

Foods and Beverages Marketed in Major Food Retailer Flyers:
A Repeat Cross-Sectional Study in the Canadian Food Environment

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Abstract

Grocery flyers are an important component of the informational food environment that can affect food purchasing behaviour. This thesis used a repeat cross-sectional design to examine the food group content and nutrient profiles of foods and beverages marketed in Canada's largest food retailer's flyers in 2014, 2017, and 2021. The largest proportions of flyer items were baked products (11%), non-alcoholic beverages (10.7%) and milk and dairy (10.2%). Least healthy/ultra-processed items, as coded by three nutrient profiling systems, made up a substantial proportion of flyer content (Canada's Food Guide (CFG): 58.5%, Ontario's Policy/Program Memorandum no. 150 (PPM150): 45.3%, NOVA (not an acronym) Level of Processing classification: 51.2%); however, the healthiest/un/minimally processed groups of items followed (CFG: 33.6%, PPM150: 36.6%, NOVA: 27.8%). The only feature of the flyer that consistently predicted healthiness was a food being on the first page of the flyer, and not store type, geographic region, or publication year.

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Chapter 1: Introduction

This first chapter offers an introduction and explanation of the need for a deeper understanding of the nutritional quality of major food retailer flyers in Canada. The context for the current study will be provided and the significance of the work will be explained. Further, the purpose of the thesis topic will be described. Finally, an outline for the remainder of the thesis will be provided.

1.1 Background and Context

Dietary risk factors represent a significant concern for the health of Canadians; they are a leading risk factor for disease burden in Canada, as measured by death and disability combined (Afshin, 2017). People are consuming excess energy which could be caused by an increased availability, accessibility, and affordability of energy-dense foods, and the intense marketing of these foods (Afshin et al., 2017). Food environments are the physical, social, economic, cultural, and political factors that impact the accessibility, availability, and adequacy of food within a community or region (Rideout, Mah & Minaker, 2015). Food environments are created by the human built and social environments (Rideout, Mah & Minaker, 2015). The food environments in which Canadians live, work and play affect their food purchasing and eating choices, the quality of their diets, and diet-related health outcomes (Rideout, Mah & Minaker, 2015). Canadians are surrounded by many influential factors in the food environment which impact dietary behaviours. It is important that we build food environments that support individuals to make healthy food choices to mitigate risks from unhealthy diet quality.

Research on the Canadian food environment has rapidly expanded. In a synthesis of papers in the field of food environments that was published in 2016, just one paper was published prior to 2005, and 75% of papers were written between 2010 and 2015 (Minaker et al.,

2016). Although strides have been made in this area, work remains in building a knowledge base to explain how aspects of the food environment lead individuals to select foods and beverages, and how we can best modify the food environment to shape diet quality.

Food choices happen in many parts of the food environment, including in retail food stores (Story et al., 2008). In this study, we will focus on one area of the food environment which affects individuals' food purchasing behaviours: food retailer flyers.

1.2 Significance

Within the food environment, there are many factors that lead to the eating patterns that people develop, including the “information environment” (Glanz et al., 2005). The “information environment” includes marketing that affects consumer attitudes and the appeal of certain foods and food sources (Glanz et al., 2005). Food retailer flyers are one part of the information environment within the larger food environment. Flyers represent a large part of the retailer's marketing budget, and they serve as an important tactic to generate revenue (Gijsbrechts, Campo & Goossens, 2003). Flyers are filled with a plethora of valuable data, which helps us to understand the products that retailers place importance on and therefore advertise directly to consumers (Ziliani & Leva, 2015).

In an integrative review by Glanz et al. (2012), findings suggest that there are several strategies for store marketing to promote healthy food choices, including: increasing availability, affordability, prominence, and promotion of healthy foods while restricting or de-marketing less healthy foods. Past research done on the composition of grocery store flyers, in other countries, has found that they are largely comprised of less nutritious items (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Jahns et al., 2014; Jahns et al., 2016). Key methodological differences in existing research include differences in nutrient

profiling models, sample sizes of assessed flyers, whether regional differences were assessed, whether different types of stores (e.g., regular versus discount grocers) were assessed and whether the content of the first page of the flyer was assessed in contrast to the whole of the flyer.

The current study will contribute to the growing body of evidence about Canadian food environments. Food retailer flyers are one small aspect of the retail food environment which could be targeted to improve the health of Canadians. This is the first major study exploring food retailer flyers in Canada.

1.3 Purpose

The current study aims to address gaps and strengthen the current literature on major food retailer flyers, specifically in Canada by addressing the three specific objectives, as described below.

Objective 1. Describe the content (food groups) of Canada's major food retailer flyers.

Objective 2. Describe the nutrient profile of the foods included in Canada's major food retailer flyers (by Canada's Food Guide (CFG), Ontario's Policy/Program Memorandum no. 150 (PPM150), and the NOVA (not an acronym) Level of Processing classification system).

Objective 3. Compare how the features of Canada's food retailer flyers (first page versus subsequent flyer page, year of data collection, region, and produced by a discount versus regular grocer) predict the nutrient profile of the foods promoted in Canada's major food retailer flyers.

1.4 Thesis Outline

Chapter 2 provides a literature review of research relevant to the topic. This includes an explanation of literature on the food environment in Canada, food marketing as it relates to food retailer flyers and the methods of nutrient profiling that we used in the study. Food environments affect people's food choices, and major food retailer flyers are one aspect of marketing that contribute to the informational food environment. Past research done on the composition of flyers has found that they are largely comprised of less nutritious items (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Jahns et al., 2014; Jahns et al., 2016). These past studies have differed along several key methodological choices, as well as countries of study. Finally, the research objectives, which strengthen the growing body of evidence on food retailer flyers, are presented.

Chapter 3 is comprised of a methods section which details the overarching methodology used to meet the thesis objectives and the results of this thesis work. We used a repeat cross-sectional design to examine the types of marketing features and content present in Canada's largest food retailer flyers over time, and the extent to which the nutrient profiles of advertised food and beverage items (defined using three separate nutrient profiling systems) were associated with specific flyer features, such as first page versus subsequent flyer page, year of data collection, region, and discount versus regular grocer.

Chapter 4 contains a draft manuscript of the flyer study for anticipated submission to a peer-reviewed journal, which serves as the results section. The results explore the content and the nutrient profile of the items in the flyers, and the factors which may predict the nutrient profiles of the foods. A few groups represented a large proportion of flyer food items. Canada's major food retailer flyers are comprised of a substantial proportion of less healthy/ultra-processed food

items. However, the healthiest/un/minimally processed groups of items on our three nutrient profiling scales followed the least healthy groups in terms of the proportion of items marketed. The only feature of the flyer that consistently predicted healthiness of items marketed was a food being on the first page of the flyer.

Finally, Chapter 5 comprises a detailed discussion of the results as well as the conclusions that can be drawn from the findings of the thesis. Our results support similar research done in the area in other countries; the largest proportion of foods in Canada's major food retailer flyers are less healthy/ultra-processed. This research filled an important research gap in Canada and had many strengths. For example, the flyer sample we chose provides representation of what the average consumer might be exposed to, because Loblaw's as a corporation holds the largest market share among food retailers in Canada, and it has both discount and regular stores. We used three nutrient profiling models and found similar results across all three. We also examined the whole flyer (not just the first page). We compared flyers from multiple years and multiple regions. The study was subject to several limitations. Future studies should further examine: the effect of time on flyer content and nutrient profile, regional differences by including multiple chains and independent retailers by province and by city, flyer content and nutrient profiles in other grocery store chains, how flyers affect consumers' choices in Canada, and the effect of healthier content in flyers on the actual purchasing and consumption behaviours as well as other potential confounders.

Chapter 2: Literature Review

2.1 Scope of the Literature Review

The literature review will begin with a section describing the food environment in Canada. Next, how food marketing contributes to the Canadian food environment will be discussed. The role of food retailer flyers will be examined and similar research that has been done examining food retailer flyers in other regions will be evaluated. The different methods of nutrient profiling will be explored and the three ways that were chosen for this study will be examined. Finally, the research objectives are presented.

2.2 Understanding the Food Environment in Canada

Dietary risk factors represent a significant concern for the health of Canadians. They are a leading risk factor for disease burden in Canada, as measured by death and disability combined (Afshin et al., 2017). People are consuming excess energy which could be caused by an increased availability, accessibility, and affordability of energy-dense foods, and the intense marketing of these foods (Afshin et al., 2017). Changes in the food environment and food systems are likely major drivers for the increase of the diet-related disease burden over the past three decades (Afshin et al., 2017).

Food choices are shaped by many factors, including the food environments in which we live, work and play. Food environments can be defined as the “collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people's food and beverage choices and nutritional status” (Swinburn et al., 2013, p.2). Research on the Canadian food environment has rapidly expanded. In a synthesis of papers in the field of food environments, published in 2016, just one paper was published prior to 2005, and 75% of papers were written between 2010 and 2015 (Minaker et al., 2016).

There are many components that contribute to individuals' diets and the food environment in which people live, work, play, and learn is one of those components. Food environments (mesolevel factors/settings) can be positioned within the larger food system, as defined in Peeter's socioecological model of the drivers of food and beverage intake (2018). It is important to acknowledge that food environments are part of a larger food system, since embracing a systems perspective serves to improve policy intervention and ultimately the health-promoting quality of the food environment (Peeters, 2018). The socioecological model depicts how food environments fall at the mesolevel of the food system, between macrolevel (policies), and microlevel (interpersonal and intrapersonal) drivers of diet (Peeters, 2018).

First, macrolevel factors are made up of many high-level factors within public and private sector institutions and public policies. These factors include nutrition labelling regulations, nutrition standards for public institutions, tax policies and subsidies, advertisement and marketing regulations, food safety and nutrition standards, serving size regulation, urban planning policies and food system regulation (Peeters, 2018). These factors are situated in the most outer layer of this socioecological model and affect individual food choices indirectly. They more directly shape food environments, that individuals then further interact with.

Second, mesolevel factors include food and beverage environments, including workplaces and educational settings, retail services, community sector organizations, and recreation facilities (Peeters, 2018). Food environments are shaped by macrolevel factors and more proximally influence the interpersonal and intrapersonal factors that drive individual food choice.

Microlevel drivers of food and beverage intake, the most inner layers of the socioecological model, include interpersonal factors and intrapersonal factors. Interpersonal

factors include family structure, parenting practices, personal relationships, social networks, and peer group pressure (Peeters, 2018). Intrapersonal factors include preferences, knowledge, skills, motivation, attitudes, self-efficacy, self-confidence, individual and household socioeconomic status, health status, sex and gender, ethnicity, and individual non-modifiable factors such as genetic predispositions (Peeters, 2018). These microlevel factors directly influence individual diet choices and the effects of many of these factors on diet can be modified by food environments.

In Canada, food environments are important contributors to food choices and often the environments in which we live, work, and play, fail to reinforce healthy choices (Vanderlee and L'Abbé, 2017). An environment that provides equitable access to healthy foods such as fruits, vegetables, whole grain foods and nutritious snack options represents a healthy food environment (National Collaborating Centre for Environment Health, 2017). Further, the existence of accessible food stores and the availability of healthy products in those stores may contribute to healthier eating patterns, acknowledging that access and availability requires that individuals/households have the financial and mobility means to access the healthier foods (Glanz and Yaroch, 2004; Clary, Matthews and Kestens, 2017).

Food choices happen in many settings of the food environment, including in retail food stores, such as supermarkets and smaller grocery stores (Story et al., 2008). From 2015-2021, Canadian households spent about 73% of every household dollar on food in stores, making stores an important aspect of the Canadian food environment (Statistics Canada, 2021). A study done in Montreal, Canada, suggests that grocery stores tend to have greater availability of healthy foods (Jalbert-Arsenault, Robitaille & Paquette, 2017). However, larger grocery stores may also have more availability or variety of less healthy options and ultra-processed food products, suggesting

that supermarkets cannot be considered uniformly healthy stores (Jalbert-Arsenault, Robitaille & Paquette, 2017; Mah and Taylor, 2020).

2.3 Marketing in the Food Environment

Within the food environment, there are many factors that lead to the eating patterns that people develop (Glanz et al., 2005). In the widely used Glanz et al. conceptual framework, researchers describe the components of the food environment (2005). These components include the “information environment” where marketing affects consumer attitudes and the appeal of certain foods and food sources (Glanz et al., 2005). Not only can food marketing operate on a national or regional level, but it can also operate at the individual store or restaurant level (Glanz et al., 2005).

Canadian grocery retailers market products to consumers to increase their sales. According to Canada’s Food Guide (CFG), food marketing can be defined as advertising that promotes the sale of certain food or food products (Health Canada, 2019). Food marketing can promote unhealthy food choices depending on the food or beverage item promoted and the context of marketing. For example, many foods and drinks that are marketed to Canadians can contribute too much sodium, sugar, or saturated fat to our diets (Health Canada, 2019).

In Canada, much evidence exists on food and beverage marketing directed toward children. We know that in Canada, the settings where children eat, buy, and learn about food expose them to powerful food marketing, often for unhealthy foods (Prowse, 2017; Potvin et al., 2017; Potvin et al., 2019). However, there appears to be less evidence about how food and beverages are marketed to primary household food shoppers. Primary household food shoppers are likely affected by different marketing strategies and in different ways than children.

2.4 Food Retailer Flyers

Flyers are a marketing communication tool used by food retailers to advertise new products, announce new stores, and communicate special offers (Prediger, Huertas-Garcia, & Gázquez-Abad, 2019). A flyer is a printed or digital means of weekly/monthly communication from retailers and is used to communicate deals and retailer image (Ziliani & Leva, 2015). Product manufacturers rely on flyers to market directly to consumers at home and in store. Food retailer flyers represent a large part of the retailer's marketing budget, and they also serve as an important revenue stream where product manufacturers buy space to advertise their products in the flyers (Gijbrecchts, Campo & Goossens, 2003). Loyalty programs have also allowed stores to collect data from customers allowing for more sophisticated flyer marketing strategies (Ziliani & Leva, 2015). Food retailer traffic and sales are "significantly affected by flyer composition characteristics, such as the average discount, the share of in-flyer space allocated to food and private label items [and] the type of category featured on the cover page" (Gijbrecchts, Campo & Goossens, 2003, p.13).

