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Mestrado em Gestão de Informação
Master Program in Information Management

CONSUMER BEHAVIOR IN HOUSEHOLD FOOD WASTE: COMPARING PORTUGUESE AND COLOMBIAN SAMPLES

Andres Ruiz Garzon

Dissertation presented as partial requirement for obtaining the Master's degree in Information Management

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November 2021

ACKNOWLEDGEMENTS

Firstly, I would like to thank my supervisor, Diana Orghian for the invaluable insights and significant support and orientation throughout the entire journey of the present research. I would also like to show my appreciation to all the people who participated in this research, and especially my family for all their support.

ABSTRACT

Food waste is a global challenge that has gained prominence as more room has been provided to investigate its roots and causes in order to preserve the efficiency of natural resources and its economic repercussions on countries. Yet, the amount of food waste varies greatly between developed and developing countries. By conducting conclusive research through both descriptive and correlation examination and a thorough review of existing literature, the present study aims at understanding the behavior of consumers towards food waste in Portugal and Colombia to promote awareness within the population as well as the endorsement of policies that tackle food waste in both countries. Up to now, the comparison of main drivers of consumers towards food waste generation within these two countries at household level have remained practically unexplored. Therefore, the outcome of this research study has substantial relevance to grow awareness among the general community and to facilitate policies that address food waste and associated impacts to promote behavioral change in both markets.

KEYWORDS

Consumer Behavior, Household Food Waste, Food Waste Management, Sustainability, Food Insecurity.

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LIST OF ABBREVIATIONS AND ACRONYMS

FLW	Food Loss and Waste
FSC	Food Supply Chain.
APED	Associação Portuguesa de Empresas de Distribuição (Portuguese Association of Distribution Companies)
ASAE	Autoridade de Segurança Alimentar e Económica (Food and Economic Security Authority)
CNCDA	Comissão Nacional de Combate ao Desperdício Alimentar (National Food Waste Combat Comission)
FAO	Food and Agricultural Organization of the United Nations
EU	European Union
UNEP	United Nations Environment Programme
WRAP	Waste and Resources Action Programme
FWRA	Food Waste Reduction Alliance (U.S)
ABACO	Asociación de Bancos Alimenticios de Colombia (Colombia´s Food Bank Association)
DNP	Dirección de Planeación Nacional de Colombia

1. INTRODUCTION

1.1. FRAMEWORK

As reported by the Food and Agriculture Organization of United Nations (FAO), nearly 1.3 billion tons of food produced for human consumption is lost worldwide every year. To put it in another way, half of the food that is produced in the globe every year is wasted. Meanwhile, around 811 million people are facing food insecurity (FAO et al., 2020). Within Europe only, it has been estimated that about 33 million people are under food security risk (European Commission, 2020). Within a nation-level, a country is deemed to be food-secure when its inhabitants have at all times physical, social, and economic access to adequate and nutritious food in accordance with their nutritional requirements and food preferences (FAO, 2006). Food waste not only traduces in a missed opportunity for the economy and food security of the nation, but also a waste in vain of all the natural resources used to produce, process, transport, and market the food (FAO, 2011). As a result, in the last decades food security has been widely used to point out the importance of structural measures that allow to fight back against food waste and loss.

Food loss refers to a reduction in food quantities or quality in the early stages of the food supply chain, which decreases the volume of food available for human consumption. Consequently, the idea of food loss is frequently attributed to post-harvest practices with a lack of mechanisms or infrastructure capacity. In other words, food is discarded even before reaching the store shelves and consumer´s homes. Conversely, food waste is generated during later phases of the food supply chain, such as in retail and consumer households (Gustavsson et al., 2011). The causes of food waste are often attributed to human behavior.

As shown in previous research, food waste has many negative economic consequences and impacts over the environment (Graham-Rowe et al., 2014; Göbel et al., 2015). Economically, it represents wasted investment that reduces household´s income by increasing consumer spending. Likewise, the loss of food and waste has important environmental impacts (Beretta et al., 2013; Garrone et al., 2014) such as unnecessary greenhouse gas emissions and inefficient water use and land, which, in turn, can lead to a decline in natural ecosystems and the services they provide.

As previously stated, food waste is a matter that occurs all over the world. In developing countries food wastage occurs mainly in the early and middle stages of the food supply chain (FSC) which can include harvest, post-harvest, transportation, and storage (FAO, 2011) while in developed countries the major contribution to food waste comes from the last parts of the food supply chain particularly in household consumption. Most of the times, the waste is not caused by a lack of facilities to store or preserve food as fridges, but consumer behavior, mostly from an excess of resources available, relatively low-cost food and inefficient buying and storage habits. In any case, current academic literature is in its early stages and there is plenty space to delve further into all of the issues and negative impacts raised above, as well as to stimulate new debates around the food loss and waste matter.

Policies that encourage food safety and food donation become even more vital ever since a country is dealing with both food waste and food insecurity. This is the case in Colombia, where it has been estimated that around 10 million tons of food are wasted every year and approximately 54

percent of the population was food insecure prior the pandemic period of Covid 19. (Broad et al., 2021). Moreover, according to Departamento Nacional de Planeacion de Colombia, more than 6 million tons of food are lost only in the initial stages of production, processing and distribution and the consumption and retail stage represent an additional number of 3.54 million tons of food that is wasted annually. (DNP, 2016). Conversely, in Portugal, food waste and loss are estimated to account for 17 percent of yearly food production, representing 1 million of tons. (Vieira e Brito et al., 2019). Even though Portugal is not among the top countries with the highest food waste, there is a combination of both public and non-governmental organizations such as the national Food Bank, Refood, the Zero Waste movement that actively battle food waste by collecting meals that otherwise would be wasted.

Consequently, holistic approaches that take into account the entire supply chain and involve various stakeholders are highly relevant (Diaz -Ruiz, 2018). Nevertheless, this research`s goal is to concentrate on a close comparison of consumer behavior drivers towards household food waste generation and the understanding of a possible relation with food safety in two contrasting contexts: Portugal, a developed European country and Colombia, a developing country in South America.

With a worldwide increasing population, the obvious thing to follow is the increasing of food waste and loss generation per day. This study attempts to understand and gather insights about human habits, needs and mechanisms in the context of food waste to contribute with suggestions to reduce the current gap in food waste crisis in both countries.

1.2. RESEARCH SCOPE AND RELEVANCE

Efforts by government organizations, farmers, food producers, retailers and consumers to measure and understand the reasons for food waste have gained momentum in recent years. However, according to a report of The Food and Agriculture Organization (FAO) the majority of food waste impact is generated at consumer level. Household food waste has a greater accumulated environmental impact than food wasted in previous stages of food supply chain such as production, storage or processing. The truth is the later the product is wasted or lost along the process, the greater the cost is, as impacts of manufacturing, transporting, or cooking are added to the overall equation (FAO, 2013).

Although there is broad awareness today of the significant economic and environmental implications of food wastage and loss, no research has yet analyzed the main drivers from a consumer behavior perspective in Colombia and Portugal towards household food waste generation. Food waste generates several negative externalities. Food losses represent a waste of resources used in production such as land, water, energy, and inputs. The processing of food that is not eaten contributes to excessive CO2 emissions in addition to the loss of economic value of food produced (Gustavsson, et al., 2011).

Thus, the present study aims to analyze one of the biggest problems of contemporary excessive consumerism: food waste. Growing population, lifestyle changes and growing consumption in households, increase the need to use additional natural resources and as a result, to increase the amount of food waste every year, making it one of the most urgent development challenges.

To reduce consumer food waste whether in developed and in developing countries, is important first to understand the factors that shape consumers` behavior. Therefore, this study proposes to analyze the similarities and differences of consumer behavior and attitudes of people in two countries: Portugal and Colombia. Therefore, the objective is to determine food waste barriers, food routines, planning as a predictor of food waste, and a review of policies applied in each country. The results of the survey give both qualitative and quantitative information in regard to the reasons to create food waste, which are based on the self-reported behavior of participants. As consumers play a predominant role in fighting against food waste via their own households, it is important to find solutions that are relevant to consumers and consequently are going to help them change their own habits.

1.3. STRUCTURE AND PROBLEM DEFINITION

The first chapter of this dissertation presents a worldwide general context around the food waste and loss issue. Likewise, the general objective and relevance of the study is provided.

Within the second chapter of the study, a thorough theoretical context around the main problem is presented, giving a literature analysis of current food waste problem worldwide and at country level.

The Methodology is presented in the third chapter providing detailed information about analytical instruments and data collection. Likewise, since the questionnaire applied to individuals is included, this section provides general procedures such as variable definitions as well as the questionnaire design and sample description.

Results of the study are presented in the fourth chapter including the analysis of the survey between Colombian and Portuguese consumers with discussion and socio-demographic characteristics. Descriptive and Inferential statistics are applied to each sample in order to test hypotheses and draw conclusions around food waste patterns in each country. Finally, the last chapter presents conclusions based on the study, study limitations as well as recommendations for future research.

2. LITERATURE REVIEW

2.1. FOOD WASTE AND LOSS DEFINITION

In consensus among previous literature, food waste has been defined as the loss of food at the end of the Food Supply Chain (FSC), presented in the stages of distribution, retail, and final consumption (Griffin et al., 2009; Parfitt et al., 2010; Gustavsson et al., 2011, Gobel et al., 2015). Furthermore, while in low-income countries loss of food occurs mainly during production and industrial transformation due to a lack of technical resources, in high-income countries food waste occurs typically at the final stages of the food supply chain because of social, cultural, or economic reasons (Dorward, 2012). Figure 2.1 presents where and how food waste and loss are materialized along each stage of the food supply chain.

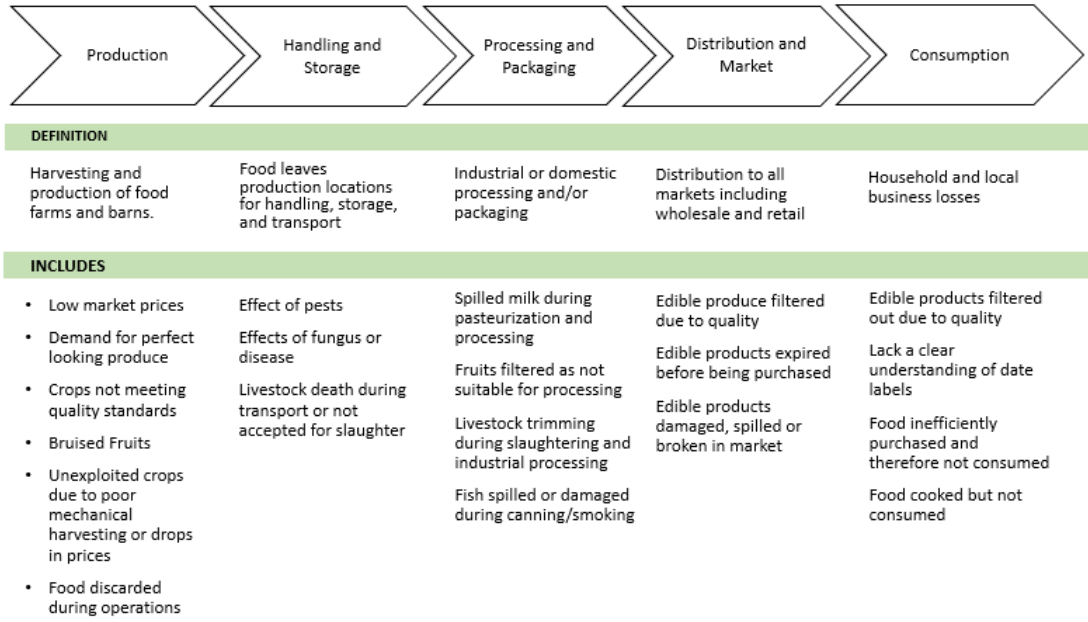

Figure 2.1 – Food Supply Stages where food is wasted

Adapted from Lipinski et al., 2013.

