Unpacking the Intention-Behaviour Gap in Canadian Consumers' Food Purchasing Decisions

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Canada has a deep-rooted reliance on single-use plastic in the food industry, with little evidence of changing its use of plastic as a durable, convenient, and cost-effective choice of packaging material to process, package, deliver and sell food to Canadian consumers (Schweitzer et al., 2018; Sundqvist-Andberg & Åkerman, 2021). A majority of Canadian consumers (73.4 percent) support banning single-use plastic food packaging in favour of more sustainable food packaging options, according to a consumer survey by Dalhousie University (Walker et al., 2021). However, barriers at the point-of-purchase, including the higher price tag and limited availability of food without plastic packaging, limit the purchase of plastic-free food products in Canada. This quantitative research project was undertaken to 1) segment consumers based on their consumer opinions regarding single-use food packaging, 2) determine the pre-purchasing intentions and point-of-purchase behaviour of Canadian consumers, and 3) determine if any gap exists between consumers' intention and their purchasing decisions when food shopping. The Theory of Planned Behaviour explains the connection between consumer intention ("intention") and purchasing decisions ("behaviour") (Ajzen, 1991). Data was collected from Ontario food shoppers using a custom mobile app to capture both consumers' intentions before shopping for food and their purchasing decisions while food shopping. The data of 95 participants who completed the study - a competition rate of 42.04 percent - was segmented into Green (20 percent) and Grey (80 percent) consumer segments for comparative analysis between the two groups. The results show that both Green and Grey Consumers are more strongly influenced by their in-store purchasing decisions regarding packaging than their pre-shopping intentions which current intention-only surveys would not reveal. This research provides evidence of consumer support for the shift to more plastic-free food products in Canadian supermarkets. The researcher intends to develop the mobile app used for this research project into a commercially viable version to support the shift away from single-use plastic food packaging.

Keywords: food, single-use plastic, plastic-free packaging, sustainable packaging, consumer decision-making, consumer segmentation, green consumers, SDG12, responsible production and consumption, circular economy, Theory of Planned Behaviour, intention-behaviour gap, quantitative survey, mobile application, Ontario, Canada

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List of Key Terms and Abbreviations

Abbreviation	Description
Consumer Demographics	Stage 1 consumer demographic questions 1-6
Consumer Segmentation	Stage 3 consumer segment segmentation questions 1-5
EPR	Extended producer responsibility
Green Consumers	Consumer segment for green-minded consumers
Grey Consumers	Consumer segment for other, or non-green minded, consumers
H1, H2, H3, H4	Alternative hypotheses 1-4
mobile app	Android mobile application used for data collection
N1, N2, N3, N4	Null hypotheses 1-4
OBJ1, OBJ2, OBJ3	Objectives 1-3 and related sub-objectives
POP	Point-of-purchase
Price Sensitivity	Stage 3 price sensitivity questions 6-7
Purchasing Behaviour	Stage 2 product feature behaviour questions
Purchasing Intention	Stage 1 product feature intention question 7
Purchasing Status	Stage 2 indicator of whether food product was purchased or not
Quest	Quest Mindshare (third-party participant recruitment company)
SDB	social desirability bias
SDG	Sustainable Development Goals
Stage 1	Stage 1 Initial Survey
Stage 2	Stage 2 Food Shopping Activity

Abbreviation	Description
Stage 3	Stage 3 Post-Shopping Survey
SUP	single-use plastic
TPB	Theory of Planned Behaviour
VBN	Value-Belief-Norm Theory

Chapter 1 Introduction and Background

1.1 Introduction

Canada has a deep-rooted reliance on single-use plastic (SUP) in the food industry. Fifty percent of the plastic used in Canada is for single-use items, including food packaging (Elmslie & Wallis, 2020). The Canadian food industry is showing little evidence of changing its reliance on plastic as a durable, convenient (Schweitzer et al., 2018), and cost-effective choice of packaging material to process, package, deliver and sell food to Canadian consumers (Sundqvist-Andberg & Åkerman, 2021). However, there is strong support from Canadian consumers to reduce or eliminate plastic waste from food packaging (Walker et al., 2021). This chapter will set the background context of the use of SUP within the Canadian food industry and situate this research study within that context. The background covers three themes: (1) the rise of SUP food packaging, (2) the stakeholders maintaining the status quo for SUP food packaging, and (3) the stakeholders supporting a shift away from SUP food packaging.

1.2 The Rise of SUP Food Packaging in Canada

Plastic emerged as a packaging material in the 1950s (York University, n.d.). In the mid-1980s, it became an environmental alternative to paper packaging, which was associated with destroying natural forests. The use of SUP food packaging has been entrenched in food manufacturing practices (Yates et al., 2019) since the mid-1980s, much of it unexpected, like plastic-lined juice cartons, and hidden inside outer packaging, such as cereal boxes.

1.2.1 Defining SUP Food Packaging

Single-use plastic is, by definition, plastic which is intended to be used only once (Government of Canada, 2023) before becoming waste. SUP is generally disposed of within a year of production (Schweitzer et al., 2018, p. 8).

Plastic food packaging[1] includes "cups, containers, bottles, and films – that is fully or partly made of plastics" (Sundqvist-Andberg & Åkerman, 2021, p2). This research will focus on food packaging for processed products in traditional Canadian supermarkets, like Walmart, Sobeys and Loblaws.

1.2.2 Scale of SUP Use in Food Packaging in Canada

Canada currently disposes of 3.3 million metric tons of plastic each year (Young, 2019). The exact quantity of plastic used for food packaging is unclear, however, estimates place that amount at 16 percent (Schweitzer et al., 2018). Only nine percent of Canada's plastic waste is recycled (Young, 2019). The remainder ends up in landfills, or is incinerated, or polluting air, land and waterways (Schweitzer et al., 2018; Yates et al., 2019). Plastic waste is projected to increase 30 percent over the next decade (Elmslie & Wallis, 2020). The CoVID-19 pandemic has also increased the use of SUP food packaging due to health and safety concerns (Kitz et al., 2020; Scaraboto et al., 2020).

1.2.3 Impacts of SUP Packaging

Yates et al. (2019) observe that "evidence for the impact of food system plastic is piecemeal" (p. 5). While proponents of using SUP in food packaging cite food safety and the reduction of food waste as benefits (Yates et al., 2019), Schweitzer et al. (2018) argue that SUP is more economically beneficial for supporting existing manufacturing and marketing practices within the food industry. There is, however, strong support that SUP packaging harms the natural environment and human health, from the Pacific Ocean garbage patch to microplastics in our food supply. With plastic production predicted to increase, estimates in global greenhouse gas emissions from plastic waste are expected to rise by up to fifteen percent of by 2050 (Schweitzer et al., 2018). Microplastics from plastic packaging also damage the human digestive system, and the resulting chemical toxicity from ingesting plastic can cause long-term health concerns, such as diabetes and reproductive cancers (Yates et al., 2019). These environmental and health impacts could result in financial impacts from dealing with plastic waste and treating illness.

[1] This research focuses on SUP used for directly packaging the food product. Other uses of plastic within the food industry for the manufacturing, transporting and selling food products, including plastic wrap used in transportation and plastic shopping bags, are excluded.

1.3 Stakeholders Maintaining the Status Quo for SUP Food Packaging

Despite the recent introduction of the Single-use Plastics Prohibition Regulations (Government of Canada, 2023), also known as the Single-Use Plastic Ban, and related efforts by the food industry to eliminate plastic shopping bags in supermarkets, there has been minimal progress in transitioning away from plastic food packaging, due to pressures from the Canadian food industry and intertwined plastics industry to maintain the status quo (Blaze Baumen & Graney, 2021).

The **Canadian food industry**, valued at over $27 billion in 2020 (Statista, 2021), comprises raw material suppliers, packaging suppliers, manufacturers, distributors, and retailers and is entrenched in a linear economy model of "take-make-waste" (Ellen MacArthur Foundation, 2020, p.4). Many dominant players in the food industry are signatories to the Plastic Pact, which aims to eliminate 20 percent of all plastic packaging produced globally by 2025 (Ellen MacArthur Foundation, 2021). While individual Canadian retailers, including Walmart and Sobeys, have announced initiatives to reduce plastic waste since 2020, these measures are limited to eliminating plastic shopping bags (Walker et al., 2021). Loblaws has taken more active steps in shifting to a circular model by partnering with Loop for a limited pilot project to introduce food packaging, which can be returned to the supermarket and put back into circulation by food manufacturers (Loblaw Companies Limited, 2021).

Business opportunities in adopting a circular economy model – where resources are reused or recycled within the production system rather than being disposed of as waste - by the food industry have been estimated by The Ellen MacArthur Foundation (2019) to be worth USD 10 billion for a 20 percent reduction in plastic food packaging globally through innovations in sustainable packaging and the development of new reuse and recycling models. Despite these business opportunities, motivation for change within the food production industry remains low.

The **plastics and petrochemical industries** are intertwined, with eight percent of the oil output worldwide being used for all plastic production (Sundqvist-Andberg & Åkerman, 2021). More than half of the world's SUP is produced by twenty corporations, mostly petrochemical companies (Laville, 2021), with the political and financial clout to lobby against threats to the existing system. Canada's plastics industry, worth $28 billion (Fawcett-Atkinson, 2021), has already pushed back on the toxic designation of plastic by the Government of Canada by launching a legal case against designation (Blaze Baumen & Graney, 2021).

The Canadian food industry demonstrates little evidence of changing its reliance on plastic to process, package, deliver and sell food to Canadian consumers. At the Circularity 2030 conference that the researcher attended in Singapore in late 2019, many speakers and attendees represented multinational

food manufacturers and packaging suppliers. While they spoke of having made innovations in food packaging, there was minimal drive to change the status quo that was currently working for them with the motivation to innovate for marketing purposes or to prepare for any regulatory standards imposed in the future. Additional pressure from outside the food industry ecosystem is required to further the transformation of the existing food industry from a linear model to a circular one that eliminates SUP food packaging.

1.4 Stakeholders Supporting a Shift Away from SUP Food Packaging

There is strong support to reduce or eliminate plastic waste from food packaging from various levels of government, packaging advocates, researchers, innovators and green consumers alike.

The **Government of Canada** (2020b) has set an ambitious goal by aiming for zero plastic waste by 2030, however, the pace of introducing steps to eliminate plastic waste is slow. The zero plastic waste goal presents an opportunity to adopt sustainable packaging and processes that support the circular economy model through reduction and reuse rather than disposal. Doing so will also contribute towards Canada meeting several of the Sustainable Development Goals (SDG) by 2030, including SDG 12 Responsible Consumption and Production, SDG 14 Life Below Water, and SDG 15 Life on Land.

In May 2021, the Canadian Environmental Protection Act was amended to designate plastic as toxic (Fawcett-Atkinson, 2021). The Canadian plastics industry lobbies strongly to maintain the status quo and quickly brought a legal case against the Canadian government to reverse the toxic designation of plastic (Blaze Baumen & Graney, 2021). In late 2022, the federal government finalised the ban on six commonly used SUP items covering “single-use plastic checkout bags, cutlery, foodservice ware made from or containing problematic plastics, ring carriers, stir sticks, and straws” (Government of Canada, 2023). The current ban on SUP items is being called ineffective as the plastic waste generated by these items represents less than 1 percent of the plastic used in Canada (Elmslie & Wallis, 2020). While the ban does include some forms of plastic waste generated by the food industry, including plastic shopping bags, six-ring drink carriers used for some canned beverages, and potentially some takeout packaging used at the pre-prepared meals counter, it does not include food packaging in general. More significant steps must be taken to eliminate plastic waste from Canada within the next seven years to eliminate SUP packaging waste, or Canada will fail to achieve its Zero Waste Plastic goal and meet the SDGs by 2030.

Provincial Governments are also making changes to make waste producers responsible for end-of-life disposal through extended producer responsibility (EPR), with the onus and cost of disposal and

recycling of waste placed on the producer rather than municipalities and taxpayers (OCED, 2001). For example, the Government of Ontario (2022) is phasing in EPR from July 1, 2023. These regulatory changes, however, do not go far enough to influence the food industry to change the status quo. EPR programs also shift the responsibility for waste disposal from waste management to producers rather than reducing or eliminating the production of plastic waste in the first instance.

Packaging Advocacy against plastic packaging is strong in Canada, with advocacy groups from Oceana Canada campaigning for a plastic-free Canada to Greenpeace Canada calling for changes to the way supermarkets package food products. Additionally, Waste Reduction Week Canada educates the public on waste reduction strategies, with the date of October 21 designated to bring awareness about plastic waste.

Researchers and innovators can influence the current system directly by developing new packaging alternatives and processes and indirectly by providing evidence for change to anti-plastic packaging advocates and the government. While the players in the food industry have significant R&D budgets, there is limited support for research and innovation development in sustainable food packaging by the Canadian federal government despite the business opportunity identified by The Ellen MacArthur Foundation (2019). Only two of the fourteen projects funded under the Zero Plastic Waste Initiative by Environment and Climate Change Canada in 2020 are working on packaging alternatives or reducing packaging use. These two projects have received only $110,000, or six percent, of the total $1.8 million funds allocated to date (Government of Canada, 2020a). No further funding has been announced. There are, therefore, significant untapped opportunities for the Canadian government to support and invest in innovation around sustainable packaging alternatives and processes.

Canada's household waste is managed by **municipal waste management** services and paid for by local taxpayers. With current plastic recycling rates averaging nine percent (Young, 2019), most plastic waste generated by the food industry ends up in landfills rather than recycled. Little evidence in the literature was found to determine the extent to which waste management, and by extension, municipal governments, have any influence over changing the volume of plastic waste generated by the food production industry.

Green Consumers – consumers who actively seek out and purchase, where possible, sustainable products and services (White et al., 2019). Consumers deal with food packaging waste daily by disposing of it in landfill garbage or recycling bins. Nearly three-quarters (73.4 percent) of Canadian consumers surveyed support banning SUP food packaging in favour of more sustainable food packaging options, according to a consumer survey by Dalhousie University in Nova Scotia (Walker et al., 2021). The

Dalhousie survey highlights the opportunity for consumers to provide the impetus for changes in the food industry supply chain to adopt sustainable food packaging options to replace SUP. Despite Canadian consumers' best intentions, barriers at the point-of-purchase (POP), including the higher price tag and limited availability of food without plastic packaging, limit the purchase of plastic-free food products in Canada (Ketelsen et al., 2020). Recently consumers have faced additional barriers to purchasing plastic-free food products, including increased price sensitivity due to rapid food inflation (Fradella, 2022) and safety fears through the COVID-19 pandemic (Scaraboto et al., 2020; Walker et al., 2021).

1.5 Problem Statement

The majority of Canadian consumers support a shift away from SUP food packaging, however, they currently have limited influence over the food industry to eliminate plastic food packaging aside from voting with their wallets by choosing food products with sustainable packaging. Green consumers are already actively shopping for plastic-free food products. By understanding any differences in the food shopping decision-making priorities between green and non-green consumers in Canada, an opportunity exists for amplifying the collective voice of the Canadian green consumer to put pressure on the food industry to eliminate SUP food packaging by understanding consumers' intentions to purchase food without plastic packaging versus their ultimate actions when purchasing food.

The purpose of this research is to understand how different consumer segments prioritise packaging when shopping for food. This research study will investigate three research objectives: (1) to segment participants into Green Consumer and Grey Consumer segments[2] based on their consumer opinions regarding SUP food packaging (OBJ1), (2) to determine the decision-making priorities of Green Consumers and Grey Consumers before shopping ("intention") and at the POP ("behaviour") when purchasing food products (OBJ2), and (3) determine if a gap existing between Canadian consumers' intention to purchase food products and their purchasing decisions as it relates to packaging when purchasing food (OBJ3). A breakdown of the three research objectives and related sub-objectives is detailed in Table 1. This research is based on the connection between consumer purchasing intention and purchasing behaviour as framed in the Theory of Planned Behaviour (TPB), which will be discussed in

[2] This research study segmented the sample into two consumer segments – Green Consumers and Grey Consumers. The term "Grey Consumer" was adopted over "Non-Green Consumer" or "Other Consumer" in the interests of clarity in the subsequent Results and Discussion chapters. The researcher recognises that the so-called "greenness" of consumers cannot be distinguished between "Green" and "Grey" as they will fall somewhere along a spectrum of consumer behaviour.

the Literature Review. The four research hypotheses detailed in Table 1 were formulated based on this theoretical framework.

A quantitative research methodology was adopted based on data collected from consumers using a custom Android mobile application and has been analysed to test these four hypotheses. The research contributes to both existing subject matter knowledge gaps in academic research and makes a methodological contribution to consumer research and practice. The two subject matter knowledge gaps are: (1) identifying the decision-making priorities of Canadian consumers when purchasing food, and (2) establishing the existence, if any, of an intention-behaviour gap relating to packaging in consumer purchasing decisions. The methodological contribution is collecting consumer intention and behaviour data in a real-life setting using a mobile app.

Table 1: Research Objectives and Hypotheses

Objective	Sub-Objective	Hypothesis
OBJ1: Segment participants into Green Consumer and Grey Consumer segments based on their consumer opinions regarding SUP food packaging.		
OBJ2: Identify the decision-making priorities of Green Consumers and Grey Consumers before shopping ("intention") and at the point-of-purchase ("behaviour") when purchasing food products.		
	OBJ2.1: Determine the importance of packaging on Green Consumers' and Grey Consumers' intentions when purchasing food products.	H1: The importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers.
	OBJ2.2: Determine consumers' purchasing decisions of Green Consumers and Grey Consumers regarding packaging when purchasing food products.	H2: The importance of packaging on food product purchasing decisions is scored higher by Green Consumers than Grey Consumers.
OBJ3: Determine if there is a gap between Canadian consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products.		
	OBJ3.1: Determine if there is a gap between Green Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products.	H3: A gap exists between Green Consumers' intention and purchasing decisions relating to packaging when food shopping.
	OBJ3.2: Determine if there is a gap between Grey Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products.	H4: A gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.

