

Analyzing the Reasons for Disparity in Food Waste Among Canadian and Dutch Consumers

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Thesis Research Proposal

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This research proposal has been written as a requirement of the 4th year thesis for the dual-degree bachelors' study 'International Food Business' at AERES University of Applied Sciences and Dalhousie University. My name is Jan Kajkowski and I am a 22-year-old student from Poland in the 4th year of my study. I would like to my coach Cynthia Akkermans for supporting me throughout the duration of this project by providing valuable feedback and direction.

Selecting a topic was by far the hardest part of this research, many days were spent thinking of topic ideas that were both interesting and related to the IFB program. The topic of food waste was the right one because it fulfills the above mentioned criteria and is directly connected to the previous life experiences of the author. The personal perspective allows to combine research and personal experiences to come up with new conclusions and ideas about the problem of food waste.

This bachelor thesis analyzes the possible explanations for the disparity in the rate of food waste among Dutch and Canadian consumers. Its goal is to find concrete reasons about the differences in food systems in both countries, not attack Canadian consumers and imply that the disparity is caused solely by their shopping habits and lifestyle.

After consulting with the assigned coach, many improvements were made to this thesis. Firstly additional peer-reviewed sources were used so that the total number of peer-reviewed sourced younger than 10 years is 10. Also, the reasons for selecting the food waste figures from research were specified. When analyzing the data, some of the food waste figures and the numbers pertaining to the time spent in the store were merged so that the results of the analysis were clearer and the structure of the whole report was also changed so that it makes more logical sense. Lastly, the missing in-text citations were added so that the APA standard is met.

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1. Introduction

1.1 The Food Waste Problem

On an annual basis, 1.3 billion tons of food are thrown away world-wide (Vilarino, Franco, Quarrington, 2017). This figure was first identified in 2011 and since then, food waste has become an issue of great public concern (FAO, 2011). Many governments and organizations have pledged to take action to reduce the problem (FAO, 2020). Currently, food waste is a part of the agenda for the UN sustainable development goals calling for halving per capita global food waste at retail and consumer levels by 2030, as well as reducing food losses along the production and supply chains (FAO, 2020). Since then, the amount of wasted food has not decreased, in fact, it is continuously increasing and is projected to reach 2.1 billion tons annually by 2030 (Yale School of the Environment, 2018).

Food waste is a prevalent issue in both developing and developed countries, the difference among them being the step in the food supply chain where the waste occurs (FAO, 2011). In developing countries more than 40% of the food losses occur at post-harvest and processing levels, while in industrialized countries, more than 40% of the food losses occur at retail and consumer levels (FAO, 2011). In fact, food waste at consumer level in industrialized countries (222 million ton) is almost as high as the total net food production in Sub-Saharan Africa (230 million ton) (FAO, 2011). In the world there are the 821 million people that live in a food insecure state, even more – one in three – suffer from some form of malnutrition (Food Aid Foundation, 2020). This phenomenon occurs despite the fact that the current agricultural outputs are sufficient enough to accommodate the needs of every person on the planet (Holt-Gimenez, 2012). In addition, food waste is a contributing factor to other issues that affect all humans like pollution and methane gas emissions (FAO, 2013).

In developed countries, the largest culprits of food waste are consumers, however there are still disparities among developed countries in the amount and type of food waste. This thesis aims to find out why those differences occur, specifically which behaviors in the home and the grocery store show the largest correlation to an increased rate of food waste. Two very

different countries in terms of the food culture, grocery store sizes, geographical size and population will be analyzed, those countries are the Netherlands and Canada. In Canada, the amount of consumer food waste per capita falls in the range of 85kg-140kg (Massow, 2019)(National Zero Waste Council, 2020), in the Netherlands this figure falls in the 34.3kg – 50kg range (Voedings Centrum, 2019)(Netherlands Nutrition Centre, 2018).

1.2 Food Waste – Global Scale

When discussing issues regarding food systems and the changes that need to take place, the alarming amount of food going to waste is often mentioned. It is a commonly held notion that agricultural outputs need to increase in order to accommodate the upcoming increase in world population, but the amount of food currently being produced is already capable of sustaining the growing population. According to the Food and Agriculture Organization of the United Nations, the world produces more than 1.5 times the food needed to feed all people on this planet (Holt-Gimenez, 2012). Despite the agricultural capabilities, there are still many people that live in a state of food scarcity, one of the reasons for this is the lack of infrastructure and technology in developing countries contributing to food waste occurring before food reaches the consumer (World Counts, 2020). The largest source of food waste in developing countries is in the production phase where over 500 million tons is lost due to issues like crop pests and ineffective harvesting and irrigation (World Counts, 2020). This is followed by “postharvest handling and storage” and “consumption” both with around 350 million tons (World Counts, 2020). These three phases account for around 75% of all food waste (World Counts, 2020). In the developed world, a vast majority of food waste occurs at the consumer level. In North America, consumers are responsible for 61% of the total food waste in the chain, and in Europe consumers account for a total of 52% (Lipinski, 2015). To reduce food waste in the developed world, the focus of most programs and initiatives should therefore be on the final consumer.

The FAO defines food waste as “the removal from the food supply chain of food (whether processed, semi-processed or raw) which is fit for consumption, by choice, or which has been left to spoil or expire as a result of negligence by the actor, predominantly, but not exclusively, the final consumer at the household level” (FAO, 2018). This phenomenon has many repercussions that impact society as a whole. It affects people, the economy as well as the environment. Some of the most noticeable impacts of food loss are decreased profits for producers and environmental damage (FAO, 2018).

Consequences of Food Waste

Food waste at the consumer level has two main consequences, first is the sacrifice of resources including land, water and energy, thus producing environmental damage such as excessive greenhouse gas emissions (FAO, 2013). The second result of food waste is the loss of capital for actors in the food supply chain, it is estimated that the global economy loses over 900 bn annually on food waste (Rabobank, 2018).

The stage in the supply chain in which the food is wasted changes the degree of impact that food waste has on the environment (FAO, 2013). This is because when food wastage occurs along the food supply chain impacts of all the phases that the product has gone through (e.g. processing, transport), are added to the initial agricultural impact and the final end-of-life impact (FAO, 2013). For instance, the highest carbon footprint of wastage occurs at the consumption phase (37 percent of total), whereas consumption only accounts for 22 percent of total food wastage (FAO, 2013), that is because the carbon footprint also includes the energy used for growing, processing and storing of the food.

The particular effects of food waste on the environment include greenhouse gas production caused by food that ends up in landfills and wasting the water used in food production (FAO, 2013). The global carbon footprint of food waste, excluding land change, has been estimated at 3.3 giga tons CO₂: making food wastage the third top green-house gas emitter after the U.S. and China (FAO, 2013). Food waste also places a great strain on the earth's water resources. A large section of water used around the world is utilized in agriculture, therefore

wasting food equates to wasting the water that was used to grow the food (FAO, 2013). Globally, the blue water (surface and groundwater sources) footprint of food wastage is about 250 km³. In terms of volume, it represents almost three times the volume of Lake Geneva (FAO, 2013).

From a financial perspective, food waste is also a significant problem. It is estimated that industrialized and developing countries lose around USD 680bn and USD 310bn, respectively, each year on food waste (Rabobank, 2018). The financial opportunity of reducing food waste is therefore quite substantial.

1.3 General reasons for food waste by consumers

In order to understand consumer-related food waste, it is vital to understand the factors that shape consumer behavior within the household and grocery store. Food waste is not an isolated phenomenon, it is intertwined with other aspects of everyday routines like living situations, available space for storing food, proximity to grocery stores and means of transportation (Hebrok & Boks, 2017). It occurs within many different, but interconnected practices of everyday life such as shopping routines, storing food, cooking, and eating (Quested, Marsh, Stunell & Parry, 2013). Given this assertion, food waste is best viewed as the result of multiple behaviors that contribute to food being wasted (Quested, et al., 2013). Meaning that by the time an item of food is thrown away, the opportunity to prevent that food from becoming waste has usually passed, or the actions leading to the waste may have occurred some time ago (Quested, et al., 2013).

Personal values are also an important aspect of food waste because they affect how people perceive food and its treatment (Hebrok & Boks, 2017). For some, wasting food goes against their personal values, therefore they avoid it at all costs, other people may not have such strong convictions about discarding food (Hebrok & Boks, 2017). Besides values, lifestyles

are also relevant, especially the high convenience level people have become accustomed to (Hebrok & Boks, 2017).

In terms of household income, research is conflicted on how it impacts food waste. According to 'Osner (1982)', affluent households waste more food than low income households because they can afford to, and there is a clear correlation between the proportion of income spent on food and the amount of food wasted (Parfitt, Mark & Macnaughton, 2010).

However, other research (Wenlock et al. 1980) states that there is evidence that low-income households also waste significant amounts of food and that there is little to no correlation between income and food waste.

Age also determines how people value food. According to studies conducted in the UK, people over 65 years of age waste less food than other age groups (Quested, et al., 2013). Researchers hypothesize that people over 65 are influenced by their past, having experienced times of scarcity; they bring with them a different "education" when it comes to handling food than other age groups (Hebrok & Boks, 2017). Besides age, the stage of life and family structure has also been proved to impact the rate of food waste. Families with children produce more total waste and types of food waste, but less per capita – they also more often plan for shopping and buy in bulk (Parizeau & Massow, 2015). Also it is difficult to predict how much food children will eat during a meal and it is common for kids to not finish the food they are given by parents in lunchboxes, therefore tracking food waste within a large household is more problematic (Parizeau & Massow, 2015). There are many factors that make efficient provisioning of food more difficult for a single-person household. Food is only available for decreased costs at large quantities, all recipes cater towards large groups, and differences in consumption have a stronger effect in smaller households (Quested, et al., 2013).

Food waste differs from other practices like recycling or using plastic bags because it is a private matter and is almost never seen by others (Tucker & Speirs, 2003). This reduced visibility is also a feature of food waste generation in the home with the consequence that the

ability of social norms to influence practices may not be as strong as some more 'visible' behaviors (Tucker & Speirs, 2003).

Food packaging is necessary for food storage and transport, it is also one of the driving factors of food waste (Williams, 2011). In fact, up to 25% of all household waste is related to packaging issues (Williams, 2011). Large packages that are difficult to consume before the expiry date and date labelling are some of the most common packaging related causes (Williams, 2011). Date labels on food packaging are often used to justify the disposal decision (Williams, 2011). As could be expected, the dates are often misunderstood by consumers, especially younger consumers which tend to rely more rigidly on the date to evaluate food safety and when to discard compared to older consumers (Hebrok & Boks, 2017).

Household storage behavior is also another aspect contributing to food waste within the home (Aschemann, De Hooge, Pegah & Bech-Larsen, 2015). For example, consumers keep potentially never used items that were bought for a special recipe or for a special occasion that has never occurred, these items are at some point thrown out (Aschemaan et al., 2015). Errors in storing food are also common, for instance maintaining the refrigerator temperature too high, storing vegetables incorrectly, keeping leftovers for too long and using expiry date labelling to assess disposal even if it no longer applies after opening (Aschemaan et al., 2015). Moreover, the way consumers handle foods often differs between food categories, not necessarily according to what would be the right handling for the best preservation of the food (Aschemaan, et al., 2015).

1.4 Comparison of Food Waste Among Dutch and Canadian Consumers

The data on food waste by consumers in Canada and the Netherlands is very inconsistent. According to some sources, Canadian citizens waste 140 kg of food per year (National Zero Waste Council, 2020), while others state 85 kg (Massow, 2019). Data on food waste in the Netherlands is also inconsistent, sources mention figures ranging from 34.3 kg (net Centrum, 2019) to 47 kg (Netherlands Nutrition Centre, 2018). Nevertheless, the figure stated in

Canada is always higher than the figure pertaining to the Netherlands, therefore it is reasonable to assume that Canadian consumers waste more food than Dutch consumers.

In 2019, Dutch households wasted an average of 41 kg per person in solid food (Dooren, 2019), while Canadian consumers threw away 85 kg of food (Massow, 2019). For the purpose of this thesis, these figures will be used. The reason for selecting these figures has to do with the credibility of all the analyzed sources, and the method for formulating the number. 'The National Waste Council', which stated that Canadians waste 140 kg of food is a non-profit organization from Vancouver, not a scientific journal, therefore it has less credibility compared to the figure provided by (Massow, 2019), which comes from a peer-reviewed scientific journal article. The figure for the Netherlands was chosen because the source from which the figure is derived from quality references, additionally the other figure coming from 'Voedings Centrum' (34.3 kg), does not include liquids, therefore comparing this figure to the Canadian figure which includes liquids would not be fair. The chosen figures for both countries include liquids which makes for a fair comparison.

Additionally the definition of food waste formulated by the FAO will be used (FAO,2018), FAO defines food waste as "the removal from the food supply chain of food (whether processed, semi-processed or raw) which is fit for consumption, by choice, or which has been left to spoil or expire as a result of negligence by the actor, predominantly, but not exclusively, the final consumer at the household level.

The proportion on which foods are wasted noticeably differs when comparing the two nations. The table below illustrates which product categories make up the largest share of food waste by consumers in each country.