Food waste can be categorized into: (1) avoidable and probably preventable waste relating to "edible" food thrown away and (2) inevitable food waste arising from food processing that is not and was not edible, such as bones, shells and skins (WRAP, 2009; Parfitt et al., 2010). Within the avoidable and possibly avoidable food wastage, an immense number of impacts are generated as a consequence. In the consumption stage, it has been estimated that food waste can represent an annual cost of €454 in the case of an average Italian household and £420 for an average UK household. (Segrè & Falasconi, 2011).

Besides the economic impact of food waste, environmental effects have been illustrated by research. According to WRAP (2009) and Venkat (2011), Greenhouse gas emissions (GHG) are one of the most known examples, or wastewater as well (Lundqvist et al., 2008). Additionally, it has been noted that the average annual food waste in developed countries of 220 million tons, is almost

equivalent to the total net food production of Sub-Saharan Africa (Gustavsson et al., 2011) hence, indicating the social impacts that food waste can carry out.

Wasted food consists of superior quality food suitable for human consumption that ultimately does not get consumed because it is discarded- either before or after it spoils (Papaj, 2016). As previously stated, food waste usually, but not necessarily, occurs at the retail and consumption level of the food supply chain because of negligence or deliberate effort to dispose of it. Most of the times food waste is unintended as a result of inefficiencies of the food supply chain. As stated by FAO (2016), the decrease of food may be accidental or intentional, but ultimately leads to less food available for all.

Households are responsible for the vast majority of food waste in developed countries, according to Parfitt et al. (2010). Essentially at the consumption level, food waste can be categorized into three main groups of avoidable food:

1. Original food which includes food in unopened packages which was thrown away because it passed the expiration date including products like cheese, yogurts (among another dairy products), loose fruits and vegetables which became rotten and never were used.
2. Leftovers which consist of food left on the plates or cooked in big amounts by miscalculation and ended up not being eaten.
3. Partly used food, which may have been opened or untouched but was never finished. (i.e. loaf of bread or stale crackers)

Unavoidable food such as bones, skins, seeds or peels are not considered as food wasted within this study since in most supply chain they are not intended for human consumption or are discarded to be used as food.

As the problem proposed to solve is to understand consumers´ barriers and drivers towards food waste generation at household level, it becomes necessary to understand their motivations, restrictions, and the roots of this point in question. Considering food waste and loss have a broad variety of impacts such as social, economic, and environmental, everyone benefits from the reduction of food waste impact. Consequently, all produced food whether it is consumed, wasted or not it has consumed water and contributed to the burden on other natural resources (Lundqvist,2008).

2.2. SCALE OF THE PROBLEM AND DIRECT IMPACTS OF FOOD WASTE

Food wastage takes place along every stage of the food system. The Food and Agriculture Organization for the United Nations (FAO) estimates that around 35% of food waste is produced at consumption level, another 35% is represented by the agriculture stage, another 13% at processing, 10% in harvesting and the remaining 7% at distribution stage. In terms of global regions, North America, Europe and Oceania are the three regions that generate the highest food wastage rate per capita – from 300-340 kg per person per capita (Gustavsson et al., 2011). According to Stenmarck et al. (2016), in a study conducted only in Europe, where was included both the avoidable and unavoidable food along the food supply chain, it was estimated on 173 kg per person per year, of which 53% corresponded to household food waste.

Approximately one out of every four calories grown to feed people is not eventually consumed by humans (Lipinski et al., 2013). Across the planet and along all stages of food supply chain, all types of food are lost and wasted to a varying extent. As a consequence, overall global food availability is lower than it would be otherwise, adversely impacting food security and forcing worldwide agriculture system to produce the excess of food that ultimately will compensate the food that is not consumed by people.

As shown in figure 2.2, of the total of food that is lost and wasted by its weight, fruits and vegetables, roots-tubers and cereals make up 83%. Comparatively, meat is only a small 4% of the total. However, combined with the high economic costs of meat, the relatively significant environmental impacts of meat in terms of greenhouse gas emission, land-use and water waste (Reijnders, 2003) indicate that minimizing meat loss and waste should acquire as much consideration as other commodities, while representing a lower share of weight losses. Likewise, from an economic and food waste perspective, it is particularly important to preserve food products that would carry high environmental impact, like meat, dairy or fish (Kummu et al., 2012).

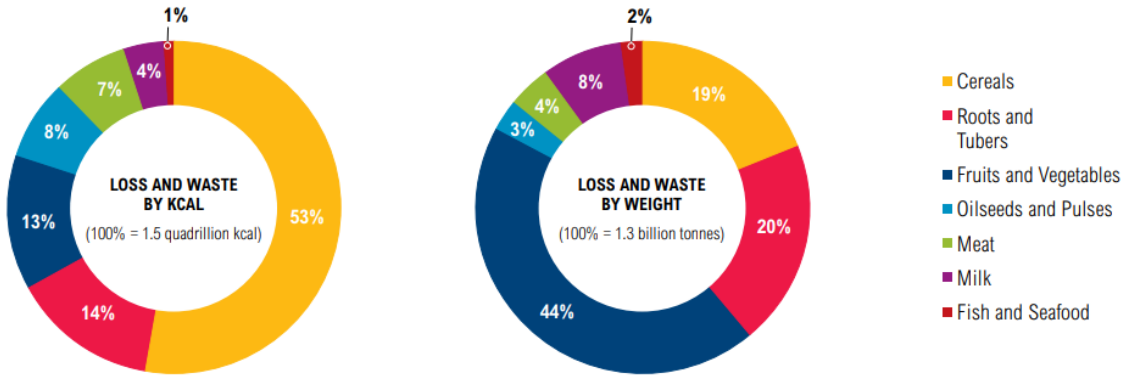

Figure 2.2 – Share of Global Food Loss and Waste per Food Category

Source: Global food losses and food waste (FAO, 2011)

As has been previously presented by some researchers, a change in diet and lifestyle habits would be the most sustainable solution to overcome the environmental impact of food waste, recognizing the importance of eating patterns particularly the growing demand for meat products and convenience food. (Garnett, 2011). In the other hand, households are still the major contributor to food waste. According to studies conducted in the UK, food waste occurring at household level accounts for 46% from overall food waste. (Defra, 2014b). Just in the UK, a total of 16 million tonnes of food are wasted every year with slightly more than half from households, summing a total of 8.3 million ton (Quested, 2011). For this reason, Rivera et al. (2014) stated that food waste “is the single most important factor for reducing the environmental impacts of food”.

Usually in rural areas of developing countries, households themselves process food for immediate or later consumption. But in general, with many players and interests involved, the relations between production and consumption have become problematic.

2.3. STATE OF FOOD SECURE AND FOOD WASTE IN THE WORLD

Food losses and food waste are global threats. According to FAO`s estimation, more than 850 million people in the world are undernourished. Primarily because members within the household do not have the means to obtain food or are unable to produce or to grow the food they need (Lundqvist, 2008). Simultaneously, near to 1.3 billion tonnes of food wastage are generated worldwide every year (FAO, 2011), of which nearly 88 million tonnes are generated in the EU annually. As a result of this losses occurring among the various stages of the Food Supply Chain, it has been estimated that up to one third of edible food is thrown away every year (Steinfeld et al., 2006; Gustavsson et al., 2011). Due to the importance of tackling food wastage, in 2015 the United Nations included a specific target (Goal number 12.3) within the Sustainable Development Goals (SDG´s), which aims to "Ensure sustainable consumption and production patterns" to halve per capita global food waste at the retail and consumer level by 2030 (United Nations, 2015). Lately, the European Commission dedicated a crucial role to food waste management and prevention through the Circular Economy Package. The necessity to define accurate targets for the measurement and management of food waste by 2023 was revisited (European Commission, 2018). More recently, the European Commission has promoted strategies focused on putting forces together within the industry, consumers, and non-governmental organizations to reduce food waste output.

Over the last decades, the food industry has evolved dramatically for both producers and consumers. Although the product range of a retail store in 1954 was 1400 products, there exist today over 30,000 different products (Hayn et al., 2005; J Sainsbury plc, 2016) and even up to 90,000 in some cases (Wood and Butler, 2015). Nowadays, large retailers are highly competitive in terms of price, globally sourcing food and distributing through multi-tier structures. Regardless of the season, consumers expect professionally stocked stores with a full product selection. Furthermore, consumers are exposed to opposing trends towards slow food and mindful eating versus consuming more processed meals. Other trends are present in Western countries with smaller households and aging population, resulting in vastly different consumption habits (Beitzen-Heineke, 2017). Additionally, due to the growing proportion of single households increase, the amount of food waste generation per person is rising up to 45 percent in comparison with average households. Retailers and producers offer smaller packaging options which might minimize food waste, nevertheless it carries out a greater environmental impact by creating more packaging per unit (Akkerman et al., 2010).

On the other hand, the COVID-19 pandemic has been a wake-up call for a variety of countries all over the world in regard to food waste action plans. According to The Food Foundation, the vast amount of people facing food insecurity has expanded among those who regularly struggle to afford food and generated new economic vulnerability due to loss of work and income because of the current situation (Loopstra, 2020). The COVID-19 pandemic provides an opportunity for countries to develop and build recovery strategies that can reverse existing trends and shift consumption habits towards a more sustainable future. Alternatively, food waste trends were observed in Italy where there was a decrease in food waste as a result of the confinement, which motivated people to learn or improve food planning and preparation routines (Amicarelli & Bux, 2020).

In order to consider a population, household or individual as food secure it must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden

shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security (FAO, 2006).

As previously mentioned, the principal focus of this study is food waste arising at the consumption stage of the food supply chain. In this regard, most developed countries have streamlined and mechanized supply chains and yet, consumption-level food waste accounts for nearly 35 percent, the largest share of all stages. In spite of this figure, the distribution of this food loss and waste differs greatly between developed and developing countries (figure 2.3), taking into account that developing countries see food waste more during the stages of production, handling and storage and developed countries seeing around 28 percent of food waste at consumption stage (Lipinski et al., 2013)

2.4. Overall situation of food waste in Portugal and Colombia

According to DNP – Direccion Nacional de Planeación de Colombia (2016), every year Colombia wastes around 10 million tons of food, which is comparable to 34% of the total food supply designated for human consumption—an amount that could feed more than 8 million people each year, which is similar to the population of Colombia's capital, Bogotá. At household level, food waste accounts for 15.6% of the total, whereas food waste from agricultural production, post-harvest, and storage processes account for 40.5% and 19.8%, respectively, and food waste from distribution and retail accounts for 20.6% (DNP, 2016).