Chapter 2 Literature Review

2.1 Introduction

This chapter will examine three themes in the academic literature (1) defining and segmenting "green consumers", (2) identifying the product features that influence consumers' decisions to purchase food products, and (3) identifying the methodological gap in consumer research. This chapter will also establish TPB as the theoretical framework for this research and state the hypotheses on which the research is based.

2.2 Green Consumer Segmentation

The concept of green consumers arose in consumer behaviour literature in the 1970s (Larson & Farac, 2019). However, a clear definition of who constitutes a green consumer is lacking in the literature. An initial consumer study which compares green and non-green consumer purchasing behaviour was Barbarossa & De Pelsmacker (2016) on eco-friendly tissue paper products. This study focused on behavioural activities to define green consumers as "those individuals who engage in a set of pro-environmental behaviors (e.g., recycling, reducing household waste) primarily for environmental reasons, while non-green consumers are defined as those individuals who do not engage in a set of pro-environmental behaviors." (p. 230).

Barbarossa & De Pelsmacker (2016) highlight the importance of segmenting consumer segments based on their propensity to purchase green products or services: "green consumers may have a fundamentally different EFP [eco-friendly products] purchasing process and may be driven or constrained by different factors than non-green consumers, and the intention–behaviour relationship may differ across the two consumer groups." (p. 230). In considering the non-green consumer perspective, Smith (2021) focuses on intention over behaviour to state that the non-green consumer "lacks expertise regarding green products, does not feel that green products are a good value or of high quality, lacks trust in green companies, and tends to believe that they alone cannot make a positive impact on the planet on green consumption" (p.151). Barbarossa & De Pelsmacker (2016) describes this spectrum from "deep greens" to "those who are honestly unengaged in green behaviors" (p. 230).

While formal segmentation methods, including cluster analysis (Baruk & Iwanicka, 2015; Lee & Haley, 2022; Verain et al., 2016) and factor analysis (Baruk & Iwanicka, 2015; Budhathoki et al., 2022;

Jürkenbeck et al., 2020) have been used in consumer studies, these segmentation methods are more appropriate for studies with larger sample sizes. However, Ketelsen et al. (2020) points out the lack of comparability between studies using different segmentation methods.

2.3 Product Feature Prioritisation in Food Purchasing Decisions

Consumer studies on the importance of sustainable packaging in food purchasing decisions were reviewed. Eleven quantitative research studies, including mixed method studies, spanning a seven-year period, from 2013 to 2019, were identified through two recent systematic reviews by Ketelsen et al. (2020) and Popovic et al. (2019). The review results of these studies are summarised in Table 2. The studies were reviewed to identify the product features included in each study and how the identified product features were ranked in order of importance by the study.

There is a lack of a standardised definition of the term **sustainable packaging** in the literature (Herbes et al., 2018; Jerzyk, 2016). The terms "sustainable packaging", "green packaging", "environmentally friendly" and "eco-friendly packaging" are used interchangeably in the academic and grey literature (Jerzyk, 2016; Ketelsen et al., 2020; Nguyen et al., 2020). Nguyen et al. (2020) provide a definition for the standard of sustainable packaging by the Sustainable Packaging Coalition® which has been commonly cited since 2011:

> Sustainable packaging is beneficial, safe and healthy for individuals and communities throughout its life cycle; meets market criteria for performance and cost; is sourced, manufactured, transported, and recycled using renewable energy; maximises the use of renewable or recycled source materials; is manufactured using clean production technologies and best practices; is made from materials healthy in all probable end of life scenarios; is physically designed to optimise materials and energy; and is effectively recovered and utilised in biological and/or industrial cradle-to-cradle cycles. (p. 2).

More recently, Walker et al. (2021) describe green packaging "to include several broad criteria, such as easily or readily recyclable, produced from natural raw materials with limited environmental consequences during production and end-of-life, or reusable materials" (Walker et al., 2021, p2).

Three of the studies broadly consider sustainable packaging as important to consumer purchasing decisions (Aday & Yener, 2014; Baruk & Iwanicka, 2015; Martinho et al., 2015). Through a review of the previous studies, product features relating to packaging could be grouped into three types: (1) packaging material, (2) packaging disposability, and (3) other packaging features, including design and functionality. The studies show that consumers' purchasing decisions relating to packaging are primarily influenced by packaging material and packaging disposability.

Three studies referred to packaging material generally (Arboretti & Bordignon, 2016; Herbes et al., 2018; Lindh et al., 2016), while two others considered environmental material (Boesen et al., 2019; Nørgaard Olesen & Giacalone, 2018). Three studies considered specific packaging material features: recycled content (Boesen et al., 2019; Jerzyk, 2016), renewable origins (Herbes et al., 2018) and material safety (Jerzyk, 2016). The Arboretti & Bordignon (2016), Lindh et al. (2016) and Nørgaard Olesen & Giacalone (2018)studies found that packaging material was the primary product feature for consumers when considering the food product's environmental impact, however, most other studies considered packaging disposal to be more important than packaging material in purchasing decisions.

For packaging disposal, consumers prioritised recyclability (Aday & Yener, 2014; Arboretti & Bordignon, 2016; Boesen et al., 2019; Herbes et al., 2018; Jerzyk, 2016; Lindh et al., 2016), composability or biodegradability (Arboretti & Bordignon, 2016; Boesen et al., 2019; Herbes et al., 2018) and reusability (Herbes et al., 2018). Boesen et al. (2019) suggest that the method of packaging disposability is important to consumers as the disposal of packaging is directly experienced by consumers once the food product has been consumed. Additionally, Herbes et al. (2018) point out that waste management systems generally focus on recycling packaging, therefore, recyclability is considered to be important by consumers.

The remaining packaging features primarily relate to packaging design and packaging functionality, which are both considered important product features in Martinho et al. (2015). Packaging design product features included: appearance (Arboretti & Bordignon, 2016; Jerzyk, 2016; Nørgaard Olesen & Giacalone, 2018) and packaging size (Baruk & Iwanicka, 2015; Boesen et al., 2019; Lindh et al., 2016). The Vilnai-Yavetz & Koren (2013) study solely looked at two packaging design features: opaque and transparent packaging. Packaging functionality product features included product protection and shelf-life/expiry date (Arboretti & Bordignon, 2016; Baruk & Iwanicka, 2015; Jerzyk, 2016). Ketelsen et al. (2020) comment that packaging design plays an important role in consumers' decision-making process as the packaging, including colour, may signal the product's environmentally friendliness to consumers, although packaging design can also potentially lead to greenwashing.

In studies that included non-packaging related product features, the product features important to consumer decision-making when purchasing food included production method (Herbes et al., 2018), including organic (Nørgaard Olesen & Giacalone, 2018), local/regional origin (Baruk & Iwanicka, 2015; Nørgaard Olesen & Giacalone, 2018), transportation (Aday & Yener, 2014; Herbes et al., 2018), brand familiarity (Nørgaard Olesen & Giacalone, 2018), convenience (Hao et al., 2019) and price (Hao et al., 2019; Martinho et al., 2015; Nørgaard Olesen & Giacalone, 2018). In understanding the relative importance of packaging and non-packaging product features in food purchasing decisions, Ketelsen et al.

(2020) observed that consumers would purchase food products in sustainable packaging only if other product features were not impacted. However, Jerzyk (2016) predicts that the importance of sustainable packaging is expected to rise in future purchasing decisions.

The studies reviewed mainly originated from Europe (Arboretti Giancristofaro & Bordignon, 2016; Boesen et al., 2019; Herbes et al., 2018; Jerzyk, 2016; Lindh et al., 2016; Martinho et al., 2015; Nørgaard Olesen & Giacalone, 2018) with two studies based in the United States of America (Herbes et al., 2018; Vilnai-Yavetz & Koren, 2013), one in Türkiye (Aday & Yener, 2014) and one from China (Hao et al., 2019). Three studies were carried out with participants in two or more countries (Arboretti Giancristofaro & Bordignon, 2016; Herbes et al., 2018; Jerzyk, 2016), although again these were Europe-based with only the Herbes et al. (2018) study, including the United States along with France and Germany. One Canadian study by Macall et al. (2021) was identified, however, it was not included in the literature review as the research focused on packaging in general rather than specifically sustainable packaging. The prevalence of European studies may be attributed to Europe being considered a leader in sustainability, with the European Union Action Plan for Circular Economy published in 2015 (Boesen et al., 2019).

Table 2: Review of 2013-2019 Quantitative Consumers Studies on the Importance of Packaging on Food Purchasing Decisions

Study	Location	Product Focus	Product Feature Importance[3] (ranked in order of importance as determined by the original study)	Uses Theory of Planned Behaviour	Method	Demographic Focus
Boesen et al. (2019)	Denmark	Liquid food (olive oil and skinned tomatoes) and beverages (milk, beer, soft drinks)	● Recyclability ● Composability/biodegradability ● Recycled content ● Packaging size, environmental material	N	Online survey (n=197) and semi-structured interview (n=10)	Cross section: gender, age, education
Hao et al. (2019)	China	General food	● Product protection ● Environmental pollution status ● Convenience of use, reusability ● Social advocacy and promotion ● Type of packaged food ● Price, government subsidies/sales discounts	Y	Survey (n=781)	Cross section: gender, age, geographic region, income level
Herbes et al. (2018)	Germany, USA, France	General food	● Reusability, biodegradability, renewable origins ● Recyclability ● Production method, transportation, use	Y	Survey (Germany/USA/France n=948/610/443)	Cross section: gender, age, income, education, migration status/ethnicity
Nørgaard Olesen &	Denmark	Carrots	● Packaging material, transparency ● Organic, local origin, appearance, price	N	Survey (n=251)	Cross section: gender, age

[3] The product features have been ordered in terms of the relative importance identified in the relevant research study. Some product features have been grouped to show their relative importance rather than an exact ranking of the product features. Product features, and groupings, have been listed in relative order of importance, as indicated in the study, rather than strict rankings.

Study	Location	Product Focus	Product Feature Importance[3] (ranked in order of importance as determined by the original study)	Uses Theory of Planned Behaviour	Method	Demographic Focus
Giacalone (2018)			● Environmental packaging ● Brand familiarity			
Arboretti Giancristofaro & Bordignon (2016)	Italy/Austria	Fresh food	● Packaging material, size/shape ● Biodegradability and recyclability ● Shelf-life	N	Questionnaire and focus group (n=205)	Cross section: gender, age, nationality
Jerzyk (2016)	France/ Poland	General food	● Product quality and shelf-life ● Recyclability ● Material safety ● Material source (recycled, biodegradable) ● Material and energy optimisation ● Product appearance	N	Auditorium questionnaire (n=161)	Students (17-30) Cross section: gender, age, nationality
Lindh et al. (2016)	Sweden	General food	● Packaging material ● Easy to open/reseal ● Packaging size ● Amount of packaging ● Recyclability	N	Survey (n=155)	Cross section: gender, age income, household size, urban-rural
Baruk & Iwanicka (2015)	Poland	Dairy	● Expiry date, brand, regional origin ● Packaging size, ease of use ● Eco-friendliness of packaging	N	Face-to-face survey (n=550)	Cross-section: gender, age, education level
Martinho et al. (2015)	Portugal	General food	● Price, product quality ● Sustainable packaging ● Packaging design and functionality	Y	Online questionnaire (n=215)	Cross section: gender, age, education,

Study	Location	Product Focus	Product Feature Importance[3] (ranked in order of importance as determined by the original study)	Uses Theory of Planned Behaviour	Method	Demographic Focus
						and employment status
Aday & Yener (2014)	Türkiye	General food	● Food-related information ● Easy-to-use and store ● Recyclability, low environmental impact ● Ease of transportation	N	Questionnaire (n=324)	Younger adults (18-25) Cross section: gender, age, marital status, education, income level, urban-rural
Vilnai-Yavetz & Koren (2013)	USA	Chilled (ready-to-eat) meals	● Opaque packaging ● Transparent packaging	Y	Supermarket observation (n=100)	Cross section: Gender, age, marital status, education

The product features identified in the systematic review of the literature (Table 2) have been categorised into six product feature categories: 1) Brand and Product Quality, 2) Nutrition & Dietary Need, 3) Origin and Production Method, 4) Packaging, 5) Price, and 6) Use & Storage (Table 3).

Table 3: Product Feature Categorisation Based on Previous Consumer Studies

Product Feature Category	**Product Features Included:**
Brand & Product Quality	brand familiarity, reputation
Nutrition & Dietary Need	nutritional information
Origin & Production Method	local, regional; transportation distance; organic
Packaging	material: environmental/sustainable, recycled content, material safety; disposal: recyclable, biodegradable, compostable, reusable design: appearance, transparent/opaque; unit size functionality: product protection, food safety
Price	affordability: sales/discounts, value
Use & Storage	convenience/ease of use, resealable; ease of transportation; storage shelf-life/expiry date

2.4 Methodological Gap in Surveys in Consumer Research

A methodological gap has been identified through the review of the consumer studies on sustainable food packaging. Namely, there is a lack of consumer-based quantitative research conducted in a real-life setting within a supermarket. Ketelsen et al. (2020) highlight this gap in consumer-based research in which "consumers' response to environmentally-friendly food packaging is not yet well understood, in particular with regards to purchasing behaviour (in the real world as opposed to in a survey setting)" (p. 1). The quantitative methodological approach of the studies reviewed, or the quantitative component of any mixed methods studies, predominantly utilised surveys (Baruk & Iwanicka, 2015; Boesen et al.,

2019; Hao et al., 2019; Herbes et al., 2018; Lindh et al., 2016; Nørgaard Olesen & Giacalone, 2018) or questionnaires (Aday & Yener, 2014; Arboretti Giancristofaro & Bordignon, 2016; Jerzyk, 2016; Martinho et al., 2015). Only three studies specified how these surveys or questionnaires were conducted, with only two explicitly conducted online (Boesen et al., 2019; Martinho et al., 2015) and one face-to-face (Baruk & Iwanicka, 2015). Two studies took a non-survey/questionnaire-based approach, with Arboretti Giancristofaro & Bordignon (2016) conducted focus groups and Vilnai-Yavetz & Koren (2013) carried out observational studies of consumer behaviour while in the supermarket. This gap resulting from research conducted in a real-life setting leads to a lack of understanding of the purchasing behaviours of consumers as existing surveys capture purchasing intentions only. In addition to the ten survey-based research studies identified in the literature review, the Dalhousie survey (Walker et al., 2021) is an example of a study that quantifies consumers' intention to buy sustainably packaged food, however, it does not measure consumers' actual purchasing decisions. This study, therefore, aims to address this methodological gap by conducting research in a real-life setting with participants collecting data using a mobile app while shopping for food in order to compare both purchasing intention and purchasing behaviour.

2.5 Theory of Planned Behaviour

TPB is used as the theoretical foundation for this research study to aims to determine if a gap exists between Canadian consumers' "intention" and their purchasing decisions ("behaviour") at the point of purchase when food shopping. The TPB explains the connection between consumer intention and behaviour. TPB emerged in the mid-1980s (Belleau et al., 2007; Hansen et al., 2004; Kordi Ghasrodashti, 2018). Ajzen (1991), the proponent of TPB, describes this theoretical framework as "a theory designed to predict and explain human behaviour in specific contexts" (p. 181). At the center of the TPB framework (Figure 1) is intention, described by Ajzen (1991) as "individuals intention to perform a given behaviour" (p. 181). Ajzen (1991) posits that "the stronger the intention to engage in a behaviour, the more likely should be its performance." (p. 181). However, in consumer studies, reality often shows that an

"intention-behaviour gap"[4] exists, meaning there is a difference between consumers' intentions and behaviours (Ketelsen et al., 2020).

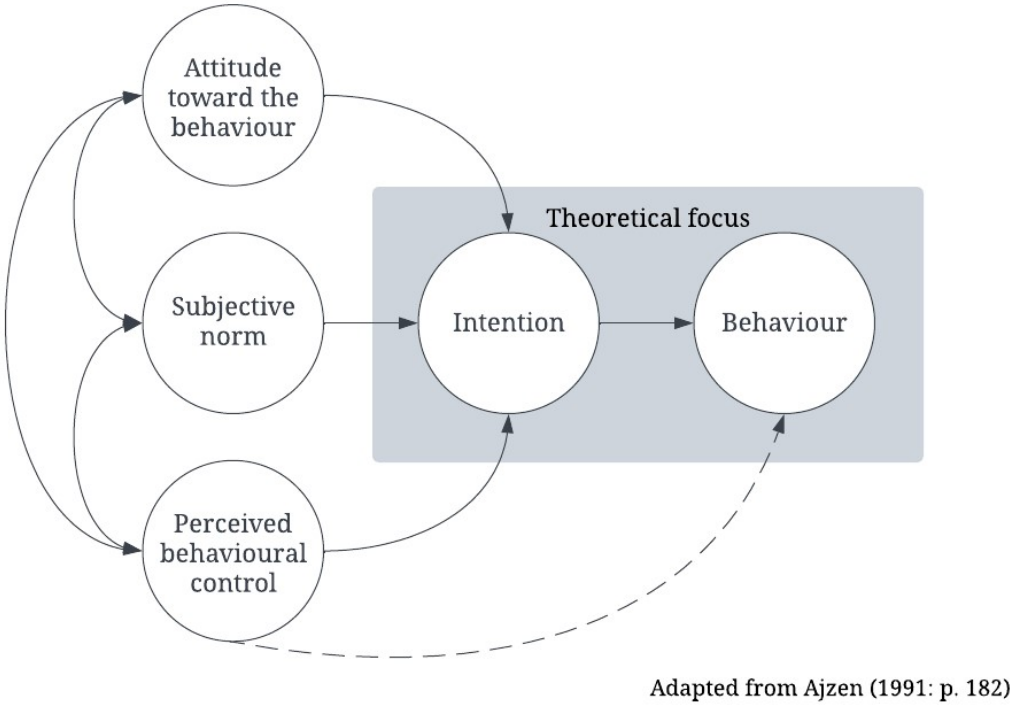


Figure 1: Framework of Ajzen's Theory of Planned Behaviour

Critics of TPB highlight an overdependence on the framework in consumer studies (Popovic et al., 2019), although it is worth noting that only four of the eleven studies (Aday & Yener, 2014; Hao et al., 2019; Herbes et al., 2018; Martinho et al., 2015) reviewed in Table 2 explicitly used TPB as the theoretical foundation. Further criticism includes TPB's focus on rational decision-making by consumers (Koenig-Lewis et al., 2014) and the lack of consideration of the impact of the broader systems in which consumers operate (Smith, 2021; Zhang & Dong, 2020). Despite these criticisms, TPB continues to be

[4] The terms "intention-behaviour gap", "attitude-behaviour gap" and "intention-action" are used interchangeably in the literature. For clarity purposes, this thesis will use "intention-behaviour gap" to align with the theoretical focus of this research study (indicated in the grey box in Figure 1) and the terminology used in the Methodology, Results and Discussion chapters.

utilized by researchers conducting consumer studies into sustainable consumer behaviour, including research conducted within the Canadian context by Macall et al. (2021) and Walker et al. (2021).