Proportion of Wasted Foods by Country			
Netherlands		Canada	
41 kg of food waste per capita (consumer)		85 kg of food waste per capita (consumer)	
Bread	22%	Bread	9%
Dairy Products	17%	Dairy Products	7%
Vegetables	14%	Vegetables	30%
Fruit	12%	Fruit	15%
Meat	7%	Meat	6%

Figure 1 – Proportion of wasted foods by country (Massow, 2019) (Dooren, 2019) (National Zero Waste Council, 2020)

1.4.1 Consumer Overview Netherlands

Dutch consumers have a strong connection with their food and place a lot of value on eating food that is good for their health, the environment and the producers. In total, Dutch consumers spent 5,3 billion USD on products which are certified as sustainable (Pinckaers, 2019). A quarter of consumers indicate that they look for labels which indicate that the product was sustainably sourced such as the free-range eggs label, meat with a high ranking on animal welfare stars and organic produce (Pinckaers, 2019). Based on this data, a hypothesis can be made suggesting that there is a correlation between purchasing higher quality food and producing less food waste, however research disputes this claim. According to Conrad et al. (2018), higher quality diets are actually associated with more food waste therefore simultaneous efforts to improve overall food quality and to reduce food waste are necessary.

In Dutch cities, consumers no longer shop in the traditional matter of going to a supermarket once a week. Instead, it is now increasingly more common for people to buy breakfast on the way to work, buy lunch during the lunch break and buy dinner on the way home (Pinckaers, 2019). This has caused the number of small convenience stores which are a part of a larger chain such as 'Albert Heijn To Go' to increase (Pinckaers, 2019). Such convenience stores mostly offer ready-to-eat meals like salads and sandwiches rather than traditional groceries. However, this trend might have decreased during the Covid-19 pandemic, but this won't be considered while researching.

In 2018, the 'to go' sector officially reached 2635 stores, no fewer than 143 new stores were opened which was nearly three-quarters of all new supermarkets in 2018 (Colliers International, 2019). Most of them were opened in highly populated areas that have a large amount of people passing them on a daily basis like city centers, public transportation hubs and University campuses, which are mostly used by commuters (Colliers International, 2019). The average size of the two largest supermarket chains in the Netherlands, 'Albert Heijn' and 'Jumbo' is **1,270 meters squared** and **1,295 meters squared** (Statista, 2016).

1.4.2 Consumer Overview Canada

Canadian consumers are increasingly working on improving their diet and recognizing the connection between a healthy diet and longevity. As of now, over 20% of Canadians are on a committed dietary regimen (Wunsch, 2020). Canadians also appreciate ethnic cuisines and enjoy experimenting with new foods (Wunsch, 2020).

When analyzing the consumer behavior in Canada, a number of trends can be identified. The first one is the growing demand for house brands among price sensitive consumers (Wunsch, 2020). This is especially common among middle and lower-middle class areas that prefer these products over more expensive alternatives produced by external companies (Wunsch, 2020). In 2017, the average Canadian household spent 5,646 Euro on grocery shopping (Statista, 2018).

When analyzing the growth of different product categories, it is clear that there is an increased demand for healthy, nutritious and organic products (Zeit, 2019). This applies specifically to high-income areas where the demand for such products is greater (Zeit, 2019). In addition, this trend is driving the growth of specialty stores which target this specific market and often outperform standard grocery stores (Zeit, 2019). In Canada, the average supermarket is between **2,300 and 4,600 square meters** (University of Alberta School of Retailing, 2015). From a consumer perspective, this is a very noticeable difference compared to the average supermarket size in the Netherlands.

1.5 Government Action Aimed at Reducing Food Waste

The global awareness of climate change and other climate related issues has grown steadily over the past decades (FAO, 2011). This includes food waste which is now a growing concern among citizens, governments and NGO's (FAO, 2020). As previously mentioned, halving per capita food waste and reducing food losses is one of the objectives created by the United Nations as a part of the Sustainable Development Goals (FAO, 2020). As a response, many governments, including the Netherlands and Canada have pledged to take action aimed at preserving the climate and reducing the food waste problem (Meulen & Gilles, 2015) (Global Ag Media, 2020).

1.5.1 Food Waste Reduction Initiatives in the Netherlands

The Netherlands has introduced multiple initiatives and programs aimed at reducing food waste by all food chain stakeholders including consumers. In 2009, the Dutch Sustainable Food policy contained the aim to reduce food waste by 20% by the end of 2015 (Meulen & Gilles, 2015). To measure food waste and to measure the reduction, the Food Waste monitor was introduced (Meulen & Gilles, 2015). It was recognized early on that a vast portion of food waste in the Netherlands was caused by consumers, in order to combat this form of waste, a website 'kliekipedia' was formed (Meulen & Gilles, 2015). The website offered citizens tips and ideas for re-using leftover food (Meulen & Gilles, 2015). An initiative aimed to educating the consumer about 'ugly vegetables' was also created (Meulen & Gilles, 2015). The initiative was named 'kromkommer' and it is an organization that makes and sells products from 'ugly' vegetables in several supermarket chains (Meulen & Gilles, 2015). It is perceived as a solution to throwing away fresh produce by producers, which is driven by the demands of the consumer.

Since the Netherlands is a member state of the European Union, it is also affected by programs brought on by the EU. The European Union is committed to achieving the Sustainable Development Goals aiming to halve per capita food waste at the retail and consumer level by 2030 (European Commission, 2021). To achieve this ambitious goal, the

EU Commission has adopted the 'Farm to Fork Strategy' comprised from a series of actions to reduce food waste and improve the sustainability of the European food system (European Commission, 2021). Within the strategy is the 'Circular Economy Action Plan' aimed at recovery and reusing of edible food to those who need it. It facilitates compliance of providers and recipients of surplus food to ease the processes needed to give and receive food (European Commission, 2021). In addition to finding new uses for edible food, the EU is also taking action to utilize food no longer fit for human consumption, but still useable for animal nutrition (European Commission, 2018). Using food as animal feed avoids the negative repercussions of composting, landfilling or incinerating (European Commission, 2018).

Recently, a new initiative was created by Dutch retailers focused on providing insight into food waste in the Netherlands. In collaboration with Wageningen University and the Ministry of Agriculture the five biggest Dutch retailers are working together to create research that would provide clear insight into food waste within the Dutch supermarket sector (Wageningen University, 2020).

1.5.2 Food Waste Reduction Initiatives in Canada

The Canadian government recognizes the food waste problem and is implementing measures aimed at the problem of food waste. During the era of COVID-19, Canada is supporting the reduction of food waste through the 'Surplus Food Rescue Program', which diverts excess food from waste while addressing food insecurity of vulnerable populations impacted by the pandemic (Government of Canada, 2020). Many Canadian producers are left with a surplus of product caused by the closure of the HoReCa sector, this program provides funding for the re-distribution of this surplus to areas with high food insecurity (Government of Canada, 2020). HoReCa stands for hotels, restaurants and cafes. The Canadian government has allocated 50 million CAD into this initiative, specifically by funding

organizations that can re-distribute or process the food in an efficient matter while ensuring it reaches the most at-risk communities in the north (Government of Canada, 2020).

In November of 2020, Canada's minister of agriculture unveiled the 'Food Waste Reduction Challenge' aimed at reducing food waste in the food chain (Global Ag Media, 2020). It is comprised of a multi-million dollar fund which will award innovators that create a new business model or product which has the ability to divert food waste and any stage of the food supply chain (Global Ag Media, 2020).

The Canadian private sector has also contributed to food waste reduction efforts. Many members of the industry such as 'Food and Consumer Products of Canada' and 'The Retail Council of Canada' have conducted studies to learn more about the issue (Uzea, Gooch & Sparling, 2014). Besides research, a few initiatives were very successful in reducing food waste like the Waste-free Lunch challenge and the 3RCertified Waste Reduction and Diversion Program (Uzea, Gooch & Sparling, 2014)..

1.6 Knowledge Gap

Food waste is a topic that has been heavily researched by academia, governments and other organizations. It is an area of high interest for many stakeholders because it is connected to climate change and world hunger, both of which are very relevant in 2021. Many governments conduct annual studies to learn more about food waste in their countries by analyzing the total amount of food waste, food categories most likely to be thrown away and conducting data analysis. This research is useful in tracking food waste trends and data, however it does not provide an explanation for food waste at the consumer level or possible solutions to alleviate the problem.

While there is research about general reasons for food waste by consumers and research about food waste in particular countries, there is no research that aims to draw a comparison between any two countries in regards to food waste. Investigating differences between countries can identify and isolate behaviors that are correlated to higher rates of food waste.

Once the specific behaviors are isolated, only then the solutions to the behaviors can be created and the problem addressed.

A detailed research about consumers in the Netherlands and Canada detailing their shopping habits and lifestyle differences can provide valuable information on why food waste at the consumer level is higher in Canada than in the Netherlands.

The main question this research will attempt to answer is:

What are possible reasons that Canadian consumers waste more food per capita than Dutch consumers?

In order to better understand the problem, the following sub questions were formulated:

1. Which demographic factors such as age, gender, household size and education are correlated to an increased amount of food waste?
2. Which food related habits within the home, such as meal planning and checking the pantry before shopping are correlated to a higher rate of food waste and type of food waste?
3. What factors outside the home such as time spent going to the grocery store, time spent in the store and shopping frequency affect food waste?

In terms of the objectives for this thesis, the main objective is to find out if there are any differences in food related behaviors in Canada and the Netherlands. If there are any differences, they will be analyzed and researched with the objective of determining how these specific differences can be a contributing factor in an increased rate of food waste. Moreover, this project will attempt to point out differences in the shopping behavior among both countries and how it relates to food waste. The final goal is to gain a better understanding of the food waste problem in the Netherlands, Canada as examples of developed countries.

This research can be used by anyone that is interested in food waste in Canada and the Netherlands, however it is especially aimed at a few main stakeholders. Those stakeholders are consumers that want to learn what they can do to waste less food in their household, governments and non-profit organizations that want to increase their knowledge in the area of food waste and educate consumers. Researchers and other institutions interested in the topic of food waste reduction are also welcome to read this thesis and use it to expand their knowledge to gain new perspectives on the problem of food waste. This thesis is also applicable in business, specifically by companies that are interested in environmental and social sustainability and learning about the specific reasons why consumers waste food. It can serve as a source of information when companies are interested in making changes to their packaging and product size. The results can also be used by retailers that are interested in learning what actions they can take to reduce food waste committed by consumers. Finally, the results can be used by other countries that are interested in reducing food waste.

2. Material and Methods

2.1. Survey Explanation

To understand the differences in food waste among both countries, primary data was be collected from consumers in the form of a survey. The research design is based upon distributing a survey with fifteen questions about food related habits in the home, grocery store as well as demographic factors like age, gender, household size and education. The survey was distributed to both Dutch and Canadian consumers via social media. All questions contained within the survey are closed, as a consequence, this was a quantitative research. Once the results were obtained, they were then analyzed and cross-referenced in order to attempt to answer the research question. There are two versions of the survey, first one in Dutch and the other one in English, both of which can be found in appendix A.

The first four questions of the survey were strictly related to the demographic factors of respondents. The questions inquire about the age of the respondents, gender, education and household size. Their purpose was to get a better idea of the people that answered the survey, and to see the differences in food related habits and food waste among different demographics in both countries. The remaining survey questions were aimed at food habits at home and the supermarket to determine which variables like time spent grocery shopping differ among Dutch and Canadian consumers. For example, how many times a week Canadian respondents go grocery shopping compared to their Dutch counterparts. The survey also included questions about meal planning, time spent shopping, time needed to reach the supermarket as well as other factors deemed relevant. All the questions contained within the survey were formulated with answering the following sub-questions in mind.

The first sub-question aims to know if different demographics are connected to an increased amount of food waste.

1. *Which demographic factors such as gender, household size and education are correlated to an increased amount of food waste and type of food waste?*

Survey questions 1-4 and 6-7 were used to answer this question. The first four questions are about the demographics of the respondents and questions six and seven inquired about the daily amount and type of food waste. Once the survey results were obtained, results from the first four questions were grouped based on results from the sixth question, thus revealing any correlations between demographics and the amount of food waste in both countries. A similar process was used to find correlations between demographics and the type of food waste, which is derived from the seventh question.

The second sub-question aimed to find a correlation between food related habits in the home and an increased rate of food waste in both countries.

2. Which food related habits within the home, such as meal planning and checking the pantry before shopping are correlated to a higher rate of food waste?

The second sub-question was addressed with survey questions 6,8-10, which were specifically targeted towards habits within the home. Questions 8-10 inquired about the following habits: creating shopping lists (Q8), checking the pantry/fridge before grocery shopping (Q9) and meal planning (Q10). Once the results were obtained, answers from the previously mentioned questions were grouped based on results from the sixth question to determine if there were any correlations between food habits at home and food waste. The results were also compared among the two countries, thus revealing the behaviors correlated to a higher rate of food waste.

The third question focused on grocery habits outside the home and aimed to find if there were differences among the two countries in factors like time spent going to the store.

3. What factors outside the home such as time spent going to the grocery store, time spent in the store and shopping frequency affect food waste?