In Section 2.2, a socioecological model describing drivers of food and beverage intake in the larger food system was described (Peeters, 2018). Flyers can be situated in and affected by both the macrolevel (policies) and mesolevel (community settings) factors, as well as consumer demand. For example, advertising and marketing policies (macrolevel) may affect what retailers advertise in flyers. Flyers may be a representation of the physical food and beverage environments in local retail stores (mesolevel). Microlevel factors may also affect why or how consumers reference food retailer flyers, and shape what retailers place importance on in flyer messaging (for instance, households may consult flyers to look for promotional offers that align with their financial constraints).

In an integrative review by Glanz et al. (2012), findings suggest that there are several strategies for in-store marketing to promote healthy food choices, including increasing availability, affordability, prominence, and promotion of healthy foods while restricting or reducing marketing of less healthy foods. They reviewed publications that focused on aspects of food marketing that consumers are exposed to in grocery stores, components of those strategies and consumer responses to in-store marketing (Glanz et al., 2012). Glanz et al. (2012), used the “marketing mix” or 4 Ps (product, price, place, and promotion) as a conceptual framework to summarize literature related to grocery store marketing strategies. The 4 Ps model is a foundational marketing tool used by businesses to market goods or services to their consumers (Kotler and Armstrong, 2010). This framework is of particular interest for our study due to the importance of food retailer flyers to a grocery store’s marketing strategy, as described previously. Many consumers consult flyers to understand the offerings of the store before choosing which store to shop at.

Researchers state that variety of products, which consumers value, brings them into the store (Glanz et al., 2012). However, too much variety can be overwhelming, and if their preferred product is present in the store consumers may prefer less variety (Glanz et al., 2012). In Canada, there are discount and regular grocery stores. Although there is little empirical research evaluating their differences, their webpages advertise some key differences, including variety. For example, No Frills, a discount grocery retailer belonging to the Loblaws chain, emphasizes on their website that they sell a limited number of products and that the products themselves are simpler (No Frills, 2022). In contrast, Real Canadian Superstore and Atlantic Superstore, two of Loblaws’ regular stores, advertise that they carry a diversity of products of exceptional quality (Loblaws, 2022).

Products in a grocery store can contribute to shaping either a healthy or unhealthy food environment. If we consider that flyers may be a representation of what is available in the stores, it is significant that it has been found that greater availability of energy dense snack food in stores can modestly contribute to a higher body mass index (BMI) amongst community members, but space devoted to fruits and vegetables did not (Glanz et al., 2012). No major study in Canada has examined differences in the nutrient profiles of foods in discount versus regular grocery stores to our knowledge. Researchers in Australia have found that a discount supermarket chain advertised significantly more fruits and vegetables and significantly fewer discretionary items relative to regular supermarket chains (Cameron et al., 2017), whereas researchers in the Netherlands found the opposite association (Ravensbergen et al., 2015). These conflicting findings suggest that different store types may have different product offerings in different countries. This phenomenon should be examined in Canada as both discount and regular stores are prominent in the food environment.

Price promotions are an important part of marketing, especially in food retailer flyers (Glanz et al., 2012). Price drives the choice of stores and products, and shoppers across an economic spectrum are increasingly interested in using coupons and bargain shopping (Glanz et al., 2012). Glanz et al. (2012) found that manipulating pricing can be an efficient way to promote healthy diets. Returning to the example of discount versus regular stores in Canada, No Frills (2022) claims that their products may even be displayed in their original boxes with the sides cut away to decrease costs. They note in advertising that they have “give[en] up the frills to save some money” and that they focus on great meat, produce and trusted low prices (No Frills, 2022). Regular stores, in contrast, do not appear to advertise this focus on price reductions in their brand identity (Loblaws, 2022). To date, studies done on flyers have focused on differences

in nutritional quality of flyer items between grocery stores in high and low-income neighborhoods, and by discount or regular grocery stores, and not directly on prices (Ethan, Samuel & Basch, 2013; Cameron et al., 2017). This could suggest that researchers have not yet fully explored product prices in flyers or are directly assessing prices in physical environments rather than examining prices in flyers.

In their iteration of the framework, when discussing placement, Glanz et al. (2012) focus on the in-store placement of items. They do not discuss placement of food items in printed means of marketing like flyers. However, items that are marketed in flyers are often closely linked to product positioning in-store (Cameron et al., 2017). For example, the products placed at end-of-aisle and other in-store displays typically include those that are on sale and promoted in flyers (Cameron et al., 2017). Also, in terms of in-flyer placement, the front pages of flyers generate the most viewer attention; a common item to study in flyer research is what items appear on the first page (Ethan, Samuel & Basch, 2013; Martin-Biggers et al., 2013).

Finally, as it relates to promotions, Glanz and team (2012) explain that different consumers respond to different methods of promotion. In flyers, grocery retailers emphasize certain products through means such as displaying pictures of attractive items and advertising items individually instead of as a group. Sense of vision is a powerful driver of food preference (Spence et al., 2016). Visually appealing foods, like fresh produce and bakery items, can stimulate hunger and drive consumer purchases (Spence et al., 2016). Displaying images of visually appealing food in flyers is a powerful tactic for drawing consumers into a store.

The 4Ps are not mutually exclusive and are often combined to increase the effectiveness of marketing strategies by retailers (Glanz et al., 2012). In summary, the 4Ps are laid out in the context of food retailer flyers in Figure 1.

Figure 1. Glanz et al. (2012) 4 Ps of Food Marketing as they Relate to Major Food Retailer Flyers.



2.5 Identification of Gaps in Existing Literature on Food Retailer Flyers

Select studies have examined the regional and national flyer landscapes outside of Canada. Past research done on the composition of grocery store flyers has found that they are largely comprised of less nutritious items (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Jahns et al., 2014; Jahns et al., 2016). In the only study to do an international comparison of 12 countries (Australia, Canada, Hong Kong, India, the United Kingdom, the United States, New Zealand, Singapore, Sweden, Malaysia, South Africa, and the Philippines) most countries advertised a high proportion of discretionary foods, with the only exceptions being the Philippines and India (Charlton et al., 2015). Flyers are an important part of food marketing and can affect the food choices that consumers make in stores (Prediger, Huertas-Garcia, & Gázquez-Abad, 2019). If flyers promote energy-dense and nutrient-poor foods, instead of highly nutritious foods, they may contribute to unhealthy diets. Therefore, to improve the retail food environment for consumers, flyers may be an important point of intervention. To our knowledge, there has not been a study done on the content and nutrient profiles of products in major food retailer flyers in Canada, using Canadian food guidelines.

Previous research has differed along several key methodological choices. Key methodological differences in existing research include differences in nutrient profiling models, sample sizes of assessed flyers, whether regional differences were assessed, whether different types of stores (e.g., regular versus discount grocers) were assessed and whether the content of the first page of the flyer was assessed and compared to subsequent pages.

First, nutrient profiling is the science of classifying foods according to their nutritional composition for reasons related to preventing disease and promoting health and serves as a

means of categorizing foods, not diets (World Health Organization, 2015). Various methods exist for measuring the nutrient profiles of foods and past flyer studies have used varying methodologies. For example, in previous work done on the nutrient profiles of foods in the flyers, some research has focused on dietary alignments with national dietary guidelines (Jahns et al., 2014; Jahns et al., 2016; Cameron et al., 2017; Ravensbergen et al., 2015; Martin-Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch; 2013). Others have used the NOVA Level of Processing food classification system (Camargo et al., 2019; Botelho et al., 2020). Some studies used both a food guide-like nutrient profiling model and NOVA (Hendrikson et al. 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). Most dietary guidelines categorize foods based on their nutritional quality, whereas NOVA measures the level of food processing more specifically. Although both may be valuable in increasing our understanding of the types of foods that exist in the flyers, they are distinct measures and perhaps when combined and compared, lead to more substantive results.

When grouping foods into food groups, researchers have used different methods. However, researchers have generally used a system derived from the national food composition/nutrient database specific to the country of interest (Hendrikson et al., 2021; Jahns et al., 2016; Ethan, Samuel & Basch, 2013). Previous research from the United States has found that protein foods make up a quarter of items advertised in the flyers and that fruits and vegetables made up a very small percent (less than 10% respectively) (Jahns et al., 2014; Jahns et al., 2015). To our knowledge, in Canada, there has not been any significant research that has been done on the food group content of major food retailer flyers. However, in Canada, a similar methodological choice would be to categorize foods based on the Bureau of Nutritional Surveillance (BNS) classification system from the Canadian Community Health Survey-

Nutrition 2015 (CCHS-N) and then break foods up into groupings. Although using food grouping methods from the country performing the study is valuable in applying the findings on a national/regional level, when all studies use grouping methods specific to their country of interest, it can make comparing results of studies internationally difficult.

Sample sizes of assessed flyers have ranged from 20 flyers (Botelho et al., 2020) to 260 flyers (Vandevijvere and Van Dam., 2021; Mendes et al., 2021), with collection periods ranging in length from one month (Martin-Biggers et al., 2013) to one year (Vandevijvere and Van Dam., 2021; Mendes et al., 2021; Jahns et al., 2016; Jahns et al., 2014). In studies conducted over a one-year period, it was found that there was no significant seasonal variation in the content of the flyers (Mendes et al., 2021; Jahns et al., 2016). To our knowledge, there has not been a study done to examine the changes in flyers over time (i.e., through multiple years). However, interventions and events happen over time that may shape what retailers promote in flyers (i.e., the release of a new food guide or the COVID-19 pandemic.)

Few researchers to date have assessed geographic regional differences in food retailer flyers. Those researchers that have examined regional differences have done so on a sub-national scale (Cameron et al., 2017; Martin-Biggers et al., 2013) and on an international scale (Charlton et al., 2015). Researchers have found sub-national regional differences in flyer content which could be explained by consumer preferences or other factors that alter the food environment. For example, it was found that, in the United States, the region with the highest obesity rate devoted significantly more advertising space to sweets, the lowest obesity-rate region allocated the most space to fruits and in the western geographical region, vegetables were allocated the least space (Martin-Biggers et al., 2013). Some researchers have excluded retailers whose flyers differ across regions (Ravensbergen et al., 2015; Hendrikson et al., 2021). By making this

methodological choice, researchers may miss important trends by geographical region, and their results may be less applicable to the country's population.

Selected research has included flyers from discount and regular grocery stores (Ravensbergen et al., 2015; Hendriksen et al., 2021; Cameron et al., 2017; Camargo et al., 2019). By including different types of retailers in their studies, researchers found differences in advertising practices between store types (Cameron et al., 2017). In Canada, discount stores are usually between 5,000 to 10,000 square feet and offer about 7,000 or more products whereas, regular stores tend to have a larger footprint (about 150,000 square feet) and have a much larger selection of products (18,000 or more) (Agriculture Council of Saskatchewan, 2013). Retailers' self-described approach to discount stores includes removing 'extras' such as sophisticated displays, product variety and customer service upgrades, in order to pass on savings to consumers (No Frills, 2022). In contrast, regular stores advertise a larger variety of products and include more sophisticated store upgrades such as meat counters, large in-house bakeries, and prepared food counters (Loblaws, 2022). The purpose of the different retail banners is to signal to the consumer the positioning of the store with respect to product price, level and range of services, product selection, and shopping experience (Agriculture Council of Saskatchewan, 2013). Previous studies have found that discount stores had higher proportions of less healthy foods (Ravensbergen et al., 2015; Hendriksen et al., 2021), whereas others found they included fewer unhealthy items (Cameron et al., 2017). These equivocal results emphasize the importance of examining different types of retailers when conducting this kind of research. If their marketing methods are distinct, as described above, perhaps it is due to different consumer preferences. Differences in nutrient profiles of content in discount versus regular flyers could also point to potential differences in diet quality between consumer groups of these two store types.

Finally, the first page of flyers has the most viewer traffic compared to later pages. A common feature to study in flyer research is the content of the first page (Martin-Biggers, 2013; Ethan et al., 2013; Vandevijvere and Van Dam., 2021; Camargo et al., 2015). Generally, studies have found that the contents of the first page of the flyer are rated as healthier and less processed compared to the remainder of the flyer (Vandevijvere and Van Dam., 2021; Camargo et al., 2015). Fresh whole produce, which is considered to be almost uniformly healthy, such as fruits and vegetables, are also visually appealing in marketing and catch a consumer's eye (Spence et al., 2016). This could be one potentially confounding reason why foods on the first page of the flyer are generally found to be more healthy and less processed. Some researchers have exclusively examined the first page of the flyer but did not collect data for the remainder of the flyer (Martin-Biggers, 2013; Ethan et al., 2013). We see a pattern from other studies that the first page of the flyers is generally healthier than the rest of the flyers. When researchers only examine the first page of the flyer, they must be cautious not to assume the rest of the flyer shows the same trend.

2.6 Nutrient Profiling Models

Various methods exist for measuring the nutrient profiles of foods. Nutrient profiling models are a useful tool for a variety of applications and are a critical tool for the implementation of restrictions on the marketing of foods (World Health Organization, 2015). Nutrient profiling serves as a method of differentiating between foods that contribute to a healthy diet and those that do not (World Health Organization, 2015). They are, however, a means of categorizing foods, not diets (World Health Organization, 2015).