A more recent theory by Value-Belief-Norm Theory (VBN), as an extension of Schwartz's moral norm-activation theory (Stern et al., 1999), was also considered as the theoretical foundation for this research study. VBN has been used to examine consumer behaviour as it relates to environmentalism. The primary difference between TPB and VBN is that VBN is founded on the influence of the moral good on an individuals' decisions while TPB is primarily interested in the impact of an individuals' intention on their ultimate behaviour, where intention is preceded by the influence of wider social norms in addition to two personally motivating factors (Kaiser et al., 2005). While VBN may be appropriate for studies specifically focussed on the drivers of sustainable behaviours, the scope of this research study was to understand consumer decision-making more generally and how that knowledge can be applied to the decision to purchase of plastic-free food, and by extension, environmentally favourable behaviour. VBN was considered to be too narrowly focussed to be an appropriate theory on which to base this research study, therefore, TPB was selected as the theoretical foundation for this study.

2.6 Research Hypotheses

Four research hypotheses were developed to address the subject matter knowledge gaps and the methodological gap identified in the literature (Table 4).

Table 4: Research Hypotheses

Alternative Hypothesis	Null Hypothesis
H1: The importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers.	N1: The importance of packaging on food purchasing intentions is scored the same or less by Green Consumers than Grey Consumers.
H2: The importance of packaging on food product purchasing decisions is scored higher by Green Consumers than Grey Consumers.	N2: The importance of packaging on food purchasing decisions is scored the same or less by Green Consumers than Grey Consumers.
H3: A gap exists between Green Consumers' intentions and purchasing decisions relating to packaging when food shopping.	N3: No gap exists between Green Consumers' intention and purchasing decisions relating to packaging when food shopping.
H4: A gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.	N4: No gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.

Chapter 3 Methodology

3.1 Introduction

This chapter discusses the quantitative research methodology used to conduct this research project: (1) the research paradigm will be established, (2) the research method will be described, (3) the data collection procedure using the mobile app will be detailed, and (4) the data analysis procedure will be explained.

3.2 Research Paradigm within the Postpositivist Worldview

The research paradigm adopted for this research study is based on the postpositivist worldview. Quantitative consumer behaviour research is traditionally grounded in the positivist or postpositivist worldviews (Belk, 2009; Goulding, 1999). The postpositivist worldview adopts the scientific method, whereby the research hypotheses are tested to address the primary research questions based on the underpinning theory and generalize the results to the broader population (Creswell & Creswell, 2018; Mohajan, 2020).

3.2.1 Researcher's Experience Influencing Choice of Research Method

These professional and personal; experiences have influenced this research study's objectives and design. This research was conducted using the more traditional postpositivist worldview with the researchers' longer-term goal to put this research into action through their social enterprise NoSUP Canada to shift the food industry towards offering more food products with plastic-free packaging. The researcher's first-person story of their motivations for conducting this research and plans for putting it into action is described below.

This research sits at the intersection of my professional experiences in business and policy as well as my personal experiences as a green consumer. My entrepreneurial experience as the cofounder of a small-scale food production company, KP Kitchen Taiwan, from 2015 to 2020, led me to this area of research. My experience in the food industry, particularly as a small-scale manufacturer and retailer, highlighted the challenges of producing a food product with sustainable packaging, including the availability and cost of suitable packaging materials, and showed me the general resistance within the food industry to move away from the status quo towards more sustainable choices. The barriers were too significant for my own company to adopt sustainable packaging. In addition, my background in systems development also positioned me to project manage the development of a mobile application as a data collection tool with the help of an external mobile app developer. I am also actively involved in developing green policy on innovation and labour issues which informs my desire to make systemic changes around how food is packaged.

As a green consumer and founder of the social enterprise NoSUP Canada, I plan to transform the food industry due to my experiences and frustrations of shopping for plastic-free food. An anecdotal example of these frustrations occurred during one of my food shopping trips soon after I returned to Canada in August 2020. I wanted to buy bottled lime juice and was surprised to discover that my favourite brand uses plastic bottles in Canada, unlike glass bottles of the same brand of lime juice in Taiwan. Despite planning to buy bottled lime juice, I walked away empty-handed as my values to buy plastic-free food overrode my desire to buy lime juice. I realized that consumers make similar decisions every day without ways to influence or change the food system in which they shop. Through NoSUP Canada, I plan to use the collective voice of green consumers by gathering data on similar decisions made by consumers every day to show the Canadian food industry that there is demand for plastic-free food in supermarkets.

Karen Farley

De Witt (2016) recognizes the role of adopting new worldviews to examine and tackle environmental issues by creating novel approaches toward sustainable change. The transformative worldview links political and social action to restore power to marginalized groups. The ultimate driver for this research project and subsequent real-world implementation is to establish a case for transformation within the food industry using the data provided by consumers as evidence of support to change. Using a novel approach to harnessing consumer' collective voice in demanding change to the way food is packaged, this postpositivist research methodology, and by extension, the transformational commercial application thereof, brings together the consumer voice to effect change in the system.

This research-to-commercialization approach allows for a design thinking framework to be adopted whereby the research process provides the first iteration of the prototype mobile app's design, development and testing to validate the business model (Osterwalder & Pigneur, 2016). Melles (2020) examines the importance of design thinking in creating innovators through education, while Wakkary et al. (2007) highlight the connection between technology-based research methodologies and commercialization. The former provides an opportunity to develop and test a prototype or minimum viable product for the latter.

The Mitacs Accelerate Entrepreneurship program is designed explicitly for research-to-commercialization projects where researcher-entrepreneurs are given project funding with matched funding[5] provided by an industry partner, in this case, the researcher's early-stage venture, NoSUP Canada. In order to qualify for this program, the research secured the support of the University of Waterloo's campus incubator, Velocity Incubator. Furthermore, research based on design thinking is particularly relevant in supporting sustainable change (Ardoin et al., 2022; Beausoleil, 2022; Buhl et al., 2019; Earle & Leyva-de la Hiz, 2021; Huang & Hands, 2022; Maher et al., 2018).

[5] Matched funding is usually offered with a 50:50 split; however, Mitacs provided 75% of the funding for the first term due to a special offer at the time of application.

3.3 Research Method

The primary data collection method utilized an interactive tool: a mobile app. The researcher has frequently been asked why they are developing a mobile app for data collection when other established methods, including an online Qualtrics survey, could also be used. There are three primary reasons for adopting this novel approach: (1) a gap has been established by reviewing prior academic research in the lack of consumer research conducted in a real-life environment (Fernqvist et al., 2015; Seo et al., 2016), such as shopping in the supermarket, (2) academic research of consumer behaviour tends to capture consumers' intentions at a point in time rather than their actual behaviours, leading to a limited understanding of any differences between intention and behaviour, and (3) most consumers are familiar with using a mobile app to conduct day-to-day activities, including creating online shopping lists and tracking eating habits. A mobile app was chosen as the data collection tool to increase consumer confidence and comfort in the data collection tool leading to better data.

In considering the advantages of using mobile apps for self-administered data collection over other survey methods, including paper-based ones, Marcano Belisario et al. (2014) suggest increased speed, scalability and lower cost of implementation, as well as the reduction of recall bias as advantages of an app-based approach. However, no discernible benefit in data accuracy or response rates compared with other survey methods was found.

Previous research was conducted at the University of Waterloo using a mobile app to gather information on consumer shopping behaviour and healthy eating choices (Bomfim et al., 2020). While consumers used the mobile app while food shopping, the research conducted by Bomfim et al. (2020) differed from this research study in terms of its intended outcomes. Bomfim's mobile app was designed to influence the behaviours around healthy eating choices of the app users rather than using the data collected from app users to effect change within the system. Bomfim's experiences of using a mobile app as a research tool served as a guide for developing the mobile app for this research project, including research design, technical, and ethical considerations.

3.3.1 Research Sample

The targeted sample size for this research was 100 participants recruited from Ontario across the demographics (age, gender, education level, household income and size) similar to that of the Walker et al. (2021) study. The gender demographic question was extended beyond man/woman choices to allow participants to self-identify their gender or abstain from disclosing their gender. The marital status question was removed. The number of children question was removed and replaced with the number of people supported by household income. After data cleaning, the final sample size was 95 participants. The sample was compared with the Ontario population to determine the sample's representativeness.

3.3.2 Bounding the Data Sample

Due to constraints of time and budget for this research project, the data sample was limited by three aspects (1) a target sample size of 100 participants, (2) who were based in Ontario and (3) those using an Android mobile phone.

Limiting sample size: A target sample size of 100 participants was determined to ensure demographic representation of participants based on gender, age, education level and household income.

Limiting operating system: The mobile app used for this research project was developed to be compatible with mobile phones using the Android operating system (version 6.0 and above). Apple iOS users were not included in the study. In Canada, 84.4 percent of the population aged 15 and older own a mobile phone (Statistics Canada, 2021). The breakdown between mobile operating systems in Canada puts Android users at 44.64 percent, and iOS users make up 54.77 percent (Statcounter Global Stats, 2021b). Of Android users, nearly 89.9 percent use Android 9.0 or above (Statcounter Global Stats, 2021a). Therefore, limiting the study to users with Android mobile phones only did not impact the ability to recruit participants for this study, and the sample size of 100 participants was achievable.

3.4 Survey Design

The survey for the mobile app was designed and developed based on three stages: Stage 1 Initial Survey, Stage 2 Food Shopping Activities, and Stage 3 Post-Shopping Survey (Figure 2). The order of these three stages was determined to mitigate any potential social desirability bias (SDB).

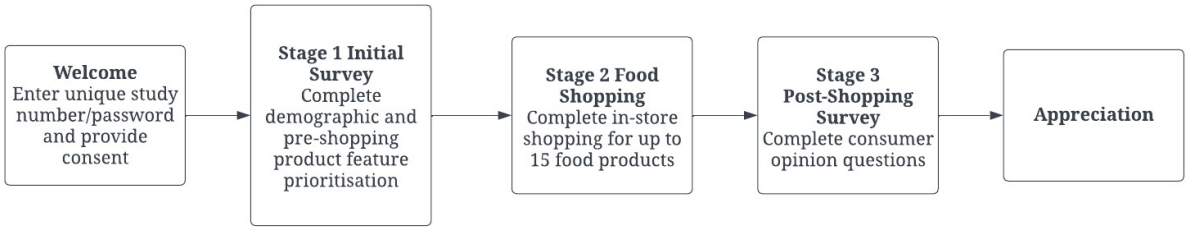


Figure 2: Mobile App Workflow Through the Data Collection Process

Stage 1 Initial Survey: Participants completed an initial survey to provide demographic information (age, gender, education level, household income, and household size) and score the importance of different product features to the participants' purchasing decisions when shopping for food. The product feature data was used to establish consumers' intentions before going food shopping (OBJ2.1). The data collection instrument for Stage 1 can be found in .

Stage 2 Food Shopping Activity: Participants provided information on their purchasing decisions using the mobile app while food shopping. First, participants were asked to create a virtual shopping list for up to 15 food products that they planned to purchase. Then, while food shopping in the supermarket, participants were asked to take a photo of the front of the package of each food product, select reasons for choosing that food product and note the importance of each reason on a 7-Point Likert scale (from 1 Not Important to 7 Very Important). A dropdown list of reasons for purchasing the product was provided in randomized order, and a freeform box for participants to enter other reasons (Figure 3). Finally, for each product remaining on the virtual shopping list, when the participant had finished shopping, the participant was asked to provide reasons for not purchasing the remaining products. A dropdown list of reasons for not purchasing a product was provided in randomized order, and a freeform box for participants to enter other reasons. The data was used to

capture consumers' purchasing decisions when purchasing food while food shopping (OBJ 2.2). The mobile app design for the Stage 2 Food Shopping Activity is shown in Figure 3.

The data collection instrument for Stage 2 can be found in . Food products traditionally found in the center aisles of the supermarket were included in the study. Food products traditionally found in the perimeter of the supermarket, including fresh fruit, fresh vegetables, and alcohol, were excluded from this study. A complete list of product types included in the study can be found in Appendix E.

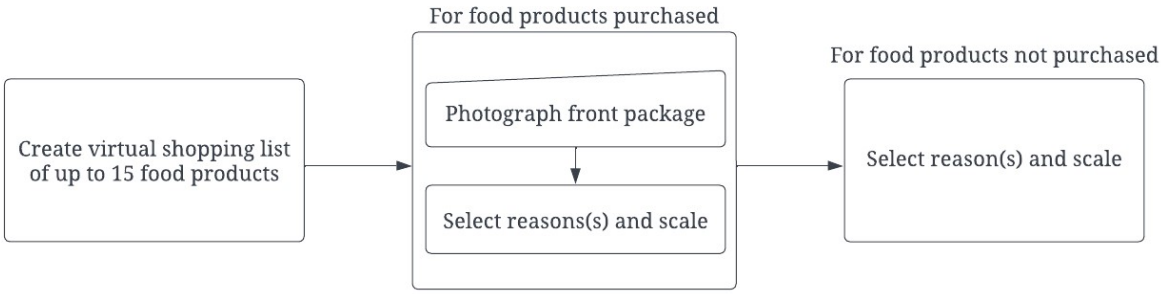


Figure 3: Mobile App Design for Stage 2 Food Shopping Activity Data Collection

Stage 3 Post-Shopping Survey: Participants completed a subset of the questions from the Dalhousie survey (Walker et al., 2021) relating to their consumer opinions toward single-use food packaging. These responses were used to segment the participants into consumer segments. (OBJ 1). An additional question on the impact of rising food products on participants purchasing decisions was added to Stage 3. The data collection instrument for Stage 3 can be found in .

3.4.1 Product Feature Categories

Seven product feature categories were used to categorise the product features for the Consumer Intention questions and reasons for purchasing or not purchasing food products. Six product feature categories: 1) Brand and Product Quality, 2) Nutrition & Dietary Need, 3) Origin and Production Method, 4) Packaging, 5) Price, and 6) Use & Storage documented in the Literature Review (Table 3)

were used for the product feature prioritisation and reasons for purchasing, or not purchasing, food products in the mobile app. Dietary need was not explicitly identified from the product features categorised during the literature review. Dietary need was included in the “Nutrition & Dietary Need” category as the North American population has recently become more focused on dietary needs (from veganism to food allergies or intolerances) when buying food. This trend is supported by a rise in research highlighting North American consumers' preferences for organic food (Polzin et al., 2023), non-genetically modified foods (Macall et al., 2021) and food suitable for plant-based diets (Polzin et al., 2023; Sogari et al., 2022). There is also an established link between the rising trend in sustainable lifestyles and dietary choices (Osawe et al., 2023). As a result, the product feature category "Nutrition & Dietary Need" was included in this research study. A seventh product feature category "Availability" was added to capture consumer decision-making based on whether or not the product was available in the supermarket. "Other" was added to capture other responses for potential further categorisation. References to resource management, including material and energy optimisation, and marketing, including promotion and social advocacy, were excluded as this research study focused on POP decision-making. The final list of product feature categories is found in Table 3.

3.4.2 Social Desirability Bias in Consumer Research

SDB occurs in self-reported consumer research when participants report socially acceptable behaviours more positively and suppress negative ones (Larson & Farac, 2019). SDB relates to environmental studies on consumer behaviour as environmentally positive behaviours are seen as desirable. Consumers might respond in a way that inflates their tendency to make more environmentally positive purchasing decisions. However, in their systematic review of consumer studies relating to sustainably packaged food, Ketelsen et al. (2020) note that only seven of the studies raised concerns about SDB impacting their research.

Formal tests for SDB, including the Marlowe-Crowne scale and the Balanced Inventory of Desirable Responding scale, are adopted to reduce SDB in research (Fisher & Katz, 2000; Larson & Farac, 2019). Two common approaches used in research have significant drawbacks. First, by removing data for participants with the highest SDB scores, valuable data may be lost, and no longer represent the research sample. Second, measuring SDB in the sample population using these standard

SDB tests is intensive and time-consuming for research participants and may take the focus away from the intended research topics. Fisher & Katz (2000)argue that SDB may be a positive outcome of research studies to highlight the tendency of research participants to overreport socially desirable behaviours. However, Larson & Farac (2019) suggest that SDB may contribute to the "attitude-behaviour gap" of green consumers.

In considering how SDB might impact the data collected, given that this research was based on self-reported data collection by participants and what take actions to mitigate the impact of SDB on the final results, the researcher decided that neither of the above approaches for dealing with SDB was acceptable. Instead, four mitigation steps in the design of this research and the data collection tool. First, participation in the research study was anonymous, with no identifying personal data associated with the participant responses. Second, the Stage 3 Post-Shopping Survey to collect consumer intention data was placed after the Stage 2 Food Shopping Activity to avoid the potential bias from the survey questions related to attitudes towards SUP packaging in the field study responses. Third, the reasons for purchasing or not purchasing a food product were randomized to reduce the potential for skewing the participants' choices. Fourth, the original interface design of the mobile app using the green brand colour of the funding partner, NoSUP Canada, was changed to a neutral colour palette due to the potential bias of green being associated with environmental issues.

3.4.3 Mobile App Development

The mobile app was developed based on the above survey design as part of this research study. A mobile app developer was contracted by the participating company, operating as NoSUP Canada, to complete the mobile app design, development, testing, and deployment between March and June 2022. NoSUP Canada retains all intellectual property and rights to future development and use of the mobile app. Before data collection, a pilot test of the mobile app was conducted from June 23 to July 7, 2022, with 6 test users to test the mobile app's usability and to ensure the data collected could be analyzed to meet the study objectives.