The third sub-question was answered with survey questions 6,11-14. These questions asked about the factors outside the home such as shopping frequency, time spent getting to the supermarket and time spent grocery shopping. Once the results were obtained, answers

from question 11-14 were grouped based on results from the sixth question to determine if there were any correlations between factors outside the home and food waste. The results obtained from these questions were also compared among the two countries, thus revealing the behaviors correlated to a higher rate of food waste.

2.2 Data Collection and Analysis

For the purpose of collecting data, an electronic survey created with Google forms was used. Surveys were selected as the preferred method of data collection because they are able to gather enormous amounts of data in a short time, while being very cost-effective. The surveys were distributed through social media profiles on Facebook, Instagram and LinkedIn. In addition to posting the survey on the author's profile, multiple Facebook groups in Canada and the Netherlands will be engaged in order to reach more people. Besides access to more respondents, contacting social media groups gives the opportunity to receive input from groups that would normally be unreachable through a social media post on the author's profile, such as 40 year old women from Canada. The aim was to receive 100 respondents from each country, the minimum acceptable limit of respondents is 40 per country and the survey will be active for the required time it takes to reach the goal number.

The analysis was done with the use of SPSS by cross-referencing the independent and dependent variables with various tools and tables. The independent variables is the data gathered from the questions pertaining to the personal information of the respondents, questions 1-5. The dependent variables will be comprised of the answers to the remaining questions of the survey. Furthermore, Microsoft Excel will also be used to compare and analyze the collected data.

The core of this research is finding correlations between dependent and independent variables. In order to achieve this purpose, the **Chi-square test**, the **Kruskal-Wallis test**, and the **Mann-Whitney test** was used. Each of the above mentioned tests is suited towards either nominal or ordinal variables, therefore this will be the deciding factor when selecting which test to use. The nominal variables are comprised of the answers to survey questions

1,7,8,9,14,15, the ordinal variables originate from the answers to the questions 2,3,4,5,6,10,11,12,13.

For the purpose of this thesis, the Chi-Square test will be used to determine if an increased amount of food waste is connected to time spent in the grocery store. It will also be used to figure out if an increased amount of food waste is connected to household size or education. Additionally, a potential correlation between other habits within the home such as planning meals and food waste will be identified. Finally, it will be used to analyze the correlation between habits outside the home such as time spent going to the supermarket and the amount of food waste. The Monte Carlo method of the chi-square is used because it allows the estimation of the exact significance without relying on the assumptions required for the asymptotic method, which the data set used, does not meet.

Throughout this research, the Kruskal- Wallis test test was used to determine if there is a statistically significant difference in food waste among different demographics.

Lastly, the **Mann-Whitney Test** will be used to analyze the relationships between the dependent variables (questions pertaining to demographics) and independent behaviors (questions pertaining to food-related habits). It is best suited for factors that only have two possible answers, for example questions with 'yes' and 'no' answers. For the purpose of this thesis it was used for questions that fit the above mentioned criteria.

3. Results

The survey was distributed to Canadian and Dutch citizens through social media groups and personal connections of the author. Much of the survey results came from members of social media groups such as 'Expats in the Netherlands' and 'Canadian Students', additionally former professors of the author in Canada reached out to their colleagues which was crucial in reaching the goal number of respondents. It took a total of three weeks to reach 100 respondents from each country.

Below is an overview of all the survey results based on demographics. Because there was a total 100 respondents per country, the percentages per country are the same as the actual number of responses.

This chapter used SPSS tests like the Chi-square test and the Kruskal-Wallis test, the output files of these tests can be found in Appendix B. When creating some of the Chi-Square tests, a Monte Carlo simulation was added. The Monte Carlo Simulation serves as a way of verifying the validity of the test when more than 20% of the cells have an expected count of less than five, which was the case for some of the Chi-Square tests created.

3.1 Survey Results Based on Demographics

In the Netherlands, 59% of the respondents were women and 41% were men. In Canada, women made up 63% of the respondents, men made up 35% and the remaining 2% chose to not specify their gender. In both countries, women made up the majority of the respondents.

Table 2 – Survey Results Based on Gender

Survey Results Based on Gender		
	Netherlands	Canada
Man	41	35
Woman	59	63
Other	0	2

Secondly, the survey inquired about the education level of the respondents. In both countries, most of the respondents either possess, or are in the process of acquiring a Bachelor's degree. In the Netherlands 68% of the respondents declared to have a Bachelor's Degree and in Canada 60%. The second most popular level of education among both countries was a 'Master's Degree/PhD'. Below is a detailed breakdown of the survey results based on the education level.

Table 3 – Survey Results Based on Education – Netherlands and Canada

Survey Results Based on Education		
	Netherlands	Canada
Primary School	0	0
Highschool Graduate	11	15
Bachelor's Degree	68	60
Master's Degree or PhD	21	25

The age of the respondents is also a demographic included within the survey. In both countries, most of the respondents are within the '18-25' age group, 39% of the Dutch and 35% of the Canadian respondents gave this answer. The least popular answer given to this question was '55+', it was given by less than 10% in both countries. The results are explained in further detail below.

Survey Results Based on Age				
	Netherlands	%	Canada	%
18-25	39	39%	35	35%
25-35	27	27%	32	32%
35-45	21	21%	19	19%
45-55	11	11%	9	9%
55+	2	2%	5	5%

Table 4 – Survey Results Based on Age – Netherlands and Canada

The final demographic related question inquired about the household size of the respondents. The results to this question are distributed relatively evenly compared to the other questions, however two-person households are still the most common for both countries.

Survey Results Based on Household Size				
	Netherlands	%	Canada	%
1	11	11%	15	15%
2	34	34%	39	39%
3	23	23%	26	26%
3+	30	30%	20	20%

Table 5 – Survey Results Based on Household Size – Netherlands and Canada

3.2 Amount of Food Waste Depending on Demographics

The first sub-question aims to know which demographics are correlated to an increased rate of food waste. In order to answer it, the daily amount of food waste will be cross-referenced with answers to the demographic questions. For this purpose, the data from Canadian and Dutch consumers will be combined. Below is a table of the daily self-reported food waste among Dutch and Canadian consumers.



Figure 1 – Self-Reported Food Waste – Comparison between Netherlands and Canada

Nearly half, (42) of the Dutch respondents indicated that they waste ‘100 grams or less’ of food on a daily basis. The same answer was given by (23) Canadians. Among Canadians, ‘100-200 grams’ was the most common answer among Canadian respondents (34). In comparison, (29) Dutch respondents gave this answer. Finally, Canadians are more likely to not know how much food they waste because (3) Dutch and (10) Canadian respondents answered with ‘I don’t know’.

Figure 2 shows the amount of food waste per gender. Out of all the respondents in the '100-200 grams' category, (38) were women and (25) were men. In the '200-500 grams' category (29) of the respondents were women and (24) were men. Among men, an increasing trend is seen throughout the first three food waste categories. As the amount of food waste increases, the number of male responses also increases. A Kruskal Wallis H test, shows that there is a statistically significant difference in food waste between genders $X=13,331$, $p=0,004$. Men indicate that they waste more food than women in this survey.

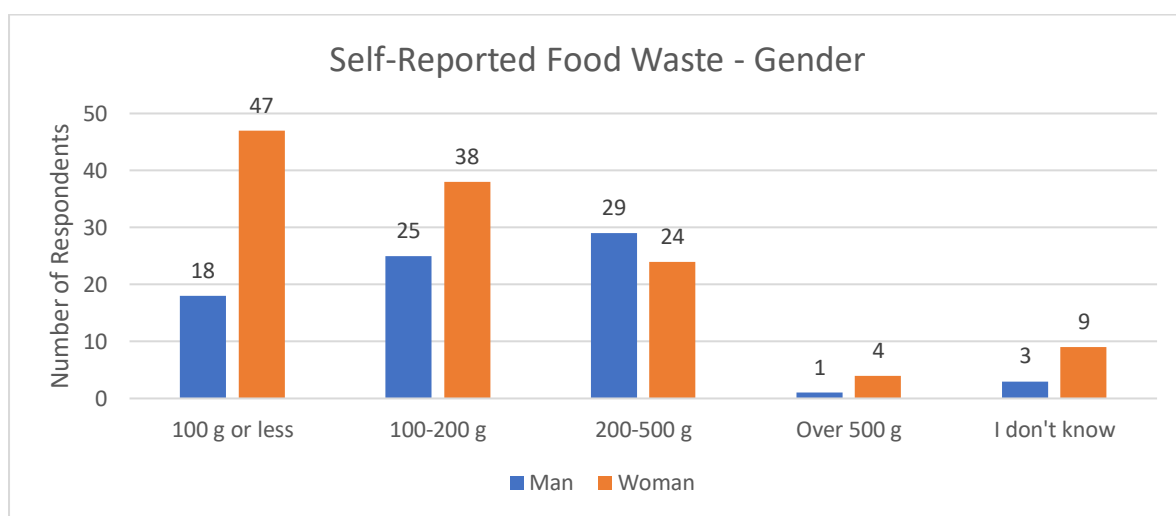


Figure 2 – Self-Reported Food Waste, a comparison between genders

In Figure 3, the results of the education demographic are shown. Most of the respondents (127) have a bachelor's degree. The most popular answer among them is '100 grams or less', it was given by (41) respondents. A trend can be seen among the respondents with Master's/PhD, as the amount of daily food waste increases, the number of respondents with Master's/PhD decreases. There is no visible trend among high school graduates, which also make up the smallest percentage of the respondents. A Kruskal Wallis H test, shows that there is no significant difference in food waste between different education levels $X=0,598$, $p=0,742$.

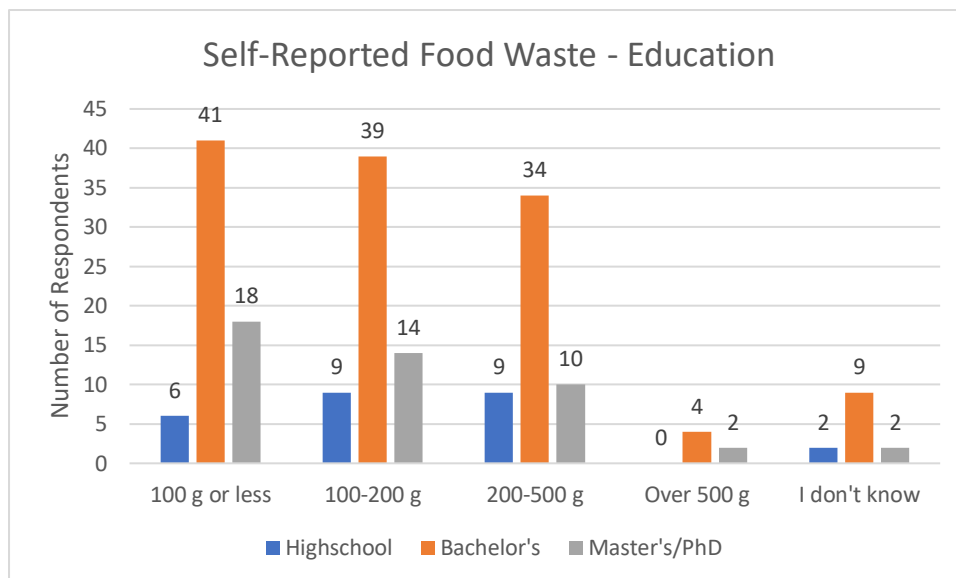


Figure 3 – Self-Reported Food Waste among different Education levels

Figure 4 shows that most of the survey participants in the '18-25' age category indicated they waste '100 grams or less' (35), '100-200 g' (22) and 200 to 500 g (16). In the '25-35' age category, respondents indicated they waste '100 grams or less' (18), '100-200 g' (22), '200-500' (16). As the age group increases, the number of people that claim to waste '100 grams or less' decreases. When looking at the respondents that answered '200-500 grams', nearly half (19) are in the 35-45 category. A Kruskal Wallis H test, shows that there is a statistically significant difference in food waste between age groups $X=26,035$, $p=0,001$. Younger people reported to waste less than the other categories.