In most countries where flyer studies have been done, researchers have used similar food-based dietary guideline documents to Canada's (Ravensbergen et al., 2015; Jahns et al., 2014;

Jahns et al., 2016; Cameron et al., 2017; Martin-Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch, 2013), the NOVA Level of Processing system (Botelho et al., 2020; Camargo et al., 2019) or both a food guide document and NOVA (Hendriksen et al., 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). Of interest to our study are three models used to assess the nutrient profiles of foods: Canada's Food Guide (CFG), *Policy/Program Memorandum no. 150, School Food and Beverage Policy* (PPM150) and the NOVA Level of Processing food classification system.

CFG

Past flyer studies have used food guides to nutritionally profile foods in flyers (Ravensbergen et al., 2015; Jahns et al., 2014; Jahns et al., 2016; Cameron et al., 2017; Martin-Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch, 2013; Hendriksen et al., 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). There have been many iterations of Canada's Food Guide but its original and continued purpose has been guiding food selection and promoting the nutritional health of Canadians (Health Canada, 2007). In 2019, Canada published a new Food Guide. National food-based dietary guidelines play a role in guiding individuals' food choices but more importantly provide a population-based approach to inform a breadth of practitioners, organizations, companies, and institutions of how foods and beverages fit into an evidence-based healthy dietary pattern (Government of Canada, 2022). The 2019 Food Guide includes a plate diagram that is meant to be flexible and easy to understand. The guide suggests that one should eat plenty of fruits and vegetables (half of the plate), eat protein foods (a quarter of the plate), choose whole grain foods (a quarter of the plate), and make water the drink of choice (Government of Canada, 2022). It also includes recommendations on eating habits, stating that, "Healthy eating is more than the foods you eat. It is also about where, when, why

and how you eat” (Government of Canada, 2022). It suggests that individuals should be mindful of eating habits, cook more often, enjoy food, and eat meals with others (Government of Canada, 2022).

In Canada, research is still emerging on the development of measurement instruments to evaluate retail environments using the new CFG recommendations. The Store Environment Audit (SEA) Tool is a novel protocol for designing retail food environment audit instruments (Jago et al., (unpublished protocol and data), 2022). The SEA Tool allows researchers to develop geographically and demographically relevant store environments assessment tools and was used here to design an audit tool to evaluate store flyers. As in the food guide recommendations, a list of Foods to Consume and Foods to Limit was created in the development of the SEA Tool through the review of food criteria documents published as part of Canada’s 2019 Food Guide as well as Canada’s Food Guide webpages designed for the public.

PPM150

A second nutrient profiling system from the Canadian context is The *Policy/Program Memorandum no. 150, School Food and Beverage Policy* (PPM150). Canada does not have a national school food policy, however, many of the school food guidelines are similar and PPM150 is a reasonable representation of what typical provincial/territorial school food guidelines resemble (Hernandez et al., 2018). PPM 150 is a nutrient profiling system that was created in 2010 by the Ontario provincial government to guide the foods available in schools. PPM 150 uses the previous Canada’s Food Guide food groups (Vegetables and Fruit, Grain Products, Milk and Alternatives, and Meat and Alternatives) to categorize foods and then further breaks them into three groups: “Sell Most”, “Sell Less” and ‘Not Permitted for Sale”. The “Sell

Most” category should comprise at least 80% of foods sold in schools and the “Sell Less” should not comprise more than 20% of foods and beverages (Ontario Ministry of Education, 2010).

NOVA

In previous studies done in this area, researchers have compared nutrient profiles from their national dietary guidelines to the NOVA Level of Processing food classification system (Hendriksen et al., 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). The NOVA Level of Processing food classification system was designed by Monteiro and colleagues to classify foods based on their extent and purpose of processing. Foods are divided into four NOVA categories as follows: unprocessed or minimally processed foods (Group 1), processed culinary ingredients (Group 2), processed foods (Group 3) and ultra-processed foods and drinks (Group 4) (Montiero et al., 2019). The unprocessed category of foods comprises “edible parts of plants (fruit, seeds, leaves, stems, roots, tubers) or from animals (muscle, fat, offal, eggs, milk), and fungi, algae, all after separation from nature” and “spring and tap water” (Montiero et al., 2019, p. 31). Minimally processed foods include “unprocessed foods altered by industrial processes such as removal of inedible or unwanted parts, drying, powdering, squeezing, crushing, grinding, fractioning, steaming, poaching, boiling, roasting, and pasteurization, chilling, freezing, placing in containers, vacuum packaging, non-alcoholic fermentation, and other methods that do not add salt, sugar, oils or fats or other food substances to the original food” (Montiero et al., 2019, p. 31). Processed culinary ingredients included “substances obtained directly from group 1 foods or from nature by industrial processes such as pressing, centrifuging, refining, extracting or mining” (Montiero et al., 2019, p. 32). Processed foods are “products made by adding salt, oil, sugar or another group 2 ingredient to group 1 foods, using preservation methods such as canning and bottling, and, in the case of bread and cheeses, using non-alcoholic fermentation” (Montiero et

al., 2019, p. 32). The final group is comprised of ultra-processed foods; “processes used to make ultra-processed foods include the fractioning of whole foods into substances, chemical modifications of these substances, assembly of unmodified and modified food substances using industrial techniques ...; use of additives at various stages of manufacture ...; and sophisticated packaging...” (Montiero et al., 2019, p. 33). It should be noted that although NOVA is widely used as a tool to assess the healthiness of foods in the flyers, its purpose is to measure the level of processing of foods. Although the two may be related, they are distinct.

2.7 Research Objectives

Through this literature review, it was highlighted that diet-related risk factors are of significant concern for Canadians and that the food environment is likely a major driver of these concerns (Afshin et al., 2017). Food choices are shaped by many factors in the food environment, including retail food stores and the information environments associated with these stores (Glanz et al., 2005). Food retailer flyers are a component of the information environment that exists within the food environment, and they are an important marketing communication tool used by food retailers (Prediger, Huertas-Garcia, & Gázquez-Abad, 2019). There are several strategies for in-store marketing to promote healthy food choices, including increasing availability, affordability, prominence, and promotion of healthy foods and restricting or de-marketing less healthy foods (Glanz et al., 2012). However, past research done on the composition of grocery store flyers has found that they are largely comprised of less nutritious items (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Jahns et al., 2014; Jahns et al., 2016).

The current study aims to address gaps and strengthen the current literature on major food retailer flyers, specifically in Canada. Three distinct nutrient profiling models were used, flyers

from all Canadian provinces were examined, and all pages of the flyer were studied from both discount and regular stores from multiple years. Specifically, through this thesis research, three objectives were fulfilled:

Objective 1. Describe the content (food groups) of Canada's major food retailer flyers.

Objective 2. Describe the nutrient profile of the foods included in Canada's major food retailer flyers (by Canada's Food Guide (CFG), Ontario's Policy/Program Memorandum no. 150 (PPM150), and the NOVA Level of Processing classification system).

Objective 3. Compare how the features of Canada's food retailer flyers (first page versus subsequent flyer page, year of data collection, region, and produced by a discount versus regular grocer) predict the nutrient profile of the foods promoted in Canada's major food retailer flyers.

Chapter 3: Methodology

This chapter serves to review the methodology that was used to identify the results found in this thesis research. First, the sample will be reviewed. Then, the data extraction and cleaning methods will be explained. The variables will be discussed as well as the way in which they were coded. Finally, the statistical analysis will be described.

3.1 Study Design Overview

The research objectives were answered through an analysis of flyers from a major food retailer in Canada. We used a repeat cross-sectional design to examine the types of marketing features and content present in Canada's largest food retailer's flyers over time, and the extent to which the nutrient profile of marketed foods and beverages (defined using three separate nutrient profiling systems) were associated with year of data collection, region, discount versus regular grocer. Research ethics approval was not required for this project as human subjects were not involved.

3.2 Sample

We chose to study flyers from Loblaws, Canada's largest food retailer, because the chain provides large coverage of Canadian regions. Their flyers also provide representation of what the average consumer might be exposed to, because they hold the largest market share among food retailers in Canada. In 2019, they held a 27% share of the grocery store retail industry in Canada (followed by Sobeys/Safeway at 21%) (Bedford, 2022). Few past flyer studies have assessed flyers on a nationwide basis, although in these studies differences were found between regions (Cameron et al., 2017; Martin-Biggers et al., 2013). We chose to analyse flyers on a national scale, with sub-national regions, because a study of this kind has not been done in Canada. Despite the large geographic size of Canada, the Loblaws chain stores produce only four distinct

flyers per flyer cycle, for the following four regions: Atlantic (New Brunswick, Nova Scotia, Newfoundland, and Prince Edward Island), Quebec, Ontario and Western (Manitoba, Saskatchewan, Alberta, and British Columbia).

Loblaws has several banners which include discount and regular stores in each Canadian region. We chose to examine both the discount and regular store flyers in each region because the two stores have distinct purposes and fill different needs for consumers. Past studies have also found that discount and regular stores differ in terms of the healthiness of the products they offer (Cameron et al., 2017; Ravensbergen et al., 2015). Discount stores have a limited number of products and make efforts to keep prices low for consumers. Historically, they employed cost saving measures including displaying items in the boxes in which they arrived at the stores, asking customers to bag their own groceries, charging extra for bags, encouraging customers to bring their own bags, selling generic brands, and no meat counter (No Frills, 2022). Over time, some of these features have changed but overall, retailers themselves state that the main goal of discount grocers in Canada is to keep prices low (No Frills, 2022). Regular grocery stores, however, tend to include more of the so-called “frills” that the discount stores skip. They have large meat counters, elaborate product arrangements, a large variety of generic and premium products and much more (Loblaws, 2022). In Atlantic Canada, the discount banner we collected from was No-Frills, and the regular banner was Atlantic Superstore. In Quebec, the discount banner we collected from was Maxi and the regular banner was Provigo. In Ontario and in Western Canada, the discount banner we collected from was No Frills and the regular banner was Real Canadian Superstore.

Flyers from one discount and one regular grocery banner within the Loblaws chain were collected from multiple time points in each of the four regions in 2014, 2017, and 2021. The

initial phase of 2014 and 2017 data collection cycles took place prior to my involvement in the research. For the purposes of this thesis, I collected the 2021 cycle to complete the dataset, and led the remainder of data extraction, cleaning, coding, and overall dataset preparation for this thesis, with support from team members for verification and dual coding, described further below. We chose to study the flyers in three distinct periods so that the data could be analyzed for changes over time. Most past flyer studies have only analysed flyers over a period of less than a year (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Jahns et al., 2014; Jahns et al., 2015; Camargo et al., 2020; Botelho et al., 2020; Vandevijvere and Van Dam, 2021; Hendriksen et al., 2021). Because food marketing techniques and food environments tend to evolve over time, we chose to collect data in three different years over an eight-year period. In past studies, sample sizes of assessed flyers have ranged from 20 flyers (Botelho et al., 2020) to 260 flyers (Vandevijvere and Van Dam., 2021; Mendes et al., 2021). Our final sample included 53 flyers (n=25 discount, n=28 regular). The sample characteristics are laid out in Table 1.

Table 1. Flyer sample characteristics

Characteristic	2014	2017	2021
Number of flyers collected (total)	16	21	16
Mean (SD) Number of food and beverage items per flyer	106 (SD = 66.4)	174 (SD = 106.2)	215 (SD = 49.8)
Number of flyers collected by region			
Atlantic	4	5	4
Ontario	4	5	4
Quebec	4	6	4
Western	4	5	4
Number of flyers collected by discount versus regular banners			
Discount	8	9	8
Regular	8	12	8

3.3 Data Extraction, Cleaning, Verification, and Reliability Testing

The flyers were downloaded directly from retailer websites. To collect each regional flyer, a postal code from the given region was entered and a flyer was downloaded from the “Flyers & Deals” section of the website. Flyers were downloaded and saved in PDF format. Two rounds of flyers were collected in 2014, in February and August. Three rounds of data were collected in 2017, in March, April and June. In one round of data collection in 2017, the discount flyers from Atlantic Canada, Ontario and Western Canada were not collected. Finally, two rounds of flyer data were collected in 2021, in February and in March. When choosing time points to collect data, we were conscious to choose time points that did not correspond directly with any large holidays associated with food celebrated in Canada (i.e., Valentine’s Day, Halloween, and Christmas), in order to reduce bias associated with specific foods that might be

advertised at such times. In this study we aimed to examine the usual-practice marketing content of flyers, not the special content which may be present around holidays.

Data from the flyers were manually extracted by trained research assistants, led by the author of this thesis with team member support from student colleagues, with mentorship from the supervisory committee. The data were recorded in an Excel file. Each food item was recorded with the corresponding information for the variables of interest. To carry out data verification and dual coding, the research assistants coded a sub-sample of items independently, then discussed the coding together. Disagreements were resolved until a reliable method of coding was reached. Inter-rater reliability was tested for the coding of the three healthiness measures (CFG Alignment: Kappa= 0.889, PPM 105: Kappa= 0.849, NOVA: Kappa= 0.908). Data were checked thoroughly once again prior to analysis to ensure the data extraction and coding was consistent.

3.4 Variables and Coding

Variables of interest were collected for each food item included in the flyers to understand some of the marketing techniques at play in the flyers. Variables of interest for each food item in each flyer included: region (Atlantic, Quebec, Ontario, and Western Canada), store-type (discount versus regular), year (2014, 2017, or 2021), and flyer page (first page, subsequent page). Additional variables were also collected but were not analyzed as part of this study. Collected but not analyzed variables included: item prices, whether an item is part of a group, whether an item is pictured and whether the item is part of a price promotion. The additional variables were collected in order to support the compilation of a Canadian complete dataset for flyer research. However, in examining the research objectives for this thesis, these additional variables were considered outside of the scope of this project. For instance, food prices were

deemed an important but large area of study with different mechanisms to influence food choices, so the analysis of food price and price promotion data was excluded from this thesis, and not considered part of the research objectives. Non-food items and baby food products were also excluded from the analysis. Complete details for the variables analyzed can be found in Appendix 1.