3.5 Data Collection Procedure

Data was collected from 226 participants using the mobile app from August 19 to September 19, 2022. The data collection process from participant recruitment through to participant appreciation is detailed in Appendix B. Data collection through the mobile app was completed in three stages. Participants spent an estimated 3 minutes completing Stage 1 Initial Survey, approximately 15 minutes completing the Stage 2 Food Shopping Activity – in addition to the time they regularly spend shopping for food – and approximately 7 minutes completing the Stage 3 Post-Shopping Survey[6].

3.6 Data Analysis Procedure

Quantitative data analysis was completed from mid-September 2022 to January 2023 using custom code written in the R programming language. The analysis procedure was completed in four steps: (1) the data collected was cleaned and coded in preparation for data analysis, (2) the sample was segmented into two consumer segments – Green Consumers and Grey Consumers – based on the Consumer Segmentation responses (OBJ1), (3) the Purchasing Intention and Purchasing Behaviour data was analyzed (OBJ2.1-3.2), and (4) the results were tested to determine the validity and reliability of the results. The research questions, objectives, hypotheses, analysis methods and tests used in the analysis of the results are summarized in Table 13.

[6] The timings provided are estimates as the time participants spent participating in the study was not tracked due to ethical concerns. The estimates were reported to be reasonably accurate based on self-reporting timings provided by app test users during the testing phase.

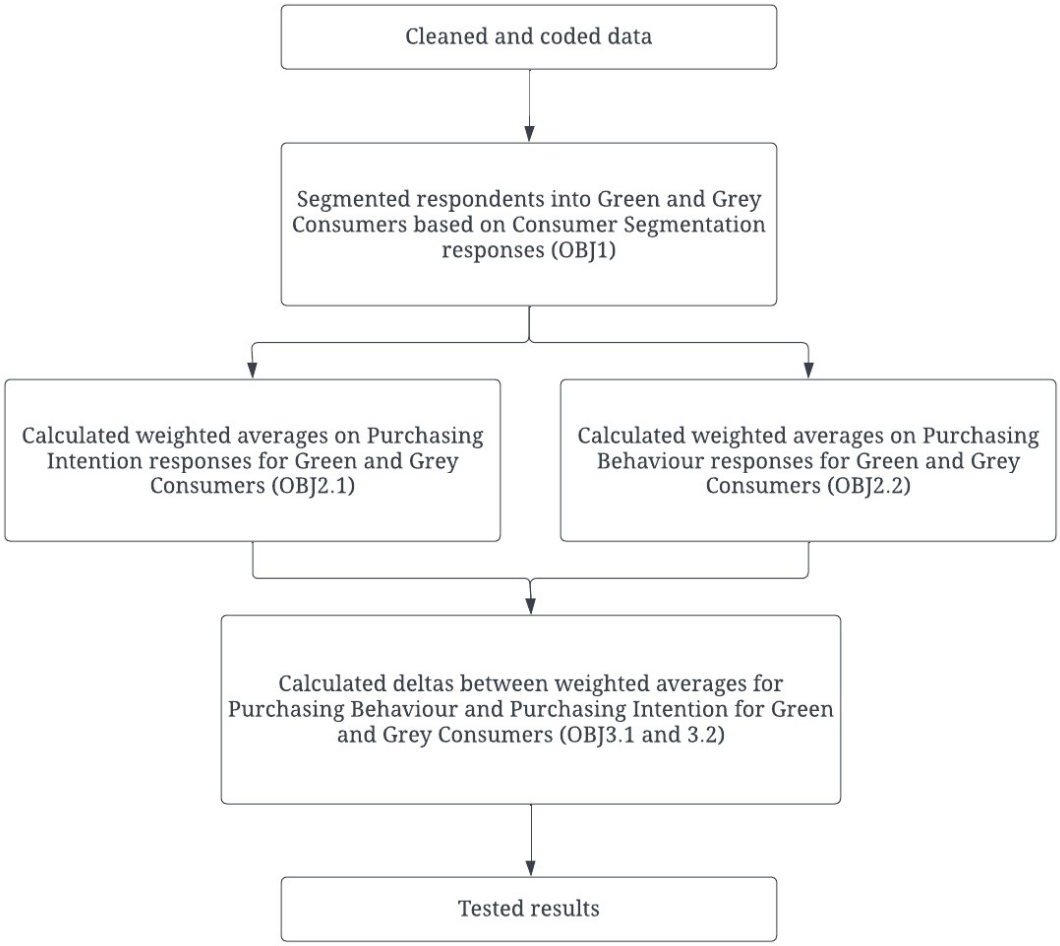


Figure 4: Data Analysis Workflow

3.6.1 Cleaning and Coding Data

The data cleaning to extract the final sample was established in three steps: (1) initial cleaning of the data based on consent, disclosure and duplication, (2) further cleaning of the data based on the completion of the three stages of the study, and (3) coding responses to the questions with an "Other" option. The cleaning process reduced 247 data entries to a cleaned and validated sample size of 95 participants (Table 5).

Table 5: Initial Data Cleaning

Entries	Status
247	Entries with study ID and consent (yes/no)
-1	Entries with missing study IDs removed
-6	Entries with consent withdrawn removed
-2	Participants excluded due to disclosure of identity
-20	Duplicate entries identified and removed
-123	Entries without key data for all three stages of the study removed
95	Participants that completed the study and included in data analysis

Data Cleaning: The data was first cleaned based on consent, disclosure and duplication (Table 6). One entry with a missing study ID was removed. Six entries where consent had been withdrawn were removed. Two participants were removed from the study due to the disclosure of their identities to the researcher through email communications regarding a technical issue and payment of remuneration. Sixteen participants submitted more than one entry. The thirty-six duplicate entries were reviewed and cleaned, and twenty duplicate entries were removed.

One hundred and twenty-three entries without key data for all three stages of the study were removed. Key data was defined as a response for at least one demographic response (S1Q2-6), aside from being located in Ontario, or at least one product feature scored (S1Q7), and at least one product with a minimum of one reason and scale of importance for the purchasing decision (S2), and at least one Consumer Segmentation question.

Table 6: Data Cleaning Based on Stage Completion

Stage	Inclusion/Exclusion Criteria	Missing Data
Stage 1 Initial Survey	● Participants live in Ontario (S1Q1) AND ● Participants answered at least one of the remaining demographic questions (S1Q2-Q6) ● OR ● Participants scored at least one of the product features above zero (S1Q7), excluding "Other"	● Two participants missing education level (S1Q4) ● One participant missing household income (S1Q5)
Stage 2 Food Shopping Activity	● Participants provided data on at least one product (S2) AND ● Participants provided at least one reason with a scale of zero or more. ● Supermarkets and photos not required	● Three participants missing supermarkets (S2) ● 334 products missing photos (S2)
Stage 3 Post-Shopping Survey	● Participants provided a score of zero or more for at least one Consumer Segmentation question ● Responses to Price Sensitivity questions not required	● 1 participant missing willingness to pay question (S3Q6) ● 2 participants missing rising food prices question (S3Q7)

The responses to the questions with an “Other” option data was coded as follows:

“Other” Supermarket (S2): Supermarket names entered manually by participants using the “Other Supermarket” box in the mobile app were cleaned. One new supermarket “Coppa's Fresh Market” was added and one manual entry for “loblaws” was standardized with capitalization. Three participants did not provide a supermarket name. A complete list of supermarkets is found in Appendix E.

“Other” Food Product Names (S2): Food product names entered manually by participants using the “Other Food Product” box in the mobile app were cleaned (Table 7). Non-food products, including fruits, vegetables, pet food and personal care products, were manually identified and excluded from the data. The remaining food products were manually coded using the original list of food product categories. Unknown food products were checked for categorization based on a search on the Walmart online store, where available, or a general internet search. Four new food product categories were added: Cheese – Other, Other Desserts, Other Drinks, and Other Grains. A complete list of food product categories and coded "Other" food products can be found in Appendix E.

Table 7: Data Cleaning of “Other” Food Products

Count	Cleaning action
147	Food products with “Other” product names
-71	Fruit, vegetable or non-food products excluded
76	Food products coded

“Other” Product Feature (S1Q7): Thirteen other product features entered manually by participants using the “Other Product Feature” box in the mobile app were reviewed. A review of the other product feature responses determined that no further coding should be undertaken to avoid duplication with the original product feature categories. The other product features that could have

been coded based on the original list of product features and a potential new product feature category for “Flavour and Personal Preference” have been noted in Appendix E for completeness. It should be noted that most participants did not provide a score for Other Product Feature for the Purchasing Intention questions, so the delta scores for Other product features cannot be meaningfully analyzed and have been excluded from the final analysis.

Other Reasons 1-3 (S2): Other reasons entered manually by Participants using the “Other Reason” box in the mobile app were cleaned (Appendix E). 112 “other” reasons were coded based on the original list of reasons. During cleaning, two potential new reason categories were identified: “Flavour and Personal Preference” and “Shopping List Modification”, with 71 and 12 responses respectively, representing only 2.9 percent of the total reason responses given. The potential new reason categories were not included in the final analysis to avoid negatively distorting the results as participants may have provided different responses if these two potential reason categories had been included in this study. Any “other” reasons that could not be coded into one of the original reason categories were included in “Other”. Researchers should consider adding additional reason categories for “Flavour and Personal Preference” and “Shopping List Modification” in future studies.

3.6.2 Segmenting the Sample

The data analysis for this research study required participants to be segmented into two consumer segments – Green Consumers and Grey Consumers. Segmentation was based on participant responses to the five 7-point Likert scale Consumer Segmentation questions:

1. I consider environmental impacts caused by single-use plastic food packaging to be important.
2. I am personally motivated to reduce the amount of single-use plastic food packaging because of its environmental impacts.
3. I actively shop for non-plastic packaging goods while grocery shopping.
4. I think regulations of single-use plastic packaging for food should be strengthened in Canada.
5. I support a ban of all single-use plastics used for food packaging.

Two options for segmenting the research participants were considered. Option 1 used a calculated average Segmentation Score, and Option 2 was based on a Segmentation Score cut-off for each question. The data was run using each option to determine the most appropriate sample segmentation for the data analysis for this research study. Each option will be explained and analyzed with a justification for the chosen approach for the data analysis.

The first option used a calculated average Segmentation Score for the five Consumer Segmentation questions: The scores were aggregated with equal weighting to calculate a total Segmentation Score out of a maximum of 35. The cut-off based on an average Segmentation Score of 6 or greater for all questions (equivalent to a total intention score of 30 or more) was established. Based on this approach, 20 percent of participants were identified as Green Consumers (n=19), with the remaining 80 percent classified as Grey Consumers (n=76). The breakdown by consumer segment for Option 1 is found in Table 8.

Table 8: Breakdown of Consumer Segment by Segmentation Score Average (Option 1)

Segmentation Score Average	Number	Percent
Green Consumer (>=6)	19	20%
Grey Consumer (<6)	76	80%
TOTAL	95	100%

The second option was based on a score cut-off of 5 or above for each Consumer Segmentation questions. The cut-off score of 5 was identified as this included all positive scores above the neutral or midpoint score on the 7-point Likert scale used for the Consumer Segmentation questions. Based on this approach, 18 percent of participants were identified as Green Consumers (n=17), with the remaining 82 percent being classified as Grey Consumers (n=78). The breakdown by consumer segment for this segmentation approach is found in Table 9.

Table 9: Breakdown of Consumer Segment by Segmentation Score Cut-off (Option 2)

Segmentation Score Cut-off	Number	Percent
Green Consumer (>=5)	17	18%
Grey Consumer (<5)	78	82%
TOTAL	95	100%

After examining the segmentation resulting from these two approaches, a review of the participants determined to be Green Consumers was conducted for each option. The average scores for each Segmentation Question was calculated and showed that the average score for question 3 regarding the degree to which the consumers' actively shop for non-plastic packaging goods while grocery shopping (average score 3.77) was lower than the averages for the other four questions (average scores ranged from 4.41 to 4.87) as illustrated in Figure 5. The first option was selected for the data analysis for this research study as averaging the Segmentation Score allows for some variation in participant responses to the five questions that the rigidity of a score cut-off does not. Other segmentation approaches could be considered for future studies, for example, setting a Segmentation Score cut-off of 2 or below to identify Grey Consumers or using only the Segmentation Score question 3 re actively shopping for non-plastic packaging goods while grocery shopping.

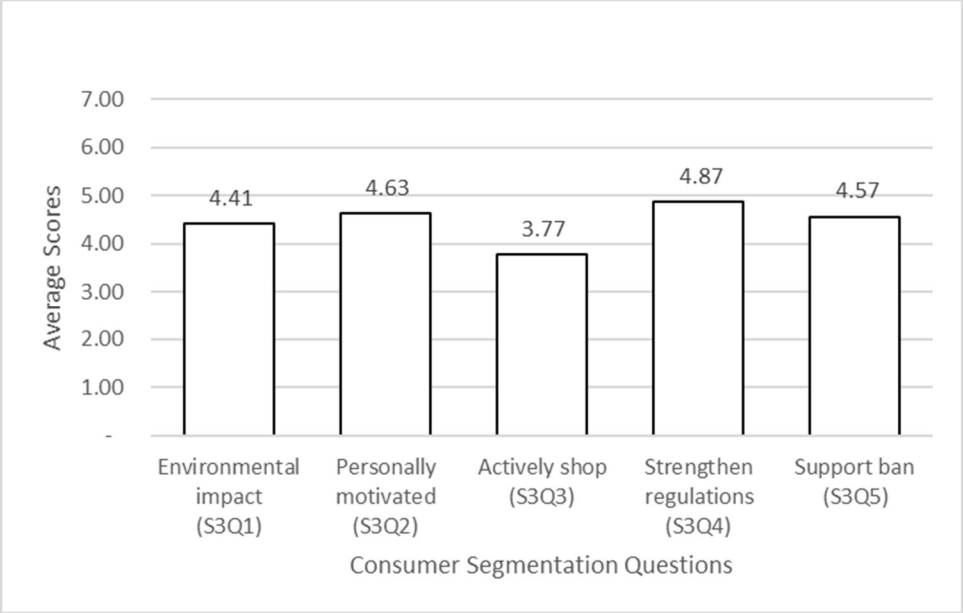


Figure 5: Average Scores for Segmentation Responses for All Consumers

3.6.3 Analysing Purchasing Intention and Purchasing Behaviour Data

The segmented data was analysed in three steps (Figure 6): (1) the weighted averages for each product feature category were calculated based on Purchasing Intention responses for each consumer segment (OBJ2.1), (2) the weighted averages for each product feature category were calculated based on Purchasing Behaviour responses for each consumer segment (OBJ2.2), and (3) for each consumer segment, the Purchasing Intention and Purchasing Behaviour responses for each product feature category were compared to determine if a gap exists between their intention and purchasing decisions related to packaging when food shopping (OBJ3.1 and 3.2). The analysis excluded the Other product feature category as most participants did not provide a score for Other product feature for the Purchasing Intention questions, so the Other product feature data cannot be meaningfully analyzed.

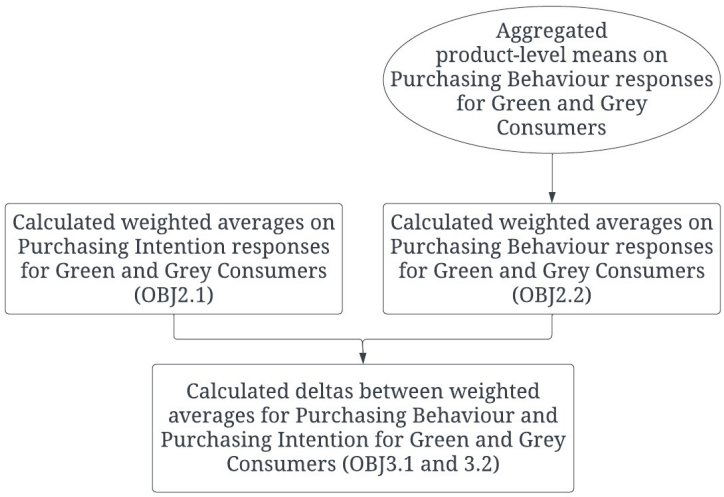


Figure 6: Workflow for Analysing Purchasing Intention and Purchasing Behaviour Data

For Purchasing Intention, the product feature categories scores were collected for each product feature category at the individual participant-level. Weighted averages were calculated for each product feature category for each consumer segment. The weighted average of each product feature category is equivalent to the sum of the products of each score and its Likert scale weight, divided by the total number of responses for the product feature category. The weighted averages for Purchasing Intention were graphed to allow for analysis between product feature categories and comparison between consumer segments (Figure 7).

For Purchasing Behaviour, the product feature categories scores were collected for each product feature category at the product-level. Participants provided scores for up to three reasons for purchasing or not purchasing each product. As the Purchasing Intention data was collected at the participant-level and the Purchasing Behaviour data was collected at the product-level, the Purchasing Behaviour data was aggregated to the participant-level. Thus, the product-level data for purchasing behaviour was first aggregated by means for each participant. Next, a weighted average for the product feature category was calculated to allow for comparison with the Purchasing Intention weighted averages calculated above. The weighted average of each product feature category is equivalent to the sum of the products of each score and its Likert scale weight, divided by the total

number of responses for the product feature category. This calculation of the Purchasing Behaviour weighted averages for each product feature category is the same as the calculation of the Purchasing Intention weighted averages which allows for comparison in later analysis. The weighted averages for Purchasing Behaviour were graphed to allow for analysis between product feature categories and comparison between consumer segments (Figure 8).

The deltas, or differences, between the weighted averages for Purchasing Behaviour and Purchasing Intention were calculated for each product feature for each consumer segment based on the formula:

$$\Delta = \bar{x}_{Behaviou} - \bar{x}_{Intention}$$

The deltas were graphed to allow for comparison between consumer segments (Figure 9).