To tackle the latter, the creation of food banks is a social measure that may induce up to 30 percent reduction of food waste since food is redistributed prior to it qualifies as waste, as stated by Chalak et al., (2016). In Colombia, food banks initially appeared in 2001, and there are now 19 of them, all of which are located in the country's central area. They are all members of the Association of Food Banks of Colombia (ABACO), which is in responsibility of organizing, planning, projecting, and implementing action plans that benefit each of the country's banks. In line with their mission, an estimated of 25.089 tons of food has been rescued for 650.000+ beneficiaries along the country (Broad et al., 2021). However, Colombia’s food situation is severe and concerning, according to ABACO, (2019). As a food-producing country, 40.5 percent of food is lost during the production stage of agriculture. In distribution and retail, 20.6 percent is squandered and lastly, 15.6 percent is lost in households.

There is no publicly available data regarding the exact figures of food that is grown or sold in Colombia for human consumption that eventually becomes waste. However, the vast amount of food waste generated in Colombia indicates consumers' behavior response to purchasing more in comparison with their consumption. A large amount of food waste is a result of a lack of consumer awareness in regard to the impacts that food waste actually has.

Technical, financial, and structural limitations in the supply chain have a direct impact on the deterioration of fruits and vegetables (Anaya et al., 2017). A study was conducted in the two biggest farmers´ markets located in Bogotá, Colombia, in order to measure the amount of individuals awareness towards the best use and recovery of fruits and vegetables. As stated by Anaya et al., (2017) even though people from farmers markets handle and manipulate food and meat in a daily basis, 74% of them appear to ignore what is the correct disposal of food.

Regulatory and economic measures have been implemented at different governmental levels across the world in an attempt to reduce food waste in households (Chalak et al., 2016). Programs such as Pay-as-you-throw (PAYT) are used in countries including United States, Canada, Japan, Taiwan, and China (Herszenhorn et al., 2014). A fee is charged to households in proportion to the waste generated upon collection, with the ultimate goal of reducing food disposal. In addition to this, under the EU`s Waste Framework Directive, members states must establish mandatory food waste reduction targets and consequently devise preventative measures (Chalak et al., 2016).

In terms of law regulations, Colombia became the first country within the LatAm region to approve the first bill with the same goal of combat food wastage in 2019. (Broad et al., 2021)

In Portugal, several humanitarian organizations have been aiding the state in its social and ethical obligation to offer basic requirements such as food and/or shelter to populations at danger. Without substituting its role, groups like the Food Bank, the CAIS association, the Dar & Acordar movement, ReFood, Fruta Feia consumer cooperative, the Vida Abundante association, among others, will continue to play an important role within the food waste situation at a household level (Silva, 2016). According to Eurostat data, in 2006 Portugal wasted around 1,4 million tonnes of food. Production stage was responsible for wasting around 632 000 tonnes, households for around 385 000 tonnes and the other sources were responsible for 374 000 tonnes of wasted food. The labor of food banks to fight against the hunger is critical worldwide. For more than 30 years, more than 20 cells have been operating in Portugal delivering over 100 tons per day while reaching over 450,000 people with proved necessities (European Commission, (2011)

Between September and November 2015, Deco the Portuguese Consumer Defense Association, conducted a survey where 1700+ Portuguese customers between 25 and 74 years old were asked about food waste concerns. According to the research, more than half of customers acknowledged tossing out food that had passed its expiration date, and two-thirds of the sample had no idea what the terms "use by" and "best by" meant. In terms of waste, the study found that 14% of those polled threw food away because they prepared too much. Seven out of ten people said they go to the supermarket to do the groceries shopping. Price was the most important aspect that led to the previous statement (80%), followed by closeness, product diversity, and supply of low-cost items. The study gathered significant insight around food waste, particularly the fact that more than half of the respondents said they threw away food that was out of date. This behavior is appropriate when it comes to perishable products (the term refers to “use by” such as meat, fresh fish, eggs, milk, cakes with cream or fresh cheese (Papaj, 2016)

On the other hand, a Portuguese regulation law presented in October 2020 aimed to decrease food waste, argued that large surface supermarkets should donate the food that is still in consumption conditions through the Portuguese Food Bank or through local NGO organizations such as REFOOD.

REFOOD organization aims at activating citizens, institutions, retailers, businesses, and associations by distributing food that either way would be wasted. The movement is powered by the goodwill of the community, especially local volunteers that sustain the day-to-day operation from the collection, organization, preparation, and distribution processes. Refood´s goal is to distribute the food from local restaurants and shops which is not going to be eaten to households and institutions that are in need. Refood's actions are supported by 60 centers around the national

territory and sustained thanks to built-in systems that assure long-term viability in three major areas: financial, environmental, and social. (Refood, 2021)

While much effort has been made to address this problem at various levels – primarily by preventing food waste through recommendations, legislation, reduction targets and research programs – and to identify factors that inspire individuals to reduce household food waste, the knowledge available among Europe is extremely heterogeneous and lacks common and harmonized methodologies for collecting food waste (Bräutigam et al., 2014).

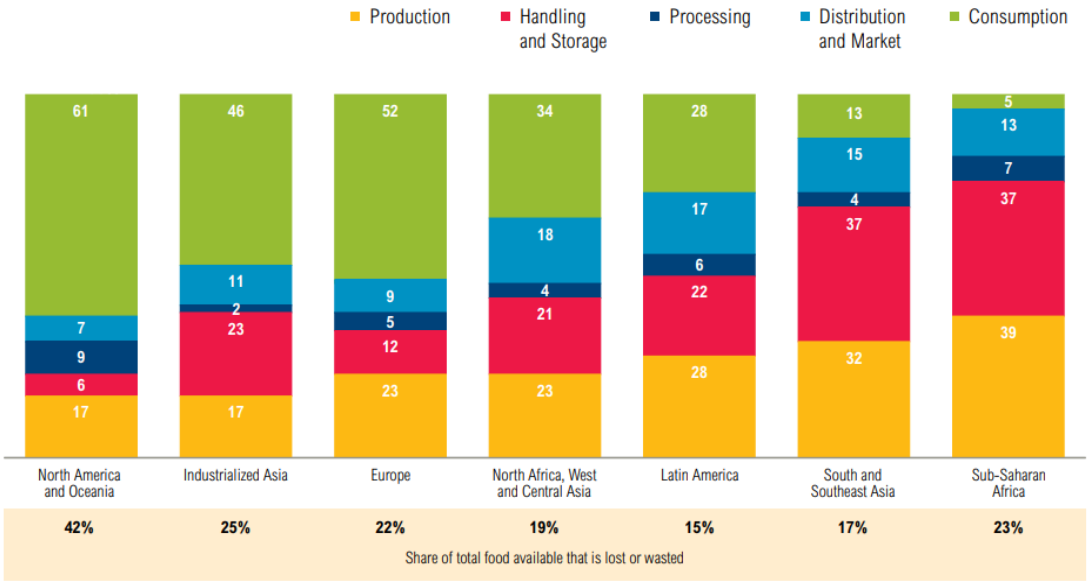

Figure 2.3 – Food wasted by region and stage along value chain

Source: WRI analysis based on FAO. 2011. Global food losses and food waste—extent, causes and prevention. (FAO, 2011)

2.5. CONSUMER BEHAVIOR

2.5.1. Behavioral factors in household food waste generation.

As stated by Perreau, (2016), beliefs and attitudes are often well-entrenched in an individual's mind and are difficult to alter. On the other hand, behavior is composed of three main elements: Intention, habitual responses, and situational constraints and conditions (Triandis, 1977). Moreover, social and affective factors influence intention, as do attitudes and emotions, which are heavily influenced by beliefs (Egmond & Bruel, 2007). Consequently, a belief is an individual's conviction in something. In addition to this, habitual behaviors are repeated on a regular basis, but they are also done effortlessly, efficiently, and with little effort or conscious awareness (Verplanken, 2003). Habits grow in power over time, and the more frequently a behavior is performed, the more automatic and less conscious it becomes.

In terms of consumer behavior, different research has demonstrated that good environmental views from consumers may not always lead to real behavior (Johnstone & Tan, 2015). According to past research from Kearney, from 71% of participants who have confirmed they occasionally consider environmental issues when shopping, only 52% have made purchasing decisions based on

environmental concerns and purchased sustainable or green products. Furthermore, extrinsic barriers to green consumption are common, such as cultural, infrastructural, political, and economic circumstances in markets and society (Johnstone & Tan, 2015).

Different variables such as economic and socio-demographic relate to the behavior of food waste as household income (Setti et al., 2016), gender and age (Visschers et al., 2016, Quested, Marsh, Stunell, & Parry, 2013). However, psychological research is increasing to tackle this matter (Aitsidou et al., 2019; Farr-Wharton et al., 2014; Graham-Rowe et al., 2015; Kallbekken & Sælen, 2013; Porpino et al., 2016; Schanes et al., 2018; Stancu et al., 2016).

Consumer behavior is influenced by different variables, whereas it is hard to observe the effects and their relations between them (Fischer, 2015). Cultural influence should be followed at aiming to create the foundation of an individual's behavior, (Menzel & D'Aluisio, 2008). It is difficult to measure the diverse attributes, not just among countries, but also within countries. The values that play a significant role in consumer behavior have a cultural and ethnic basis. In empirical studies, the role of these values in consumer behavior has been overlooked, yet on a theoretical basis, impacts on environmental and food security have been addressed, along with values and moral thinking (Bamberg, 2003). Consumer's surroundings play a major role in lifestyle decisions, particularly for families with consumers of younger ages. Furthermore, the surroundings such as their colleagues and friends with which a consumer encounters play a similar role (Hazuchová, 2020)

Demographic variables, household size and economic development, are among the principal factors of food waste to proceed, as well as, finally, the price of food that households consume. Demographic factors such as age or gender are typically important in all aspects of consumer behavior and should be addressed when planning consumer education strategies focused on influencing or changing behavior (Filipová et al., 2017).

Giordano et al. (2019) investigated how specific sociodemographic and behavioral variables influence food waste. According to their findings, preparing a shopping list and inspecting the pantry and fridge prior to shopping groceries, were shown to have no significant impact on the amount of food waste produced. According to Talia et al. (2019), the size of the household plays a fundamental role, as does the gender and education of household elements. As mentioned beforehand, a sole individual produces more food waste than larger household groups, with higher-income households and urban households often finding to waste more (Tokareva & Eglite, 2017). As mentioned by Hazuchová et al. (2020) higher-income household customers waste more, as do younger and economically productive customers. In the other hand, retired groups waste less than other classes. According to Ilakovac et al. (2020) the age of respondents had a positive effect on waste avoidance, while income level and the number of children under the age of 18 had an unfavorable impact within the household. Porpino et al. (2015) adds, on the other hand, that low-income families often generate food waste, e.g. because of lack of preparation or failure to store food adequately.

2.5.2. Moral Norms and Household Food Waste routine:

There is evidence to think that most individuals share an ideal desire to avoid waste, as they tend to be waste-aversive (Bolton & Alba, 2012). Moral norms relate to the feeling of guilt and a bad conscience (primarily for the poor or/and natural environment) of an individual when they waste food (Stancu et al., 2016). Also, it was suggested by Stefan et al. (2013) that people with more

determined moral norms are strongly committed to preventing food waste. Individuals with low moral norms, on the other hand, are more prone to make excuses for food wasted during the stages of preservation and preparation and are unconcerned about the social and economic consequences of food waste (Parizeau et al., 2015). Past research pointed out that most individuals dislike wasting food, according to Quested et al. (2013) and the guilt associated with food waste pushes people to prevent food waste in their households.