Further, all food items were coded according to the food group to which they belong, as shown in Table 2. Foods were each assigned a food group so a breakdown of which food groups consumed what proportion of space in the flyers could be done and compared to similar studies in other countries (Jahns et al., 2014). Canadian tools were used to categorize the foods into food groups. Foods were first categorized based on the Bureau of Nutritional Surveillance (BNS) classification system. This classification system is derived from the 2015 Canadian Community Health Survey- Nutrition (CCHS-N), where over 2,500 unique food items were recorded as having been consumed by survey respondents (Statistics Canada, 2017). The 2,500 unique food items were further collapsed into the food categories, that comprise the BNS classification system (Statistics Canada, 2017). Next, we categorized the BNS food categories into food groups. In 2019, Kirkpatrick et al. identified these categories based on those used previously for research on done on improving diets based on sodium, energy, fat, and sugar consumption and on Canadian sales data (Fischer et al. 2009; Arcand et al. 2016; Reedy and Krebs-Smith 2010; Top Items Report, National All Channels 52 weeks to February 4, 2017; accessed by Agriculture and Agri-Food Canada). The final list of food groups is presented in Appendix 2.

To understand their nutrient profiles, in past flyer studies, researchers have used their country's specific food guideline to categorize healthy versus unhealthy foods in their flyers (Ravensbergen et al., 2015; Jahns et al., 2014; Jahns et al., 2016; Cameron et al., 2017; Martin-

Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch, 2013). In a similar methodological choice, we first analyzed the foods in our flyer sample using an audit instrument, based on Canada's Food Guide 2019 recommendations, which was created using the Store Environment Assessment (SEA) Tool (Jago et al., (unpublished protocol and data), 2022). A list of "Foods to Consume" and "Foods to Limit" was created in the development of the SEA Tool through the review of food criteria documents published as part of Canada's 2019 Food Guide, as well as Canada's Food Guide webpages designed for the public. The foods in the original list were matched with the Bureau of Nutritional Surveillance (BNS) classification system to avoid duplication of items. Foods not included in the food list were categorized into a separate category entitled, 'Not included' in CFG recommendations (e.g., baby food products). Further, when classifying foods according to Canada's Food Guide, where flyer food items were unspecific (e.g., 'bread' rather than white or whole wheat bread), we used the nutrient profile from the most consumed food item in the BNS food group according to results from 2015 CCHS-N. Each food item in the flyers was recorded and food was categorized as either "Food to Limit, "Food to Consume", or "Food that is Not Included" in the dietary recommendations.

Foods in the flyers were also coded according to the PPM 150 system. PPM 150 is a nutrient profiling system that was created in 2010 by the Ontario provincial government to guide the foods available in schools. This method of nutrient profiling was selected in the absence of a national school nutrition guideline (Hernandez et al., 2018). Further, the Loblaws' headquarters is located in Ontario (Loblaws, 2022) and researchers involved in the project work closely with public health units/professionals in Ontario, suggesting that PPM 150 has good practical salience to the research. The PPM 150 uses earlier iterations of Canada's Food Guide food groups (Vegetables and Fruit, Grain Products, Milk and Alternatives, and Meat and Alternatives) to

categorize foods and then further breaks them into three groups: “Sell Most”, “Sell Less” and ‘Not Permitted for Sale’. The foods were categorized based on PPM150 to allow for comparison in results between nutrient profiling models.

The NOVA Level of Processing system categorizes foods as either unprocessed or minimally processed, processed culinary ingredient, processed or ultra-processed. This system is used in other flyer studies as a means of nutrient profiling (Botelho et al., 2020; Camargo et al., 2019). As in our study, others have used both a country-specific food guide documents and NOVA to allow for comparison between the two (Hendriksen et al., 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021).

The use of three distinct nutrient profiling models was deemed to be important in accomplishing the research objectives. The rationale for the three is as follows. First, although NOVA has been used in past flyer research and was a logical choice, we determined that it would be useful to use NOVA as well as other nutrient profiling models because NOVA focuses specifically on the level of processing of food, versus nutrient composition or other food groupings. PPM150 serves as a practical model that is relevant to health promotion practice. Canada’s Food Guide is also important to decision-makers and health promotion practitioners, and existing flyer research has focused on dietary alignments with national dietary guidelines. However, we chose to include both CFG and PPM150 as nutrient profiling models in order to examine the relationship between them, given the importance of provinces and territories to Canadian health policy. We also used a novel methodology for the protocol development tool and this thesis research provided a means of operationalizing it for Canada’s Food Guide, and thus comparing to an established measure.

3.5 Statistical Analysis

All analysis was performed using SPSS Statistics software version 24.0 (IBM).

Descriptive analyses were used to examine proportions of items within each category of the variables described above. The food items were categorized into food groups to ascertain the frequency of each group appearing in the flyers. We summarized the intended flyer customer audience using geographic region (Atlantic, Ontario, Quebec, Western Canada) and store type (discount or regular). We also described the total composition of foods included in each flyer, including relative proportion of food items by food group. We described an important promotional advertising feature of foods in the flyers, whether the food was on the first page. Further, the food items were split into food groups to ascertain the frequency of each group appearing in the flyers.

Next, the data were analyzed for the proportions of foods belonging to each category of our three healthiness scales (CFG, PPM150 and NOVA). Binary logistic regression analysis was performed to test the odds of foods aligning with Canada's Food Guide by time, store type and region given differences in each of the flyer features assessed (first page [yes/no]; store type [discount/regular]; region [Atlantic/Quebec/Ontario/West]; time [2014, 2017, 2021]). P-value of <0.05 was considered statistically significant.

Chapter 4: Results/Manuscript

Authorship Statement

Title: What Types of Foods are Marketed in Major Food Retailer Flyers? A Repeat Cross-Sectional Study in Canada

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Contributions

This paper is submitted as a results chapter in the MAHSR thesis prepared by AD. AD led or co- led all components of the research presented in the thesis with supervisory committee support from CM and LM. The contributions specifically for the paper are as follows. CM and LM conceptualized the idea for the study and the direction. AD, in consultation with CM and LM, finalized the direction of the paper. LM previously led data collection for the 2014 and 2017 datasets. AD completed data collection and cleaning for the 2021 dataset. AD was the lead author on the paper. All sections were written by AD with initial, intermediate, and final revisions by CM. LM was involved with intermediate and initial revisions on this paper. AD revised the final draft and prepared references.

4.1 Introduction

Dietary risk factors represent a significant concern for the health of Canadians; they are a leading risk factor for disease burden in Canada, as measured by death and disability combined (Afshin et al., 2017). People are consuming excess energy which could be caused by an increased availability, accessibility, and affordability of energy-dense foods, and the intense marketing of these foods (Afshin et al., 2017). Changes in the food environment and food systems are likely major drivers for the increase of the diet-related disease burden over the past three decades (Afshin et al., 2017).

Food environments are “the collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people's food and beverage choices and nutritional status” (Swinburn et al., 2013, p.14). The food environments in which Canadians live affect their food choices and ultimately, their diet quality (Health Canada, 2013). Although Canadians may understand the components of a healthy diet, their food environments may influence them to choose less nutritious food options (Health Canada, 2013).

From 2015-2021, Canadian households spent 73% of every household dollar spent on food in stores, making stores an important aspect of the Canadian food environment (Statistics Canada, 2021). A study done in Montreal, Canada, suggests that grocery stores have greater availability of healthy foods; however, they also have more availability of ultra-processed food products, suggesting that supermarkets cannot be considered uniformly healthy stores (Jalbert-Arsenault, Robitaille & Paquette, 2017).

In 2019, new dietary guidelines were released to guide the food choices made by Canadians. According to information provided in Canada's Food Guide (CFG), food marketing is defined as advertising that promotes the sale of certain food or food products (Health Canada,

2019). Also, many foods and drinks that are marketed can contribute too much sodium, sugar, or saturated fat to our diets (Health Canada, 2019).

Food retailer flyers are a type of food marketing that may influence the food items that consumers choose to purchase. A promotional flyer is a printed or digital means of weekly/monthly communication from retailers and is used to communicate deals and retailer image (Ziliani & Leva, 2015). Product manufacturers also rely on flyers to market directly to consumers, at home and in store. Food retailer flyers represent a large part of the retailer's marketing budget, and they also serve as an important revenue stream where product manufacturers buy space to advertise their products (Gijsbrechts, Campo & Goossens, 2003). Food retailer traffic and sales are “significantly affected by flyer composition characteristics, such as the average discount, the share of in-flyer space allocated to food and private label items [and] the type of category featured on the cover page” (Gijsbrechts, Campo and Goossens, 2003, p. 13).

Select studies have examined the regional and national flyer landscapes outside of Canada. To our knowledge, there has not been a study examining the nutritional quality of flyers in Canada, using Canadian food-based dietary guideline recommendations. Past research done on the composition of grocery store flyers has found that they are largely comprised of less nutritious items (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017). In the only study to do an international comparison of 12 countries (Australia, Canada, Hong Kong, India, the United Kingdom, the United States, New Zealand, Singapore, Sweden, Malaysia, South Africa, and the Philippines), it was found that most countries advertised a high proportion of discretionary foods, with the only exceptions being the Philippines and India (Charlton et al., 2015). If flyers promote energy-dense and nutrient-poor

foods, rather than highly nutritious foods, they may be an important point of intervention to improve the quality of the retail food environment.

Previous research has differed along several key methodological choices, as well as countries of study. Key methodological differences in existing research include differences in nutrient profiling models, sample sizes of assessed flyers, whether regional differences were assessed, whether different types of stores (e.g., regular versus discount grocers) were assessed and whether the content of the first page of the flyer was assessed in comparison to the whole of the flyer.

First, nutrient profiling is the science of classifying foods according to their nutritional composition for reasons related to preventing disease and promoting health, and serves as a means of categorizing foods, not diets (World Health Organization, 2015). Various methods exist for measuring the nutrient profiles of foods and past flyer studies have used varying methodologies. For example, in previous work done on the nutrient profiles of foods in the flyers, some research has focused on dietary alignments with national dietary guidelines (Jahns et al., 2014; Jahns et al., 2016; Cameron et al., 2017; Ravensbergen et al., 2015; Martin-Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch; 2013). Others have used the NOVA Level of Processing food classification system (Camargo et al., 2019; Botelho et al., 2020). Some studies used both a food guide-style nutrient profiling model and NOVA (Hendrikson et al. 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). Most dietary guidelines that countries follow categorize foods based on their nutritional quality, whereas NOVA measures the level of processing of foods more specifically. Although both may be valuable in increasing our understanding of the types of foods that exist in the flyers, they are distinct measures and perhaps when combined and compared, lead to more substantive results.

When grouping foods into food groups, different researchers have used different methods. However, researchers have generally used a system derived from the national food composition/nutrient database specific to the country of interest (Hendrikson et al., 2021; Jahns et al., 2016; Ethan, Samuel & Basch, 2013). Previous American research has found that protein foods make up a quarter of items advertised in the flyers and that fruits and vegetables made up a very small percent (less than 10% respectively) (Jahns et al., 2014; Jahns et al., 2015). To our knowledge, in Canada, there is a limited understanding of the food group content of major food retailer flyers. However, in Canada, a similar methodological choice would be to categorize foods based on the Bureau of Nutritional Surveillance (BNS) classification system from the Canadian Community Health Survey to categorize foods into groupings. Although using food grouping methods from the country performing the study is valuable in applying the findings on a national/regional level, when all studies use grouping methods specific to their country of interest, it can make comparing results of different studies difficult internationally.

Sample sizes of assessed flyers in past research have ranged from 20 flyers (Botelho et al., 2020) to 260 flyers (Vandevijvere and Van Dam., 2021; Mendes et al., 2021), with collection periods ranging in length from one month (Martin-Biggers et al., 2013) to one year (Vandevijvere and Van Dam., 2021; Mendes et al., 2021; Jahns et al., 2016; Jahns et al., 2014). In studies done over a one-year period, it was found that there was no significant seasonal variation in the content of the flyers (Mendes et al., 2021; Jahns et al., 2016). To our knowledge, there has not been a study done to examine the changes in flyers over time (i.e., through multiple years). However, interventions and events happen over time that may shape what retailers promote in flyers (i.e., the release of a new food guide or COVID-19).

Few researchers to date have assessed sub-national, regional differences in food retailer flyers (Cameron et al., 2017; Martin-Biggers et al., 2013); some research has been done on an international comparative scale (Charlton et al., 2015). Researchers have found regional differences in flyer content which could be explained by consumer preferences or other factors that alter the food environment. For example, one study in the United States found that the region with the highest obesity rate devoted significantly more advertising space to sweets, whereas the region with the lowest obesity rate allocated the most space to fruits and in the western geographic region, vegetables were allocated the least space (Martin-Biggers et al., 2013). Some researchers have excluded retailers whose flyers differ across regions (Ravensbergen et al., 2015; Hendrikson et al., 2021). By making this methodological choice, researchers may miss important trends by geographical region, and their results may be less applicable to the country's population.

Selected research has included flyers from discount and regular grocery stores (Ravensbergen et al., 2015; Hendriksen et al., 2021; Cameron et al., 2017; Camargo et al., 2019). By including different types of retailers in their studies, researchers found differences in advertising practices between store types (Cameron et al., 2017). In Canada, discount stores are usually between 5,000 to 10,000 square feet and offer about 7,000 or more products, whereas regular stores tend to have a larger footprint (about 150,000 square feet) and have a much larger selection of products (18,000 or more products) (Agriculture Council of Saskatchewan, 2013). Retailers' self-described approach to discount stores includes removing 'extras' such as sophisticated displays, product variety and customer service upgrades, in order to pass on savings to consumers (No Frills, 2022). Regular stores, in contrast, advertise a larger variety of products and include more sophisticated store upgrades like meat counters, large in-house

bakeries, and prepared food counters (Loblaws, 2022). The purpose of the different banners is to signal to the consumer the positioning of the store with respect to product price, level and range of services, product selection, and shopping experience (Agriculture Council of Saskatchewan, 2013). Previous studies have found that discount store flyers had higher proportions of less healthy foods (Ravensbergen et al., 2015; Hendriksen et al., 2021), whereas others found they included a smaller proportion of less healthy items, relative to regular stores (Cameron et al., 2017). These differing results emphasize the importance of examining different types of retailers within the same study. Differences in nutrient profiles of content in discount versus regular flyers could point to differences in consumer preferences or diet quality between consumer groups of these two store types.