3.6.4 Testing Validity and Reliability

The data was tested for validity and reliability using relevant tests depending on the data type and analysis. The seven-point Likert scale Consumer Segmentation questions were tested for reliability using Cronbach's alpha with a threshold over 0.8, indicating reliability of responses. Welch's Two Sample *t*-tests were selected as the statistical method for hypotheses testing the packaging results for the segmented consumers' Purchasing Intention and Purchasing Behaviour (H1 and H2). Welch's two-sample *t*-test is used to compare the means between the two independent segments of the sample and is used for small sample sizes (Colwell & Carter, 2012; Creswell & Creswell, 2018; Keller, 2016). This research is based on the segmentation of the sample into two distinct segments - Green Consumers and Grey Consumers –thus the Welch's two-sample *t*-test is an appropriate method of testing the hypotheses. The null hypothesis was rejected if the *p*-value was less than 0.05. As the packaging deltas for each consumer segment did not identify an intention-behaviour gap that aligned with the TPB, the deltas were not tested.

3.6.5 Data Excluded from the Results

Some data collected through the mobile app was excluded from the results as this data fell outside the final scope of the research project: (1) photos of the food products purchased, (2) the Purchasing Status indicator for food products purchased versus food products not purchased by the participants and (3) responses to the two Price Sensitivity questions. Further analysis to determine if there is any difference in the purchasing decisions based on purchasing status could be conducted in the future.

Chapter 4 Results

4.1 Introduction

The results of this research are presented as follows: (1) the breakdown of the sample's consumer demographics is described for the whole sample and the segmented sample of Green Consumers and Grey Consumers (OJB1), (2) the product feature prioritization for consumers' Purchasing Intention and Purchasing Behaviour responses are analyzed for each consumer segment to determine the importance of packaging when purchasing food products (OBJ2.1 and 2.2), and (3), the Purchasing Intention and Purchasing Behaviour responses were compared for each consumer segment to determine if a gap exists between their intention and purchasing decisions related to packaging when food shopping (OBJ3.1 and 3.2).

4.2 Study Sample Demographics

Descriptive statistics were used to describe the demographics for the study sample and compare the sample's representativeness with the population of Ontario. The consumer demographics of the sample was collected for gender, generation, education level, household income and household size (Table 10). The sample's consumer demographics for this research study were compared with the Ontario population based on the 2021 census (Statistics Canada, 2022).

Nearly two-thirds of participants are women (64.2 percent) compared with a nearly fifty-fifty split in Ontario (Statistics Canada, 2022). The predominance of women participating in the study aligns with women being the primary food shoppers in Canadian households and reflects the study's recruitment criteria for participants to be regular food shoppers for their household.

Millennials or Gen X represented 78.9 percent of participants (44.2 percent and 34.7 percent, respectively). The participation of Millennial or Gen X was significantly higher than the 54 percent these two generations represent within the Ontario population. Only 5.3 percent of participants are Gen Z. Sixteen percent of participants are Boomers. The lack of Gen Z participants may indicate that Gen Z individuals do not do their own food shopping. There were no Silent Generation participants potentially due to the use of a mobile app to participate in the study.

Nearly 83 percent of participants (82.8 percent) have post-secondary or tertiary education (college diploma or above) in line with 76.3 percent of the Ontario population, although proportionally more participants had postgraduate degrees than the Ontario population. Sixty percent of participants' household incomes are between $40,001 and $80,000, comparable with the Ontario population at 52.9 percent. Only 28.7 percent of participants reported a household income of less than $40,000, with 43.5 percent of the Ontario population in the same income bracket. Additionally, 10.6 percent of participants earn more than $150,001 compared with 3.6 percent of the Ontario population. The representation of household size was similar between the sample and the Ontario populations.

The sample demographic breakdown does not fully represent the Ontario population based on the 2021 census (Statistics Canada, 2022). This discrepancy in representation may be due to the small sample size (n=95) and the method of participant recruitment adopted for this study. The lack of representativeness of the study sample to the Ontario population constitutes a limitation of this study.

4.3 Green Consumer and Grey Consumer Demographics

The first objective of this research seeks to segment participants into Green Consumer and Grey Consumer segments based on their consumer opinions regarding SUP food packaging (OBJ1). The sample was segmented into 20 percent Green Consumers (n=19) and 80 percent Grey Consumers (n=76) using the selected consumer segmentation methodology. The Consumer Segmentation questions met the reliability threshold of 0.8 for the Cronbach's α coefficient (α=0.916), indicating that reliability of the Consumer Segmentation responses is high.

Proportionally more women in the sample were identified as Green Consumers (78.9 percent) than Grey Consumers (60.5 percent). The split between Green Consumers and Grey Consumers was similar across all generations, except for Gen Z. No Gen Z participants were identified as Green Consumers. More Green Consumers hold a post-graduate degree or doctorate (42.1 percent), with only one holding an undergraduate degree (5.3 percent) whereas post-secondary education was more evenly split for Grey Consumers (51.3 percent). There was relative alignment in the spread of household income and household size between the two consumer segments. The small sample size of Green Consumers (n=19) compared with Grey Consumers (n=76) may have resulted in these sampling differences, which could be addressed by replicating this study with a larger sample size.

Table 10: Study Sample Demographic Breakdown by Green Consumers and Grey Consumers

Consumer Demographics	Total Sample n=95	Percent	Green Consumer n=19	Percent	Grey Consumer n=76	Percent
Geographic Location						
Ontario	95	100.0%				
Gender						
Man	34	35.8%	4	21.1%	30	39.5%
Woman	61	64.2%	15	78.9%	46	60.5%
Generation						
Gen Z (1997-2004)	5	5.3%	0	0.0%	5	6.6%
Millennial (1982-1996)	42	44.2%	9	47.4%	33	43.4%
Gen X (1967-1981)	33	34.7%	7	36.8%	26	34.2%
Boomer (1947-1966)	15	15.8%	3	15.8%	12	15.8%
Education Level						
High School Diploma	14	15.1%	3	15.8%	11	14.9%
College Diploma	30	32.3%	7	36.8%	23	31.1%
Undergraduate Degree	23	24.7%	1	5.3%	22	29.7%
Graduate Degree or Doctorate	24	25.8%	8	42.1%	16	21.6%
Other	2	2.2%	0	0.0%	2	2.7%
Household Income						
< $40,000	27	28.7%	5	26.3%	22	29.3%
$40,001-$80,000	27	28.7%	7	36.8%	20	26.7%
$80,001-$150,000	30	31.9%	6	31.6%	24	32.0%
$150,001>	10	10.6%	1	5.3%	9	12.0%
Household Size						
One	28	29.5%	7	36.8%	21	27.6%
Two	32	33.7%	4	21.1%	28	36.8%

Consumer Demographics	Total Sample n=95	Percent	Green Consumer n=19	Percent	Grey Consumer n=76	Percent
Three	13	13.7%	4	21.1%	9	11.8%
Four	18	18.9%	3	15.8%	15	19.7%
Five	4	4.2%	1	5.3%	3	3.9%

4.4 Decision-Making Priorities of Green Consumers and Grey Consumers

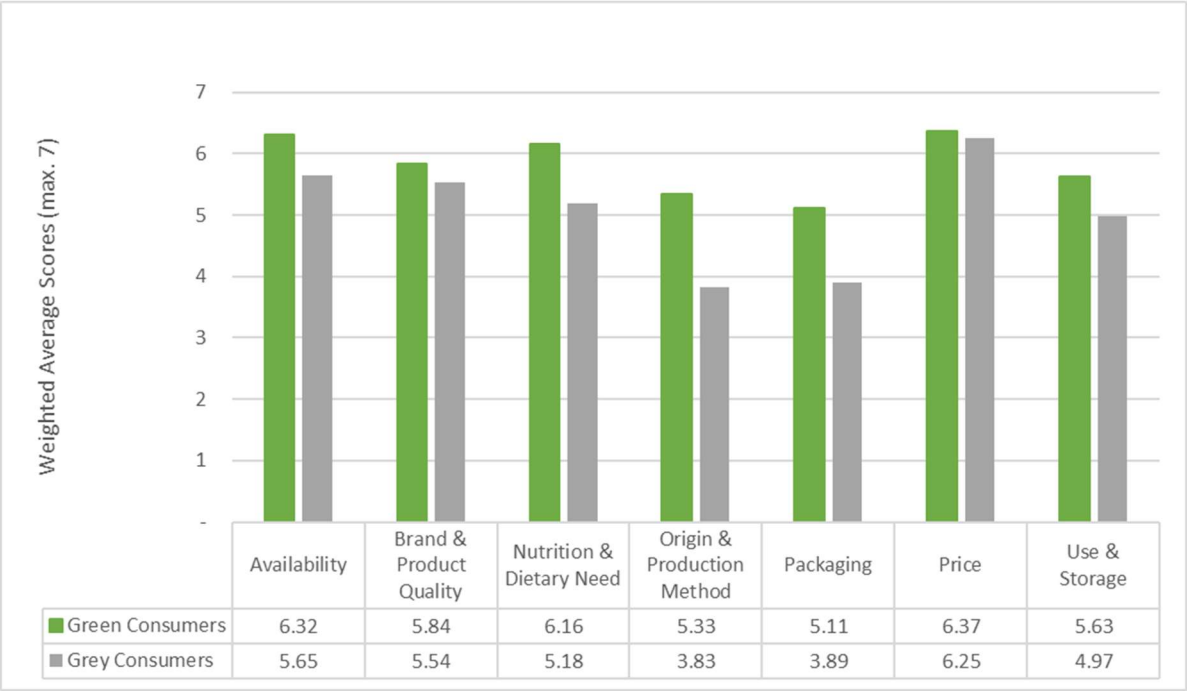
The second objective of this research seeks to identify the decision-making priorities of Green Consumers and Grey Consumers before shopping ("intention") and at the point-of-purchase ("behaviour") when purchasing food products (OBJ2).

4.4.1 Difference in Purchasing Intention between Green Consumers and Grey Consumers

The first sub-objective of OBJ2 seeks to determine the importance of packaging on Green Consumers' and Grey Consumers' intentions when purchasing food products (OBJ2.1). The participants' purchasing intentions were based on calculating the weighted averages of the Purchasing Intention scores for each product feature by consumer segment.

Alternative Hypothesis	**Null Hypothesis**
H1: The importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers.	N1: The importance of packaging on food purchasing intentions is scored the same or less by Green Consumers and Grey Consumers.

Green Consumers' scores for all product features purchasing intentions were higher overall than Grey Consumers (Figure 7). Green Consumers had a narrower range of means between the product feature intention scores compared with Grey Consumers ($\mathbb{R}_{Green}$=1.26; $\mathbb{R}_{Grey}$=2.42).



	Availability	Brand & Product Quality	Nutrition & Dietary Need	Origin & Production Method	Packaging	Price	Use & Storage
Green Consumers	6.32	5.84	6.16	5.33	5.11	6.37	5.63
Grey Consumers	5.65	5.54	5.18	3.83	3.89	6.25	4.97

Figure 7: Purchasing Intention Weighted Average Scores by Consumer Segment

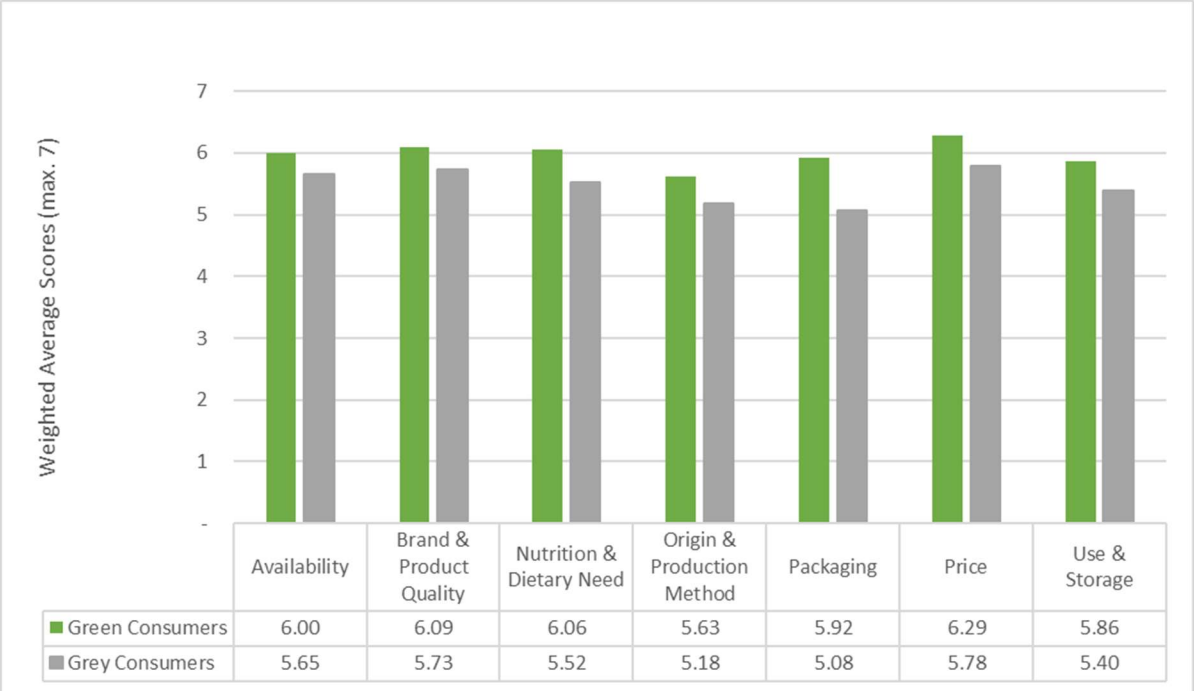
This result provides evidence in support of the hypothesis that the importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers (H1). The Welch Two Sample *t*-test used to test H1 showed that Green Consumers' Purchasing Intention for Packaging are statistically greater than Grey Consumers (p=.006561).

4.4.2 Difference in Purchasing Behaviour between Green Consumers and Grey Consumers

The second sub-objective of OBJ2 seeks to determine the purchasing decisions of Green Consumers and Grey Consumers regarding packaging when purchasing food products (OBJ2.2). The participants' purchasing decisions were based on calculating the weighted averages of the Purchasing Behaviour prioritization scores for each product feature by consumer segment.

Alternative Hypothesis	Null Hypothesis
H2: The importance of packaging on food product purchasing decisions is scored higher by Green Consumers than Grey Consumers.	N2: The importance of packaging on food purchasing decisions is scored the same or less by Green Consumers than Grey Consumers.

Green Consumers' scores for all product features purchasing behaviours were higher overall than Grey Consumers (Figure 8). Green Consumers had a similar range of means between the product feature intention scores compared with Grey Consumers ($\mathbb{R}_{Green}$=0.66; $\mathbb{R}_{Grey}$=0.7).



	Availability	Brand & Product Quality	Nutrition & Dietary Need	Origin & Production Method	Packaging	Price	Use & Storage
Green Consumers	6.00	6.09	6.06	5.63	5.92	6.29	5.86
Grey Consumers	5.65	5.73	5.52	5.18	5.08	5.78	5.40

Figure 8: Purchasing Behaviour Weighted Average Scores by Consumer Segment

This result provides evidence in support of the hypothesis that the importance of packaging on food product purchasing behaviours is scored higher by Green Consumers than Grey Consumers (H2), although this difference was smaller than for the intention scores. However, the Welch Two

Sample *t*-test used to test H2 showed that the difference between Green Consumers' and Grey Consumers' Purchasing Behaviour responses for Packaging is not statistically significant (p=.6949).

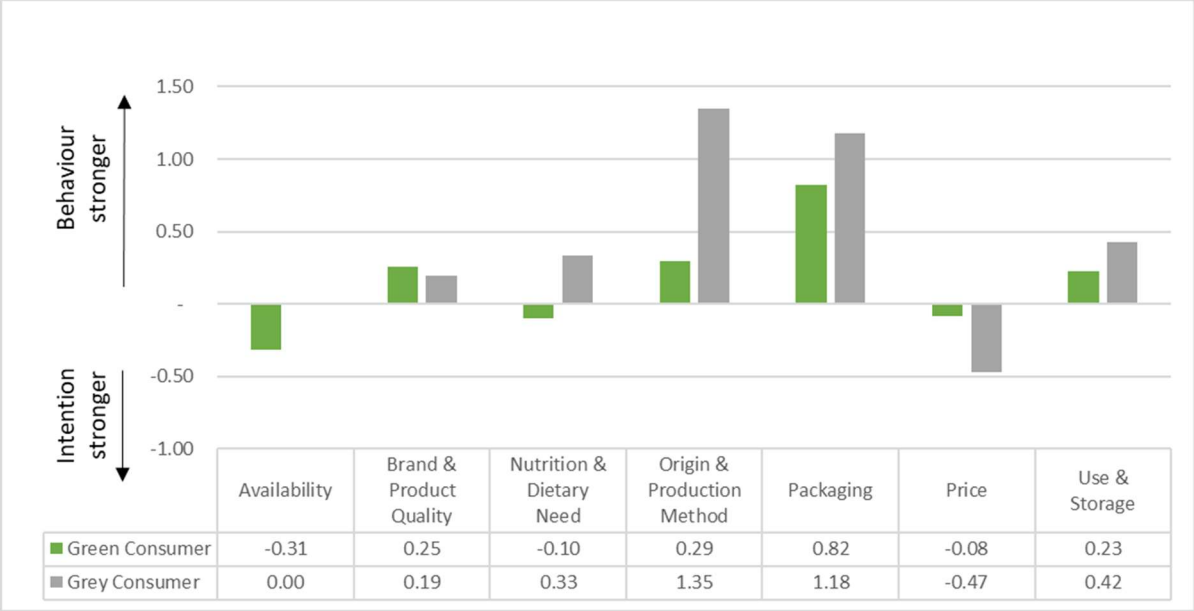
4.5 Difference Between Green Consumers and Grey Consumers Intention-Behaviour Towards Packaging

The third objective of this research seeks to establish if a gap exists between Canadian consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products (OBJ3). The first sub-objective of OBJ 3 seeks to establish if a gap exists between Green Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products. (OBJ3.1). The second sub-objective of OBJ 3 seeks to establish if a gap exists between Grey Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products (OBJ3.2). The deltas, or the differences, between the weighted averages of Purchasing Intention and Purchasing Behaviour were calculated for each consumer segment to test the hypotheses that gaps exist between intentions and purchasing decisions.