According to Schiffman (2004, p.35), “Attitudes are an expression of inner feelings that reflect whether a person is favorably or unfavorably predisposed to some "object" and “attitude formation, in turn, is the process by which individuals form feelings or opinions towards other people, products, ideas, activities, and other objects in their environment”. It is important to ascertain if consumers feel bothered or guilty when throwing food away, if there is concern about wasted money, damage to the environment or economy or in general, if the food wasted is seen as a problem. Consumer views and attitudes towards food waste are diverse, some are mindful of environmental issues related to food waste, but on the contrary, some accept that seldom food waste is important to ensure that food tastes fresh (Qi & Roe, 2016).

As stated by past research, wasting food may induce guilt (Hamilton, et al., 2005; Parizeau et al., 2015; Quested et al., 2013; WRAP, 2007). According to Qi and Roe (2016), inducing guilt may lead to a reduction in household food waste by outlining a moral norm. Richter and Bokelmann (2018) revealed that individuals who consider food waste to be ethically unacceptable do so because it is the product of a bad conscience. Hence, they propose like Qi and Roe (2016), addressing these consumer emotions through awareness campaigns.

Different societies may have different moral standards when it comes to wasting food. Traditional communities (i.e., pastoralists, horticulturists), where food acquisition is more difficult and complicated than in western industrialized society, may have stricter moral standards about food waste, according to Misiak et al. (2018). They anticipated that moral standards against food waste may function as a cultural adaptation to difficult conditions by preventing individuals from wasting food.

In the light of the foregoing, moral norms can potentially inspire many people to improve their food waste behavior at home. Therefore, the following hypotheses were proposed:

Hypothesis 1 (H1). Moral Norms positively influence consumers` adoption of behaviors and habits that reduce household food waste generation.

Hypothesis 1a (H1a). Moral Norms positively influence consumers` adoption of behaviors and habits that reduce household food waste generation in Colombia

Hypothesis 1b (H1b). Moral Norms positively affect the adoption of behaviors and habits that reduce household food waste generation in Portugal

Hypothesis 2 (H2). Moral Norms have influence over food waste reduction at household level

Hypothesis 2a (H2a). Moral Norms have influence over food waste reduction at household level in Colombia

Hypothesis 2b (H2b). Moral Norms have influence over food waste reduction at household level in Portugal

Hypothesis 3 (H3). Moral Norms regarding food-wasting vary among different populations

3. METHODOLOGY

3.1. STUDY DESIGN AND DATA COLLECTION

As explained previously, this research aims to understand better and to gather insights on how moral norms and behavioral attributes in consumers can influence household food waste behavior in Portugal and Colombia. For this purpose, a conclusive research design with both descriptive and correlational research was conducted. To further ensure reliable and valid results, previous researchers' guidelines and validated questions (Van Herpen et al., 2019; Stefan et al., 2013; Teng et al., 2020) were followed and complemented with new research questions adapted for the reality of both markets considered in the scope of this study.

3.2. CONSTRUCT SELECTION AND QUESTIONNAIRE DESIGN

To better understand the main differences regarding food waste generation between the households of the two countries that the present research proposes, a questionnaire was designed and translated from English to Portuguese and to Spanish. It can be seen in Table 8.1.

The questionnaire was composed of 6 sections including the consent page, 4 constructs, demographics, and a final section to understand the food insecurity or scarcity situation of respondents. In Table 3.1 can be seen the composition of blocks with number of questions per construct. Anteceding the commence of the questionnaire, a consent page with the objective of the research was presented as well as the food waste and loss definition in order to avoid bias or misunderstanding for all respondents when evaluating each of the constructs.

Block Name	Block Objective	Number of questions
Consent Form	Present relevant information about the study, duration and the data collection policy	
Rating Scale Introduction	Introduce the respondent to the scale used in construct measurement	
Construct 1 - Moral Norms	Measure the Moral Norms within food wastage	4
Construct 2 - Shopping Behavior	Measure the Shopping Behavior construct	2
Construct 3.1 - Food Waste Generation - Action of Disposing Food (FWG1)	Measure the respondents` perception in regards to the frequency to generate food waste	1
Construct 3.2 - Food Waste Generation - Factors driving food waste (FWG3)	Measure the respondents` perception regarding the influence of a set of factors to generate food waste at their households	7
Construct 3.3 - Food Waste Generation - Actions that help reduce food waste (FWG7)	Measure respondents` perception regarding their willingness to incorporate actions that achieve the reduction of food waste	5
Contruct 3.4 - Food Waste Generation - Sources of food waste (FWG8)	Measure respondents` perception regarding the source of the food that is wasted within their household	1
Demographics	Collect information like country of residence, household composition that allows characterizing the sample	7
Food Scarcity	Collect information regarding the food insecurity situation of respondents	1

Table 3.1 – Constructs´ composition in questionnaire

Moral Norms (MN)

In the first section of the questionnaire, 4 questions regarding Moral Norms (MN) were asked to assess the level of guiltiness and how less aware of moral norm respondents could perceive the food waste generation behavior in their household, since the moral norms have an impact on the psychological process of an individual (Bhatti et al., 2019). A seven-rating scale from Stancu et al.,

(2016) was adopted where 1= “strongly disagree” and 7 = “Strongly agree”. Participants were asked whether if they would feel bad conscience when wasting food, feeling guilty about people that not have enough food, or feeling guilty regarding the environment when wasting food within their household.

Shopping Behavior (SB)

As mentioned in the theoretical framework of this research, the frequency to buy groceries and the preparation that people spend when purchasing groceries have a direct impact on the food waste generation in their households. Therefore, a set of two categorical questions from Stancu et al., (2016) and Stefan et al., (2013) regarding the frequency in purchasing groceries and the usage of shopping list to perform the planning stage by consumers were proposed as Shopping behavior (SB).

Food Waste Generation - Action of Disposing Food (FWG1)

A construct of Food Waste Generation Behavior was designed to examine respondents' perceptions of the frequency with which they or their households generate food waste, regardless of the source of the food. The seven-item rating scale from Teng et al., (2020) was used for this purpose. Food types measured included raw, prepared, stored but not used, vegetables and fruits and delivery or take away food. The intent of this construct is to evaluate the influence that moral norms have on this frequency, as it is expected that higher moral norms drive a reduction on food waste generation.

Food Waste Generation – Factors driving food waste (FWG3)

Through a three-points rating scale, a second construct of Food Waste Generation composed by a subset of seven items were generated to see how much particular attitudes and habits such as miscalculation when purchasing groceries or bulked buying can influence food waste behavior. The items presented in this construct were validated before by Diaz Ruiz, R. (2018). The intent is to understand the factors that influence consumers to throw away food, including food expiration, mold, storage, or preference for not repeating meals – among others. This allows drawing conclusions on the reasons behind food disposal in households from Colombia and Portugal.

Food Waste Generation – Actions that help reduce food waste (FWG7)

A series of 5 questions in 7-point rating scale measure selected a combination of actions validated in prior literature that help reduce food waste generation. The construct intends to evaluate the relationship between Moral Norms and the willingness to incorporate actions that help achieve food waste reduction. Namely, actions that are evaluated are better labeling in food packages, better planning among households, and usage of appliances to conserve food – among others.

Food Waste Generation – Sources of food waste (FWG8)

The set of questions composing this section have the purpose of identifying sources of food waste among households and allows drilldown on this behavior for each of the populations in this study. Evaluated sources include delivery or takeaway, home-cooked meals, and home-grown products.

3.3. DATA COLLECTION AND ANALYSIS

Data was collected between June and August 2021 with the assistance of a Marketing survey platform (Qualtrics software). A questionnaire composed by 22 questions was developed in English, translated into Spanish and Portuguese, and distributed to respondents through online platforms (LinkedIn, Facebook and Instagram) as well as via email using a distribution list within the academic community. A link was sent to potential respondents living in Colombia and Portugal who were asked to forward it to friends and acquaintances using the well-known and successfully snowball sampling technique (Kosinski et al., 2015).

A total of 685 responses were recorded for this study. In table 3.2 the demographic profile of the sample is shown (Age, Education, Household composition, Location, Numbers of elements within household). Python was used for data cleaning and analysis, using Jupyter Notebook and Google Colab for data processing. It was detected that not all respondents had completed all their answers, hence, 167 incomplete survey answers were discarded as well as 68 records with missing values. A total of 450 records were used for descriptive analysis and hypothesis testing. In addition, subsets were created for analysis and comparison between countries – with a set for Portugal containing 182 records (40% of the sample) and a set for Colombia with 268 records (60% of the sample). Ideally, both sets should be balanced with a similar quantity of records for both sets but given the sampling method used and research questions involved, all available data was used.

Sociodemographic Category	Overall Sample	Portugal	Colombia
Age of respondents (mean)	38	32	41
Country of residence	450	182	268
Education level of participants (%)			
Master's or equivalent	40%	45%	37%
Bachelor's or equivalent	31%	35%	29%
Postgraduate Diploma	18%	8%	25%
Secondary school	6%	9%	4%
PhD - other	4%	3%	5%
Household Composition (%)			
Parents with children	36%	31%	40%
A couple	31%	31%	31%
Single	14%	22%	9%
Grandparent, parent, children or relatives	8%	4%	11%
Roommates	5%	10%	2%
Single parent with children	5%	2%	7%
Elements per household	3	3	3

Table 3.2 – Demographic characterization of the sample

For the analysis of results, constructs were created for hypothesis testing and descriptive analysis. The construct Moral Norms was created using 4 questions, while 3 separate Food Waste constructs were added to the dataset. The first Food Waste construct was built using 7 questions that used a 3-point rating scale, measuring the distinct factors that influence household food disposal. Additionally, a second Food Waste construct was built using 5 questions that used a 7-point ranking scale which measured the response of each population to actions that may reduce food waste. Finally, the variable measuring food waste generation behavior was transformed from a categorical variable to an integer scale by applying transformation of its levels to numerical values.

In order to assess internal consistency for all constructs, Cronbach's alpha coefficient was measured for each of them through the Pingouin library in Python. The Cronbach alpha method showed a result of 0.80 for Moral Norms, 0.62 for Food Waste , and 0.82 for Food Waste 7. According to Griethuijsen et al., (2014), using a threshold of 0.6 is adequate to measure both reliability and consistency. Therefore, it is concluded that all 3 constructs are valid for analysis – however future researchers are encouraged to use base questionnaires that have constructs with higher cohesion that provide more reliable results, in particular for the construct of factors driving Food Waste Generation.

Furthermore, descriptive analysis in the following sections was performed using Python with the statistical functions available in the Pandas and Numpy libraries. Exploratory data analysis and graphical evaluation of variables was achieved with the Matplotlib and Seaborn libraries, while inferential statistics were achieved with the Scipy library, specifically the T-Test and Pearson methods for parametric evaluations. Normality was evaluated with the Statsmodel library, while nonparametric evaluations were done with the Spearman and Mann Whitney U test methods available in Scipy. Results of these evaluations are detailed in the next section.

4. RESULTS AND DISCUSSION

4.1. DESCRIPTIVE STATISTICS

4.1.1. Sample Demographics and Behavior

Respondents in the sample have a mean age of 37, with 75% of them being over 30 years old. According to Cannali et al., (2017) older people tend to generate less food waste, and as so, it might be expected that results in this study are consistent with this premise. However, the sample from Portugal has a lower mean age (32 years) and very low representation of people above 50 years. On the other hand, the sample from Colombia has a mean age of 43 years and has at least 25% of respondents with 50 years or more.