Finally, the first page of flyers has the most viewer traffic compared to later pages, and a common item to study in flyer research is the content of the first page (Martin-Biggers, 2013; Ethan et al., 2013; Vandevijvere and Van Dam., 2021; Camargo et al., 2015). Generally, studies have found that the contents of the first page of flyers are rated as healthier and less processed compared to the remainder of the flyer (Vandevijvere and Van Dam., 2021; Camargo et al., 2015). Fresh produce, typically coded as healthy, such as fruits and vegetables, are visually appealing and catch a consumer's eye (Spence et al., 2016). This could be one confounding reason why foods on the first page of the flyer are generally more healthy and less processed. Some researchers have exclusively examined the first page of the flyer but did not collect data for the remainder of the flyer (Martin-Biggers, 2013; Ethan et al., 2013). We see a pattern from other studies that the first page of the flyers is generally healthier than the rest of the flyers (Ethan, Samuel & Basch, 2013; Martin-Biggers et al., 2013). Therefore, when researchers only

examine the first page of the flyer, they must be cautious not to introduce bias by assuming that the rest of the flyer shows the same trend.

The objective of this study is to describe the content of Canada's major food retailer flyers and how the features of the flyers predict the nutrient profile of the foods in the flyers. We will examine the flyers' food group content, how the foods align with different nutrient profiling models, and how some features of the flyers (i.e., time, store-type, page, and region) predict the nutrient profiles of the foods in the flyers.

4.2 Methodology

Study Design Overview

We used a repeat cross-sectional design to examine the types of marketing features and content present in Canada's largest food retailer flyers over time, and the extent to which the nutrient profile of advertised foods and beverages (defined using three separate nutrient profiling systems) were associated with year of data collection, geographic region, and discount versus regular grocer. Research ethics approval was not required for this project as human subjects were not involved.

Sample

We chose to study flyers from Loblaws, Canada's largest food retailer, for the data source. The chain provides large coverage of Canadian regions and provides a reasonable representation of what the average consumer might be exposed to, given that they hold the largest market share among food retailers in Canada. In 2019, Loblaws held a 27.2% share of the grocery store retail industry in Canada (followed by Sobeys/Safeway at 21%) (Bedford, 2022). Despite the large geographic size of Canada, the Loblaws chain stores produce only four distinct flyers per flyer cycle, for the following regions: Atlantic (New Brunswick, Nova Scotia,

Newfoundland, and Prince Edward Island) Quebec, Ontario and Western (Manitoba, Saskatchewan, Alberta, and British Columbia).

Loblaws also owns a variety of grocery banners under its corporation, including discount and regular stores in each Canadian region. In Atlantic Canada, the discount banner we collected from was No-Frills, and the regular banner was Atlantic Superstore. In Quebec, the discount banner we collected from was Maxi and the regular banner was Provigo. In Ontario and in Western Canada, the discount banner we collected from was No Frills and the regular banner was Real Canadian Superstore. Flyers from one discount and one regular grocery banner within the Loblaws chain were collected from multiple time points in each of the four regions in 2014, 2017, and 2021. The 2014 and 2017 datasets were collected prior to the first author's involvement in the work. The first author led the 2021 data collection and completed the dataset. The final sample was 53 flyers (n=25 discount, n=28 regular). The sample is described in Table 1.

Table 2. Flyer sample characteristics

Characteristic	2014	2017	2021
Number of flyers collected (total)	16	21	16
Mean (SD) Number of food and beverage items per flyer	106 (SD=66.4)	174 (SD=106.2)	215 (SD=49.8)
Number of flyers collected by region			
Atlantic	4	5	4
Ontario	4	5	4
Quebec	4	6	4
Western	4	5	4
Number of flyers collected by discount versus regular banners			
Discount	8	9	8
Regular	8	12	8

Data Collection

Flyers were downloaded directly from the retailer's websites. To collect each regional flyer, a postal code from the given region was entered and a flyer was downloaded from the "Flyers & Deals" section of the website. Flyers were downloaded and saved in PDF format. Two rounds of flyers were collected in 2014, in February and August. Three rounds of data were collected in 2017, in March, April and June. In one round of data collection in 2017, the discount flyers from Atlantic Canada, Ontario and Western Canada were not collected. Finally, two rounds of flyer data were collected in 2021, in February and in March. Data collection time points were purposefully selected to avoid large holidays celebrated in Canada typically associated with special foods (e.g., Halloween, and Christmas, Easter).

Data Extraction and Coding

Data from the flyers were manually extracted into MS Excel by trained research assistants, as described below. Variables of interest for each food item in each flyer included: region (Atlantic, Quebec, Ontario, and Western Canada), store-type (discount versus regular), year (2014, 2017, or 2021), and flyer page (first page, subsequent page). Non-food items and baby food products were excluded from the analysis. Complete details for the variables of interest can be found in Appendix 1.

Like past studies done in this area, we used food grouping systems derived from the national food composition/nutrient database specific to the country of interest (Hendrikson et al., 2021; Jahns et al., 2016; Ethan, Samuel & Basch, 2013). Foods were first categorized based on the Bureau of Nutritional Surveillance (BNS) classification system from the Canadian Community Health Survey. This classification system is derived from the 2015 Canadian Community Health Survey - Nutrition (CCHS-N), where over 2,500 unique food items were recorded as having been consumed by survey respondents (Statistics Canada, 2017). The 2,500 unique food items were further collapsed into the food categories that comprise the BNS classification system (Statistics Canada, 2017). Where a food item was unspecific in the flyer (i.e., Bread) we categorized the food based on the most consumed food by Canadians in that category based on data from the CCHS-N (i.e., white bread, commercial).

Next, we categorized the BNS food categories into food groups. In 2019, Kirkpatrick et al. identified food group categories based on those used previously for research done on improving diets based on sodium, energy, fat, sugar consumption, and on Canadian sales data (Fischer et al. 2009; Arcand et al. 2016; Reedy and Krebs-Smith 2010; Top Items Report, National All Channels 52 weeks to February 4, 2017; accessed by Agriculture and Agri-Food Canada). The final list of food groups is presented in Appendix 2.

Each food was also categorized based on different nutrient profiling models: Canada's 2019 Food Guide (CFG), PPM150 and the NOVA Level of Processing, as described in the next section titled Nutrient Profiling Models.

Disagreements after initial coding were resolved until a consistent and reliable method of coding was reached. Inter-rater reliability for the three nutrient profiling models (described below) was assessed between the two raters and found to be high: CFG Alignment: Kappa= 0.889, PPM 105: Kappa= 0.849, NOVA: Kappa= 0.908.

Nutrient Profiling Models

Nutrient profiling is the science of classifying foods according to their nutritional composition for reasons related to promoting health (World Health Organization, 2015). Various methods exist for measuring the nutrient profiles of foods, and past studies studying flyers have used varying methodologies including national food guidelines from varying countries (Ravensbergen et al., 2015; Jahns et al., 2014; Jahns et al., 2016; Cameron et al., 2017; Martin-Biggers et al., 2013; Charlton et al., 2015; Ethan Samuel & Basch, 2013), NOVA (Botelho et al., 2020; Camargo et al., 2019) and both a food guide and NOVA (Hendriksen et al., 2021; Vandevijvere and Dam, 2021; Mendes et al., 2021). We used three nutrient profiling models: Canada's Food Guide, *Policy/Program Memorandum no. 150, School Food and Beverage Policy* (PPM150) and NOVA.

The use of three distinct nutrient profiling models was deemed to be important to accomplishing the research objectives. The rationale for the three is as follows. First, although NOVA has been used in past flyer research and was a logical choice, we determined that it would be useful to use NOVA as well as other nutrient profiling models because NOVA focuses specifically on the level of processing of food, versus nutrient composition or other food

groupings. PPM150 serves as a practical model that is relevant to health promotion practice. Canada's Food Guide is also important to decision-makers and health promotion practitioners, and existing flyer research has focused on dietary alignments with national dietary guidelines. However, we chose to include both CFG and PPM150 as nutrient profiling models in order to examine the relationship between them, given the importance of provinces and territories to Canadian health policy. We also used a novel methodology for the protocol development tool and this thesis research provided a means of operationalizing it for Canada's Food Guide, and thus comparing to an established measure.

CFG Alignment

Like similar flyer studies done in other countries, Canada's Food Guide was first used to measure the nutrient profile of the foods in the flyers (Hendrikson et al. 2021; Cameron et al., 2017; Jahns et al., 2015). The Store Environment Audit (SEA) Tool is a novel protocol for designing store audit instruments, and in our case, was used to design an audit tool to evaluate store flyers (Jago et al., (unpublished protocol and data), 2022). Using this protocol, we used the primary Canada's Food Guide publication devoted to decision-maker and nutrition professional audiences and related web pages to extract a list of Food Guide items, corresponding to "Foods to Consume" and "Foods to Limit". Food items were then further matched to the Bureau of Nutritional Surveillance (BNS) classification system and duplicates were removed. Foods in flyers that could not be readily matched to a corresponding item in the Canada's Food Guide list were categorized into a separate category titled 'Not included' (e.g, baby food products). Further, when classifying foods according to Canada's Food Guide, where flyer food items were unspecific (e.g., 'bread' but white or whole wheat type unspecified), we used the nutrient profile from the most consumed food item in the BNS food group according to results from 2015

CCHS-N. This coding process resulted in each food item in the flyers being categorized as either “Food to Limit”, “Food to Consume”, or “Food that is Not Included” in the dietary recommendations.

PPM 150

PPM 150 was used as a second means of nutrient profiling. PPM 150 is a nutrient profiling system that was created in 2010 by the Ontario Provincial Government to guide the foods available in schools. This method of nutrient profiling was selected in the absence in a national school nutrition guideline in Canada (Hernandez et al., 2018). Also, the Loblaws’ headquarters is located in Ontario (Loblaws, 2022) and as such the Ontario guideline may have particular salience to the sample of grocery flyers we used. PPM 150 uses the previous Canada’s Food Guide food groups (Vegetables and Fruit, Grain Products, Milk and Alternatives, and Meat and Alternatives) to categorize foods and then further breaks them into three groups: “Sell Most”, “Sell Less” and ‘Not Permitted for Sale’. The “Sell Most” category should comprise at least 80% of foods sold in schools and the “Sell Less” should not comprise more than 20% of foods and beverages (Ontario Ministry of Education, 2010). Foods in the flyers were coded according to the PPM 150 criterion as either “Sell Most”, “Sell Less” or ‘Not Permitted for Sale’.

NOVA

Finally, similar to previous studies done in this area, we used the NOVA level of processing food classification system (Hendriksen et al., 2021; Botelho et al., 2020). The NOVA level of processing food classification system was designed by Monteiro and colleagues to classify foods based on their extent and purpose of processing. Foods are divided into four NOVA categories as follows: unprocessed or minimally processed foods (Group 1), processed

culinary ingredients (Group 2), processed foods (Group 3) and ultra-processed foods and drinks (Group 4) (Montiero et al., 2019). The unprocessed category of foods comprises “Edible parts of plants (fruit, seeds, leaves, stems, roots, tubers) or from animals (muscle, fat, offal, eggs, milk), and fungi, algae, all after separation from nature” and “Spring and tap water” (Montiero et al., 2019, p.31). Minimally processed foods include: “Unprocessed foods altered by industrial processes such as removal of inedible or unwanted parts, drying, powdering, squeezing, crushing, grinding, fractioning, steaming, poaching, boiling, roasting, and pasteurization, chilling, freezing, placing in containers, vacuum packaging, non-alcoholic fermentation, and other methods that do not add salt, sugar, oils or fats or other food substances to the original food” (Montiero et al., 2019, p.31). Processed culinary ingredients included: “Substances obtained directly from group 1 foods or from nature by industrial processes such as pressing, centrifuging, refining, extracting or mining” (Montiero et al., 2019, p.32). Processed foods are “Products made by adding salt, oil, sugar or another group 2 ingredient to group 1 foods, using preservation methods such as canning and bottling, and, in the case of bread and cheeses, using non-alcoholic fermentation” (Montiero et al., 2019, p.32). The final group is comprised of ultra-processed foods; “Processes used to make ultra-processed foods include the fractioning of whole foods into substances, chemical modifications of these substances, assembly of unmodified and modified food substances using industrial techniques ...; use of additives at various stages of manufacture ...; and sophisticated packaging...” (Montiero et al., 2019, p.33). The foods in the flyers were categorized based on NOVA level of processing ratings as either unprocessed or minimally processed, processed culinary ingredient, processed or ultra-processed.

Statistical Analysis

Descriptive analyses were used to examine proportions of items within each category of the variables described above. The food items were split into food groups to ascertain the frequency of each group appearing in the flyers

Binary logistic regression analysis was performed to test the odds of foods aligning with Canada's Food Guide along time, store type and region given differences in each of the flyer features assessed (first page [yes/no]; store type [discount/regular]; region [Atlantic/Quebec/Ontario/West]; time [2014, 2017, 2021]) of CFG alignment. P-value of <0.05 was considered statistically significant. Data analyses were performed using SPSS Statistics software version 24.0 (IBM).

4.3 Results

A total of 53 flyers were analyzed over 7 time points in 2014, 2017 and 2021. The total sample size was n=8,790 food and beverage items advertised across all the flyers in the pooled dataset.