In Figure 9, deltas exist for both the stronger influence of purchasing intention and the stronger influence of purchasing behaviour on consumer decision-making. The former can be seen in the importance of purchasing intention for Price by Grey Consumers with the delta appearing *below* the neutral point (Δ_{Grey}=-0.47). This intention-oriented difference indicates that Grey Consumers are more influenced by Price before they go shopping than when they are in-store, on average. The latter is evidenced more strongly for both Packaging (Δ_{Grey}=1.18) and Nutrition & Dietary Need (Δ_{Grey}=1.35) for Grey Consumers where the respective deltas appear *above* the neutral point. This behaviour-oriented difference shows that Grey Consumers are, on average, more influenced by Packaging and Nutrition & Dietary Need while shopping than their pre-shopping intentions suggest.

Alternative Hypothesis	**Null Hypothesis**
H3: A gap exists between Green Consumers' intention and purchasing decisions relating to packaging when food shopping.	N3: No gap exists between Green Consumers' intention and purchasing decisions relating to packaging when food shopping.
H4: A gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.	N4: No gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.

The deltas provide evidence that a difference exists between both Green Consumers' and Grey Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products (Figure 9). Both Green Consumers and Grey Consumers are most strongly influenced by Packaging at the point-of-purchase (Δ_{Green}=0.82, Δ_{Grey}=1.18).



	Availability	Brand & Product Quality	Nutrition & Dietary Need	Origin & Production Method	Packaging	Price	Use & Storage
Green Consumer	-0.31	0.25	-0.10	0.29	0.82	-0.08	0.23
Grey Consumer	0.00	0.19	0.33	1.35	1.18	-0.47	0.42

Figure 9: Purchasing Behaviour and Purchasing Intention Weighted Average Score Deltas for Product Features by Consumer Segment[7]

However, the results were not statistically analysed as the deltas for Packaging showing that Purchasing Behaviour is stronger than Purchasing Intention for both consumer segments. This result is in contrast to the TPB which establishes the directionality of any intention-behaviour gap going from intention to behaviour. Therefore, the results were not statistically analysed further to test H3 and H4, despite the large delta value in Figure 9.

[7] Delta scores represent Behaviour minus Intention Weighted Average Scores. When interpreting the deltas breakdown in Figure 9: (1) if a bar is close to the zero line, action and intention for that bar were rated similarly by that consumer segment; (2) if the bar is above the line, the consumer segment was more strongly influenced by that factor at the point-of-purchase than pre-shopping purchasing intentions; and (3) if the bar is below the line the consumer's pre-shopping intentions were stronger than point-of-purchase decision-making.

4.6 Summary of Findings

The results of this research study established that H1 is supported whereas H2 is not supported, and the results for H3 and H4 could not be tested (Table 11).

Table 11: Summary of Hypotheses Results

	Hypothesis	**Test**	***t*-value**	***p*-value**	**Confidence interval**	**Decision**
H1	The importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers.	Welch Two Sample *t*-test	2.9595	0.006561	0.3690532 to 2.0519994	Supported
H2	The importance of packaging on food product purchasing decisions is scored higher by Green Consumers than Grey Consumers.	Welch Two Sample *t*-test	-0.3957	0.6949	-74480.55 to 50227.36	Not supported
H3	A gap exists between Green Consumers' intentions and purchasing decisions relating to packaging when food shopping.					Not tested
H4	A gap exists between Grey Consumers' intentions and purchasing decisions relating to packaging when food shopping.					Not tested

Chapter 5 Discussion

5.1 Introduction

The purpose of this research study is to understand how different consumer segments prioritise packaging when shopping for food. This chapter will discuss the results of this research study to explain how the findings address the two subject matter knowledge gaps and the methodological contribution. The subject matter gaps are (1) the importance of packaging on food purchasing decision-making in Canada, and (2) if any intention-behaviour gap exists in consumer purchasing decisions related to packaging. The methodological contribution is the development of a mobile app for data collection in a real-life setting to capture both purchasing intention and purchasing behaviour. Furthermore, the chapter will examine the implications of the research study in practice, discuss the methodological and research design limitations of this research study and identify opportunities for future research.

5.2 Importance of Packaging on Food Purchasing Decision-Making in Canada

The results support the hypothesis that Green consumers consider packaging more important to their purchasing intention than Grey Customers (H1, Figure 7). However, the results did not establish support for a similar difference between the two consumer segments in the purchasing behaviour on food purchasing decisions related to packaging (H2, Figure 8).

In this research study, Packaging scored amongst the lowest across the seven product feature categories for both purchasing intention and purchasing behaviour. The majority of the studies in the literature review show that green-minded consumers consider packaging material and packaging disposal important. However, Packaging as a product feature category in this research study was broad and undefined within the data collection tool. A limitation of this research study is that the specific product features of packaging that consumers are concerned about when food shopping, including packaging material, disposal, appearance and functionality, is not investigated. Green Consumers in this study may have considered sustainable packaging material and disposal factors when scoring packaging, however, the research design does not allow for that conclusion to be made. A follow-up study could be conducted

to examine the importance of specific product features on consumer decision-making when purchasing food.

Regarding the prioritisation of general product features in food purchasing decisions, there is less consensus between this study and the literature. Among the studies in the literature review that considered general product features, including packaging, Barbarossa & De Pelsmacker (2016) report that non-green consumers prioritise quality and price while Zhang & Dong (2020) identify product quality, brand loyalty and price as key product features in decisions to purchase green food products. This research study agreed with the high prioritisation of Price by these two studies in the literature review. However, this research study found less consistency for Brand & Product Quality which scored second highest for the Purchasing Behaviour of both consumer segments but were ranked lower for Purchasing Intention. The Canadian study by Macall et al. (2021) ranked price as the primary driver of decision-making for food purchases, followed by Canadian-origin and GMO-free production methods. In this research study, the prioritisation of Origin & Production Method was ranked amongst the lowest of the seven product feature categories for Green Consumer and Grey Consumer segments for both Purchasing Intention and Purchasing Behaviour. The difference may be explained by different market conditions for the two Canadian studies. Recent food inflation and supply chain issues through the CoVID-19 pandemic, may have resulted in Canadian consumers prioritising price more in this research study than the Macall et al. (2021) research study conducted in 2018. Repeating this research study when food prices stabilise in Canada could determine whether consumer purchasing decisions have indeed changed or have been temporarily influenced by market conditions.

5.2.1 Alternative Explanations of Low Packaging Scores for Green Consumers

The results showed that packaging was scored low for Green Consumers compared with other product features (Figure 7 and Figure 8). The bounds of this research study meant that the reasons for this low score could not be established, so two alternative explanations have been considered. First, the prioritisation of price may have been influenced by the study design as this research study was limited to consumer-packaged food products – excluding fruit, vegetables and alcohol – for which plastic-free options are limited in Canadian supermarkets. Second, the market conditions – food

inflation and supply chain shortages discussed above – at the time of the study may have influenced the results.

The results for price showed that purchasing intention and purchasing behaviour were closely aligned, with intention being slightly stronger for both Green Consumers and Grey Consumers. This result implies that perceptions about price may not be strongly influenced by what happens in-store, as concern about food prices is greater before shopping. In other words, consumers will buy the food they need despite price concerns. This alternative could be examined by repeating this research study when food prices stabilise in Canada.

With regard to packaging, Green Consumers may limit their food purchases in supermarkets to food products they can not buy with plastic-free packaging at farmers' markets or in zero-waste stores. Therefore, it is possible that green-minded consumers do not consider packaging as an important feature while shopping in supermarkets, as sustainable packaging had already been factored into their decision as to where to buy specific products. Baruk & Iwanicka (2015) found that when "environmental performance [of packaging]" is chosen, it tends to be the only product feature of importance (p. 190). Future research could be conducted to determine if Green Consumers are already factoring sustainable packaging and alternatives to buying food in supermarkets into their decision-making before they go food shopping.

5.2.2 Alternative Explanation of the Packaging Difference Between Intention and Behaviour for Grey Consumers

The results showing that there is a difference between purchasing intention and purchasing behaviour for both Green and Grey Consumers, particularly with in-store purchasing behaviour having a stronger influence on purchasing decisions when shopping for food (Figure 9). The Barbarossa & De Pelsmacker (2016) study which states that "green consumers may have a fundamentally different EFP [environmentally friendly product] purchasing process and may be driven or constrained by different factors than non-green consumers, and the intention–behaviour relationship may differ across the two consumer groups" (p. 231). In contrast, this research shows that there is more similarity in the purchasing decisions relating to packaging between the two segments than previously known. This

may mean that Grey Consumers could be more influenced to purchase food products in sustainable packaging if such products were available on supermarket shelves. Further research could be conducted to study the influence of the availability of sustainably packaged food products on Grey Consumers in-store purchasing decisions.

5.2.3 Alternative Explanations for the Lack of Intention-Behaviour Gap in Consumer Purchasing Decisions

The results establish a difference between both Green Consumer and Grey Consumers purchasing intentions and purchasing behaviours relating to packaging, with purchasing behaviour being stronger for both consumer segments (Figure 9). However, due the directionality of any gap going from intention to behaviour in the TPB, an intention-behaviour gap as expressed in the TPB could not be established for either Green Consumers or Grey Consumers.

The lack of granularity in the data collected for the product feature categories, including packaging, was identified above as a limitation of this study. This limitation means that the precise reasons for the difference between purchasing intention and behaviour for packaging can not be established in this research study. Future research could capture sub-product features, such as packaging material, disposal, appearance and functionality for both purchasing intention and purchasing behaviour in order to gain a deeper understanding of the differences for specific product features.

Furthermore, one of the critiques of the TPB identified in the Literature Review chapter is that the TPB fails to consider influence of the wider system in which individuals operate. In this research, the system in which consumers purchase food products is the food industry. As highlighted in the Introduction chapter, plastic packaging is entrenched in Canada's food industry with limited options to purchase plastic-free food products on supermarket shelves. This constraint on consumer decision making when purchasing food may result in consumers perceiving their options at limited at the pre-shopping intention stage resulting in lower Purchasing Intention scores for Packaging. However, once in the supermarket, the importance of packaging on their actual purchasing decisions may be elevated when faced with the choices of food products available to them instore. Future

research could examine the impact of the availability of plastic-free food on consumers purchasing intention and purchasing behaviour.

5.3 Methodological Contribution

This research study has made a methodological contribution to the academic literature by designing a novel data collection method using a mobile app in a real-life setting to capture both intention and behaviour of consumers' purchasing decisions. Traditional consumer surveys capture purchasing intentions only, and therefore, the consumer data collected is only accurate when purchasing intention and purchasing behaviour align. By using a mobile app to collect data in the supermarket while shopping for food, the study was able to capture both the participants' pre-shopping intentions and behaviour while food shopping. Thus, the analysis could be completed to identify the existence or lack thereof of the intention-behaviour gap. The results show a difference between purchasing intention and purchasing behaviour for packaging for both Green and Grey Consumers (Figure 9), which traditional intention-only surveys would not identify. By capturing both purchasing intention and purchasing behaviour, any differences between purchasing intention and purchasing decisions made at the POP can be identified. Any differences between purchasing intention and purchasing behaviour can provide a fuller understanding of consumers true purchasing decisions when shopping for food. Therefore, the novel methodology used in this research study fills the methodological gap found in using traditional intention-only surveys in consumer research. Future research could be conducted to replicate this research study with a larger sample size to create a model that corrects or adjusts for any intention-behaviour gap for traditional intention-only surveys.

5.4 Implications for Research in Practice

By capturing both purchasing intention and purchasing behaviour as well as segmenting the research sample between these two consumer segments, this research revealed a clearer understanding of consumers' decision-making priorities. Without capturing both purchasing intention and purchasing behaviour, the difference between the two could not be established and the implications of that difference examined. This understanding can be used to influence the food industry as the system in which they

purchase food. The food industry may lose out on the Green Consumer market segment if they do not consider their Green Consumers' decision-making priorities. In other words, Green Consumers may shop for food in places that align with their green values, such as farmer's markets and zero-waste stores. Furthermore, identifying that the difference for packaging exists for Grey Consumers also has implications for the food industry. As current market research focuses on intention only, the food industry may not be getting a full picture of Grey Consumers true opinions towards sustainably packaged food. By having a holistic understanding of both purchasing intention and purchasing behaviour for each consumer segment, the food industry could create different packaging for different consumer segments or introduce sustainable packaging for all consumers.

A clearer understanding of the similarities and differences between consumers' purchasing intentions and purchasing behaviours is important as adopting positive sustainable behaviour in one area can lead to a positive spillover of sustainable behaviour elsewhere (Barbarossa & De Pelsmacker, 2016; White et al., 2019). Addressing the intention-behaviour gap is critical for achieving industry for environmental sustainability (White et al., 2019) and, by extension, policy goals to the same end. As previously stated, the mobile app used for data collection is a prototype for putting this research into action. Multiple stakeholders in the current system could use data collected from Green Consumers: (1) food retailers, manufacturers, and packaging suppliers could identify market opportunities for introducing more plastic-free food on supermarket shelves, (2) the Canadian government could support decision-making around extending the ban on SUP food packaging and the need for additional funding for research and innovation of plastic-free food packaging and alternative packaging models, including reuse and refill models, (3) anti-plastic advocates could show evidence of consumer support behind their campaigns to eliminate SUP food packaging, and (4) municipalities could plan for future waste management based on the increased availability of plastic-free packaging.

5.5 Limitations and Future Research

The limitations of this research study will be examined across two themes: (1) methodological limitations and (2) research design limitations. Then, the replicability of this research study and opportunities for future research will be discussed.

5.5.1 Methodological Limitations

The methodological limitations were primarily due to constraints of time and budget which impacted the sample size and representativeness, geographic reach, and technology adopted for this research study.

Sample Size and Representativeness: The sample size of 95 participants for this research project was relatively small, and due to the selected participant recruitment method, it was not possible to achieve a representative sample that aligns with the population of Ontario. There was a significant gap in the representation of younger participants, particularly with Gen Z for which there were only five participants, none of whom were identified as Green Consumers. This generational gap could be avoided in future studies by using alternative avenues for participant recruitment to attract more participants from younger generations, for example, through social media. There is also potential to conduct future research based on different demographic groups, for example, younger generations versus older generations.

Geographic Reach: The research study was limited to participants from Ontario, meaning the generalisability of the results could not accurately be determined. Future research studies could be conducted with a larger sample size across Canada to allow for more generalizable results and comparisons, for example, between provinces/territories or urban versus rural participants. A cross-Canada study would require the content of the survey questions within the mobile app to be translated into French to account for both official languages in Canada.

Technology Platform: The mobile app used for this research study was developed for mobile phones using only the Android operating system, which excluded participation from users of Apple mobile phones using iOS. This decision may have had implications for the participation of specific consumer demographics, for example, green-minded consumers or younger generations may be more likely to use Apple mobile phones. In hindsight, the mobile app could have been developed using device-agnostic programming methods to allow the mobile app to be available to both Android and Apple mobile phone users. Further research could be undertaken to determine if the choice of the mobile platform has any implications for the sampling of green-minded consumers or attracting younger generations. Limitations of the research mobile app and potential improvements for future versions of the mobile app are listed in Table 12.

Table 12: Limitations of the Research Mobile App and Potential Improvements for Future Versions of the Mobile App

Research Mobile App	Future Versions
Android only	A device agnostic mobile app could be developed to allow both Android and Apple users to utilise the mobile app.
No descriptions of product feature categories	An informational popup box could be added for each product feature category in Stage 1 and Stage 2 to provide users with a description of each product feature category.
No granularity of sub-product features for Packaging	Additional functionality could be added to capture sub-product features, such as packaging material, disposal, appearance and functionality, if the user selects the product feature category Packaging in Stage 2.
No indication of whether the reason for the purchasing decision was positive or negative	An indicator could be added to each score for the product feature categories to capture whether the user considered it to be a positive or negative reason for purchasing or not purchasing a product.
No requirement to provide three reasons for each purchasing decision	Amend Stage 2 to require users to provide three reasons for each purchasing decision.

5.5.2 Research Design Alternatives

The main advantage of using a mobile app for the data collection in this research study was the users familiarity with using mobile apps in daily life as illustrated by the 42.04 percent completion rate. Alternative research designs, such as Qualtrics surveys, focus groups and interviews, have advantages and limitations compared with the chosen mobile app methodology. An online survey could have been designed to collect the same data with fewer resources, however, the survey format may have

been less familiar to participants and less convenient to complete, potentially resulting in a lower completion rate with lower-quality data. Interviews and focus groups may have resulted in opportunities to explore the reasons for the participants' purchasing decisions in more depth, however, these approaches would be more time intensive and have a higher risk of being influenced by SDB due to the researcher's direct involvement in the interview process. Focus groups and interviews would be more appropriate for a qualitative research study. Observational studies may have had the lowest risk of participant SDB, however, the data collected would have been limited to participants' purchasing decisions rather than including their pre-shopping intentions, and recording of the data may be influenced by researcher interpretation. Given the previously stated quantitative research objectives and the opportunity to prototype the mobile app through this research, the chosen mobile app-based methodology was the best fit to meet those goals despite any advantages of the other approaches.

In addition to survey design, segmenting consumers into Green Consumer and Grey Consumer segments allows for a more in-depth and nuanced examination of consumer decision-making. As explained in the Methodology chapter, this research study utilised a consumer segmentation method to distinguish Green Consumers from Grey Consumers. However, more established segmentation approaches, such as cluster analysis or factor analysis, could also be tested in future research.

5.5.3 Future Research

Due to the use of a mobile app for data collection, the potential for replicability of this research study is high. The study could be easily replicated with a larger sample size across all Canadian provinces and territories to ensure representativeness and generalisability. The study could also be targeted toward a narrower population group, such as green consumers only, or understudied demographics, like Gen Z. The study could also be conducted for different consumer product types, like cleaning products, toiletries, and cosmetics. Additionally, the study could be repeated at a different point in time for comparative purposes, for example, once food prices stabilize. The alternative survey designs discussed above do not offer such capabilities of ease of replicability.