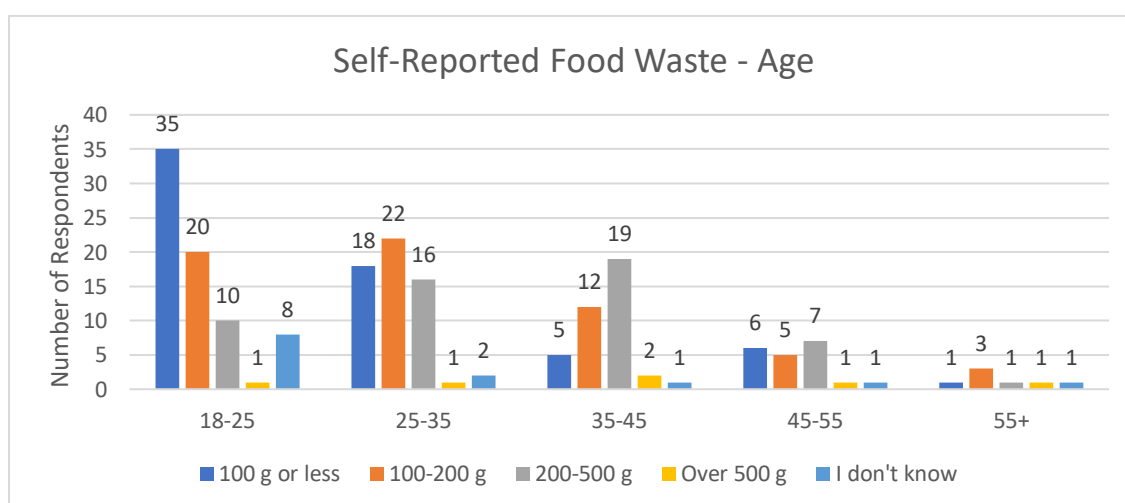


Figure 4 – Self-reported Food Waste among different age groups

Figure 5 shows that most of the surveyed people live in two person households, among them, the most common was '200-500 grams, which was given (26) times. Among one person households, the most common answer to this question is '100-200 grams', which was given (11) times. The largest possible household size in the survey was '3+', the respondents within this demographic were split evenly among the food waste groups. The most common are the '100 grams or less' and '200-500 grams', both of them had (13) respondents. When looking at the respondents that live in three person households, (9) indicated that they waste '100 grams or less', (16) indicated '100-200 grams' and (12) waste '200-500 grams' and 'over 500 grams'. A Kruskal Wallis H test, shows that there is a statistically significant difference in food waste between household sizes $X=8,776$, $p=0,032$. As a result, the null-hypothesis that there is no significant difference in food waste between household sizes is rejected.

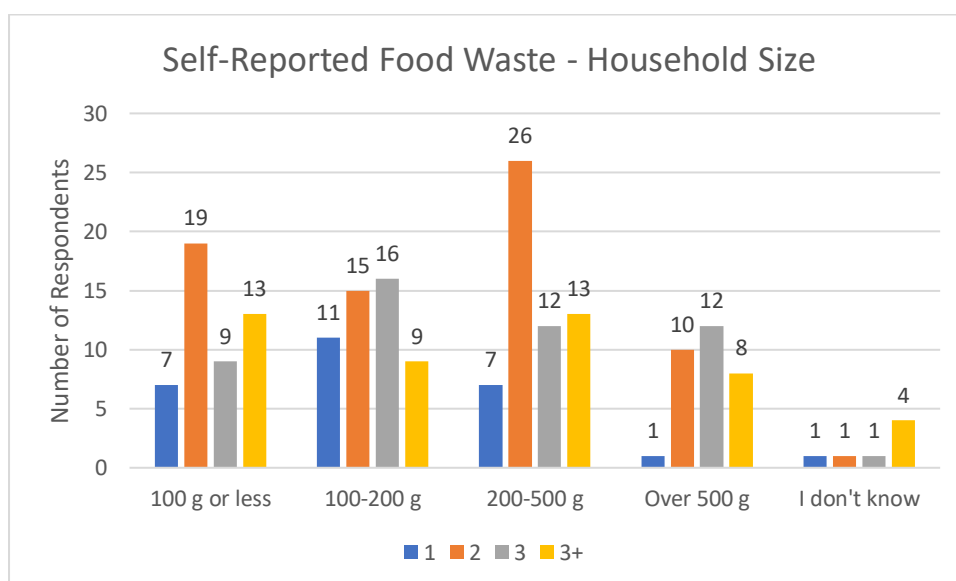


Figure 5 – Self-reported Food Waste among different household sizes

3.3 Comparison of Food Related Habits at Homes – Netherlands and Canada

The survey inquired about food related behaviors at home like planning meals. The results of the survey will indicate if Dutch and Canadian citizens differ from each other in terms of food related habits at home, thus revealing possible habits correlated to a higher rate of food waste. Below are the survey results indicating the difference in food related habits at home

for Dutch and Canadian respondents. Statistical analysis was also done to determine if the differences between the two countries are significant. For this purpose, the chi-square test in the form of a Monte Carlo simulation was used because the requirements for a regular chi-square test were not met.

Figure 6 shows a small difference in the frequency of creating shopping lists among respondents in both countries. Most of the respondents claim to make shopping lists 'sometimes' or 'often' before grocery shopping, however nearly three times more Canadians claim to never create shopping lists before grocery shopping. The statistical analysis revealed a significance of $p=(0,177)$, therefore the differences are not significant.

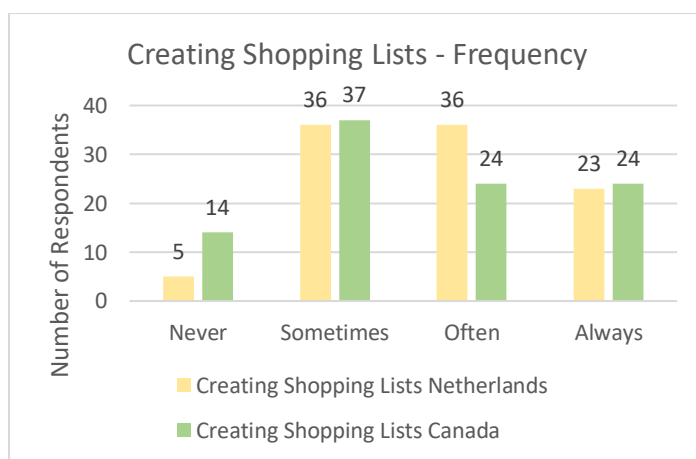


Figure 6 – Comparison of the frequency of creating shopping lists among Dutch and Canadian respondents

Figure 7 shows that the respondents from both countries gave nearly identical answers to this question: most respondents in both countries check the pantry and refrigerator before shopping. The statistical analysis revealed a significance of $p=(0,419)$, therefore the differences are not significant.

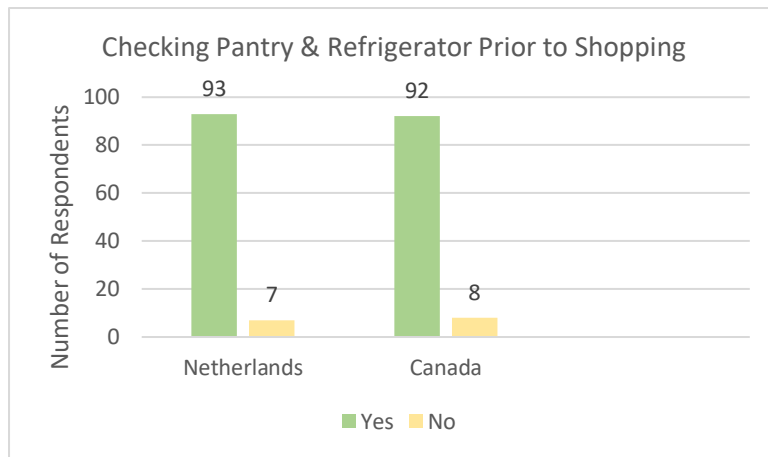


Figure 7 – Comparison of likelihood of checking pantry & refrigerator prior to shopping – NL&CAD

Figure 8 shows some differences among Dutch and Canadian respondents in meal planning frequency. More than double Canadian respondents claim to not do any meal planning, but more Canadian claim to plan meals for the entire week. Nearly half of the Dutch respondents (46) plan their meals for the following two days. Very similar number of respondents plan meals for the following day. The statistical analysis revealed a significance of $p=(0,422)$, therefore the differences are not significant.

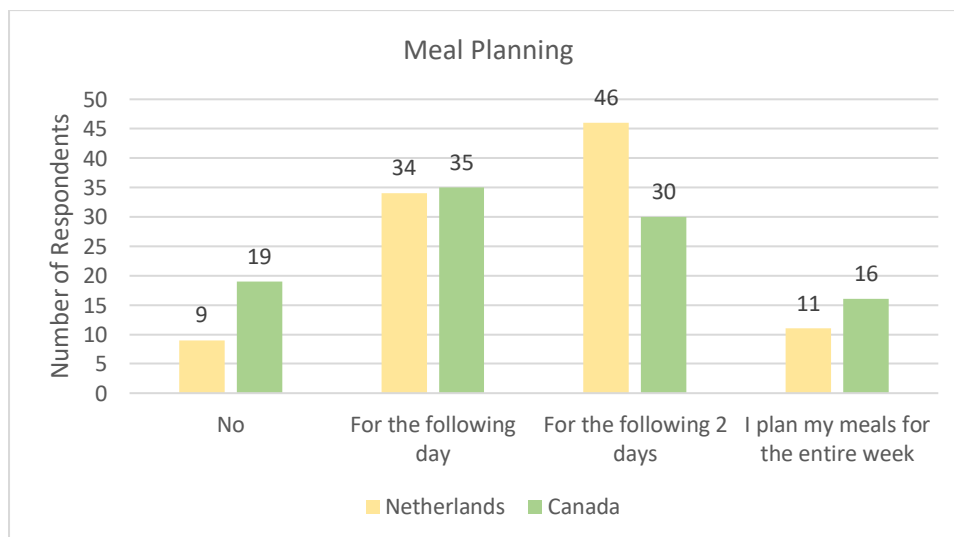


Figure 8 – Comparison of meal planning frequency where the respondents needed to indicate for how many days in advance they plan their meals – NL&CAD.

3.4 Comparison of Food Related Habits Outside the Home – Netherlands and Canada

Besides habits at home, the external environment was also investigated by this research as a potential cause of food waste. The questions about the external environment include shopping frequency, time spent in the store and time getting to the store.

When looking at Figure 9, a clear difference between the two countries is seen. Most of the Canadian respondents (64), go grocery shopping '1-2 times per week', (25) respondents shop 'once a week' and (8) shop '3-4 times per week'. In the Netherlands, nearly half (42) respondents purchase groceries '3-4 times per week', (44) respondents purchase groceries '1-2 times per week' and (7) respondents purchase groceries 'once a week'. The statistical analysis revealed a significance of $p=(0,563)$, therefore the differences are not significant.

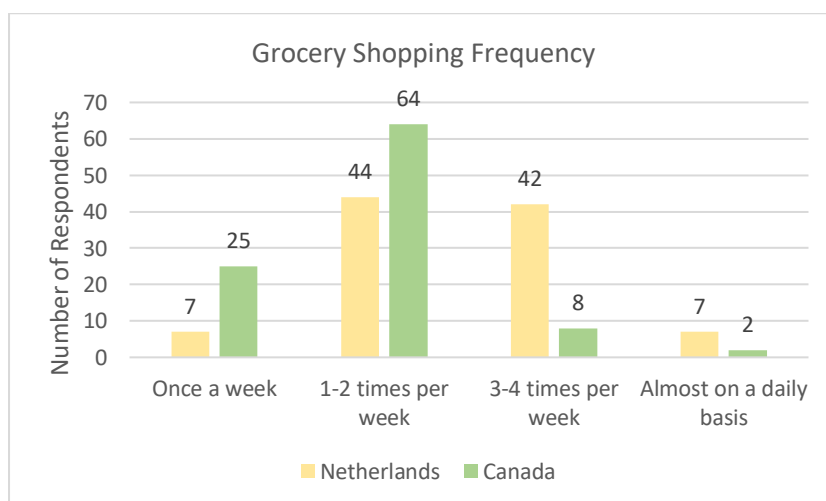


Figure 9 – Comparison of grocery shopping frequency among the two countries

In Figure 10, a clear difference between the Dutch and Canadian respondents is seen. More than half of the Dutch respondents (54) and (23) Canadian respondents spend 20 minutes grocery shopping. Over half of the Canadian respondents (55) and (37) Dutch respondents spend 40 minutes shopping. Twice as many Canadian respondents spend an hour shopping compared to the Dutch respondents. The statistical analysis revealed a significance of $p=(0,292)$, therefore the differences are not significant.

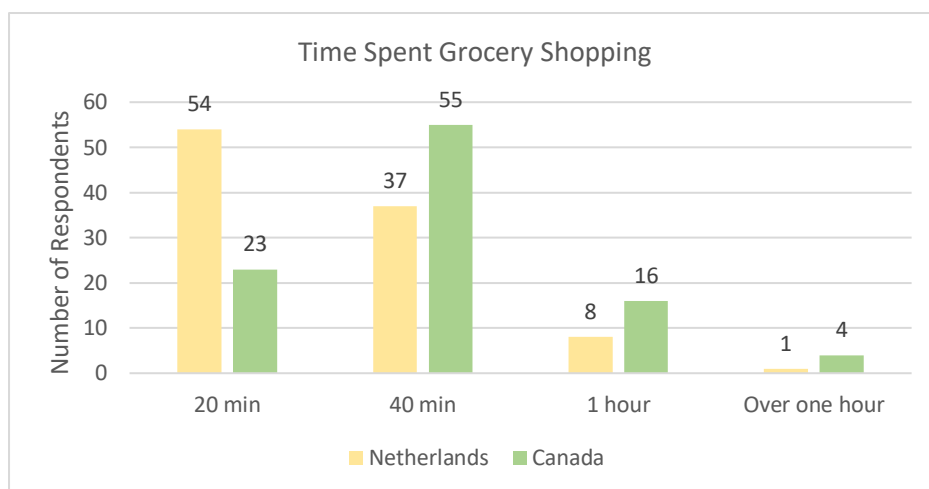


Figure 10 – Comparison of time spent grocery shopping between the two countries

Figure 11 shows that a majority of Dutch respondents (68) spend '10 minutes or less' getting to the grocery store, (29) respondents spend '20 minutes'. The remaining (3) respondents spend either between '30 minutes' and '40 or more minutes'. In terms of the Canadian respondents, (51) answered '10 min or less', (45) respondents answered '20 min'. Only a tiny fraction of the respondents in both countries spend either '30 minutes or '40 or more minutes' getting to the store. The statistical analysis revealed a significance of $p=(0,891)$, therefore the differences are not significant.