Content of Major Food Retailer Flyers

We examined what items the flyers contained in terms of food group breakdown. The results of the descriptive food group analysis are shown in Table 2. We found that 7.2% (638) percent of flyer items belonged to the additions group. A small proportion, 1.4% (124), of foods were fats and oils. Fruits comprised 6.5% (567) of flyer items and 8.3% (727) of foods were vegetables. Milk and dairy products made up 10.2% of items. Meat products constituted 7.2% (631) of flyer items, 3.2% (284) were processed meat products, 2.9% (251) were protein alternatives and 5.2% (460) were finfish or shellfish products. Grain products made up 2.7% (241) of food items in the flyers, 11.0% (965) were baked products, and 1.9% (169) were breakfast cereals. Sweets made up 8.1% (716) of flyer items and snacks made up 5.1% (450).

Entrees were 5.8% (513) of items. Of the flyer items, 10.7% (943) were non-alcoholic beverages whereas, 1.0% (89) were alcoholic beverages. Finally, 1.5% (131) of items were baby food products.

Table 3. Food and beverage items (n=8790) belonging to each food group in Canada’s major food retailer flyers from 2014, 2017 and 2021 (pooled analysis).

Food Group	Frequency	%
Additions	638	7.2
Fats and Oils	124	1.4
Fruits	567	6.5
Vegetables	727	8.3
Milk and Dairy	893	10.2
Meat Products	631	7.2
Processed Meats	284	3.2
Protein Alternatives	251	2.9
Finfish and Shellfish Products	460	5.2
Grains	241	2.7
Baked Products	965	11.0
Breakfast Cereals	169	1.9
Sweets	716	8.1
Snacks	450	5.1
Entrees	513	5.8
Non-Alcoholic Beverages	943	10.7
Alcoholic Beverages	89	1.0
Baby Foods	131	1.5

Nutrient Profiles of the Food in the Flyers

Proportions of healthy versus less healthy foods according to the three different nutrient profiling models are presented in Table 3. For all three food categorizing methods, CFG Alignment, PPM 150 and NOVA, foods from the least healthy/most highly processed category were most prominent. Over half of flyer foods (58.5%) did not align with Canada's Food Guide. Less than half (45.3%) of foods were in the Not Permitted for Sale category of PPM 150. Finally, 51.2% of foods were in NOVA's ultra-processed food category.

Although a prominent proportion of foods aligned with the most unhealthy category of each rating system, the healthiest categories ranked next. 33.6% of foods were Foods to Consume as per Canada's Food Guide, 36.6% of foods aligned with PPM150's Sell Most category and 27.8% of foods aligned with NOVA's Unprocessed/Minimally Processed category.

Finally, foods that fell into PPM 150's Sell Less category made up 16.1% of flyer food items and 0.5% of foods were not included in PPM150's guidelines. Foods that fell into NOVA's Processed Culinary Ingredients category were 1.7% of flyer items and 17.8% were Processed Foods. In all three systems, 1.5% of foods were baby food products.

Table 4. Healthiness of the foods in Canada’s major food retailer flyers (n=8092), as measured by alignment with Canada’s Food Guide (CFG), Nutrition Standards for Ontario Schools (PPM150) & the NOVA Classification System (NOVA).

	Sample Size	%
Items (total)	8790	-
CFG Alignment		
Not Included in Guidelines	567	6.5
Does Not Align	5141	58.5
Aligns	2951	33.6
Baby Food Product	131	1.5
PPM150		
Not Included in Guidelines	43	0.5
Not Permitted for Sale	3985	45.3
Sell Less	1416	16.1
Sell Most	3215	36.6
Baby Food Product	131	1.5
NOVA		
Unprocessed/Minimally Processed Food	2446	27.8
Processed Culinary Ingredients	148	1.7
Processed Food	1566	17.8
Ultra-Processed Food	4499	51.2
Baby Food Product	131	1.5

Odds of Flyer Foods Aligning with Canada’s Food Guide

Next, we analysed the odds of a food item in Canada’s major food retailer flyers being aligned with Canada’s Food Guide separately for both discount and regular stores. In a discount flyer, there were significantly higher odds that, in 2014, foods would align with CFG compared

to 2021 (OR=1.371, 95%CI 1.106, 1.701, p=0.004). In a regular store flyer, there were significantly lower odds that in 2017 foods would align with CFG compared to 2021 (OR=0.795, 95%CI 0.700, 0.902, p=0.000). In both regular (OR=1.600, 95%CI .290, 1.985, p= 0.000) and discount (OR=1.570, 95%CI 1.168, 2.108, p= 0.003) flyers, the odds were significantly higher that the foods on the first page would align with Canada's food guide compared to other pages. There was no significant difference in the predictability of healthiness between the flyers in the different Canadian regions in the discount or the regular flyers.

Table 5. Logistic regression analysis of variables related to the odds of a food item in Canada’s major food retailer flyers being aligned with Canada’ Food Guide (discount and regular food retailers).

	Discount (n=2563)		Regular (n=5529)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Region (Ref: Atlantic Canada)				
Western Canada	1.015	(.791, 1.303)	1.106	(.934, 1.309)
Ontario	1.120	(.877, 1.432)	.990	(.845, 1.161)
Quebec	1.050	(.833, 1.323)	.993	(.865, 1.141)
Year (Ref: 2021)				
2014	*1.371	(1.106, 1.701)	1.036	(.887, 1.209)
2017	.990	(.823, 1.191)	*.795	(.700, .902)
Flyer Page (Ref: Not First Page)				
First Page	*1.570	(1.168, 2.108)	*1.600	(1.290, 1.985)

***Bold = Significance at 0.05 level**

Finally, we assessed the odds of a food item in Canada’s major food retailer flyers being aligned with Canada’ Food Guide, by Canadian region. In Western Canada, the odds of foods aligning with Canada’s food guide were significantly higher in 2014 compared to 2021(OR=1.731, 95%CI 1.295, 2.312, p= 0.000). In Ontario (OR=1.831, 95%CI 1.222, 2.742, p=0.003), Quebec (OR=1.495, 95%CI 1.092, 2.046, p=0.012) and Atlantic Canada (OR=1.746, 95%CI 1.283, 2.376, p=0.000), the odds were significantly higher that the foods on the first page of the flyer would align with Canada’s food guide compared to other pages. In Quebec

(OR=0.689, 95%CI 0.573, 0.828, $p= 0.000$) and in Atlantic Canada (OR=0.791, 95%CI 0.646, 0.968, $p=0.023$), there were significantly lower odds that in 2017 foods would align with CFG compared to 2021.

Table 6. Logistic regression analysis of variables related to the odds of a food item in Canada's major food retailer flyers being aligned with Canada's Food Guide (Western Canada, Ontario and Quebec and Atlantic Canada).

	Western Canada (n=1492)		Ontario (n=1703)		Quebec (n=2644)		Atlantic Canada (n=2253)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Store Type (Ref: Discount)								
Regular	1.109	(.893, 1.378)	.877	(.714, 1.077)	.959	(.807, 1.139)	1.021	(.824, 1.265)
Year (Ref: 2021)								
2014	*1.731	(1.295, 2.312)	1.217	(.928, 1.596)	.941	(.754, 1.174)	.993	(.780, 1.263)
2017	1.128	(.888, 1.434)	.993	(.795, 1.239)	*.689	(.573, .828)	*.791	(.646, .968)
Flyer Page (Ref: Not First Page)								
First Page	1.316	(.921, 1.881)	*1.831	(1.222, 2.742)	*1.495	(1.092, 2.046)	*1.746	(1.283, 2.376)

***Bold = Significance at 0.05 level**

4.4 Discussion

Summary of Results

The Canadian food environment affects people's diet-related health outcomes (Health Canada, 2013). Often the environments in which we live, work, and play fail to reinforce healthy choices, and dietary risk factors are the leading risk factor for disease burden in Canada (Vanderlee and L'Abbé, 2017; Afshin, 2019). Major food retailer flyers form an important part of major food retailers' marketing strategies to a wide range of consumer groups and contribute to the healthfulness of the consumer food environment (Glanz et al., 2012).

Several main findings emerged from our examination of major food retailer flyers and help to strengthen our understanding of food marketing in Canada. Flyer items were made up largely of these groups: baked products (11%), non-alcoholic beverages (10.7%) and milk and dairy (10.2%). We also noted vegetables (8.3%) and fruits (6.5%), and protein foods (18.5%) as being groups of interest for discussion. Across all three nutrient profiling systems, the least healthy/most highly processed food categories were advertised most often (CFG: 58.5%, PPM150: 45.3%, NOVA: 51.2%), although the most healthy/least processed was found to follow.

The only feature of the flyer to consistently predict healthiness of items advertised was an item being on the first page of flyers, which we found to advertise healthier food categories relative to subsequent pages. Further, there were few differences by year, and there were no major differences between Canadian regions or discount and regular grocery flyers. Each of these findings will be described in more detail below.

Since our sample contained flyers from the largest food retailer in Canada, these results may be able to be applied to Canada as a whole.

Interpretations

Our analysis on the proportions of food groups represented in the flyers highlighted a few groups of interest: baked products, non-alcoholic beverages and milk and dairy, vegetables and fruits, and protein foods. Baked products were the single food group comprising the greatest proportion of items, at 11.0% of flyer food items. In-store bakery departments serve as a large draw for consumers to go to the grocery store. Although a more precise study was not found, in a marketing survey, regarding Canadians' grocery shopping habits, 54% of consumers claimed to purchase bread and 43% claimed to purchase sweet baked goods from an in-store bakery (Puratos, Food Innovation for Good, 2019).

Non-alcoholic beverages made up 10.7% of total flyer food items. An American study found that 59% of beverages advertised in flyers were sugar sweetened beverages (Ethan, Samuel & Basch, 2013). Sugar sweetened beverages are of concern for many researchers because these beverages contribute substantially to Canadians' overall energy intake (Jones, Kirkpatrick, and Hammond, 2019). Vegetables and fruits represented 8.3% and 6.5% of total flyer food items respectively, representing similar proportions to previous research (Jahns et al., 2014).

Advertising visually appealing images, like fruits and vegetables, in flyers is a powerful tactic for drawing consumers into a store (Spence et al., 2016). In terms of protein foods, meats represented 7.2%, finfish and shellfish represented 5.2% of items, processed meats came in at 3.2%, and protein alternatives followed closely at 2.9%. In an American study, a cumulative total of 'protein foods' represented 25% of total flyer space (Jahns et al., 2014); our findings and those of this study cannot be directly compared, given differences in food item coding. However, our result may actually be comparable in light of the actual consumption of protein foods, as shown

in one study that found the prevalence of total meat consumption was higher in the US (73.6%) than in Canada (65.6%) (Frank et al., 2021).

Flyers from Canada's largest food retailer were dominated by unhealthy food promotions. Like most past studies, we found that the largest proportions of flyer food items were in the least healthy and/or ultra-processed categories of our nutrient profiling models (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Botelho et al., 2020; Hendriksen et al., 2021; Vandevijvere & Van Dam, 2021; Mendes et al., 2021; Camargo et al., 2019). Although we used three unique nutrient profiling models, they all showed that the foods in our sample of Canada's food retailer flyers are largely unhealthy. Moreover, our results reproduced trends found in nine other studies in the last decade in the field of flyer research, which suggests that the findings could be expanded beyond the scope of our sample.

In most instances, the odds were significantly higher that the foods on the first page of the flyer would align with Canada's Food Guide, as compared to other flyer pages. In past studies like ours, it was found that foods on the flyer covers were healthier/less processed than entire flyers (Vandevijvere and Dam, 2021; Camargo et al., 2019). The first page of a flyer is the page typically with the most views and tends to be the most sought-after advertising space (Gijssbrechts, Campo and Goossen, 2003). Thus, the page that receives the most traffic is also the page that appears to display more healthy foods. Fruits and vegetables, which would be considered healthy by all our nutrient profiling scales are also visually appealing to consumers (Spence et al., 2016). These visually appealing foods may serve as a marketing technique to draw consumers into reading the flyer. This finding does also emphasize the importance, however, of studying the entire flyer rather than only the first page as some researchers have done (Martin-Biggers et al., 2013; Ethan, Samuel & Basch, 2013).

Although some pairwise statistically significant differences were found between years of flyer publication in predicting healthiness, no broad apparent pattern emerges. A larger, longitudinal study should be done to examine these phenomena more closely. In addition, previous research has revealed that there could be seasonal variations in flyer content, which we were not able to evaluate in our research. One past study found that significantly fewer protein foods and more grains were advertised in the fall, and slightly more dark green vegetables were advertised in winter and spring than in summer and fall (Jahns et al., 2014).

There were no significant differences between discount and regular grocery stores in how they predicted the healthiness of flyer food items. This result differs from previous studies. In an Australian study, it was found that a discount supermarket chain advertised significantly more fruits and vegetables and significantly fewer discretionary items relative to a regular supermarket chain (Cameron et al., 2017). In contrast, in the Netherlands, a study found that a discount supermarket chain promoted significantly more unhealthy foods and significantly fewer promotions on healthier options compared to regular supermarkets (Ravensbergen et al., 2015). In both studies, researchers examined the whole flyer from various national chains and used their respective national food guidelines to assess nutrient profiles (Cameron et al., 2017; Ravensbergen et al., 2015). Despite the differences in marketing techniques between discount and regular stores, our results coupled with conflicting results from Australia and the Netherlands may suggest there may not be a correlation between store type and nutrient profiles of flyer foods. However, more research should be done to confirm this assumption. Also, from a food supply perspective, often discount and regular chains are different banners owned by the same corporation and therefore, in future studies, other features of the flyers such as prices should be studied to examine further their similarities and differences.