For Education level shown in table 4.1, 40% of respondents have a Master's education, 31.3% have a bachelor's degree, 18.2% have a postgraduation, and 3.1% have a PhD. In total, 92.6% of the sample has higher education, meaning that a bias may be present regarding education level. As mentioned by Talia et al. (2019), education may have an influence on food waste behavior. The most representative education backgrounds are Business and Law (21.3%), Engineering and Manufacturing (15.1%), Humanities and Arts (10.6%), and It and Computing (8.4%).

Education	Colombia	Portugal	Col(%)	Por (%)
None	1		0.37	
Secondary school	10	17	3.73	9.34
Bachelor's or equivalent	78	63	29.10	34.62
Postgraduate Diploma	67	15	25.00	8.24
Master's or equivalent	98	82	36.57	45.05
PhD	9	5	3.36	2.75
Other	5		1.87	

Table 4.1 – Comparison of education between Portuguese and Colombian respondents

Regarding shopping behavior, and specifically in the frequency of food purchases, most respondents purchase food once a week (39.1%), followed by two times per week (22.2%) and every two weeks (21.3%). By contrasting country samples, it was found that Portuguese consumers tend to have higher frequency in comparison to Colombians, with more than 50% of Portuguese purchasing between every day and two times per week, while only 20.8% of Colombians showed this behavior. In contrast, 38.4% of Colombians purchase food every two weeks or more, while only 12.1% of Portuguese citizens purchase with this frequency. These results are shown in table 4.2. However, it was found that both populations have a high tendency towards using shopping lists when grocery shopping, with around 47% of both samples using them every time they shop as shown in table 4.3. Less than 20% of both populations mentioned never using a shopping list, showing how Colombians and Portuguese populations have incorporated good practices for reducing food waste. As demonstrated by past research, the use of shopping lists stimulates the reduction of food waste

since the food-related lifestyle includes a substantial degree of planning, with the primary goal of reducing food surplus (Stefan et al., 2013; Stancu et al., 2016).

Food Shopping Frequency	Colombia	Portugal	Col(%)	Por (%)
Almost Everyday	19	30	7.09	16.48
Two times per week	37	63	13.81	34.62
Once a week	109	67	40.67	36.81
Every two weeks	79	17	29.48	9.34
Every three weeks or more	19	3	7.09	1.65
Never or rarely	5	2	1.87	1.10

Table 4.2 – Comparison of food purchase frequency between Portuguese and Colombians

Shopping List Usage Behavior	Colombia	Portugal	Col(%)	Por (%)
Everytime I do my grocery shopping	127	85	47.39	46.70
Once in a while (1 out 5 times)	78	45	29.10	24.73
Sometimes (1 out of 10 times)	25	19	9.33	10.44
Never or rarely	38	33	14.18	18.13

Table 4.3 – Comparison of shopping list usage between Portuguese and Colombians

Cooking at home behavior is very similar among both samples, with 40.6% of respondents cooking at home between 6 and 7 times per week. This is followed by 4 to 5 times per week, with a representation of 35.7%, and finally by 1 to 3 times per week with 23.5% of the representation. table 4.4 shows these results.

Cooking Frequency	Colombia	Portugal	Col(%)	Por (%)
1–3 times per week	65	41	24.25	22.53
4–5 times per week	95	66	35.45	36.26
6–7 times per week	108	75	40.30	41.21

Table 4.4 – Comparison of cooking at home frequency between Portuguese and Colombian respondents

In terms of household composition for the overall sample, the highest representation is from parents with children (36.0%), followed by couples (31.1%) and singles (14.4%). Non-conventional families composed of other relatives make up for 8% of the sample, while 5.3% are roommates and 5.1% are single parents with children. When comparing country samples, table 4.5 shows how representation of single-person households is higher in the Portuguese sample by double, while

roommate representation is more than 3 times higher than in the Colombian sample. Likewise, most single parents and non-conventional families appear in the Colombian sample.

Household Composition 2	Colombia	Portugal	Col(%)	Por (%)
Single	25	40	9.33	21.98
A couple	84	56	31.34	30.77
Single parent with children	18	5	6.72	2.75
Parents with children	106	56	39.55	30.77
Grandparent, Parent, Children or other relatives	29	7	10.82	3.85
Roomates	6	18	2.24	9.89

Table 4.5 – Comparison of household composition between Portuguese and Colombians

Finally, scarcity was measured given the events of the Covid-19 pandemic, as well as the 2021 riots in Colombia taken place between late April and mid-June. (Gamboa, 2021). The latter in particular was characterized by strikes that prevented food providers from entering cities and restricted the normal goods delivery to supermarkets. The intention of this question is to understand the effect of these events on shopping behavior and food waste generation, based on external factors. As shown in table 4.6, 23.8% of Colombian respondents experienced food scarcity in the previous month prior to answering the questionnaire, while only 1.6% of Portuguese respondents encountered scarcity in the same period. These results may also affect Colombian responses based on perception from the strike period.

Food Scarcity	Colombia	Portugal	Col(%)	Por (%)
I do not know. (Please provide more information)	2	2	0.75	1.10
I have not	202	177	75.37	97.25
Yes, I have experienced food scarcity at least once during the last month	64	3	23.88	1.65

Table 4.6 – Comparison of scarcity between Portuguese and Colombian respondents

4.1.2. Moral Norms and Food Waste Generation

For food waste generation, the frequency in which all respondents throw food at home is a few times per month (36.6%), followed by once in a couple of months or less (23.1%), and once a week (16.4%). Surprisingly, only 5.1% of respondents never throw food away – while 3.7% do it almost every day. By comparing answers from both countries, it can be seen how behavior does not have significant differences and is in general terms very similar. However, the percentage of respondents that throw away food every day is more than double in Portugal in comparison with Colombia, while the percentage of people that never throw food in Colombia is almost 2.5 times the percentage of Portuguese citizens that never throw food. These results are shown in table 4.7.

Food Waste Generation	Colombia	Portugal	Col(%)	Por (%)
1 - Never	18	5	6.72	2.75
2 - Once in a couple of months or less	58	46	21.64	25.27
3 - Few times a month	98	67	36.57	36.81
4 - Once a week	48	26	17.91	14.29
5 - Few times a week	39	28	14.55	15.38
6 - Almost everyday	7	10	2.61	5.49

Table 4.7 – Comparison of food disposal frequency between Portuguese and Colombians

From the different sources of food waste evaluated in this study, home-cooked food showed higher participation with 73.5% of respondents agreeing at some level in the positive rating scale for this source (table 4.8). This shows a coherence behavior with the home cooking frequency, which was identified as almost daily for both countries. No significant differences were found for home-cooked food disposal between countries. Nevertheless, delivery food with 23.3% of respondents agreeing at some level on this source did evidence differences between countries. For Colombians, delivery food disposal had a positive affirmation of 29.8% of respondents, while it only accounted for 13.7% of the Portuguese sample (table 4.9). Finally, home-grown food disposal had low recognition (11.7% of responses in the agreeing categories) - with a higher representation in Portugal (17.0%) in comparison to Colombia (8.1%) - as shown in table 4.10.

Delivery - Food waste	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	77	81	28.73	44.51	158	35.11
2	71	50	26.49	27.47	121	26.89
3	24	11	8.96	6.04	35	7.78
4	16	15	5.97	8.24	31	6.89
5	41	17	15.30	9.34	58	12.89
6	27	7	10.07	3.85	34	7.56
7	12	1	4.48	0.55	13	2.89

Table 4.8 – Comparison of home cooked food as a source of food waste

Home Cooked Food Waste	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	17	4	6.34	2.20	21	4.67
2	22	15	8.21	8.24	37	8.22
3	20	11	7.46	6.04	31	6.89
4	14	16	5.22	8.79	30	6.67
5	63	70	23.51	38.46	133	29.56
6	96	44	35.82	24.18	140	31.11
7	36	22	13.43	12.09	58	12.89

Table 4.9 – Comparison of delivery / take away as a source of food waste

Home Grown	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	152	73	56.72	40.11	225	50.00
2	42	28	15.67	15.38	70	15.56
3	9	5	3.36	2.75	14	3.11
4	43	45	16.04	24.73	88	19.56
5	10	13	3.73	7.14	23	5.11
6	6	15	2.24	8.24	21	4.67
7	6	3	2.24	1.65	9	2.00

Table 4.10 – Comparison of home grown as a source of food waste

Regarding the factors that influence consumers to throw away food, the highest factor is "bulk purchases due to promotions" – with a positive response from 68.8% of people (table 4.11) - and a higher representation in Portugal (75.8%) than in Colombia (64.1%). "Preference for not eating the same food" follows in rank with a positive response from 68.2% of respondents (table 4.12). Like the previous factor, Portuguese representation is higher than the Colombian, accounting for 76.9% and 62.3% respectively. Likewise, "miscalculation of food consumption" proved to be an influential factor – with 44.0% of positive responses (table 4.13). Interestingly, this factor also showcased higher representation in the Portuguese sample with 50% of positive responses, in contrast with the Colombian sample and its 39.9%. As mentioned by Katt & Mexner (2020), hedonic-minded consumers seek satisfaction in the form of immediate hedonistic pleasure and, therefore, it may result in more wasteful behavior. Finally, among influential factors is the "duration of food being stored", with 24.6% of positive responses overall (table 4.14) and the same influential behavior between countries – 31.3% for Portugal and 20.1% for Colombia.

Bulk Purchases and Promotions	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	29	5	10.82	2.75	34	7.56
2	67	39	25.00	21.43	106	23.56
3	172	138	64.18	75.82	310	68.89

Table 4.11 – Detail of bulk purchasing and promotions as a factor influencing food waste

Desire for Variation	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	28	6	10.45	3.30	34	7.56
2	73	36	27.24	19.78	109	24.22
3	167	140	62.31	76.92	307	68.22

Table 4.12 – Detail of desire for variation as a factor influencing food waste

Consumption Miscalculation	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	58	16	21.64	8.79	74	16.44
2	103	75	38.43	41.21	178	39.56
3	107	91	39.93	50.00	198	44.00

Table 4.13 – Detail of consumption miscalculation as a factor influencing food waste

Duration of Food Storage	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	96	35	35.82	19.23	131	29.11
2	118	90	44.03	49.45	208	46.22
3	54	57	20.15	31.32	111	24.67

Table 4.14 – Detail of duration of food storage as a factor influencing food waste

On the other hand, factors with low influence include “expiring food” – with 15.7% of positive responses (table 4.15); “moldy food” – with 4.22% (table 4.16); and “food taste, smell and aspect” – with 3.5% (table 4.17). For expiring food, behavior is consistent with previous factors having higher representation from the Portuguese sample (23.0% vs. 10.8% from the Colombian sample). However, the last two cases exhibit a different trend, having within the Colombian sample slightly higher values than the Portuguese one (6.34% vs 1.09% for moldy food, and 4.1% vs 2.7% for food taste and smell).