5.6 Conclusion

This research study provides evidence of a difference between the decision-making priorities between Green Consumers and Grey Consumer segments in Canada. The findings of this research have determined that both Green and Grey Consumers are more strongly influenced by their in-store purchasing decisions regarding packaging than their pre-shopping intentions. By adopting a novel mobile app-based methodology to capture both consumers' purchasing intentions and purchasing behaviours, a clearer understanding of consumer decision-making when shopping for food can be established, compared with traditional intention-only consumer surveys. Through this differentiation in purchasing intention and purchasing behaviour of different consumer segments, a more nuanced understanding can be used to support changes within the food industry towards more plastic-free packaging in Canada. Despite the limitations of scope, time and budget of this research study, the potential for replicability of future research using the mobile app developed in this study is high. The researcher intends to further develop the mobile app used for this research project into a commercially viable version to support the shift away from single-use plastic food packaging.

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Appendix A Research Design

Table 13: Research Questions, Objectives, Hypotheses, Analysis Methods and Tests

Objective	Sub-Objective	Alternative Hypothesis	Null Hypothesis	Analysis Method	Test
OBJ1: Segment participants into Green Consumer and Grey Consumer segments based on their consumer opinions regarding SUP food packaging.					
OBJ2: Identify the decision-making priorities of Green Consumers and Grey Consumers before shopping ("intention") and at the point-of-purchase ("behaviour") when purchasing food products.					
	OBJ2.1: Determine the importance of packaging on Green Consumers' and Grey Consumers' intentions when purchasing food products.	H1: The importance of packaging on food product purchasing intentions is scored higher by Green Consumers than Grey Consumers.	N1: The importance of packaging on food purchasing intentions is scored the same or less by Green Consumers than Grey Consumers.	Calculated mean scores of prioritization score breakdown by product feature for Purchasing Intention and consumer segment (based on Consumer	Tested using Welch's Two Sample t-test of Green Consumers' and Grey Consumers' Purchasing Intentions responses for Packaging

Objective	Sub-Objective	Alternative Hypothesis	Null Hypothesis	Analysis Method	Test
				Segmentation questions).	
	OBJ2.2: Capture consumers' purchasing decisions of Green Consumers and Grey Consumers regarding packaging when purchasing food products.	H2: The importance of packaging on food product purchasing decisions is scored higher by Green Consumers than Grey Consumers.	N2: The importance of packaging on food purchasing decisions is scored the same or less by Green Consumers than Grey Consumers.	Calculated mean scores of prioritization score breakdown by product feature scores for Purchasing Behaviour and consumer segment (based on Consumer Segmentation questions).	Tested using Welch's Two Sample t-test of Green Consumers and Grey Consumers Purchasing Behaviour responses for Packaging
OBJ3: Establish whether or not a gap exists between Canadian consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products.					
	OBJ3.1: Establish whether or not a gap exists between Green Consumers' intention and their purchasing decisions as it relates	H3: A gap exists between Green Consumers' intention and purchasing	N3: No gap exists between Green Consumers' intention and purchasing	Compared feature prioritization of Purchasing Intention versus Purchasing	Not tested

Objective	Sub-Objective	Alternative Hypothesis	Null Hypothesis	Analysis Method	Test
	to packaging when purchasing food products.	decisions relating to packaging when food shopping.	decisions relating to packaging when food shopping.	Behaviour for Green Consumers (based on Consumer Segmentation questions).	
	OBJ3.2: Establish whether or not a gap exists between Grey Consumers' intention and their purchasing decisions as it relates to packaging when purchasing food products.	H4: A gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.	N4: No gap exists between Grey Consumers' intention and purchasing decisions relating to packaging when food shopping.	Compared feature prioritization of Purchasing Intention versus Purchasing Behaviour for Grey Consumers (based on Consumer Segmentation questions).	Not tested

Appendix B Data Collection Process

B.1 Participant Recruitment

A third-party market research company, Quest Mindshare (Quest), was used to recruit participants. Quest is a market research company based in Markham, Ontario. Quest recruited participants for the study and dispensed the remuneration to participants after the study (see participant recruitment materials in Appendix C). Quest did not administer the surveys as these stages were conducted through the mobile app. Quest recruited participants through proprietary and affiliate partner websites using a double opt-in approach, meaning participants had to verify their willingness to participate in this study after they were recruited. Once verified, participants were invited to participate in the research. Participant recruitment was done in several rounds to ensure enough participants were recruited to complete the study while remaining within the project budget.

Potential short-term risks with minimal impact on participant recruitment were identified during the ethics review process, and the actions detailed in Table 14 were taken to mitigate these risks.

Table 14: Potential Risks of Participation and Mitigation Actions Taken

Potential Risk	Mitigation Action Taken
Loss of privacy during participant recruitment	An agreement was made with Quest to ensure that identifying data collected from participants was limited and securely stored. Quest created a unique study number for eligible participants, and no identifying data was passed from Quest to the researcher.
Loss of privacy during the data collection using the mobile app	The mobile app was designed to ensure that identifying data collected from participants was limited and securely stored. Quest created a unique study number for eligible participants; no identifying data was required or collected through the mobile app from participants during data collection. Participants were made aware during the consent process of any risks posed by collecting and storing their identifying data through participation in the study.

Potential Risk	Mitigation Action Taken
	Any identifying data was removed from the data collected before analyzing the data and determining the research findings.
Data leakage during data collection using the mobile app	Secure storage of data collected using the mobile app was built into the design and development of the mobile app according to mobile app development standards. The contractor involved in the mobile app's design, development and testing was required to sign a non-disclosure agreement and was made fully aware of the need to maintain data security and integrity. The mobile app and data collected were hosted on a secure external server by the reputable data management and hosting cloud service, Google Firebase. Firebase is the industry standard for reliably and securely hosting mobile apps and databases. Firebase was used for storing data instead of a University of Waterloo server to provide a seamless user experience regarding mobile app performance and data security.
Use of mobile phones	No safety concerns other than that arising from regular mobile phone use were identified.

B.2 Participant Eligibility

Quest conducted participant eligibility screening during participant recruitment. Eligibility screening of participants based on five participant screening criteria, namely food shopper, aged 18 or over, living in Ontario, with an Android mobile phone, as detailed in Table 15. Participants meeting all the eligibility criteria were provided with a unique study number by Quest and directed to download the mobile app to participate in the study. Quest advised any potential participants not meeting all the eligibility criteria of their ineligibility to participate in the study. Quest deleted data collected during the eligibility screening if an individual was deemed ineligible to participate in the study.

Table 15: Participant Screening Criteria

Screening Criteria	Reason
Participants must be food shoppers for their households	Participants will need to be food shoppers for their households to participate in the food shopping activity conducted while shopping for food in the supermarket.
Participants must be at least 18 years old.	Participants under 18 will be excluded as this research will study purchasing decisions made by adult consumers.
Participants must live in Ontario.	Participants living in provinces or territories other than Ontario were excluded from the study to ensure a representative sample with the study's target sample size of 100 participants.
Participants must use a mobile phone with Android 9.0 or higher	Participants will need a mobile phone with Android 9.0 or higher to use the mobile app for data security purposes.

Quest Mindshare provided participants meeting all the eligibility criteria with a unique study number and directed participants to download the mobile app from Google Play Store using a private link. When the participants downloaded the mobile app onto their mobile phone and launched it, they were asked to enter the unique study number and provide their consent to participate in the study. The unique study number was checked to ensure it met the expected length and that another participant had not used it.

B.3 Participant Confidentiality and Anonymity

Quest collected identifiable participant information as part of their standard operating practices to recruit participants for this study. Quest signed a confidentiality agreement to ensure participants' privacy and confidentiality were maintained, including protecting identifiable participant information, before starting participant recruitment. Identifiable participant information was not accessible to as participants were assigned a unique study number to participate in the study. During data collection, the unique study number was entered by participants onto the Welcome screen when accessing the mobile app for the first time. The mobile app database did not contain a list of participants' study numbers linked to their real names or other identifying information. At the end of the data collection phase, the researcher used the unique study number to notify Quest of the participants participating in the study for remuneration

purposes. Participation information was transferred to Quest through a password-protected file via a link to a secure folder containing only the information being transferred on the cloud hosting service. The password was sent to Quest separately from the secure link. Participant responses collected in the mobile app were not shared with Quest. The contractor involved in the mobile app's design, development, and testing also signed a non-disclosure agreement. During the data collection phase, this data was hosted on a secure external server by reputable data management and hosting cloud service, Google Firebase.

When data collection was complete, the study data was downloaded into a password-protected folder on the University of Waterloo server, accessible only by the researcher and the supervisor. The data collected was summarized and analyzed; individual participants are not identifiable from these summarized results. Participants will not be identified in the thesis, journal articles, or other reports. The Mitacs Accelerate program terms and conditions require the maintenance of records for a minimum of two years after the research project is completed (i.e. after the researcher's thesis has been defended), after which time it will be destroyed.

B.4 Participant Consent and Withdrawal

Participants were provided with study information and asked to provide consent on the mobile app's Welcome screen by clicking one of two radio buttons. During any stage of the data collection phase, participants could withdraw from the study through the mobile app by returning to the Welcome screen. If participants withdrew their consent, the participant's unique study number and any data they provided was deleted before the data was summarized and analyzed. As the data was collected anonymously, participants could not withdraw from the study after the data collection period was complete.

B.5 Participant Appreciation

Participants were offered $5 for participation in the Stage 1 and Stage 3 surveys, in whole or in part, and up to $15 for participation in the Stage 2 Food Shopping Activity ($1 per food product entered up to a maximum of 15 products)[8]. Once the data collection phase was complete, the researcher provided Quest with a list of the participant study numbers and the amount of remuneration due to each participant. Quest administered the distribution of the remuneration to participants paid via the participants' choice of an e-gift card through the provider Tango card as per Quest's standard practice. Participants were not expected to incur any expenses through their participation in the study.

[8] All amounts are in Canadian dollars unless otherwise stated.

Appendix C Participant Recruitment Materials

C.1 Screening of Potential Participants Web Page

You are invited to participate in a research study conducted by the University of Waterloo, Canada. The objective of the research study is to understand the purchasing decisions of Canadian consumers when buying food in supermarkets.

The study will be conducted from **[start date] to [study end date]** using an Android app on your cell phone. If you decide to participate, you will be asked to complete the study in three stages using this app. You can complete all three stages in one shopping trip.

Stage 1: an initial online survey (approx. 3 minutes)

> You will be asked to provide demographic information for data analysis purposes. You will also be asked about the importance of different product features on your purchasing decisions when shopping for food.

Stage 2: a field study activity while shopping for food (approx. 12-15 minutes)

> Before you start shopping, you will be asked to create a shopping list to identify of up to 15 food products you plan to buy while shopping in the supermarket. While you are shopping, you will be asked to take a photo of each of the food products on your shopping list and provide a reason for choosing the product. When you are finished shopping, you will be asked to provide reason(s) for not choosing any food products remaining on your shopping list.
>
> *Notes: You will be able to add 1-15 food products to your shopping list and you will receive $1 per food product you provide information on. You are not required to buy any of the food products you choose as part of this study.*

Stage 3: a post-shopping survey (approx. 3 minutes)

> After shopping, you will be asked to complete questions on your intentions when shopping for food.

In appreciation of your time, you will receive up to $20 based on your participation in all the stages of the research study. You will receive $5 for participating in the initial and/or post-shopping survey, and up to an additional $15 for participating in the field study. At the end of the study period on September 12, 2022, you will be offered a choice of e-gift cards through Tango card. No cash remuneration will be

offered. You will be sent the e-gift card to the email address you provide when you sign up to the study within two weeks of the study end date.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board.

Please answer the following questions to determine your eligibility to participate in this study. If you are eligible, you will be shown information on how to download the mobile app with a unique ID and password you will use to participate in the study. You will also be emailed this study information.

#1 - In what country do you live? **[Must select Canada]**

#2 - Which of the following provinces do you currently reside in? **[Must select Ontario]**

#3 - Which of the following best describes your age?

- Under 18 **[Terminate]**
- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 and older

4. What is your gender?

- Man
- Woman
- Other gender identity

#5 - Are you a regular food shopper for your household? Yes/No **[No Disqualify]**

#6 - Do you use a cell phone with Android 9.0 or higher? Yes/No **[No Disqualify]**

C.2 Study Inclusion for Eligible Participants Onscreen Notification

Thank you for your participation in this research study. You meet the eligibility criteria for participating in this research to understand the purchasing decisions of Canadian consumers when buying food in supermarkets.

The next steps are:

1. Download the app [linked to mobile app on Google PlayStore] and install it on your Android cell phone (version 9.0 or above).
2. Use this unique ID **[unique ID]** and password **[study password]** to complete the activities before, during and after food shopping in the supermarket as instructed in the app before **[study end date]**.

The study will take approx. 20 minutes on top of your regular shopping time and you can complete all three stages in one shopping trip. In appreciation of your time, you will receive up to $20 based on your participation in the study.

If you have any technical issues downloading or using the mobile app, please contact **Rachel Saysana at** *rsaysana@questmindshare.com*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board. For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

C.3 Study Exclusion for Ineligible Potential Participants Onscreen Notification

[The Quest Mindshare standard ineligibility notification was displayed onscreen]

C.4 Study Instructions Email for Eligible Participants

[Emailed within 24 hours of qualification]

Subject Line: Participation in Research Study

Dear **[insert name]**,

Thank you for your participation in this research study to understand the purchasing decisions of Canadian consumers when buying food in supermarkets.

The next steps are:

1. Download the app [linked to mobile app on GooglePayStore] and install it on your Android cell phone (version 9.0 or above).
2. Use this unique ID **[unique ID]** and password **[study password]** to complete the activities before, during and after food shopping in the supermarket as instructed in the app before **[study end date]**.

The study will take approx. 20 minutes on top of your regular shopping time and you can complete all three stages in one shopping trip. In appreciation of your time, you will receive up to $20 based on your participation in the study.

If you have any technical issues downloading or using the mobile app, please contact **Rachel Saysana at** *rsaysana@questmindshare.com*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board. For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

Sent by Quest Mindshare on behalf of Karen Farley, University of Waterloo

C.5 Follow Up Email #1 for Eligible Participants

[For participants who have not downloaded the app and signed in up to 4 days after qualification]

Subject Line: Reminder to Participate in Research Study

Dear **[insert name]**,

Thank you for your interest in this research study to understand the purchasing decisions of Canadian consumers when buying food in supermarkets.

We note that you have not yet started the study.

The next steps are:

1. Download the app [linked to mobile app on GooglePayStore] and install it on your Android cell phone (version 9.0 or above).
2. Use this unique ID **[unique ID]** and password **[study password]** to complete the activities before, during and after food shopping in the supermarket as instructed in the app before **[study end date]**.

The study will take approx. 20 minutes on top of your regular shopping time and you can complete all three stages in one shopping trip. In appreciation of your time, you will receive up to $20 based on your participation in the study.

If you have any technical issues downloading or using the mobile app, please contact **Rachel Saysana at** *rsaysana@questmindshare.com*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board. For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

Sent by Quest Mindshare on behalf of Karen Farley, University of Waterloo

C.6 Follow Up Email #2 for Eligible Participants

[For participants who have downloaded the app and signed in, however, they have not completed the study up to 4 days after signing into the app]

Subject Line: Reminder to Complete in Research Study

Dear **[insert name]**,

Thank you for your interest in this research study to understand the purchasing decisions of Canadian consumers when buying food in supermarkets.

We appreciate that you have started the study, however, you have not yet completed it.

The study will take approx. 20 minutes on top of your regular shopping time and you can complete all three stages in one shopping trip. In appreciation of your time, you will receive up to $20 based on your participation in the study. Please complete the study before **[study end date]**.

If you have any technical issues downloading or using the mobile app, please contact **Rachel Saysana at** *rsaysana@questmindshare.com*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board. For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

Sent by Quest Mindshare on behalf of Karen Farley, University of Waterloo

C.7 Appreciation Email for Final Participants

[The Quest Mindshare standard appreciation email with details on renumeration was sent to participants who complete all or part of the study after data collection was complete]

Appendix D Mobile App Content

D.1 Welcome Screen

Enter your unique ID: _____

Enter your password: _____

Consent to Participate

Please read the following study information and confirm your consent below:

You are invited to participate in a research study for a master's thesis conducted by ***Karen Farley***, under the supervision of ***Dr. Sean Geobey, School of Environment, Enterprise and Development*** of the University of Waterloo, Canada. The objective of the research study is to understand the purchasing decisions of Canadian consumers when buying food in the supermarket.

Eligible participants will need to be food shoppers, age 18 years or over, live in Ontario, and have a cell phone with Android 9.0 and above.

The study will be conducted from **[study start date] to [study end date]** using an Android app ("app") on your cell phone. If you decide to participate, you will be asked to complete the study in three stages using this app. You can complete all three stages in one shopping trip.

Stage 1: an initial online survey (approx. 3 minutes)

You will be asked to provide demographic information for data analysis purposes. You will also be asked about the importance of different product features on your purchasing decisions when shopping for food.

Stage 2: a field study activity while shopping for food (approx. 15 minutes)

Before you start shopping, you will be asked to create a shopping list to identify up to 15 food products you plan to buy while shopping in the supermarket. While you are shopping, you will be asked to take a photo of each of the food products on your shopping list and provide reasons for choosing the product. When you are finished shopping, you will be asked to provide reasons for not choosing any food products remaining on your shopping list.

Notes: You will be able to add 1-15 food products to your shopping list and you will receive $1 per food product you provide information on. You are not required to buy any of the food products you choose as part of this study.

Stage 3: a post-shopping survey (approx. 3 minutes)

After shopping, you will be asked to complete questions on your intentions when shopping for food.

Your participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer. You can withdraw your participation at any time during the study by changing your consent within the app. If you withdraw from the study, your unique ID number, and any data you provide will be deleted before the data is summarized and analyzed. You will not be able to withdraw from the study after the data collection period is complete.

Your participation in this study is confidential and your identifying information will not be collected. You will use a unique ID number and password to log into the app and record your responses during the study. All the data collected will be summarized, and you will not be identifiable from these summarized results. You will not be identified in the thesis, journal articles, or other reports.