Finally, there did not appear to be any significant difference in the healthiness of flyers between the Canadian regions; even visually in our dataset, flyers from the regular stores were found to be similar between regions, as were the discount flyers. This result differs from Martin-Biggers et al.'s (2013) result where they found evidence of regional variation in the United States in the healthiness of the flyers they examined. A future study should be done in Canada where more grocery store chains are included to examine this phenomenon further.

Limitations and Recommendations

This study was subject to several limitations. First, we had only a few collection points in each year where we collected flyers (2014, 2017 and 2021). Although most other studies of its kind had more collection points in each year, ours was the first study to study flyer content over multiple years. Because we did not collect flyers from each season, in future studies, seasonal variability in Canadian food retailer flyers should be examined. In previous studies, seasonal variation was found in the nutritional quality of the foods included in the flyers (Jahns et al., 2014). Second, there is a lack of evidence as a whole on how flyers relate to in-store placement in Canada, so we cannot be sure how our study on the healthiness of the foods in the flyers relates to in-store placement/promotion of items. Future studies should examine how flyer placement relates to in-store placement. Third, our study only examined flyers from one grocery store chain. Although Loblaws holds the largest market share in Canada (27.2%) (Bedford, 2022) and with regional representation as well as discount and regular banners, examining the flyer content of other grocery store chains and smaller independent retailers may help to increase our understanding of the potential differences between chains/stores. Fourth, because there is not a nutrient profiling model that is shared among countries, international comparisons between our study and studies using different models may be difficult, apart from the NOVA classification. A

strength of our study was thus the use of Canada's Food Guide, a provincial nutrient profiling system (PPM150) as well as NOVA which other researchers have also used. It is noteworthy that our conclusions were largely consistent with researchers who used different nutrient profiling models. Finally, our 2021 data collection points took place during the COVID-19 pandemic. We cannot be sure how the pandemic may have impacted the results from our 2021 collection points.

Implications

Our sample of Canadian flyers heavily promote foods with poor nutrient profiles, contributing to a food environment which can promote unhealthy eating behaviours. Future research should examine how foods in Canada's major food retailer flyers affect consumers' purchasing behaviours and by extension their food choices and diet quality. If flyers impact their purchasing behaviours and by extension their diet quality, improving the nutrient profiles of the foods in Canada's major food retailer flyers could serve as an important population health intervention given our results.

4.5 Conclusion

Our results show the relatively poor nutrient profile of foods featured in our sample of Canada's major food retailer flyers. Our chosen nutrient profiling models consistently show the least healthy, ultra-processed foods that are most often portrayed. However, foods on the first page of the flyers were more likely to align with Canada's Food Guide. Region and store type did not seem to influence the healthiness of the flyers. Future studies should be done over more time to clarify the significance of the odds of healthier foods appearing in certain years. Food retailer flyers may prove to be an important representation of the food environment in major grocery stores in Canada and should be further examined to implement future population health interventions around healthy eating.

Chapter 5: Discussion and Conclusions

5.1 Summary of Key Findings

Dietary risk factors are the leading cause for disease burden in Canada, as measured by death and disability combined (Afshin et al., 2017). The Canadian food environment affects people's diet-related health outcomes (Health Canada, 2013). Often the environments in which we live, work, and play fail to reinforce healthy choices, and dietary risk factors are a leading risk factor for disease burden in Canada (Vanderlee and L'Abbé, 2017; Afshin, 2019). Major food retailer flyers contribute to food marketing and the communication of important information to inform dietary choices in the food environment. Through a sample of major food retailer flyers in Canada, we have contributed to our understanding of the food items that they contain and the nutrient profiles of those foods. Since our sample contained flyers from the largest food retailer in Canada, these results may be able to be applied to Canada as a whole.

In **Objective 1**, we aimed to describe the content (food groups) of Canada's major food retailer flyers. A few groups represented a large proportion of flyer food items, including baked products (11%), non-alcoholic beverages (10.7%) and milk and dairy (10.2%). We also noted vegetables (8.3%) and fruits (6.5%), and the accumulated protein foods group (18.5%) as being groups of interest for discussion. The role of **Objective 2** was to describe the nutrient profile (CFG, PPM150 & NOVA) of the foods included in Canada's major food retailer flyers. The flyers contained large proportions of least healthy/ultra-processed items, however (CFG: 58.5%, PPM150: 45.3%, NOVA: 51.2%) the healthiest/un/minimally processed groups of items on our three healthiness scales followed (CFG: 33.6%, PPM150: 36.6%, NOVA: 27.8%). In **Objective 3**, we compared how the features of Canada's food retailer flyers predict the nutrient profile of

the foods promoted in Canada's major food retailer flyers. The only feature of the flyer that consistently predicted healthiness was a food being on the first page of the flyer.

5.2 Interpretations

Content of the Flyers

After our analysis done on the proportions of food groups represented in the flyers a few groups of interest can be highlighted: baked products, non-alcoholic beverages and milk and dairy, vegetables and fruits, and protein foods.

Among food groups, baked products made up the largest proportion of foods (11.0%) advertised in the flyers in our study. Although a more precise study was not found, in a marketing survey, regarding Canadians' grocery shopping habits, 54% of consumers claimed to purchase bread and 43% claimed to purchase sweet baked goods from an in-store bakery (Puratos, Food Innovation for Good, 2019). The most important consideration that shoppers reported when asked why they shopped at an in-store bakery was whether the product was baked on the same day (Puratos, Food Innovation for Good, 2019). According to this evidence, in-store bakery departments serve as a large draw for consumers to go to the grocery store. This potentially serves as important reasoning why baked products were the most prevalent food group category in Canadian major food retailer flyers.

Non-alcoholic beverages represented 10.7% of the food items in the flyers. In Kirkpatrick et al.'s (2019) food groupings, the method we used for this study, non-alcoholic beverages include items such as coffee, energy drinks, fruit drinks, fruit juice, soft drinks, sports drink, tea (including iced tea), vitamin water, and water. This is a broad category and may account for the large proportion of space which this category consumes. However, it is important to note that many beverages included in this category would be considered sugar-sweetened beverages.

Sugar sweetened beverages are of concern for many researchers because these beverages contribute substantially to Canadians' overall energy intake (Jones, Kirkpatrick, and Hammond, 2019). Although consumption of sugar-sweetened beverages in Canada decreased between 2004 and 2015 (Jones, Kirkpatrick, and Hammond, 2019), we observe through our study that retailers continue to promote them.

Next, milk and dairy represented 10.2% of flyer items. The milk and dairy category, from Kirkpatrick et al.'s (2019) food groupings, includes cheese, milk, plant-based beverages, and yogurt. Milk and dairy products are the largest supply managed commodity in Canada (Agriculture Canada, 2021). Because milk and dairy products are a supply managed commodity, retailers have relatively less control over pricing changes in store, given that prices are set by dairy industry governing bodies each year (Ontario Ministry of Agriculture, Food and Rural Affairs, 2021). Although grocery stores cannot substantially manipulate dairy price as a marketing technique, grocery stores likely market milk and dairy products so heavily because consumers may buy those products frequently. In data from the 2015 CCHS-N, 87.7% of Canadians consume milk and milk alternatives in a daily basis (Vatanparast, Islam, and Shafiee, 2021).

Vegetables and fruits were 8.3% and 6.5% of flyer food items, respectively. Our results are similar to previous research (Jahns et al., 2014). Advertising visually appealing images like fruits and vegetables in flyers is a powerful tactic for drawing consumers into a store (Spence et al., 2016). The large proportion of flyer items being consumed by these categories is likely due to their visual appeal.

In terms of protein foods, meats represented 7.2%, finfish and shellfish represented 5.2% of items, processed meats were 3.2%, and protein alternatives followed closely at 2.9%. In the

United States study, protein foods represented 25% of total food items in the flyers (Jahns et al., 2014). Our accumulated total proportion of protein foods was 18.5% (the cumulative total of the Meat Products, Processed Meats, Protein Alternatives and Finfish and Shellfish Products groups) which was less than Jahns and colleagues found. Our study may not be directly comparable to theirs, given the likelihood that our coding of the protein foods group and theirs may not have been comparable. However, our study result may reflect the actual consumption of protein foods in the United States relative to Canada. One direct comparative study found that prevalence of total meat consumption was higher in the US (73.6%) than in Canada (65.6%) (Frank et al., 2021).

Nutrient profiles of the foods in the flyers

Flyers in Canada's largest food retailer were dominated by least healthy/ultra-processed food and beverage items (CFG: 58.5%, PPM150: 45.3%, NOVA: 51.2%). Similar to past studies, we found that most foods were found in the least healthy and most highly processed (ultra-processed) categories of our nutrient profiling models (Martin-Biggers et al., 2013; Charlton et al., 2015; Ravensbergen et al., 2015; Cameron et al., 2017; Botelho et al., 2020; Hendriksen et al., 2021; Vandevijvere & Van Dam, 2021; Mendes et al., 2021; Camargo et al., 2019). It is worth noting, however, that we found that the healthiest categories for all three scales made up the next largest proportions of the flyers (CFG: 33.6%, PPM150: 36.6%, NOVA: 27.8%).

This study is the first to use Canada's 2019 Food Guide as a means of measuring healthiness of foods in flyers. Through the SEA Tool, we were able to assess Canada's flyers with the dietary recommendations made for Canadians. The NOVA categorization system can support explanations for the other two categorization systems and is internationally comparable. The ultra-processed category, for instance, represents many items that would not be

recommended by Canada's Food Guide (Foods to Limit) or provincial school food guidelines such as PPM150. Although we used three unique nutrient profiling models, they all showed that the foods in our sample of Canada's food retailer flyers are largely unhealthy. Since our results have largely reproduced the findings of nine other studies done in the past decade in the field of flyer research, this suggests that the findings could be expanded beyond the scope of our sample.

Features that predict the nutrient profiles of foods

In most instances in this thesis research, the odds were significantly higher that the foods on the first page of the flyer would align with Canada's Food Guide compared to other pages, as presented in the Results Chapter, although it should also be placed in context that only 5.7% of foods overall were advertised on the first page of the flyer. In past studies, like ours, it was found that foods on the flyer covers were healthier/less processed than entire flyers (Vandevijvere and Dam, 2021; Camargo et al., 2019). The first page of a flyer is the page with the most views and is the most sought-after advertising space (Gijsbrechts, Campo and Goossen, 2003). Hence, the page that receives the most attention or web traffic, is also the page that appears to display more healthy foods. Fruits and vegetables, which would be considered healthy by all our nutrient profiling scales are visually appealing to consumers (Spence et al., 2016). These visually appealing foods may serve as a marketing technique to draw consumers into reading the rest of the flyer.

Our finding that the first page of the flyer contains healthier foods does, however, emphasize the importance of studying the entire flyer rather than only the first page, as some researchers have done (Martin-Biggers et al., 2013; Ethan, Samuel & Basch, 2013). Studying only the first page of the flyers may have led us to detect that flyer content was healthier than it is.

There were no significant differences in how store type (i.e., discount versus regular grocery stores) predicted the healthiness of the foods and beverages advertised. This result differs from previous studies. In an Australian study, it was found that a discount supermarket chain advertised significantly more fruits and vegetables and significantly fewer discretionary items relative to the regular supermarket chain (Cameron et al., 2017). In contrast, in the Netherlands, a study found that a discount supermarket chain promoted significantly more unhealthy foods and had significantly fewer promotions on healthier options compared to regular supermarkets (Ravensbergen et al., 2015). In both studies, researchers examined the whole flyer from various national chains and used their respective national food guidelines to assess nutrient profiles (Cameron et al., 2017; Ravensbergen et al., 2015). Despite the differences in marketing techniques between discount and regular stores, our results coupled with conflicting results from Australia and the Netherlands may suggest there may not be a correlation between store type and nutrient profiles of flyer foods. However, more research should be done to confirm this apparent lack of a pattern.

There also did not appear to be any significant difference in the healthiness of flyers from different Canadian regions. This result differs from Martin-Biggers et al.'s (2013) result where they found regional differences in the healthiness of the flyers they examined, in the United States. Canada is made up of ten provinces (and three territories) which were grouped, in this study, based on the method that Loblaw's follows (Atlantic, Quebec, Ontario, Western Canada). For our objectives, it was important to examine the entire country as well as sub-national regions to gain insight into how the flyer landscape differs across the country. In a scoping review examining research in Canada about retail food environments, it was found that "more than 70% of studies have examined retail food environments within cities, as opposed to within or across

provinces and territories” (Minaker et al., 2016, p.7). Because we only studied one grocery store chain, a future study should be done in Canada where more grocery store chains are included to examine regional differences further.

No apparent pattern emerged in terms of year of data collection and the healthiness of foods advertised. Flyer food content was healthier in some years than others. However, a larger, longitudinal study should be done to examine if the nutrient profile of foods in Canada’s food retailer flyers change over time. Public health interventions as well as geopolitical and global health events affecting the food supply (e.g., the COVID-19 pandemic) could alter flyer content and the nutrient profiles of the foods included. Also, previous research has revealed that there could be seasonal variation in flyer content. One study found significantly fewer protein foods and more grains were advertised in the fall, and slightly more dark green vegetables were advertised in winter and spring than in summer and fall (Jahns et al., 2014). Because we only collected flyers from a few time points each year, the differences we found may have been due to seasonal variation, but this could be confirmed through future research.

5.3 Strengths, Limitations, and Mitigation Strategies

This is the first major nationwide study examining the content and nutrient profile of foods contained in flyers in Canada. Overall, our results align with other studies done in the field. The flyer sample we chose provides representation of what the average consumer might be exposed to because Loblaws holds the largest market share among food retailers in Canada (Bedford, 2022). The Loblaws chain also has both discount and regular stores. We used three nutrient profiling models and found similar results across all three. NOVA allows our study to be comparable to others internationally since NOVA is widely used in similar flyer research. The use of Canada’s Food Guide and PPM150 make our results more applicable to the Canadian

population and Canadian health promotion practice. We also examined the whole flyer, rather than just first page. Generally, researchers have found that items on the first page of the flyer are healthier. Examining only the first page may lead to overrepresentation of healthier foods in the results. Also, this is the first study that analyzed flyers from multiple years (2014, 2017, 2021). By studying flyers in multiple years, we were able to examine changes in the nutrient profiles of flyer items over time. Finally, we examined flyers from multiple Canadian regions, making our dataset more applicable to Canada as a whole. These strengths, taken together, make our study a unique contribution to the literature in Canada, and globally.