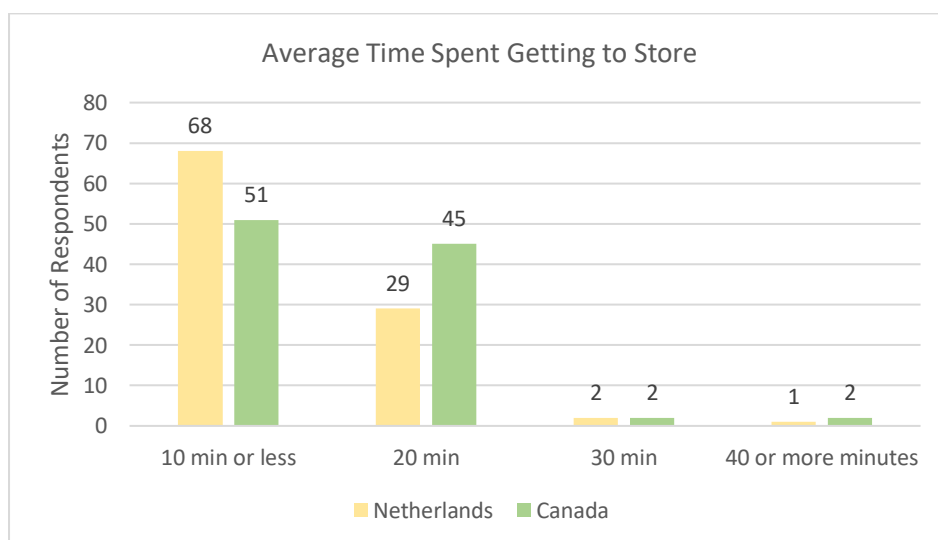


Figure 11 – Comparison of the average time spent getting to store between the two countries

The survey also inquired about the food handling skills of the respondents to see if there is a difference in food related skills among Dutch and Canadian people as well as a correlation between high food handling skills and a lower rate of food waste among the respondents.

The most common answer given by respondents from both countries was 'Above Average', it was given by (52) Dutch and (45) Canadian respondents. The same number of respondents from both countries (28) claim to have 'Average' food handling skills. More Canadian respondents (18) compared to their Dutch counterparts (14) have 'excellent' food skills. The remaining results can be found in Figure 12. The statistical analysis revealed a significance of $p=(0,375)$, therefore the differences are not significant.

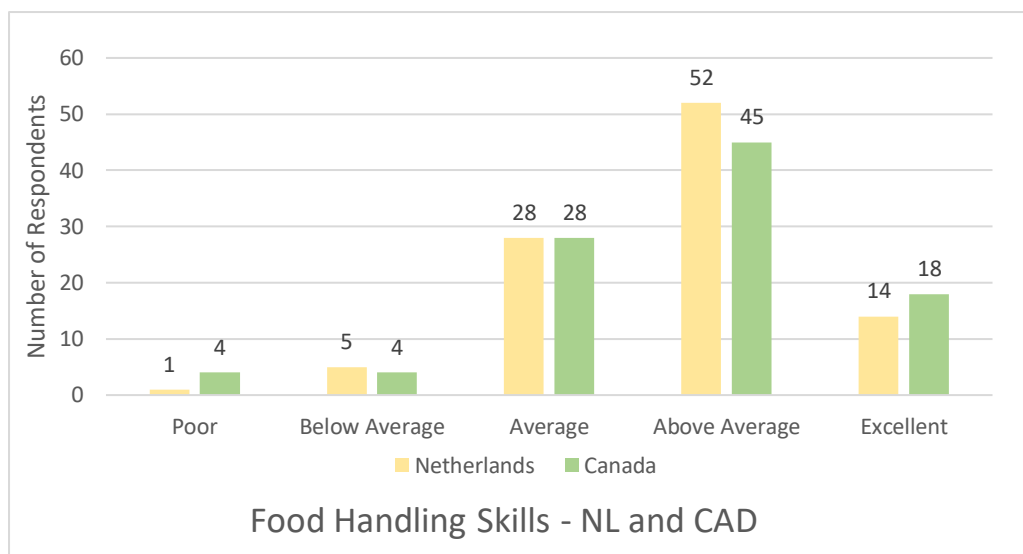


Figure 12 – Comparison of food handling skills among respondents in both countries

Figure 13 shows the results to the survey question pertaining to the likelihood of buying larger quantities of food because they are on sale. Most of the Dutch respondents (60) answered with 'sometimes', (32) said 'often' and (4) said 'never'. The Canadian respondents answered quite differently, (40) said 'sometimes' and 'often', only (2) said never. The statistical analysis revealed a significance of $p=(0,796)$, therefore the differences are not significant.

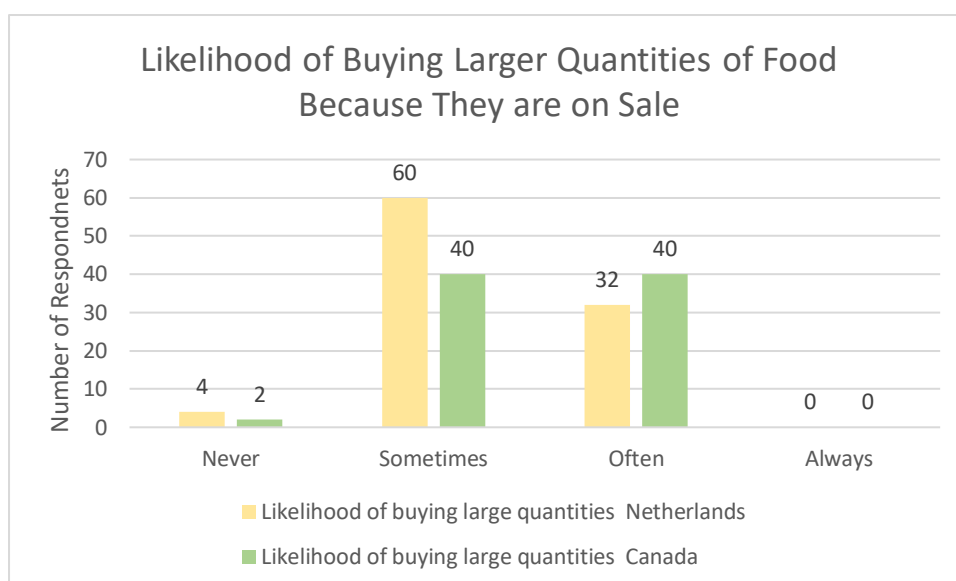


Figure 13 – Comparison of the likelihood of buying larger quantities of food among respondents in both countries

3.5 Cross-Reference - Food Related Habits at Home and Self-Reported Food Waste

In this section the self-reported food waste will be cross referenced with food related habits.

A chi-square test was also used to test the significance between each habit and food waste.

The respondents had four possible options when answering the question about creating shopping lists, they are 'never', 'sometimes', 'often' and 'always'. Out of all the respondents that claimed to waste '100 grams or less' of food on a daily basis, virtually the same number of respondents create shopping lists sometimes (20), often (19) and always (21). When looking at respondents that always create shopping lists, most of them (21) waste '100 grams or less', (15) waste '100-200 grams' and (3) waste '200-500 grams'. The remaining results are presented in Figure 14. To test the statistical significance between self-reported food waste and likelihood of creating shopping lists, a chi-square test was used, showing there is a significant correlation between the amount of food waste and creating shopping lists, $\chi^2=(17,475)$ and a significance of $p=(0,008)$. This means that respondents who make shopping list more often report to waste less food..



Figure 14 – Self-reported food waste and the frequency of creating shopping lists

Figure 15 shows that in every food waste group, the vast majority of respondents claim to check their refrigerator and pantry before grocery shopping. In the lowest food waste category, (63) respondents answered yes, in the second food waste category that number is decreased to (58). The ‘Mann-Whitney’ test was used to test the statistical significance between checking the pantry/refrigerator and the self-reported amount of food waste. The results of the test, revealed a significance of $p=(0,077)$, which is more than (0,05), therefore there is no statistical significance between checking the fridge and the amount of food waste.

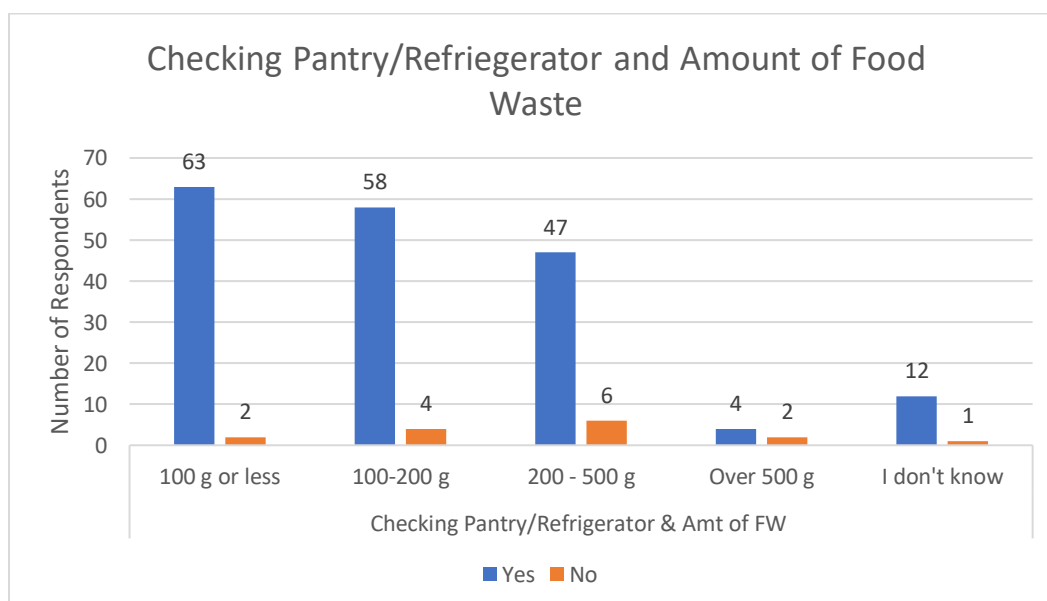


Figure 15 – Self-reported food waste and the likelihood of checking the pantry/refrigerator

Figure 16 shows that in the lowest food waste category, (8) respondents do not plan meals, (15) plan for the next day, (28) for the following 2 days and (14) for the whole week. In the '100-200 grams' category (7) don't plan meals, (23) plan for the following day, (22) plan for the following 2 days and (10) plan meals for the entire week. The rest of the results is presented in the graph below. Additionally, the Chi-square test was performed to test the statistical significance between food waste and the likelihood of buying larger amounts of food because they are on sale. The null-hypothesis states that there is no statistical significance between time spent getting to the store and food waste. The results of the test are $\chi^2=(13,836)$ and a significance of $p=(0,032)$, which is lower than (0,05), therefore there is a statistical significance and the null-hypothesis is rejected.

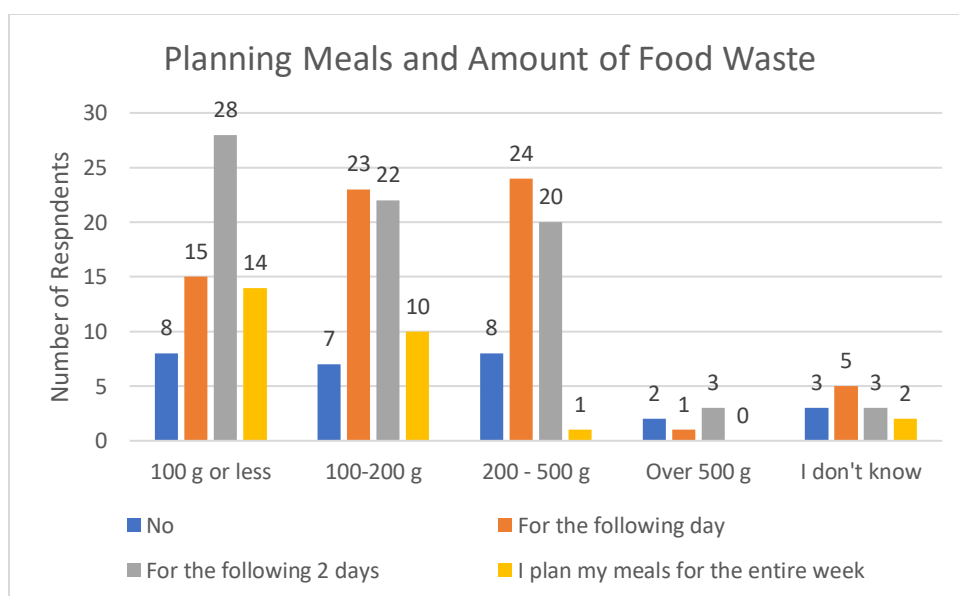


Figure 16 – Self-Reported Food Waste and the frequency of planning meals

Figure 17 shows the results of the cross-reference between food waste and food handling skills. When asked to indicate their proficiency in general food handling, most of the respondents (97), claim to have 'above average skills'. In the '100 grams or less' category, (15) respondents have average skills, (37) have above average skills and (13) have excellent skills. In the '100-200' grams category, (16) respondents answered with 'average', (30) answered with 'above average' and (13) answered with 'excellent'. Additionally, a Monte Carlo Simulation as part of the Chi-square test was performed to test the statistical

significance between food waste and the likelihood of buying larger amounts of food because they are on sale. The null-hypothesis states that there is no statistical significance between time spent getting to the store and food waste. The result of the test, reveals a significance of $p=(0,086)$, which is larger than $(0,05)$, therefore there is no significant relationship between amount of food waste and food handling skills.

