they have not led to behavioural changes to improve diet quality outside of school⁴. Furthermore, older students had lower diet quality than younger students, perhaps because they could buy lunch outside of school; there is a need for strategies to improve adolescents' food literacy and skills.

Findings from this study report approximately half of adolescents consume sugary beverages five times or more weekly, and sports and energy drinks were the second most popular drink consumed five times or more weekly. Associations between CFG use and healthier food choices further amplify the need for age-specific strategies targeting adolescents. Adolescents seem to mainly use CFG to assess how well they are eating and to choose foods, expressing an interest in seeking out resources that will aid them in adopting healthier food choices. The impact of such resources is positive: for example, in a sample of 968 Canadian adolescents aged 13-19 years, food and nutrition knowledge was generally poor, but was higher among those who reported using healthy eating resources⁵⁹. Given that Health Canada has developed resources for parents and educators, but none specifically tailored to adolescents beyond a summary of recommendations, and considering the limited evidence regarding their impact, these findings support the need for additional healthy eating resources for older adolescents⁵¹.

5.7 Implications for policy

Given our findings showing an association between use of CFG and healthier food choices, this research underscores the importance of creating evidence-based nutrition resources

tailored to the needs of various age groups. The findings also reinforce the importance that such resources remain free from the influence of the food and beverage industry to ensure recommendations prioritize public health interests. Although the 2019 CFG was developed without industry input, the food and beverage industry attempted to influence the new guidelines during the public consultation phases with strategies such as the suppression of information and appealing to emotions by alluding to the potential health impacts on vulnerable populations if certain foods or beverages, such as fruit juice, were excluded from the guide⁴⁷. To that point, industry stakeholders tried to influence the CFG revision process by maintaining that excluding fruit juice would negatively impact vulnerable populations who cannot afford fresh fruit⁴⁷. Nevertheless, fruit juice is now no longer included in CFG. Our findings show many adolescents still consume fruit juice regularly, highlighting the need for resources and policies that can help reduce adolescents' intake of all sugary beverages.

Furthermore, the failings of the current self-regulated food marketing environment allow exposure to unhealthy food and beverage products, especially through digital and social media platforms^{41,52,65,104,105}. Recent national policy efforts concentrated on implementing the National School Food Policy across provinces do not guarantee positive behaviour change in adolescents, who can buy meals outside of school^{4,106–108}. Insufficient policy efforts to address concerns over adolescents' diet quality call for more stringent food marketing regulations in Canada to help create a food environment that supports healthier food choices and to reinforce continued dissemination of accessible, evidence-

based resources. These approaches can contribute to promote healthy eating behaviours among adolescents more effectively.

5.8 Implications for future research

First, studies should seek to understand current perceptions of CFG and barriers surrounding use of CFG considering the high levels of awareness and low levels of use observed in this study, and should investigate how engagement with the Food Guide influences lifestyle and dietary behaviours. Mixed-methods and qualitative studies could enhance current understanding of adolescents' current engagement with CFG and could help identify effective strategies to better disseminate the recommendations found in the guide. Of particular interest is investigating whether older adolescents appear more responsive to CFG and developing and testing age-tailored guidance, especially tools to help translate CFG to the many food environments experienced by adolescents. Future research should explore directionality of associations by conducting longitudinal or cohort studies to determine whether CFG use leads to improved dietary behaviours. Research should also seek to investigate how adolescents interpret and apply CFG guidance, exploring factors such as nutrition knowledge, food literacy, self-efficacy, and family and peer influence. Finally, future research could also aim to expand these findings by exploring the association between CFG use and food choice using other diet quality indices such as ultra-processed food intake.

5.9 Conclusion

Although awareness levels were high among adolescents, less than half reported having used CFG. Use of CFG by Canadian adolescents was associated with healthier food

choices, notably higher odds of increased fruit and vegetable intake and lower odds of increased sugary beverage consumption. Considering dietary behaviours remain suboptimal, these nationally representative findings highlight opportunities to improve dietary behaviours among adolescents through age-appropriate healthy eating resources.

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8. Appendix A: Additional methods details

Sample exclusions: Participants with missing data for the categorical variables were retained, but participants with missing data for the continuous variables were excluded as data could not be assumed missing at random (>15% of participants).

Cell count guidelines: The analysis ensured a minimum cell count of 5 respondents per cell according to Statistics Canada vetting rules—cells with an F quality grade were not reported in Table 1, and those containing an E quality grade participants were flagged. Grading was determined according to the Statistics Canada guidelines for the 2023 CHSCY.

CFG respondents: Data from all respondents who answered questions about CFG were explored (n=8,410), but due to Statistics Canada vetting rules, Table 1 presents descriptive statistics amongst the sample used for the regression models only (n=6,930).

Examining associations between the independent and dependent variables:

Associations between awareness of CFG and food choice outcomes were first explored. However, regression models examining awareness of CFG were not included at this time because use of CFG was associated with healthier food choices, which was considered the more relevant behavioural measure for addressing the study objectives, especially as most adolescents reported being aware of CFG. There was a lack of studies exploring the usefulness of national tools such as CFG, and this study focused on exploring whether the use of such tools was associated with healthier food choices as awareness is a broad concept. Presenting models exploring awareness of CFG would have provided overlapping

information. However, regression models examining associations between awareness of CFG and healthier food choices may be presented in future analyses.