The app and data collected through the app during the study will be hosted on an external secure server by Google Firebase – industry standard in hosting mobile apps and databases – to provide you with a smooth and secure experience when using the app. The app will be developed according to industry best practices to maintain your privacy. During the study, your data will be stored in a password-protected file on the Firebase server to maintain the security of your data. When the study is complete, your responses will be downloaded and stored on a secure University of Waterloo server. Your responses will only be accessible to the researcher and their academic supervisor. Your responses will not be shared with any other person or company. The data will be electronically archived, maintained for two years after the completion of the study, and then erased. When information is transmitted or stored on the internet privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers).

In appreciation of your time, you will receive up to $20 based on your participation in all the stages of the research study. You will receive $5 for participating in the initial and/or post-shopping survey, and up to an additional $15 for participating in the field study. To end your participation early, please click through to the End Study button in the app in order to receive

your payment for the parts of the study you participated in. At the end of the study, the researcher will provide Quest Mindshare with your unique ID number and the amount of the gift card based on your participation in the study. Quest Mindshare will offer you the choice of e-gift cards through Tango card using the email address you provided when you signed up to the study. No cash remuneration will be offered. The amount received is taxable. It is your responsibility to report this amount for income tax purposes.

This research study has been funded in part by the student researcher's company which develops mobile apps. The researcher may use lessons learned during the development the app to make improvements to future versions of the app. The researcher will use your responses to answer their research question for this study to complete their master's thesis and potentially to publish the study in academic journal articles. Your data collected from this study will not be sold for commercial gain. You will not be contacted after the research study for marketing, or other business reasons.

If you are interested in viewing the results of this study, they will be posted by **December 31, 2022** at *https://nosup.ca/uw-research-results/*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board.

For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

By agreeing to participate in the study you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

[Radio button] I agree to participate.

[Radio button] I do not agree to participate

Next

[Go to Stage 1 Initial Survey]

D.2 Stage 1 Initial Survey

[SCREEN 1.0]

Consumer Profile

This information will be used to analyze the data collected in this research study across different demographic groups. It will not be used to identify you.

1. Do you currently live in Ontario?
    a. Yes
    b. No
2. What is your gender?
    a. Man
    b. Woman
    c. Non-binary person
    d. Prefer to self-identify
        [if selected, text box provided to self-identify gender]
    e. Prefer not to answer
3. What year were you born?
        [dropdown list of years starting at 2004 down to 1922]
4. What is your education level?
    a. High School Diploma
    b. Undergraduate Degree
    c. College Diploma
    d. Graduate Degree or Doctorate
    e. Other
5. Was your household income over the last 12 months?
    a. Less than $40,000
    b. Between $40,001 and $80,000
    c. Between $80,001 and $150,000
    d. More than $150,001
6. How many people are supported by your household income?
    a. One
    b. Two
    c. Three

d. Four
e. Five
f. Six or more

Purchasing Decisions

7. How important are each of these product features to you when deciding to purchase food products?

	1=not important – 7=very important
Brand & Product Quality	
Nutrition & Dietary Need	
Origin & Production Method	
Packaging	
Use & Storage	
Price	
Availability	
Other	*[text box provided to enter other product feature]*

Next

[Go to Stage 2 Field Study]

D.3 Stage 2 Field Study

[SCREEN 2.1]

Create your shopping list

Which supermarket are you shopping in today?
[popup window with a searchable list of supermarkets provided, plus option to enter "other" supermarket]

Step 1: **Add up to 15 food products** to your shopping list.
[popup window with a searchable list of products provided, plus option to enter "other" product]

Next

[SCREEN 2.2]

For food products you buy

Today you are shopping at: *[chosen supermarket displayed]*

Step 2: For each food product you purchase today, click on the food product to **take a photo** of it and **add 1-3 reasons why you chose it**.
[shopping list of selected food products appears here]

Next

[SCREEN 2.2.1 Reasons for purchasing product information screen]

Reasons for purchasing

[Chosen product displayed]

Take a photo of the front of the package for the product you have chosen to buy.

Select up to three (3) reasons why you decided to purchase this food product, and rate how important each reason is to you.

(slider for 1=not important – 7=very important)

[reasons for purchasing the product provided in a dropdown list in randomized order, plus text box for "other" reason]

Return to shopping list

[SCREEN 2.3 - displayed if products remain in the shopping list]

For food products you *did not* buy

Step 3: For each food product you **did not** purchase today, click on the food product and **add 1-3 reasons why you did not** buy it.

[shopping list of remaining products appears here]

Next

[Go to Stage 3 Post-Shopping Survey]

[SCREEN 2.3.1 Reasons for not purchasing product information screen]

Reasons for not purchasing

[Chosen product displayed here]

Select up to three (3) reasons why you decided **not** to purchase this food product, and rate how important each reason is to you.

(slider for 1=not important – 7=very important)

[reasons for not purchasing the product provided in a dropdown list in randomized order, plus text box for "other" reason]

Return to shopping list

D.4 Stage 3 Post-Shopping Survey

[SCREEN 3.0]

Consumer Opinions

1. I consider environmental impacts caused by single-use plastic food packaging to be important:

   (slider for 1=strongly disagree – 7=strongly agree)

2. I am personally motivated to reduce the amount of single-use plastic food packaging because of its environmental impacts:

   (slider for 1=strongly disagree – 7=strongly agree)

3. I actively shop for non-plastic packaging goods while grocery shopping:

   (slider for 1=strongly disagree – 7=strongly agree)

4. I think regulations of single-use plastic packaging for food should be strengthened in Canada:

   (slider for 1=strongly disagree – 7=strongly agree)

5. I support a ban of all single-use plastics used for food packaging:

   (slider for 1=strongly disagree – 7=strongly agree)

6. I would be willing to pay the following increase in price for a food product with green packaging alternatives:

   a. 0%
   b. 2%
   c. 5%
   d. 10%
   e. 13%
   f. 15%

Consumer Experience

7. How has rising food prices impacted your food shopping decisions?

   (slider for 1=no impact – 7=significant impact)

End Study

[Go to Thank You screen]

D.5 Appreciation Screen

Thank you

for participating in this research study!

At the end of the study period indicated in your email from Quest Mindshare, the researcher will provide Quest Mindshare with your unique ID number and the amount of the gift card based on your participation in the study. Quest Mindshare will offer you the choice of e-gift cards through Tango card using the email address you provided when you signed up to the study. No cash remuneration will be offered. You will be sent the e-gift card to the email address you provide when you sign up to the study within two weeks of the study end date. The amount received is taxable. It is your responsibility to report this amount for income tax purposes.

If you are interested in viewing the results of this study, they will be posted by **December 31, 2022** at *https://nosup.ca/uw-research-results/*.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board.
For questions, please contact either ***Karen Farley at*** *karen.farley@uwaterloo.ca* or ***Dr. Sean Geobey at*** *sean.geobey@uwaterloo.ca*.

Thank you again for your participation in this study. You can now close this mobile app.

Appendix E Mobile App Data Tables

E.1 Supermarkets Included in the Study

Supermarkets[9]	Analyzed
Co-op	
Coppa's Fresh Market*	1
Costco	7
Extra Foods	
Farm Boy	1
Food Basics	12
Foodland	
Fortinos	1
FreshCo	5
Freshmart	
Loblaws	5
Marché Adonis	1
Metro	1
No Frills	25
Northern/Northmart	
Real Canadian Superstore	4
Safeway	
Sobeys	1
T&T	

[9] One other supermarket "Coppa's Fresh Market" was added during coding to the original list of supermarkets used for the S2 Shopping List supermarket dropdown list in the mobile app (Screen 2.1) and is indicated with a star (*).

Valu-mart	2
Walmart	24
Wholesale Club	
Your Independent Grocer	
Zehrs	2
(none)	3

E.2 Food Product Categories Included in the Study

Food Product Categories[10]	Analyzed	"Other" Product Responses[11]	Coded
Apple sauce	7		
Baby food	2		
Baby formula			
Bacon	16		
Bagels	15		
Baked beans	3		
Baking powder/baking soda	4		
Barbeque (BBQ) sauce/seasoning	5		
Bay leaves	1		
Beans/chickpeas/lentils	9	lentils	1
Beef	18		
Bread	56	bread, buns	4
Breadcrumbs	1		
Breakfast cereal	32	breakfast cereal, cereal	2
Burgers	11	beef patties	1
Butter/margarine	22		
Cake	7		
Cake/cookie/pancake baking mix	4		
Candy	4		

[10] Four additional food product categories, "Cheese, other", "Other Dessert", "Other Drinks", and "Other Grains", were added during coding to the original list of food products categories used for the S2 Shopping List food product dropdown list in the mobile app (Screen 2.1). The potential product categories are indicated with a star (*).
[11] The "Other" Product Responses listed have been summarised to exclude duplicates and spelling variations.

Food Product Categories[10]	**Analyzed**	**"Other" Product Responses**[11]	**Coded**
Cheese, cheddar/gouda/Swiss/ parmesan	25		
Cheese, feta/goat/ricotta/ mozzarella	10	cottage cheese, vegan cottage cheese	3
Cheese, other *	2	cheese, cheese strings	2
Cheese, shredded/sliced	12		
Cheesecake	2		
Chicken	28		
Chili	3		
Chocolate bar	11		
Chocolate chips	6		
Chocolate/caramel/strawberry syrup	2		
Chutney			
Cinnamon/cinnamon sugar	2		
Club soda/tonic water	5	sparkling water	2
Cocoa	1		
Coconut oil	3		
Coconut water	5		
Coffee/coffee mixes	21	instant coffee	1
Cookie dough	2		
Cookies	22	cookies, chocolate wafers, shortbread	3
Corn chips/tortilla chips	8		
Couscous			
Crackers	17	Crispers	1

Food Product Categories[10]	**Analyzed**	**"Other" Product Responses**[11]	**Coded**
Cream cheese/cheese spread	10		
Cream/whipped topping	2		
Croissants	6		
Croutons/salad toppings	1		
Curry powder	1	Masala	1
Deli meat/lunch meat	15	cold cuts	1
Donuts	4		
Dried fruit	1		
Drink mixes/crystals/syrups	2	water enhancer	1
Eggs	37	Eggs	1
English muffins	4		
Evaporated milk/condensed milk	3	coconut milk	1
Fish, cod/tilapia/salmon/tuna	10		
Flour	8		
French fries/hashbrowns	8		
Frosting/powdered sugar	1	Icing	1
Fruit cups/jello	1		
Fruit juice/juice concentrate	18	apple juice	1
Fruit, processed/frozen	11	frozen fruit	1
Garlic bread	7		
Garlic powder/garlic salt			
Gelatin			
Granola bars/snack bars	12		

Food Product Categories[10]	Analyzed	"Other" Product Responses[11]	Coded
Granola cereal	2		
Gravy	2		
Ground beef/pork/turkey	8		
Gum	4		
Half & half/coffee creamers	5		
Hamburger buns	8		
Herbs, basil/oregano/sage	2		
Honey	7		
Horseradish	1		
Hot chocolate/cocoa mixes	2		
Hot dog buns	9		
Hot dogs/Frankfurters	1		
Hot sauce	4		
Hummus/baba ghanoush/ tzatziki	5	Hummus	1
Ice cream cones	2		
Ice cream/sorbet	8	frozen yogurt	1
Ice pops/popsicles	3		
Iced tea	5		
Instant potatoes			
Italian seasoning			
Jam/jelly/preserves	4		
Jerky/dried meat snacks	1		
Kombucha	1		

Food Product Categories[10]	Analyzed	"Other" Product Responses[11]	Coded
Lamb	1		
Lemon juice/lime juice	3		
Mac & cheese	9		
Maple syrup	4		
Marshmallows			
Mayonnaise	14		
Milk, fresh/powdered	36	milk, 1% milk, almond milk, chocolate milk, lactose free milk	8
Muffins	3		
Mustard	8		
Noodles, rice/wheat/egg	6		
Nuts, almonds/cashews/ walnuts	9	"badam [almonds], pista[chios], walnuts", chestnuts, walnuts	3
Nuts, peanuts	2	Peanut	1
Olive oil	15		
Olives	3		
Other Dessert *	1	Dessert	1
Other Drinks *	1	peanut punch	1
Other Grains *	5	buckwheat, oatmeal, oatmeal quick oats, oats	5
Pasta sauce	14		
Pasta, spaghetti/macaroni/ lasagne	14	lasagna noodles	1
Peanut butter/nut butter	10		
Pepper, ground/whole	2		

Food Product Categories[10]	Analyzed	"Other" Product Responses[11]	Coded
Pickles	8		
Pie filling			
Pie/pie shell			
Pita bread/flat bread	5	flat bread, naan, wraps	3
Pizza/pizza crust	10	frozen pizza	1
Popcorn	8		
Pork	7		
Potato chips	20	chips, lays potato chips	2
Pretzels	3		
Pudding	1		
Quinoa	3		
Ready meals/TV dinners	9	chicken nuggets, perogies, roast beef dinner	3
Relish			
Rice	14	brown rice	1
Rice cakes/popcorn cakes	1		
Salad dressing	8		
Salad/coleslaw, prepared	9	eat smart asian sesame salad, eat smart honey dijon kale salad, eat smart kale vegetable salad kit	3
Salsa/guacamole	3		
Salt	7		
Sausage	6		
Seafood, mussels/oysters/clams			
Seafood, shrimp/crab/shellfish	2		

Food Product Categories[10]	Analyzed	"Other" Product Responses[11]	Coded
Seeds	2	chia seeds	1
Shortening	2	Ghee	1
Soft drinks/soda/pop	19	coca-cola, coke	2
Soup/broth	5		
Sour cream	5		
Soy sauce			
Spices, paprika/cumin/ginger	5		
Sports/energy drinks	2		
Steak sauce			
Stuffing mixes	1		
Sugar/sugar substitute	4		
Sweet and sour sauce	2		
Syrup/molasses	1		
Tea/tea mixes	15		
Tempeh			
Teriyaki sauce	1		
Tinned/canned fish	6		
Tinned/canned meats	1		
Toaster pastries/pop tarts	1		
Tofu	4		
Tomato ketchup	12		
Tomato/tomato paste	6		
Tortillas/wraps	5	egg roll wrap	1
Turkey	3		

Food Product Categories[10]	**Analyzed**	**"Other" Product Responses**[11]	**Coded**
Vanilla essence/extract			
Vegetable juice			
Vegetable oil	10	canola oil, vegetable oil	3
Vegetables, processed/frozen	10	frozen veggies	1
Veggie burgers/soy burgers/soy hot dogs			
Veggie dips, onion/spinach/red pepper	5		
Vinegar	3		
Waffles	6		
Water	15		
Worcestershire sauce	1		
Yeast	3		
Yogurt	36	yogurt, flavour yoghurt, "yoplait blackberry, strawberry yogurt", "yoplait strawberry, fieldberry yoghurt"	4
Total Food Products Analyzed	**1125**	**Total Food Products Coded**	**76**

E.3 Product Features Included in the Study

Product Feature[12]	**"Other" Product Feature Responses**[13]	**Coded**
Availability		
Brand & Product Quality	familiarity	1
Nutrition & Dietary Needs		
Origin & Production Method		
Packaging	quantity/product quantity, size (weight) per pkge	3
Price	coupon available	1
Use & Storage	freshness	2
Other	ethnic food, innovative products, ads, (other)	4
Flavour & Personal Preference*	husband likes it, variety	2
Total Coded		**13**

[12] One potential product feature category was identified during coding to the original list of product feature categories used for the S1Q7 other product feature dropdown list in the mobile app (Screen 1.0). The potential product feature category is indicated with a star (*).
[13] The "Other" Product Features listed exclude duplicates and spelling/capitalization variations.

E.4 Reasons for Purchasing Decisions Included in the Study

Reasons[14]	Analyzed	"Other" Reason Responses[15]	Coded Reason 1	Coded Reason 2	Coded Reason 3
Availability	430	"I didn't find it in store", not available, "not available in kind i wanted", "I could not find it in store"	3		1
Brand & Product Quality	516	Brand			1
Nutrition & Dietary Need	349	diabetic friendly, fattening/often fattening, "has ingredients that match my health goals"		3	1
Origin & Production Method	188				
Packaging	261	quantity, size	1	2	1
Price	760	expensive/too expensive, coupon/free coupon, "offer of buy 2 get 1 free", sale, quantity discount	2	2	5
Use & Storage	283	fragile, perishable, "quick and easy to prepare"		2	1

[14] Two potential reason categories were identified during coding to the original list of reasons categories used for the S2 Reasons for purchasing/not purchasing product dropdown lists in the mobile app (SCREEN 2.2.1 and SCREEN 2.3.1). The potential reason categories are indicated with a star (*).
[15] The "Other" Reasons listed exclude duplicates and spelling/capitalization variations.

Reasons[14]	**Analyzed**	**"Other" Reason Responses**[15]	**Coded Reason 1**	**Coded Reason 2**	**Coded Reason 3**
Other	87	ethnicity, innovative product	2		2
Flavour & Personal Preference*		flavour/flavor, taste/good taste/taste great, yum, I like it a lot, don't like, craving/craving it, im addicted, "I like olive oil", "I like veg pizza so wanted to buy one", "I love Turkish delight", "I really like sundried tomato pesto", "Don't like ground meat", personal preference husband and I both love, husband likes it, husband really enjoys, the kids like it artificial/too artificial, fatty/too fatty, too pungent snack, very satisfying snack, satisfies hunger, "I enjoy snacking on soft cakes" flavours of cookie, didn't have the variety I wanted, "Type (Caesar not other dressings)", "Type (Crunchy not smooth)" It makes water taste better	29	16	26

Reasons[14]	**Analyzed**	**"Other" Reason Responses**[15]	**Coded Reason 1**	**Coded Reason 2**	**Coded Reason 3**
		"bones for my dog"			
Shopping List Modification*		already had, "already had at home", "already bought sparkling water", "enough at home already", changed mind, forgot, redundant	9	3	
Total Reasons Analysed	**2874**	**Total Reasons Coded**	**46**	**28**	**38**