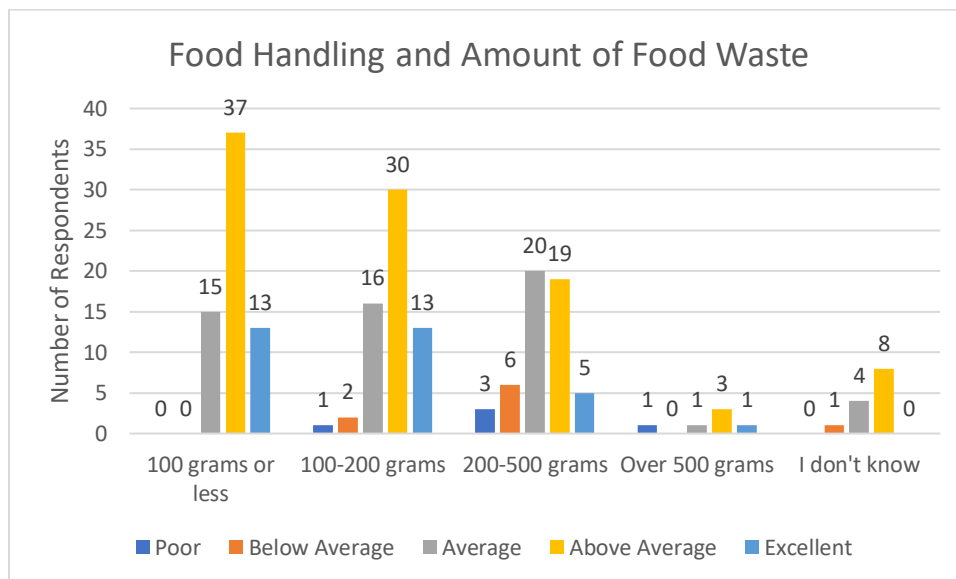


Figure 17 – Self-reported food waste the food handling ability of the respondents

3.6 Cross-Reference - Food Related Habits Outside the Home and Self-Reported Food Waste

Research also pointed to factors outside the home as possible drivers of increased food waste. Four habits were specifically mentioned, those were time spent shopping, frequency of shopping, time spent going to the grocery store and likelihood of buying food in large quantities. The answers to those questions were cross-referenced with the self-reported amount of food waste to determine if any correlations exist.

The first investigated habit is the frequency of grocery shopping. Most of the respondents indicated '1-2 times per week' as their frequency. In the lowest food waste category (14) respondents shop 'once a week', (32) respondents shop '1-2 times per week' and (18) respondents shop '3-4 times per week'. In the following food waste category, (7) respondents shop 'once a week', (40) shop '1-2 times per week' and (13) shop '3-4 times per week. The

remaining results are presented in Figure 18. Additionally, a Chi-square test was performed to test the statistical significance between these two factors. An exact test was made because 25% of the cells have an expected count of less than five. The null-hypothesis states that there is no statistical significance. The results of the test are $\chi^2=(9,097)$ and a significance of (0,168), therefore the null-hypothesis is accepted.

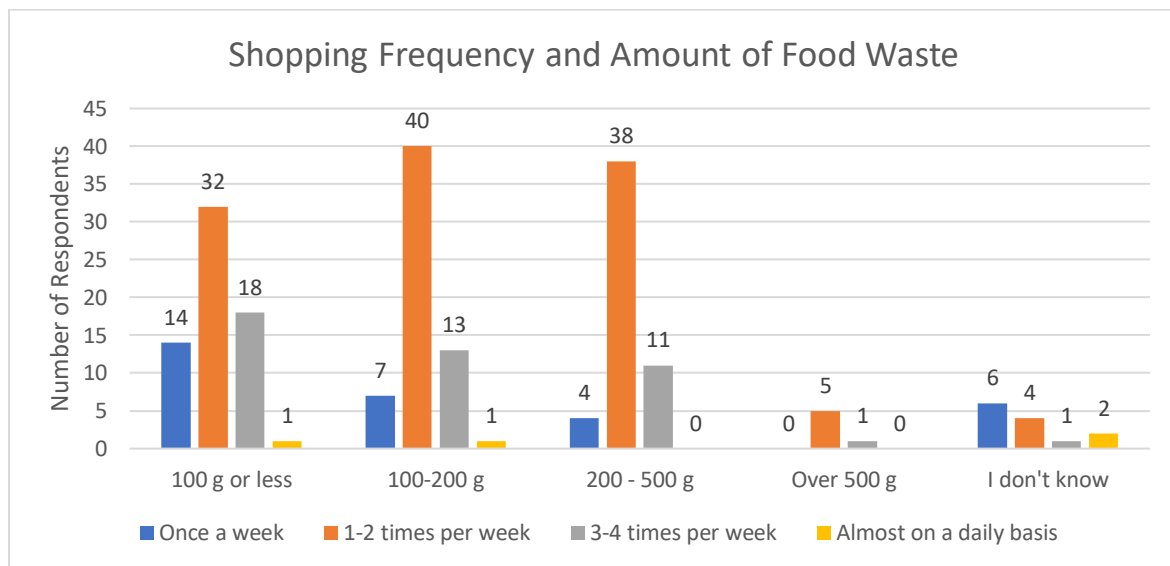


Figure 18 – Self-reported food waste and the shopping frequency of the respondents

When analysing the average time spent in the store with the amount of food waste, most of the surveyed respondents spend either '20 min' or '40 min' on grocery shopping. In the '100 grams or less' category, (30) respondents spend '20 min' and '40 min', (4) spend one hour on grocery shopping. In the '100-200 grams' category, (21) respondents spend '20 min', (32) spend '40 min' and (7) spend an hour on grocery shopping. In each food waste category, there was (1) respondent that answered with 'over one hour'. A Chi-Square test was used to extract the exact test of the significance among the two factors. The null-hypothesis is that there is no statistical significance between food waste and the habit outside of the home. The results of the test are $\chi^2=(6,796)$ a significance of $p=(0,147)$, which is larger than (0,05), therefore there is no significant relationship between self-reported food waste and time spent shopping.

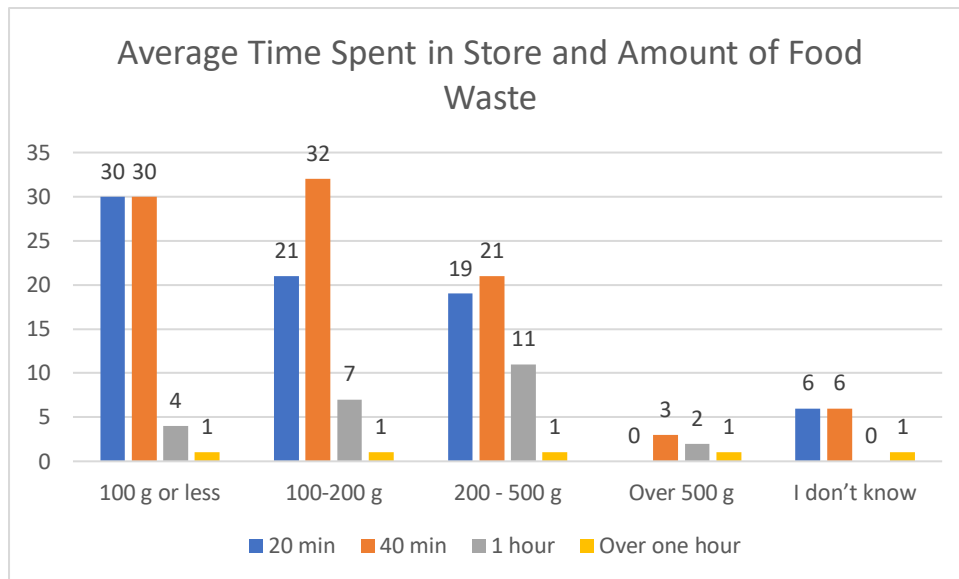


Figure 19 - Self-reported food waste and the average time the respondents spend in the store

The survey also inquired about the average time spend getting to the store. A majority of the respondents spend either '10 minutes or less' or '20 minutes' getting to the store. In the '100 grams or less' category (54) respondents answered '10 minutes or less', (10) answered with '20 min', (1) answered with '40 or more minutes'. In the '100-200 grams', (36) respondents answered with '10 min or less', (25) answered with '20 minutes' and (1) answered with '40 or more minutes'. Zero total respondents spend 30 minutes getting to the store. A Chi-Square test was created to test the significance between these two factors. The null-hypothesis states that there is no statistical significance between time spent getting to the store and food waste. The results of the test are $X^2=(6,796)$ and reveal a significance of $P=(0,147)$, which is higher than (0,05), therefore there is no statistical significance and the null-hypothesis is accepted.

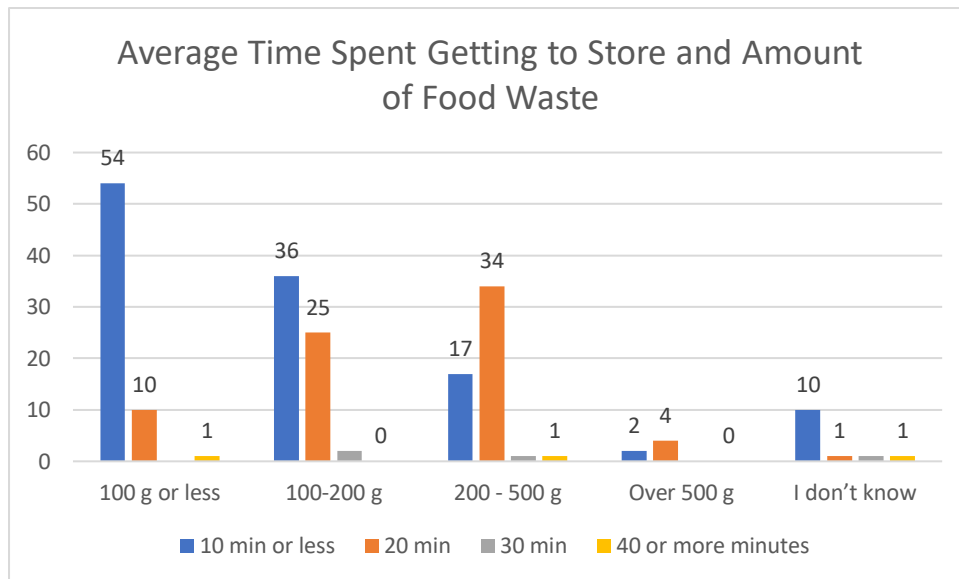


Figure 20 - Self-Reported Food Waste – Average Time Spent Getting to Store

The final external factor investigated by the survey is the likelihood of purchasing larger food quantities, because they are being sold at the discount. The most common answer among every food waste category was 'sometimes', in fact a total of (100) respondents gave this answer. The second most popular answer was 'Often', which was given by a total of (72) respondents. In the '100 g or less' category (35) respondents answered with 'sometimes', (18) answered with 'often' and (3) answered 'Never'. In the '100-200 g' category, (29) respondents answered with 'sometimes', (26) answered 'often' and (2) answered 'never'. In the graph below, is a visual representation of the remaining answers. Additionally, a Monte Carlo Simulation was performed to test the statistical significance between these two factors because the more than 20% of the cells have an expected count of less than five. The null-hypothesis states that there is no statistical significance between the likelihood of buying larger quantities of food and food waste. The results of the test are $\chi^2=(23,682)$ and a significance of (0,045), which is lower than (0,05), therefore there is a statistical significance and the null-hypothesis is rejected.