This study was subject to several limitations. First, although we made an effort to schedule data collection during ‘regular’ shopping times (as compared to holidays), we had only a few collection points in each year (2014, 2017 and 2021) where we collected flyers. Most other similar studies had more collection points in each year. In previous studies, seasonal variation was found in the nutritional quality of the foods included in the flyers (Jahns et al., 2014). Because we did not collect flyers from each season per se, in future studies, seasonal variability in Canadian food retailers should be examined.

There is a lack of evidence on how flyers relate to in-store placement in Canada, so we cannot be sure if our study on the healthiness of the foods in the flyers relates to in-store placement/promotion of items. For example, in a past study in Australia, the products placed at end-of-aisle and other in-store displays typically include those that are on sale and promoted in flyers (Cameron et al., 2017). Future studies should examine how flyer placement relates to in-store placement in Canada.

Next, our study only examined flyers from one grocery store chain. Although Loblaws holds a largest market share in Canada (27.2%) (Bedford, 2022), examining the flyer content of

other grocery store chains and smaller independent retailers would increase our understanding of the potential differences between chains/stores.

The ten Canadian provinces were included in our sample, but the three territories were excluded. One unique element of the Canadian food environment that affected our sample choice is the existence of remote northern communities which are hard to access, especially in the winter. Many remote, northern communities only have one major food retail outlet which they rely on (Skinner et al., 2016). These unique elements lead to a distinct food environment compared to more southern food environments in Canada (Skinner et al., 2016). For our study, we focused on major food retailer flyers not from northern regions of Canada, but from the ten Canadian provinces.

Although prices and price promotions were collected from the flyers as part of the data collection, they were not analyzed as part of this thesis research and were considered beyond the scope of the thesis objectives. Analyzing differences in price among different flyers is an important future direction for this area of study and specifically this dataset.

Also, because there is not a single nutrient profiling model that is shared among countries, comparison between studies using different models is difficult. This is one reason why we included Canada's Food Guide and PPM150, as well as NOVA which other researchers internationally have also used. Although different models were used, our conclusions were largely consistent with researchers using different nutrient profiling models. Also, studies used different food grouping methods. Although food grouping systems used in other studies were derived from the national food composition/nutrient database specific to the country of interest, like ours, they diverge in how specific foods and beverages are coded, and therefore make comparison difficult.

Finally, our 2021 data collection point took place during the COVID-19 pandemic. We did not detect any differences between healthiness of foods marketed during this time as compared to prior years. We cannot be sure how the pandemic may have impacted the results from our 2021 collection points.

5.4 Practical Implications

Our results show that our sample of Canadian flyers promote foods with poor nutrient profiles more frequently than those with healthy nutrient profiles. This may contribute to an informational environment within the food environment which promotes unhealthy eating behaviours.

Future research should examine how foods in Canada's major food retailer flyers affect consumers' purchasing behaviours and, by extension, their food choices and diet quality. Flyers may impact consumers' purchasing behaviours and, by extension, their diet quality and diet-related health. Although much more evidence on the correspondence is needed, it is highly reasonable to assume that items marketed in flyers are often closely linked to product positioning or importance in-store (Cameron et al., 2017). Research, policy, and program development in the realm of retail food environments is becoming of increased interest in Canada (Minaker et al., 2016). Interventions that target food environments have the potential for a more sustained impact on health outcomes than other interventions such as programmatic strategies (Health Canada, 2013). Policies, interventions, and actions aimed at improving the food environment shift individual responsibility in improving diets to collective action to support healthy food choices (Vanderlee and L'Abbé, 2017). According to our results, retail food flyers in our sample contained foods with mostly poor nutrient profiles. Improving the nutrient profiles of the foods in Canada's major food retailer flyers could serve as an important population health intervention

to improve population diets. Improving the nutrient profiles of the foods in the flyers could shift the information environment and by extension, the larger food environment to promote healthier dietary choices.

5.5 Recommendations

Although our research filled a gap in the literature, especially in the Canadian setting, future studies should continue advancing research in this field. First, the effect of time on flyer content and nutrient profile should be more robustly examined. Future research should examine flyers over multiple years with more time points in each year to examine seasonal variation and whether larger policy interventions, like the implementation of a new food guide, or major world events, like the COVID-19 pandemic, alter flyer content. Next, regional differences should be examined further by including multiple chains as well as independent retailers by province and by city. Flyer content and nutrient profiles in other grocery store chains should also be researched. It would also be important to know exactly how food retailer flyers affect consumers' choices in Canada and the direct mechanism of effect that healthier content in flyers has on purchasing and consumption behaviours.

5.6 Conclusions

Dietary risk factors represent a significant concern for the health of Canadians; they are a leading risk factor for disease burden in Canada, as measured by death and disability combined (Afshin 2017). It is important that we build food environments that support individuals to make healthy food choices to mitigate diet-related health and health equity risks from poor diet quality. Food retailer flyers are one part of the information environment within the larger food environment (Glanz et al., 2005). Our results show that our sample of major food retailer flyers in Canada promote mostly foods with unhealthy nutrient profiles. However, foods on the first

page of the flyers are more likely to align with Canada's Food Guide. In our sample, region (Atlantic, Quebec, Ontario, or Western Canada) or store type (discount or regular) did not consistently influence the healthiness of the flyers. Future studies may clarify the effect of time as well as to explore the features of the flyers, including year of publication further. Food retailer flyers are an important representation of the food environment in major Canadian grocery stores and should be further examined clarify the implications of their contents and promotions for individual and population diets.

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Appendices

Appendix 1. Coding dictionary for national major food retailer flyer study

Variable Name	Description	Possible Responses
Region	Region of Canada	Atlantic Canada, Quebec, Ontario, Western Canada
Store Type	Type of grocery store	Discount, Regular
Year	Year of data collection/ flyer publication	2014, 2017, 2021
Page	Which page the item is on?	1 through ...
Food Group	The food group which the food belongs to	Additions, Fats and Oils, Fruits, Vegetables, Milk and Dairy Products, Meat Products, Processed Meats, Protein Alternatives, Finfish and Shellfish Products, Grains, Baked Products, Breakfast Cereals, Sweets, Snacks, Entrees, Non-Alcoholic Beverages, Alcoholic Beverages, Baby Food Products
CFG Alignment	How does the food align with recommendations from Canada's 2019 Food Guide?	Not included in CFG Recommendations, Food to Limit, Food to Consume, Baby Food Product
PPM150	How does the food align with PPM150 recommendations?	Not Permitted for Sale, Sell Less, Sell Most, Baby Food Product
NOVA	How does the food align with the NOVA food classification system?	Unprocessed or minimally processed foods, Processed culinary ingredients, Processed foods, Ultra-processed foods and drinks, Baby food product

Appendix 2. Description of food groupings from Bureau of Nutritional Surveillance (BNS) categories based on findings from Kirkpatrick et al., 2019

Food Group	BNS Food Category
Additions	Gravies, Half and Half Cream, Cream (recipe sub-group), Others (baking soda/baking/powder/yeast), Salad dressings (with or without oil), Sauces (white/Bearnaise/soya/tartar/ketchup), Seasonings (salt/vinegar), Sour Cream, Spices, Table Cream, Whipping Cream
Fats and Oils	Animal Fats, Block Margarine, Butter, Calorie-Reduced Margarine, Regular Margarine, Shortening, Vegetable Oils
Fruits	Banana, Cherries, Citrus Fruit (oranges/lemons/grapefruits), Apple, Fruit Dishes, Grapes/Raisins, Melons (cantaloupe/Honeydew/watermelon), Other Fruits (blueberry/date/kiwi/fruit salad), Peaches/Nectarines, Pears, Pineapple, Plums/Prunes, Strawberries
Vegetables	Beans, Broccoli, Cabbage/Kale, Carrots, Cauliflower, Celery, Corn, French fries and hash brown potatoes, Juices: tomato & vegetables, Lettuce/Leafy greens (spinach/mustard greens), Mushrooms, Onion/green onions/leeks/garlic, other veg. (cucumber/beet/turnip), Other vegetables (boiled, baked), Peas/snow peas, Peppers: red/green, Potato, Potatoes (boiled, mashed, baked, etc.), Salads, Squashes, Tomatoes, Vegetables (mixed with other stuff)
Milk and Dairy	Cheese: 10% BF to 25% BF, Cheese: Less than 10% BF, Cheese: More than 25% BF, Condensed, Cottage Cheese, Evaporated, Milk: 1%, Milk: 2%, Milk: Condensed, Milk: Evaporated 2%, Milk: Evaporated Skim, Milk: Evaporated Whole Milk, Milk: Goat/Sheep, Milk: Other (Whey/Buttermilk), Milk: Skim, Milk: Whole, Plant-based beverage (Soy/Almond/Coconut), Reconstituted from powder, Yoghurts: Less than 2% BF, Yoghurts: More than 2.1% BF
Meat Products	Bacon, Beef: Ground, Beef: Lean + Fat, Beef: Lean only, Birds: Skin only, Chicken – meat only, Chicken: Meat + skin, Game Meat, Ham: Cured – lean + fat, Ham: Cured – lean only, Lamb: Lean + Fat/ground, Lamb: lean only, Liver, Liver Pate, Offal, Other birds: Duck/Pheasant/Pigeon, Pork: Fresh – Lean + Fat/ground, Pork: Fresh – Lean only, Turkey: Meat + skin/ground, Turkey: meat only, Veal: Lean + Fat/Ground, Veal: Lean only

Processed Meats	Luncheon Meats, Sausage
Protein Alternatives	Egg, Egg Substitutes, Foods made with vegetable proteins (tofu), Legume, Nuts, Peanut butter/other nut spreads, Seeds
Finfish and Shellfish Products	Fish: Less than 6% total fat, Fish: superior or equal to 6% total fat, Shellfish
Grains	Cereal/Grains/Flours, Other Whole Grain Breads, Pasta, Rice, White breads, Whole wheat breads
Baked Products	Biscuits: Commercial, Cakes, cheesecakes, shortcakes & brownies, Cakes: Commercial (Frozen Cake), Cookies: Commercial, Crackers/Crispbreads, Croissants/Piecrust/Phyllo Dough, Danishes, turnovers & pastries, Danishes/Doughnuts/Other Pastries: Commercial, Donuts, Dry Mixes (Cakes/Muffins/Pancakes), Filled crepes, blintzes, Cobblers, Granola Bar, Matzo/tortilla, Muffins/English muffins, Other breads, crackers, rolls, dumplings, bannocks, English muffins, Pancakes/Waffles, Pies (including pie shell), Pies: Commercial, Rolls/bagels/pita/cROUTONS/dumplings, Squares & bars, Sweet rolls and breads
Breakfast Cereals	Breakfast Cereal (other), Whole Grain/Oats/High Fibre Breakfast Cereals
Sweets	Candy/gum, Chocolate Bar, Frozen Yogurt, Gelatin/Dessert Toppings/Pudding Mixes: Commercial, Grain dishes (tapioca, rice pudding), Ice Cream, Ice cream (recipe sub-group), Ice Milk, Ice milk (recipe sub-group), Ice pop/Sherbet, Jam/Jellies/Marmalade, Milk dessert (recipe sub-group), Other sugars (syrups/molasses/honey), Sugar substitutes, Sugars: white/brown, sweet snacks, sugar, candies (recipe sub-group)
Snacks	Fried/Roasted Potatoes, Nuts and seeds (recipe sub-group), Plain popcorn/pretzels, Potato Chips, Salty/high-fat snacks (incl Tortilla chips)
Entrees	Beef (recipe sub-group), Cheese (recipe sub-group), Chicken (recipe sub-group), Chinese (recipe sub-group), Egg Dishes, Energy Bar, Fish, with less than 6% fat before cooking, Fish, with more than 6% fat before cooking, Fresh pork and ham (recipe sub-group), Game Meat (recipe sub-group), Hamburgers & cheeseburgers, Hotdogs, Lamb (recipe sub-group), Lasagna, Legume dishes with meat, Legume dishes without meat, Light frozen dinner, Macaroni, Meal replacements, Mexican dish, Mexican Recipes, Noodles (egg noodles), Organ meat (recipe sub-group), Other bird dishes (duck, pheasant, quail), Other types of burger (chicken, fish), Other, Types of Pasta (Ravioli, manicotti, gnocchi, knish, perogies, etc.), Pizza, Protein Bar/shake, Regular frozen dinner, Rice (recipe sub-group), Sandwiches, Sausage, with cured and luncheon meat (recipe sub-

group), Shellfish (recipe sub-group), Soups with Vegetables, Soups without vegetables, Spaghetti, Submarines, Turkey (recipe sub-group), Veal (recipe sub-group)

Non-Alcoholic
Beverages

Coffee, Coffee (recipe sub-group), Energy Drink, Fruit Drinks, Fruit drinks (recipe sub-group), Fruit Juice, Fruit juices (recipe sub-group), Milk-Based beverages (milk shakes, malted milk, hot cocoa, instant breakfast, etc..), Other beverages (malted milk/chocolate beverage), Soft Drink: Diet, Soft Drink: Regular, Sports Drink, Tea (incl iced tea), Tea (recipe sub-group), Vitamin Water, Water

Alcoholic
Beverages

Alcoholic beverages, Beer, Coolers, Liqueurs, Spirits, Wine

Baby Foods

Baby food products, Infant formula