Expired Food	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	160	61	59.70	33.52	221	49.11
2	79	79	29.48	43.41	158	35.11
3	29	42	10.82	23.08	71	15.78

Table 4.15 – Detail of expired food as a factor influencing food waste

Moldy Food	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	213	159	79.48	87.36	372	82.67
2	38	21	14.18	11.54	59	13.11
3	17	2	6.34	1.10	19	4.22

Table 4.16 – Detail of moldy food as a factor influencing food waste

Taste and Aspect	Colombia	Portugal	Col(%)	Por (%)	Total	Total (%)
1	222	164	82.84	90.11	386	85.78
2	35	13	13.06	7.14	48	10.67
3	11	5	4.10	2.75	16	3.56

Table 4.17 – Detail of food smell, taste and aspect as a factor influencing food waste

In addition, a set of possible solutions was tested to understand a person's response to elements that might stimulate food waste reduction. Firstly, "best before" labeling was evaluated by understanding if clearer information and easier interpretation of this package information would result in less food waste by consumers (figure 4.1). In general terms, both populations are propense to stimulation through a better understanding of labeling, with 76.2% of all respondents manifesting positive responses to this item, and only 12.2% disagreeing at some level with the statement. Nevertheless, the Colombian sample had a higher response with 82.5% of respondents stating they agreed at some level with the impact of better labeling in food products, in comparison to the 67.0% from the Portuguese sample. It is also noteworthy that the Portuguese sample had a higher number of neutral responses (19.2%) than the Colombian sample (6.3%). Yet, both countries could benefit from clearer information of labeling, with response means being high – 5.57 for Colombia and 5.12 for Portugal.

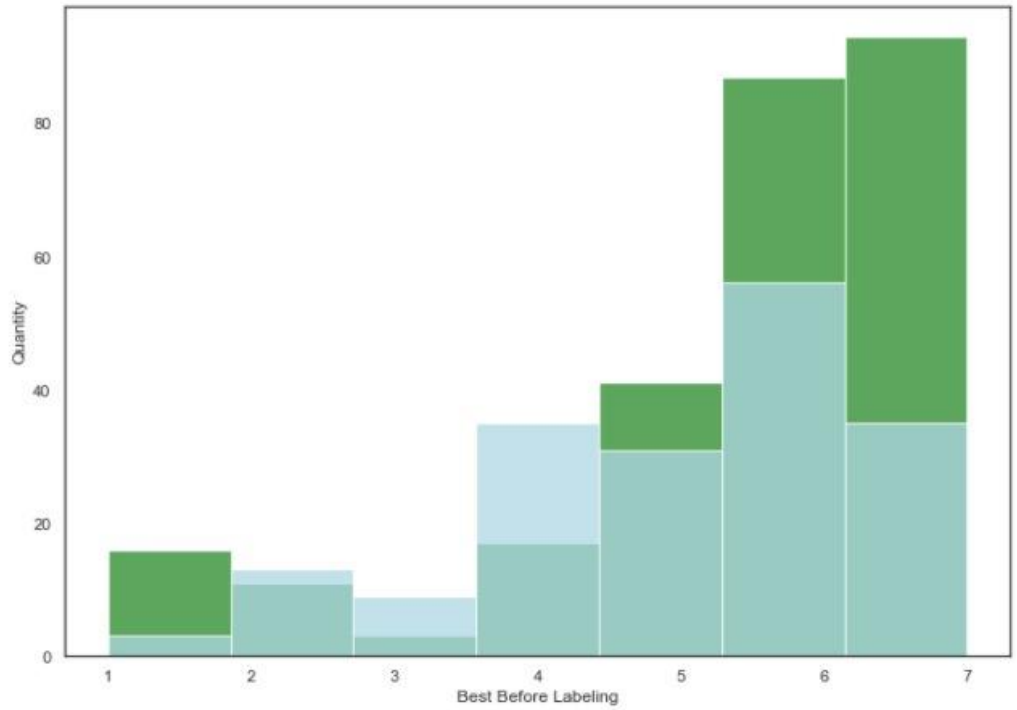

Figure 4.1 – Distribution plots for clearer information on "best before" labeling

Another possible solution evaluated in this study is the effect of having clearer information on food storage and preparation as an action anteceding food waste reduction behavior (figure 4.2). Overall, 78.9% of the entire sample agreed at some level that clearer information on this subject would have a positive impact on food waste reduction, while only 10.6% disagreed at some level with the statement. Similarly, to the previous item, Colombian positive responses are higher than the Portuguese, accounting for 82.1% versus 74.35%. This is especially noteworthy on the highest possible response (Strongly agree), where Colombian representation was 31.3% against 18.1% from the Portuguese. Still, food storage and preparation information is an issue that needs to be tackled by governments, as from mean answers it can be stated that both Portuguese and Colombian citizens need improvements on food handling data provided by producers – with means of 5.18 and 5.55 respectively.

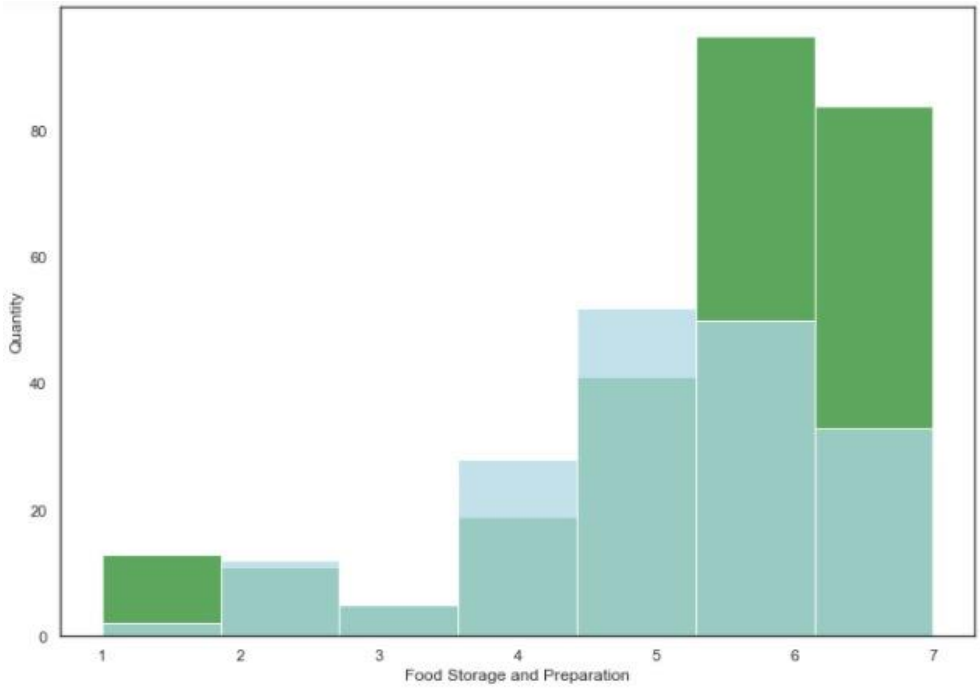

Figure 4.2 – Distribution plots for clearer information on food storage and preparation

Regarding better household consumption planning, 82.4% of respondents found this solution between somewhat important and very important, while only 8.8% found it of little to non-important. 88.0% of Colombian responses were on the positive side, showing how planning is significantly important on food waste behavior. For the Portuguese sample, 74.1% of responses were related to the importance of planning – evidencing how it is also relevant for this country. On the other hand, only 4.8% of Colombians found little to no relevance on planning their consumption, with 14.8% of Portuguese share on the same level. Contrasted with the means, it can be stated that government programs revolving around consumption planning are more relevant for the Colombian population, as the mean answer is one of the highest in the set of questions evaluating possible solutions (5.92 in average), while still being relevant for Portugal (5.24 in average).

Colombian respondents also showed higher importance to portion size estimation, with a mean answer of 5.95; while also proving to be important for the Portuguese, whose mean answer was 5.42. From all respondents, 85.3% had a positive association between better estimation of portion sizes and reducing food waste, while 6.6% had the perception that there would be no relation between these behaviors. Colombians, once more, proved to have a higher propensity towards reducing food waste through the evaluated solution – with 88.4% of them having positive responses versus 4.4% of negative responses. Similarly, Portuguese responses were also high, with 80.7% of positive responses contrasted to 9.8% of negative association.

The last stimulus evaluated was the usage of the freezer for food conservation, as a way of reducing food waste. Like previous answers, mean response was higher for Colombians (5.84) than for Portuguese (5.41). Overall, 83.5% of responses had a positive association between behaviors,

while 10.2% thought at some level that it was non-related. Evaluating positive associations allows detecting how the trend of higher positive response from Colombians is once again present, with 86.9% of answers agreeing with the statement versus 78.5% from the Portuguese. Likewise, 8.9% of negative associations were found on Colombian answers, with Portuguese negative association share being higher at 12.1%.

The effects of having clearer information, either on food expiration labeling or food preparation and conservation, may be subject to regulations in each country. It is possible that the maturity of the food market in Portugal regarding regulatory policies is higher than in the Colombian market. Hence, higher demand for stimulus is seen in all evaluated behaviors for the Colombian market, showing higher means than the Portuguese in all answers (figure 4.3).

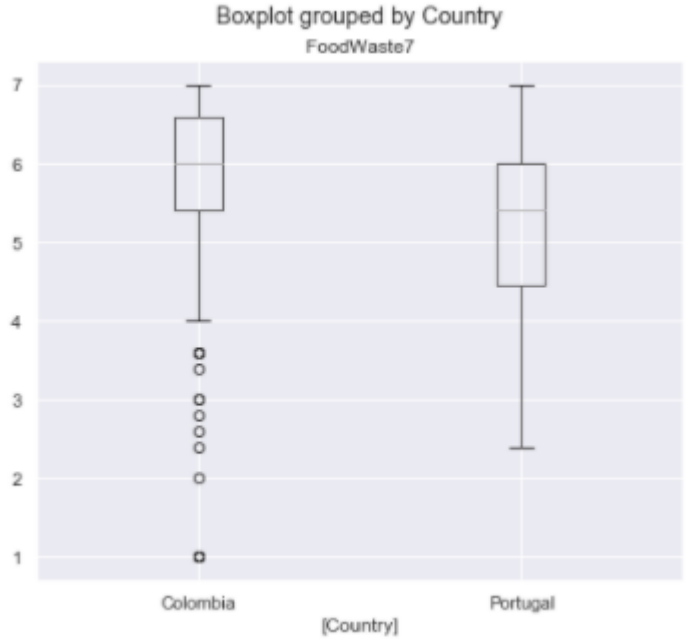

Figure 4.3 – Boxplots for aggregated response to stimuli for reducing food waste

As stated by Stancu et al., (2016) Food waste behavior is tied to moral norms, as well as the sense of guilt when people are disposing of food. Overall, the Moral Norm construct had a mean value of 5.6 - which is characterized with the sample agreeing to statements related to experiencing guilt when wasting food. In addition, even though the answer range varied between 1 (strongly disagree) and 7 (strongly agree), at least 75% of all responses were above the five-point threshold (agree). As seen in figure 4.4, Moral Norms were higher in the Portuguese sample than in the Colombian sample, with a mean of 5.79 in comparison to 5.48. It can be stated that most of the Portuguese respondents feel guilt when disposing food, and even though Colombians also feel guilt, it is not as evident as in the Portuguese sample.