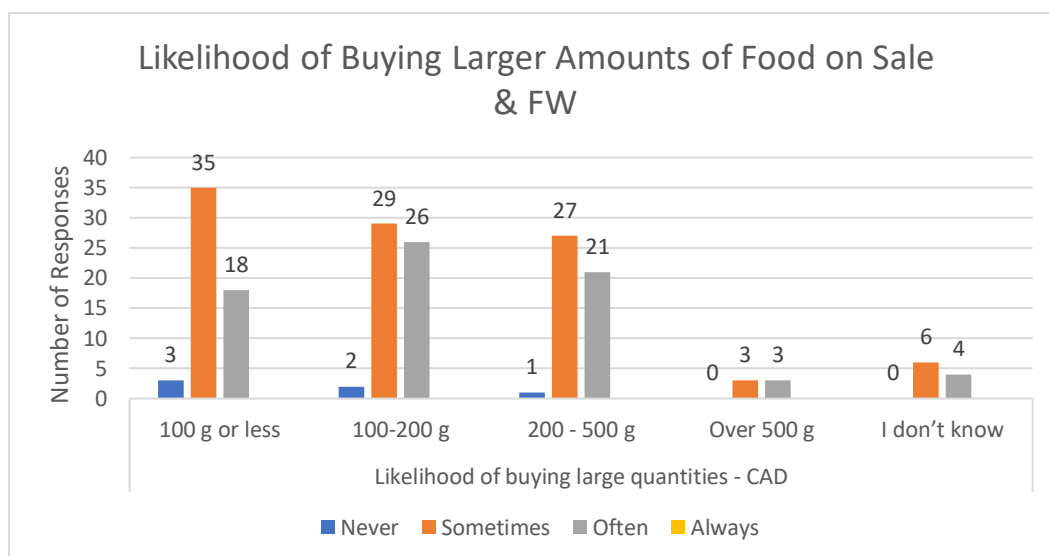


Figure 21 –Self-Reported Food Waste – Likelihood of Buying Larger Food Quantities

4. Discussion of Results

4.1 Chosen Methodology

The data was collected with the use of an online survey which seems to be the correct method. It allowed the author to get data from a wide variety of respondents in a short time at a low cost. The received responses were sufficient, however for some of the food waste categories, the number of respondents was very low, which complicated the data analysis. If there was an opportunity to re-formulate the survey, the most significant change would have been to decrease the number of food waste categories to only the first three. No other challenges were encountered while collecting responses because the correct social media platforms were used and the survey was formulated in a clear and simple way which was appreciated by many of the respondents.

It was decided that the best way to achieve the thesis goals is to cross-reference the variables in order to find correlations. For example, cross-referencing the age of the respondents with the daily amount of food waste to see if there is a trend between these two factors. This process was the core of the analysis phase and was repeated for all the demographics as well as habits included within the survey. After the data was cross-referenced, one of three statistical analysis tests was created to clearly see if the relationship between the two factors is significant.

Before the actual analysis started, the demographic data was organized to determine who the respondents are. In both countries, a majority of the respondents were women in the 18-25 age group, therefore a clear divergence between the demographics of the respondents and the country demographics was present. This had an impact on the results of the research because the results showed a clear significance between food waste and demographic factors like age and gender. Once the demographics of the respondents were known, the data on self-reported amount of food waste was split up on a country level. This

was done to determine how close are the figures found by researchers to the figures given by the respondents.

4.2 Accuracy of Self-Reported Food Waste

The amount of daily food waste given by the respondents is aligned with research because the figures provided by Canadian consumers was higher than the ones given by the Dutch. Nearly half (42) of the Dutch respondents answered '100 grams or less' when asked about their daily amount of food waste, the most common answer among Canadian respondents was '100-200 grams. On average, the Dutch respondents wasted around 60 kg of food and the Canadian respondents wasted 68kg of food. In summary, the results of the data analysis are congruent with research on food waste in both countries, which claims that on average Canadian citizens waste more food than Dutch citizens, however the exact figures are different. According to (Massow, 2019) Canadian consumers waste 85 kg of food and Dutch consumers waste 41 kg of food (Dooren,2019)

4.3 Differences in Habits Among Dutch and Canadian Consumers

Overview Table - Discussion		
Habit	Significant Difference in Food Waste	Significant Difference Between NL&CAD
Shopping Lists	Yes	No
Checking the Pantry	No	No
Meal Planning	Yes	No
Shopping Frequency	No	No
Time Spent Shopping	No	No
Time Spent Getting to the Store	Yes	No
Buying Larger Amounts of Food	Yes	No
Food Handling	No	No

Table 6 – Overview of food related habits and how they differ between NL&CAD

The survey looked at six habits in total; creating shopping lists, checking the pantry/refrigerator, planning meals, shopping frequency, average time spent in the store,

buying larger food quantities because they are on discount and average time spent getting to the store. The comparison of these factors revealed many differences between Dutch and Canadian consumers. First of all, the Dutch respondents are more likely to make shopping lists before shopping and they are also more likely to plan meals. Most of the Dutch respondents plan meals for the following 2 days, while more Canadians plan meals for just the next day. Less frequent meal planning and not creating shopping lists were indicated by research (Hebrok & Boks, 2017) (Quested et al., 2013) as some of the possible factors contributing to an increased amount of food waste. The answers provided about checking the pantry and the refrigerator were virtually identical, therefore it is not a reason for more food waste by Canadian consumers. The analysis of the factors outside the home also revealed differences among the Dutch and Canadian respondents. The Dutch respondents claim to have a higher shopping frequency, spend less time spent getting to the grocery store and spend less time on actual shopping. According to research Canadian supermarkets are larger than Dutch supermarkets (Statista, 2016). This is possibly connected to the differences in the habits outside of the home like an increased amount of time spent in the store. Statistical analysis was also completed to see if the differences between the two countries were statistically significant. According to the results, not a single habit had a significant difference, this was surprising because the two countries differed quite a bit from one another in many of these habits.

Even though on average Dutch consumers outperformed Canadian consumers, there was a small section of Canadian consumers (10-20%) that always that gave the best possible answer to the question. For example, in the question about meal planning, more Canadians answered 'for the whole week' than Dutch respondents. Also, more Canadians answered 'always' when asked about the frequency of making shopping lists. Additionally, more Canadians than Dutch claimed to have 'excellent' food preparation skills. In general, Dutch people claim to have better food handling skills, however there appears to be a small section

of the Canadian population (10-20%) that is very conscious of the food choices they make, is aware of the food waste problem and is excellent at preparing food.

In conclusion, the Canadian population is more spread out in terms of food habits. There are more people on the opposite ends of the spectrum and less in the middle compared to the Netherlands. In the Netherlands, most of the population drifts to the middle, leaning more towards answers such as 'sometimes' and 'often', as opposed to 'never' and 'always' which are more frequent among Canadian respondents. No hypothesis as to why this occurs can be stated.

4.5 Demographics Correlated to a Higher Rate of Food Waste

In order to learn which demographic factors are correlated to a higher rate of food waste, the demographic factors were cross-referenced with the self-reported amount of food waste. This analysis revealed that men generally waste more food than women. Reasons why it occurs are not clear, however one of the likely reasons for is that women are generally the person responsible for preparing food and buying it, therefore are better at using it and less likely to waste it. According to (Lake, Hyland, Mathers, Rugg-Gunn, Wood, Adamson, 2006), the role of preparing and buying food within a household is primarily held by women, due to women being generally more skilled in this area. Other reasons stated were related to work and available time.

The analysis of education did not reveal a significant connection to food waste. Therefore, it is assumed that the level of concern about food waste is not correlated to education and does not increase as the education level increases. The analysis of age revealed a clear correlation between age and food waste. According to the survey results, young people waste less food than older people, a vast majority of the respondents in the '18-25' age group answered '100 grams or less'. This was also confirmed by the statistical analysis. The most likely reason why this occurs is that young people are more likely to live alone,

therefore the household level of food waste is lower compared to the older respondents, whom are more likely to live in a larger household.

4.6 Behaviors at Home – Discussion

In order to answer this question, the answers given by the respondents were cross-referenced with the daily, self-reported food waste. The analysis revealed that making shopping lists and meal planning are significantly connected to an increased rate of food waste. Checking the pantry/refrigerator showed no statistical significance to an increase in food waste. Therefore, if someone is struggling with food waste and are looking for ways they can reduce their food waste, they should consider making shopping lists and start planning meals. Those habits are helpful because they allow a person to learn how much food they eat, what they are going to make and what they need to buy. However, there were exceptions among respondents that did not do these habits and still managed to have very low food waste. This leads to the conclusion that planning meals and shopping lists should be implemented, however there are exceptions that know exactly what to buy without having the need to write it down. They adjust their lifestyle and diet to their shopping habits so that their food waste is relatively low.

4.7 Behaviors at Outside the Home – Discussion

The analysis of the factors outside the home revealed that there is no statistical significance between shopping frequency, time spent shopping and the reported amount of food waste.. In the time spent shopping, a clear result is seen. Between '20min' and '40 min' there is no difference in the amount of food waste. However, as the time spent shopping approached one hour, the amount of food waste increases. Therefore people that spend between 20-40 minutes on shopping are able to manage their groceries so that the level of food waste is low, however, once the shopping time approaches an hour the amount of food waste increases. A possible reason why that occurs, is that people that spend an hour shopping are unable to go on multiple trips per week, therefore they are forced to over-purchase otherwise

they will run out of groceries during the week. Nowadays, the price of groceries is lower than ever relative to income therefore the repercussions for food waste are low.

The time spent going to the store buying larger quantities of food are the only external factors that shows statistical significance in relation to food waste. Out of the 64 respondents that waste '100 grams or less' of food, 54 spend less '10 min or less' on getting to the grocery store. As the amount of food waste increases the number of respondents the spend '10 min or less' on getting to the grocery store decreases drastically.

4.8 Food Handling and Food Waste

Research also identified a lack of food handling skills as a possible reason for household food waste, as a result this possibility was also investigated during the completion of this thesis. The analysis revealed that a trend is present among proficiency in food handling and the daily amount of food waste. People that claimed to have 'above average' and 'excellent' food handling skills showed a tendency to waste less food compared to respondents that had 'average' and 'below average' food handling skills. This makes logical sense because people that are proficient in food handling know more recipes and are more likely to know how to re-use unused ingredients instead of wasting them. People with lesser food handling skills may not have this ability, so if they have an ingredient that they are unable to use, they just throw it away.

5. Conclusion and Recommendations

5.1 Conclusion

The objective of the research was to find differences in food related habits between Dutch and Canadian consumers, then create a list food related habits which could be possible reasons why Canadian consumers waste more food than Dutch consumers. The connection between demographic factors and food waste was also investigated and it was revealed that gender, age and household size are all correlated to a higher rate of food waste. As the respondents increase in age, they are more likely to waste more food. The same correlation was found for men and people that live in larger households.

The second sub-question aimed to find a correlation between food related habits at home and food waste. Creating shopping lists and planning meals are the habits correlated to food waste, checking the pantry and refrigerator before shopping did not show a statistical significance.

The final sub-question aimed to find a correlation between food related habits outside the home and food waste. According to the results, only the time spent traveling and buying larger amounts of food because they are on sale are statistically significant to more food waste. Time spent shopping and shopping frequency did not show a statistical significance.

Possible reasons that Dutch consumers waste less food than Canadian consumers are because Dutch consumers create shopping lists more frequently, plan meals more frequently, shop more often and spend less time getting to the store. Therefore it is recommended that Canadian consumers implement more of these habits into their daily life if they are interested in reducing their level of food waste.

5.2 Recommendations for Canadian and Dutch Consumers

The results of the analysis revealed that Canadian and Dutch respondents differed in many of the habits investigated by the survey. Thereby, it is recommended that Canadians try to implement more of these habits like planning meals and making shopping lists into their daily routine to facilitate their food waste management efforts. Implementing these habits will not only help in preventing food waste but will also give Canadian consumers other benefits like saving money. Short-term, Canadian consumers should implement shopping lists and meal planning into their routine. When considering the factors outside the home, they are much more difficult to change compared to the habits at home because people have less control over them. Generally, it is easier to start making grocery lists rather than reduce the time spent getting to the grocery store and time spent on shopping. If that is not possible, then it is recommended that Canadian consumers make a short-term adjustment of their groceries to include more products that are better suited to a lifestyle with less frequent trips to the grocery store. For example including more products that have a longer shelf life like canned goods, grains and frozen vegetables. Finally, consumers should be careful when buying larger amounts of food simply because they are on discount since that was proved to be statistically significant to food waste.

Dutch respondents generally performed better than Canadian respondents in habits inside and outside the home. However, if Dutch consumers are interested in reducing their food waste, they should make the same lifestyle changes that were recommended to Canadian consumers.

5.3 Recommendations for all Consumers

In the results section, a group of habits statistically significant to food waste was presented, it is recommended that all consumers try and implement these habits into their daily routine. Specifically, it is recommended that consumers start to make shopping lists, plan their meals, increase their food handling skills, reduce the time they spend on travelling to the store and not over-purchase food simply because it is on sale. On top of reducing food waste, these habits are generally positive and can help with saving the consumer money.

It is also recommended that consumers pay close attention to their food waste, specifically which products they throw away the most. Then, adjustments should be made to their shopping lists by reducing the quantity of these products and replacing them with longer lasting alternatives. For example replacing refrigerated chicken breasts with frozen ones. Also, they should make sure they are well versed in the optimal storage methods of the food and make a conscious effort to learn new recipes that allow them to re-use leftovers instead of throwing them away.

5.4 Recommendations for Governments and Retailers

Governments and retailers can also assist consumers in reducing their food waste levels. The most significant thing the government can do is educate the consumer about the negative aspects of food waste and encourage the implementation of habits that showed a statistical significance to food waste like planning meals and creating shopping lists. This information will let consumers know exactly what they can do to reduce their level of food waste. Governments can reach the consumers through schools, community events and awareness campaigns. Retailers can also participate in awareness campaigns by communicating the negative consequences of food waste and by teaching consumers about

the actions that can help in food waste prevention. Buying larger amounts of food showed a strong correlation to food waste, therefore retailers should primarily discount products with a long shelf-life so that the larger quantity of food is less likely to spoil.