9. Appendix B: Supplementary logistic regression results

Table A1. Logistic regression coefficients for the association between use of CFG and fruit and vegetable intake (n=6,930)

Variable	Crude OR (95% CI)	No interaction term* aOR (95% CI)	With interaction term** aOR (95% CI)
<i>Use of CFG</i>	1.55 (1.25-1.93)	1.43 (1.14-1.80)	2.85 (1.45-5.61)
<i>Rurality</i>		1.21 (0.95-1.55)	1.21 (0.95-1.55)
<i>Age group</i>		0.99 (0.78-1.27)	1.29 (0.94-1.76)
<i>Gender</i>		1.17 (0.92-1.48)	1.16 (0.92-1.47)
<i>BMI z-score</i>		0.87 (0.78-0.97)	0.86 (0.77-0.96)
<i>Parental education</i>		1.18 (0.92-1.51)	1.18 (0.93-1.50)
<i>Ethnicity</i>		1.34 (1.03-1.74)	1.34 (1.03-1.73)
<i>Food security status</i>		1.17 (1.04-1.31)	1.17 (1.04-1.31)
<i>Screen time (sqrt)</i>		0.72 (0.60-0.87)	0.72 (0.60-0.87)
<i>Physical activity (MVPA) (log)</i>		1.05 (1.01-1.10)	1.05 (1.01-1.1)
<i>Use of CFG*Age group interaction term</i>			0.60 (0.38-0.95)

OR = odds ratio; aOR = adjusted odds ratio; CI = 95% confidence interval.

*Adjusted for age, gender, BMI-z score, parental education, ethnicity, food security status, rurality, screen time (sqrt), and physical activity (log). Model displayed in Figure 4.

**Adjusted for age, gender, BMI-z score, parental education, ethnicity, food security status, rurality, screen time (sqrt), physical activity (log), and interaction term between use of CFG and age. Model stratified by age groups displayed in Figure 4.

Table A2. Logistic regression coefficients for the association between use of CFG and sugary beverage intake (n=6,930)

Variable	Crude OR (95% CI)	Without interaction* aOR (95% CI)
<i>Use of CFG</i>	0.84 (0.71-1.00)	0.83 (0.67-0.99)
<i>Physical activity (MVPA) (sqrt)</i>		1.00 (0.98-1.03)
<i>Food security status</i>		0.96 (0.87-1.06)
<i>Province</i>		0.96 (0.93-0.98)
<i>Rurality</i>		1.31 (1.08-1.58)
<i>Screen time</i>		1.05 (1.02-1.08)
<i>Parental education</i>		0.68 (0.56-0.82)
<i>BMI z-score</i>		1.05 (0.97-1.14)

OR = odds ratio; aOR = adjusted odds ratio; CI = 95% confidence interval.

*Adjusted for BMI-z score, parental education, food security status, rurality, province, screen time, and physical activity (sqrt)

10. Appendix C: Sensitivity analysis

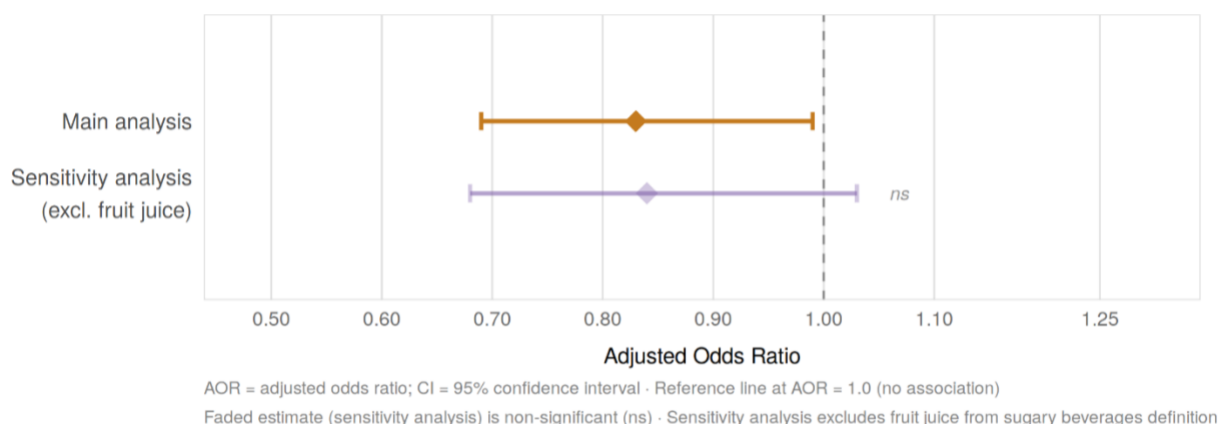


Figure 5: A sensitivity analysis for Canada's Food Guide use and sugary beverage intake excluding 100% fruit juice. aOR = adjusted odds ratio; CI = 95% confidence interval. Reference line at aOR = 1.0 (no association). Faded estimate (sensitivity analysis) is non-significant (ns). Both models were adjusted for BMI-z score, parental education, food security status, rurality, province, screen time, and physical activity (sqrt).

The sensitivity analysis excluding 100% fruit juice from the covariate-adjusted, survey-weighted logistic regression model demonstrates the direction and magnitude of the association do not significantly change; there is a 1.2% change between both point estimates (0.83 vs. 0.84). While the confidence interval widens, the loss of significance when excluding fruit juice is due in part to a reduction in statistical power and does not diminish the association of the main analysis examining CFG use and sugary beverage intake.