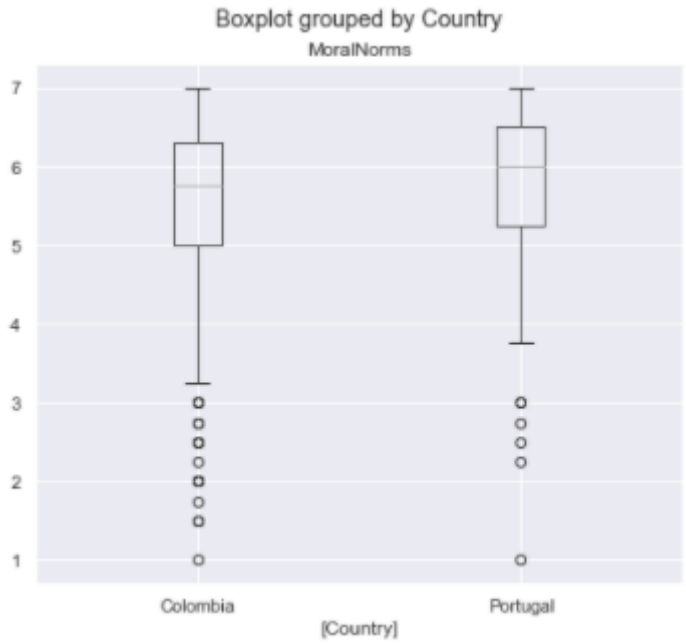

Figure 4.4 – Boxplots for Moral Norms construct in Colombia and Portugal

For each of the elements making up the construct, it can be stated from table 4.18 that feeling guilt in regard to people who do not have enough food is the highest-ranking element in both populations - with mean scores of 6.03 for Portugal and 5.97 for Colombia. This is followed by experiencing bad conscience when wasting food, which scored on average at 5.94 for the Portuguese and 5.84 for the Colombians. Previous research has shown that consumers feel guiltiest when thinking about starving people, hence, this was the most reported factor among cited motives for decreasing food waste (Krisjanti, 2020). Regarding feeling guilt about the environment when wasting food, the Portuguese mean is 5.69 while the Colombian mean is 5.40. In addition, the element evaluating the association of food-wasting behavior as immoral was evaluated with a mean of 5.51 by the Portuguese and of 4.69 by the Colombians, being the lowest scoring element in both samples.

Country	MoralNorms	MN1	MN2	MN3	MN4
Colombia	5.48	5.98	5.41	5.84	4.69
Portugal	5.80	6.04	5.69	5.95	5.52

Table 4.18 – Comparison for elements of Moral Norms in each country

Comparing the average mean of Moral Norms by each level of food waste generation - for each of the countries – allows further understanding of the effect and relation of Moral Norms with food-wasting behavior. As seen in table 4.19, the highest mean for moral norms is present in respondents who manifested never throwing away food in both samples (6.25 in Portugal, 5.87 in Colombia). Likewise, the lowest means are obtained in respondents with the highest frequency of food waste behavior (5.35 in Portugal, 5.03 in Colombia). This hints at the possible relation between

Moral Norms and Food Waste, where people who experience higher Moral Norms are expected to dispose of food less frequently. However, it must be noted that despite the identified trend, all mean values correspond to positive or affirmatory values, meaning that even though people feel guilt for throwing food, it does not prevent it from happening. Furthermore, it tends to show that feeling guilty about throwing food might be a consequence of the behavior, and not an antecedent to which behavior is ruled by. This will be explored further ahead when applying inferential statistics to understand the relationship between Moral Norms and Food Waste Generation.

Country	Food Waste Generation Frequency	Moral Norms Mean
Colombia	1 - Never	5.88
	2 - Once in a couple of months or less	5.73
	3 - Few times a month	5.43
	4 - Once a week	5.17
	5 - Few times a week	5.53
	6 - Almost everyday	5.04
Portugal	1 - Never	6.25
	2 - Once in a couple of months or less	5.99
	3 - Few times a month	5.87
	4 - Once a week	5.45
	5 - Few times a week	5.71
	6 - Almost everyday	5.35

Table 4.19 – Comparison of Moral Norms means for Food waste Generation levels in each country

4.2. INFERENTIAL STATISTICS

Through conclusive research, it was intended to test the three hypotheses for the examination between moral norms and the food waste generation behavior between both populations, Portugal and Colombia. In order to test the strengths of the relationship between the constructs in question of the three hypotheses, 6 Pearson correlation analyses and 1 T-test were conducted using Python. However, these parametric tests assumed normality of the sample distribution and as so, normality was tested as well.

An evaluation of the underlying assumptions was performed as it is required for the distribution for all samples to be Gaussian in order to perform parametric tests. (Allua & Thompson, 2009). Hence, the variable moral norms is tested for normality to evaluate if it is correct to assume that it is normally distributed. First, visual assessment is performed by applying a QQ Plot – which is a tool for comparing a set of data's distribution to a normally distributed one (Castillo-Gutiérrez & Aguilera, 2007). From figure 4.5, it can be seen that the distribution of moral norms varies greatly from the normal distribution.

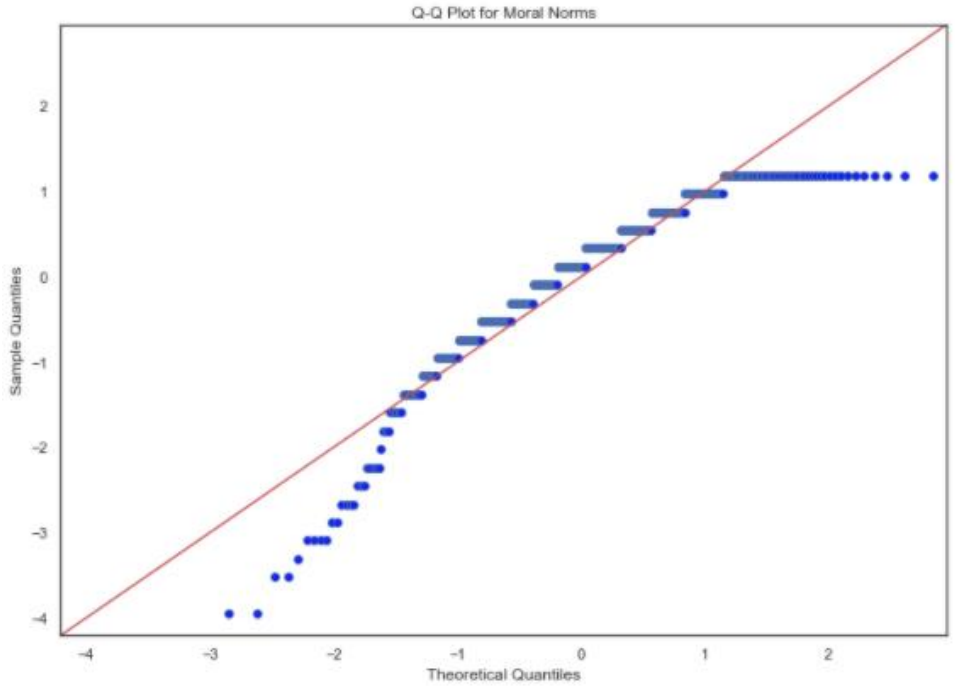

Figure 4.5 – T test for hypothesis evaluating Moral Norms mean differences between populations

Given this, it is necessary to further evaluate distribution using statistical testing on the moral norms feature. For this, a Kolmogorov-Smirnov test is used, as it allows using statistical methods to infer if a sample of observations comes from a normally distributed population (Lilliefors, 1967). For this, a null hypothesis is defined as assuming that the variable moral norms, with mean of 5.60 and standard deviation of 1.16, is normally distributed. Likewise, the alternative hypothesis is formulated as the variable moral norms being not normally distributed. It can be concluded that the Kolmogorov test indicates that moral norms do not follow a normal distribution, p= 1.8601e-06.

The previous results show how the underlying distribution is not normal, and hence, the parametric tests are not completely suitable for evaluating hypotheses in this research. Additionally, the parametric tests used are generally applicable to variables measured in ratio or interval scales (Barnes & Lewin, 2005). Therefore, it is necessary to perform a complementary set of testing in order to guarantee that results are reliable – by applying non-parametric statistical tests. These tests are generally applied to variables in ordinal and nominal scales, and do not make assumptions about the data's distributions (Allua & Thompson, 2009). New tests include Spearman's correlation and Mann Whitney U-rank test, as these are the non-parametric mirrors of Pearson and T test, respectively (Marshall & Jonker, 2011).

For Spearman correlation, the relationship between two variables is examined through the Spearman ranked order correlation coefficient, also referred to as Spearman's rho. Similar to Pearson's r coefficient, this one also varies between –1 and 1, with positive values implying positive correlation and negative values implying that as one variable increases, the other decreases (Barnes & Lewin, 2005). In addition, a p-value is provided in order to test the reliability of the test and evaluate correlation, with p-values below 0.05 indicating that the null hypothesis can be rejected, and hence, correlation exists between the two features.

On the other hand, the Mann-Whitney U Test is used to evaluate the difference of means between two samples without assuming any specific distribution of data (McKnight & Najab, 2010). Its intention is to determine whether the two samples under comparison come from the same population, and as so, its null hypothesis states that there are no differences between their means. In contrast, the alternative hypothesis aims at proving that there are significant differences between the sample's means. For this, a threshold of 0.05 is considered for the p-value, in order to reject the null hypothesis and state that sample means are statistically different.

H1. Moral Norms positively influence consumers` adoption of behaviors and habits that reduce household food waste generation.

This hypothesis is retested with Spearman's correlation. As a result, the correlation between moral norms and adoption of actions for food waste reduction is proven to exist with a p value below the alpha threshold (7.4187e-13 < 0.05). The existing correlation is measured through the rho coefficient, which is calculated at 0.32. This means there is a positive correlation, which according to Cohen (1992) is classified as moderate. It is possible to conclude that 99.99% of the times the increase in moral norms will also increase the likelihood of someone adopting measures to reduce food waste with a rho value of 0.32.

H1a. Moral Norms positively influence consumers` adoption of behaviors and habits that reduce household food waste generation in Colombia

In regard to the hypothesis 1a was found that the correlation of moral norms with the behavior adoption to reduce food waste was proven to exist, at a p value of 2.4393e-13. In accordance to Cohen's scale, the influence of moral norms over the food waste feature is classified as moderate, with a rho coefficient of 0.42. Hence, it is possible to conclude that 99.99% of the times

there will be a positive correlation between moral norms and willingness to adopt actions to reduce waste in Colombian citizens at a scale of 0.42 in rho's coefficient.

H1b. Moral Norms positively influence consumers` adoption of behaviors and habits that reduce household food waste generation in Portugal

Regarding Portugal, the results of the second correlation test showcase how there is also a positive correlation between the moral norms of the Portuguese with their willingness to adopt measures for food waste reduction. This correlation has a magnitude of 0.27 in rho's coefficient and is proven statistically significant with a p value below the threshold (0.0001 < 0.05). Hence, it is concluded that 99.98% of the times there will be positive correlation between these two features, even if the influence of one over the other is classified as weak.

H2. Moral Norms have influence over food waste reduction at household level

Hypothesis 2 is also tested with Spearman's correlation in order to prove and estimate the effect of moral norms over the frequency of food waste disposal in households from both countries (FWG1), aiming at proving how higher moral norms diminish the frequency with which food is wasted. The correlation is negative with a rho coefficient of -0.18, although it is classified as weak according to Cohen's ranges (Cohen, 1992). Also, the test is proven statistically relevant, with a p value below the threshold (8.0004e-5 < 0.05). Therefore, it can be concluded that 99.99% of the times, an increase in moral norms will have a weak effect that reduces food waste frequency, at a magnitude of -0.18.