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Appendix A: Electronic Survey – English

1. What is your gender?
 - Man
 - Woman
 - Other
2. What is your level of education
 - Primary school
 - Highschool graduate
 - Bachelor's Degree
 - Master's Degree or a PhD
3. What is your age?
 - 18-25
 - 25-35
 - 35-45
 - 45-55
 - 55+
4. How many people live in your household?
 - One person household
 - Two person household
 - Three person household
 - Over three person household
5. How would you rate your cooking and food handling skills/knowledge?
 - Poor
 - Below average
 - Average
 - Above average
 - Excellent
6. By your estimate, how much food on a daily basis do you throw away (in grams)?
 - 100 grams or less
 - 100-200 grams
 - 200-500 grams

- Over 500 grams
 - I don't know
7. How frequently do you throw away the below mentioned food categories? Choose between daily, 4-6 times per week, 1-3 times per week, less than 1 time per week.
 - Meat
 - Vegetables
 - Fruit
 - Bread
 - Other – please specify
 8. Do you create shopping lists before going grocery shopping?
 - Never
 - Sometimes
 - Often
 - Always
 9. Do you check your pantry/refrigerator to know what foods need to be replaced before grocery shopping?
 - Yes
 - No
 10. Do you plan out your meals for the upcoming days?
 - No
 - For the following day
 - For the following 2 days
 - I plan out my meals for the entire week
 11. How many times a week do you go grocery shopping?
 - Once a week
 - 1-2 times a week
 - 3-4 times a week
 - Almost on a daily basis
 12. On average, how much time do you spend on grocery shopping? (just time spent in the store)
 - 20 min
 - 40 min
 - 1 hour
 - Over one hour
 13. How much time on average does it take you to get to the grocery store?
 - 10 minutes or less
 - 20 minutes
 - 30 minutes
 - 40 or more minutes
 14. How likely are you to buy products in a larger quantity because it is cheaper on a per unit basis or sold at a discount?
 - Never
 - Not likely
 - Sometimes
 - Often
 15. Please rank for the options below what you believe are the reasons you waste food.
 - I throw away food that is spoiled
 - I throw away food that is past its expiry date

- I do not want to eat left overs
- I buy more than I need
- I do not know how to store/re-use leftovers

Appendix B: SPSS Test Results

Test Statistics^{a,b}

By your
estimate, how
much food on
a daily basis
do you throw
away (in
grams)?

Kruskal-Wallis H	13,331
df	3
Asymp. Sig.	,004

a. Kruskal Wallis Test

b. Grouping Variable: What is
your gender?

Figure 22 – Kruskal Wallis H Test testing the significance between gender and self-reported food waste

Test Statistics^{a,b}

By your
estimate, how
much food on
a daily basis
do you throw
away (in
grams)?

Kruskal-Wallis H	,598
df	2
Asymp. Sig.	,742

a. Kruskal Wallis Test

b. Grouping Variable: What is
your level of education?

Figure 23 – Kruskal Wallis H Test testing the significance between the education level and self-reported food waste

Test Statistics^{a,b}

By your
estimate, how
much food on
a daily basis
do you throw
away (in
grams)?

Kruskal-Wallis H	26,035
df	4
Asymp. Sig.	<,001

a. Kruskal Wallis Test

b. Grouping Variable: What
is your age?

Figure 24 – Kruskal Wallis H Test testing significance between the age group the and self-reported food waste

Test Statistics^{a,b}

By your
estimate, how
much food on
a daily basis
do you throw
away (in
grams)?

Kruskal-Wallis H	8,776
df	3
Asymp. Sig.	,032

a. Kruskal Wallis Test

b. Grouping Variable: How
many people live in your
household?

Figure 25 – Kruskal Wallis H Test testing the significance between household size and the and self-reported food waste

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17,475 ^a	6	,008
Likelihood Ratio	19,159	6	,004
Linear-by-Linear Association	13,289	1	<,001
N of Valid Cases	179		

a. 1 cells (8,3%) have expected count less than 5. The
minimum expected count is 4,56.

Figure 26 – Chi-Square Test testing the significance between shopping lists the and self-reported food waste

Test Statistics^a

By your
estimate, how
much food on
a daily basis
do you throw
away (in
grams)?

Mann-Whitney U	722,000
Wilcoxon W	15087,000
Z	-1,768
Asymp. Sig. (2-tailed)	,077

a. Grouping Variable: Do you
check your pantry/refrigerator to
know what foods need to be
replaced before grocery
shopping?

Figure 27 – Mann-Whitney U Test between checking the pantry/refrigerator and self-reported food waste

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13,836 ^a	6	,032
Likelihood Ratio	16,802	6	,010
Linear-by-Linear Association	8,278	1	,004
N of Valid Cases	181		

a. 0 cells (.0%) have expected count less than 5. The minimum
expected count is 6,73.

Figure 28 – Chi-Square test between testing the frequency of meal planning and self-reported food waste

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9,097 ^a	6	,168
Likelihood Ratio	9,626	6	,141
Linear-by-Linear Association	,121	1	,728
N of Valid Cases	181		

a. 3 cells (25,0%) have expected count less than 5. The minimum expected count is ,59.

Figure 29 – Chi-Square test between testing the frequency of shopping and self-reported food waste

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6,796 ^a	4	,147
Likelihood Ratio	6,621	4	,157
Linear-by-Linear Association	4,071	1	,044
N of Valid Cases	181		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 7,32.

Figure 30 – Chi-Square test between testing the time spent shopping and self-reported food waste

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31,576 ^a	2	<,001
Likelihood Ratio	33,208	2	<,001
N of Valid Cases	181		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 21,67.

Figure 31 – Chi-Square test between testing the time spent getting to the store and self-reported food waste

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	3,753 ^a	8	,879	,878 ^b	,870	,886			
Likelihood Ratio	4,278	8	,831	,853 ^b	,843	,862			
Fisher-Freeman-Halton Exact Test	3,811			,876 ^b	,867	,884			
Linear-by-Linear Association	1,445 ^c	1	,229	,230 ^b	,219	,241	,125 ^b	,116	,134
N of Valid Cases	178								

a. 8 cells (53,3%) have expected count less than 5. The minimum expected count is ,20.

b. Based on 10000 sampled tables with starting seed 2000000.

c. The standardized statistic is 1,202.

Figure 32 – Chi-Square test between testing the likelihood of buying larger amount of food simply because it is on sale and the self-reported food waste

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	25,425 ^a	16	,063	,069 ^b	,062	,075			
Likelihood Ratio	27,122	16	,040	,045 ^b	,040	,051			
Fisher-Freeman-Halton Exact Test	23,682			,045 ^b	,040	,050			
Linear-by-Linear Association	6,336 ^c	1	,012	,012 ^b	,009	,015	,006 ^b	,004	,008
N of Valid Cases	195								

a. 15 cells (60,0%) have expected count less than 5. The minimum expected count is ,15.

b. Based on 10000 sampled tables with starting seed 1535910591.

c. The standardized statistic is -2,517.

Figure 33 - Chi-Square test food handling skills of the respondents and the self-reported food waste

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	12,853 ^a	12	,380	,324 ^b	,312	,336			
Likelihood Ratio	13,607	12	,327	,330 ^b	,317	,342			
Fisher-Freeman-Halton Exact Test	12,639			,375 ^b	,363	,388			
Linear-by-Linear Association	,005 ^c	1	,941	,940 ^b	,934	,946	,487 ^b	,474	,500
N of Valid Cases	95								

a. 13 cells (65,0%) have expected count less than 5. The minimum expected count is ,04.

b. Based on 10000 sampled tables with starting seed 2000000.

c. The standardized statistic is ,074.

Figure 34 - Chi-Square test food handling skills significance between NL & CAD

Chi-Square Tests								
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)		Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval
					Lower Bound	Upper Bound		
Pearson Chi-Square	12,343 ^a	9	,195	,188 ^b	,177	,198		
Likelihood Ratio	12,226	9	,201	,264 ^b	,253	,275		
Fisher-Freeman-Halton Exact Test	11,939			,166 ^b	,156	,175		
Linear-by-Linear Association	,022 ^c	1	,881	,906 ^b	,899	,914	,456 ^b	,443 ,469
N of Valid Cases	98							

a. 7 cells (43,8%) have expected count less than 5. The minimum expected count is ,71.

b. Based on 10000 sampled tables with starting seed 624387341.

c. The standardized statistic is -,150.

Figure 35 - Chi-Square creating shopping lists significance between NL & CAD

Chi-Square Tests				
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (1- sided)
Pearson Chi-Square	,655 ^a	1	,419	
Continuity Correction ^b	,008	1	,931	
Likelihood Ratio	1,212	1	,271	
Fisher's Exact Test				1,000 ,547
Linear-by-Linear Association	,648	1	,421	
N of Valid Cases	100			

a. 1 cells (25,0%) have expected count less than 5. The minimum expected count is ,56.

b. Computed only for a 2x2 table

Figure 36 - Chi-Square checking the fridge/pantry significance between NL & CAD

Chi-Square Tests								
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)		Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval
					Lower Bound	Upper Bound		
Pearson Chi-Square	9,912 ^a	9	,358	,367 ^b	,355	,380		
Likelihood Ratio	10,838	9	,287	,385 ^b	,373	,398		
Fisher-Freeman-Halton Exact Test	8,987			,422 ^b	,409	,435		
Linear-by-Linear Association	,662 ^c	1	,416	,442 ^b	,430	,455	,232 ^b	,221 ,243
N of Valid Cases	100							

a. 8 cells (50,0%) have expected count less than 5. The minimum expected count is 1,44.

b. Based on 10000 sampled tables with starting seed 957002199.

c. The standardized statistic is -,814.

Figure 37- Chi-Square meal planning significance between NL & CAD

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	12,343 ^a	9	,195	,199 ^b	,189	,209			
Likelihood Ratio	12,226	9	,201	,269 ^b	,258	,281			
Fisher-Freeman-Halton Exact Test	11,939			,177 ^b	,167	,187			
Linear-by-Linear Association	,022 ^c	1	,881	,912 ^b	,905	,919	,467 ^b	,455	,480
N of Valid Cases	98								

a. 7 cells (43,8%) have expected count less than 5. The minimum expected count is ,71.

b. Based on 10000 sampled tables with starting seed 92208573.

c. The standardized statistic is -,150.

Figure 38 – Chi-Square shopping lists significance between NL & CAD

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
				Lower Bound	Upper Bound		Lower Bound	Upper Bound	
Pearson Chi-Square	6,148 ^a	9	,725	,625 ^b	,612	,637			
Likelihood Ratio	8,604	9	,475	,445 ^b	,432	,458			
Fisher-Freeman-Halton Exact Test	8,442			,563 ^b	,551	,576			
Linear-by-Linear Association	,436 ^c	1	,509	,532 ^b	,519	,545	,296 ^b	,284	,307
N of Valid Cases	100								

a. 12 cells (75,0%) have expected count less than 5. The minimum expected count is ,04.

b. Based on 10000 sampled tables with starting seed 1993510611.

c. The standardized statistic is -,660.

Figure 39 – Chi-Square shopping frequency significance between NL & CAD

Chi-Square Tests									
	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval		Significance	99% Confidence Interval	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	4,987 ^a	4	,289	,287 ^b	,275	,299			
Likelihood Ratio	6,719	4	,151	,199 ^b	,189	,209			
Fisher-Freeman-Halton Exact Test	4,822			,292 ^b	,280	,304			
Linear-by-Linear Association	1,021 ^c	1	,312	,351 ^b	,339	,363	,185 ^b	,175	,195
N of Valid Cases	100								

a. 2 cells (22,2%) have expected count less than 5. The minimum expected count is 1,80.

b. Based on 10000 sampled tables with starting seed 79654295.

c. The standardized statistic is -1,011.

Figure - 40 Chi-Square time spent shopping significance between NL & CAD

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	,019 ^a	1	,891		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,019	1	,891		
Fisher's Exact Test				1,000	,531
Linear-by-Linear Association	,019	1	,891		
N of Valid Cases	100				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 15,68.

b. Computed only for a 2x2 table

Figure 41 – Chi-Square time spent getting to grocery store significance between NL & CAD

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	Lower Bound	Upper Bound	Significance	Lower Bound	Upper Bound
Pearson Chi-Square	1,807 ^a	4	,771	,716 ^b	,705	,728			
Likelihood Ratio	2,513	4	,642	,703 ^b	,691	,714			
Fisher-Freeman-Halton Exact Test	2,400			,796 ^b	,785	,806			
Linear-by-Linear Association	,088 ^c	1	,767	,844 ^b	,835	,854	,459 ^b	,447	,472
N of Valid Cases	78								

a. 5 cells (55,6%) have expected count less than 5. The minimum expected count is ,08.

b. Based on 10000 sampled tables with starting seed 475497203.

c. The standardized statistic is ,297.

Figure 42 – Chi-Square likelihood of buying a larger quantity of food simply because it is on sale significance between NL & CAD