H2a. Moral Norms have influence over food waste reduction at household level in Colombia

The second test results for hypothesis 2a show how the two aforementioned features have an existing negative correlation in Colombia, with a p-value of 0.0043. However, the magnitude of their influence over the other is weak, with an absolute value of 0.17. With this, it is possible to state that 99.56% of times the moral norms of Colombians will have a small effect in reducing food waste frequency, represented with a rho score of –0.17.

H2b. Moral Norms have influence over food waste reduction at household level in Portugal

The last Spearman correlation test in this study is performed for hypothesis 2b. Similar to results for Colombia, Portugal also showed an existing negative correlation between moral norms and food waste generation frequency. Although weak, it is slightly higher in this population. The rho coefficient for this test was –0.20 and the p value was below threshold, proving statistical significance (0.0057 < 0.05). It is then possible to conclude that 99.42% of times, Portugal citizens will reduce their food wasting frequency in a small proportion when they experience guilt for this behavior, at a magnitude of absolute 0.20.

H3. Moral Norms regarding food-wasting vary among different populations

Finally, the Mann Whitney U Test is applied to the Colombian and Portuguese samples to determine if significant differences in their means can be inferred. With a Mann Whitney U Statistic of 20823 and a p value of 0.0041, it can be seen how there are significant differences between the means. Therefore, the previous conclusion stating how moral norms are statistically higher in Portugal (mean = 5.79) than in Colombia (mean = 5.48) is reinforced (U=20823, p=0.0041). Hence, it is proven that moral norms characterization in Colombia is equivalent to "somewhat agree" in the rating scale while moral norms in Portugal are equivalent to "agree", with means of 5.48 and 5.79 respectively.

4.3. DISCUSSIONS

Even though it is expected for developing countries to experience higher food waste in production stages and developed countries to experience it in consumption stages (Dorward, 2012), no significant differences were found between food waste generation in consumption stages between Colombia and Portugal. In average, both the Colombian and Portuguese frequency of food waste was equivalent to "few times a month" with a mean of 3.19 and 3.30 respectively. However, the share of respondents that do throw away food almost every day is double in Portugal, in line with Gustavsson et. Al. (2011) stating how European countries are part of the regions generating the highest food waste percentage per capita.

It was proven in this study that the relation between Moral Norms and the frequency at which food is wasted in the overall population exists, even though it is a weak influence. Therefore, both governments should develop programs using strategies to tackle the target to reduce food waste, where Moral Norms should be one, and not the only lever in the program. This is important to note as there has been an increase in psychological research tying the effects of psychographic elements with consumer behavior around food waste generation (Graham-Rowe et. al., 2005; Porpino et. al., 2016) This would be highly important for Portugal since there was a slight difference in the results from Portugal showing a higher degree of influence than Colombia – as shown in the inferential results.

Since a large amount of food is wasted due to the lack of consumer awareness and understanding of the social, economic and environmental impact, Colombian and Portuguese government programs should aim at increasing moral norms in their societies as a trigger for food waste reduction. Particularly for Colombia, programs aimed at educating society could help reduce the 15.6% of food waste that is produced at consumption level (DNP, 2016), while higher support for the organizations like ABACO could establish channels to distribute food to citizens that experience food insecurity, where not only households contribute but also producers, distributers and retailers that make up for 70.1% of food loss in the country (Abaco, 2019). On the other hand, Portugal being a developed country should create stronger programs assuming that household food waste is much higher than in developing countries (Parfitt, 2010). The wide network of food recollection agencies, like REFOOD, are a great strategy for reducing the 27% of food waste generated by households (Eurostat, 2006). Furthermore, it is safe to say that both countries have been making great efforts at regulation level, with Portugal's law from October 2020 for food waste reduction in retailers and distributers; and Colombia being pioneer in Latin America for food waste combat policies.

However, the willingness to adopt measures for food waste reduction based on the effect of moral norms in society is not the same between these two countries. For both samples, the effect of moral norms over the willingness to take action was proven to exist, although at a mild level of 0.32 in rho's coefficient. For Colombia, the effect is moderate (rho's coefficient of 0.42) while in Portugal it is mild (rho's coefficient of 0.27), and as so the needed measures differ between a developing country and a developed one. It can be stated that Colombia is in need of better education programs on household planning and portion size estimations (means equivalent to 6 for both features in the rating scale) in comparison to Portugal (means equivalent to 5 for both features). In addition, the Colombian population would also benefit from better food conservation education or better access to food conservation appliances like refrigerators and freezers (mean equivalent to 6 in the rating

scale), while the Portuguese would also experience benefit from it at a lower level (mean equivalent to 5 in rating scale). Finally, and according to consumers' perceptions, food labeling and packaging data regulations should be examined with higher importance in Colombia (means equivalent to 6 for both features), whereas the same needs are not as urgent for Portugal (means equivalent to 5 in rating scale). The overall results for food wasting actions for each country can be seen in table 4.20. On all these initiatives, whether education, regulatory, or access and inclusion, adoption by society can be driven if underlying principles include the development of moral norms in society and its consciousness on the negative effects that food waste has – as it is expected that higher moral norms will create an environment that is more propense to action adoption in both countries.

Actions for Food Waste Reduction	Colombia	Portugal
Best Before Labeling	5.57	5.12
Storage Preparation Data	5.56	5.19
Household Planning	5.93	5.25
Portion Size Estimation	5.96	5.43
Food Conservation	5.85	5.41

Table 4.20 – Differences in means for evaluated actions for food waste reduction.

In line with education needs, food waste can be reduced if food wasting sources are tackled. This is the case for bulk purchases due to promotions, which represented the highest factor influencing food waste behavior in households from the two countries (both means in an equivalent to 3 in the 3-point rating scale). Interestingly, desire for variation was also ranked highly in this evaluation, showing an interesting consumer behavior for both populations – as desire for variation may outstand the guilt felt by food wasting behavior. Consumption miscalculation and duration of food storage can be intertwined with the education programs mentioned previously, as these two sources go hand by hand with the need to perform better household consumption planning and portion size estimation. Interestingly, food that has gone awry, either because of expiration, mold or aspect, represents the lowest perceived source of food waste for both countries. The results for all these food wasting sources are shown in table 4.21.

Actions for Food Waste Reduction	Colombia	Portugal
Bulk purchasing and promotions	2.53	2.73
Desire for variation	2.52	2.74
Consumption miscalculation	2.18	2.41
Duration of food storage	1.84	2.12
Expired food	1.51	1.90
Moldy food	1.27	1.14
Food smell, taste and aspect	1.21	1.13

Table 4.21 – Differences in means for evaluated actions for food waste reduction.

It is important to mention that, according to Misiak et al. (2018), traditional communities that are facing scarcity or difficult situations to acquire food, may have stricter Moral Standards regarding food waste. As mentioned beforehand, this research was performed during a time where a national strike and riots in Colombia were taking place. In line with FAO (2006), it can be stated that Colombia may not have been food secure during the period of data collection as 64 respondents from Colombia (23.8%) confirmed they had experienced food insecurity during the last month prior to the survey. Hence, the perception of the Colombian population may have been affected by the current situation and therefore, the resulted mean for the Moral Norms may have led respondents to feel a higher sense of guilt due to the temporary lack of resources.

Nevertheless, inferential statistics applied in this study allowed understanding how the mean in moral norms from both populations are statistically different. This may be crucial for food waste reduction as it allows governments to understand the psychographic aspect of their citizens and how to use it as a driver for easier adoption of corrective measures that shift current behavior towards a significant reduction in wastage. Colombian mean stands at an average of 5.48 and the Portuguese mean at an average of 5.79. In order to increase moral norms, both populations should focus on creating awareness regarding citizens who do not have food security, as the most influential component of the moral norms construct for both countries was the fact of feeling guilt for people who do not have enough food. However, in reality all components of the moral norms construct proved to be relevant, including experiencing bad conscience when disposing food and feeling guilt about the environment.

Regarding the environment, it is important to note how, according to Rivera et. al. (2014), tackling food waste is the most important factor for reduction of environmental impact of food. Hence, addressing moral norms as an antecedent of food waste reduction is relevant for governmental policies, as it not only impacts economic aspects but also social and environmental – making it clear how society benefits from reduction of food waste impact.

Possible governmental solutions to the food waste issue can be discussed and detected. On one side, it is important for Colombia and Portugal to adhere to existing worldwide programs which encapsulate efforts at multiple levels. By participating in the United Nations food waste reduction program, Portugal and Colombia may execute global initiatives at a local level, gaining traction in awareness and openness from their citizens to engage their intention and habits. Another important aspect is to increase support for food banks, both legally and economically, as these organizations have proved to be important at taking action for food waste reduction. In this aspect, Colombia could gain a lot of context by using the Portuguese model as reference, given that Portugal has a wider network of 19 food banks with a developed and organized infrastructure covering nationwide territory. Finally, both countries can implement models such as PAYT where citizens are motivated to reduce their household food waste by obtaining tax subsidies or monetary penalties. These solutions need to be persistent, as only through frequency and repetition is that intention becomes habit, and habit becomes real and automatic action (Verplanken, 2003). Furthermore, the moral norms guiding behavior in food waste reduction should become part of these countries' culture, as cultural influence is an antecedent of forming individual behavior (Menzel & D'Aluisio, 2008). Moreover, long-term results will only be obtained if consumer from younger age incorporate the principles of food waste reduction at early stages, as consumers' surroundings significantly shape behavior (Hazuchová, 2020). Lastly, the food waste reduction culture in the long-term needs to be nurtured by

awareness campaigns that induce feelings of guilt in society by appealing to their moral norms, as was stated by Qi and Roe (2016).

It is important to also consider the differences in consumer behavior from each country. On one side, table 4.22 shows how consumers from Colombia who dispose less food also have the highest moral norms. This is also congruent with the intention that these consumers have for taking action and recognizing needs for food waste reduction, as these consumers also have the highest scores for evaluated solutions. Similarly, and as noted by Parizeau (2015), the Colombian consumers who waste food almost every day have the lowest score for moral norms and also showcased lower scores in almost all evaluated solutions. It is interesting to note that these consumers also scored highest in food conservation needs, which may be caused by socio-economic distress. This matches cooking at home frequency, where the large majority of the sample mentioned cooking at home almost every day.

Food waste Frequency	Moral Norms	Best Before Labeling	Storage Preparation Data	Household Planning	Portion Size Estimation	Food Conservation
1 - Never	5.88	6.00	6.11	6.06	6.22	6.28
2 - Once in a couple of months or less	5.73	5.74	5.71	5.86	6.00	5.97
3 - Few times a month	5.43	5.67	5.51	6.04	5.92	5.79
4 - Once a week	5.17	5.04	5.19	5.90	5.94	5.69
5 - Few times a week	5.53	5.69	5.69	5.74	5.92	5.74
6 - Almost everyday	5.04	4.57	5.29	5.71	5.71	6.29

Table 4.22 – Comparison of food waste reduction frequencies versus actions for food waste reduction and moral norms in Colombia

For Portugal, consumer behavior also showed how consumers with the highest moral norms are the ones who claim to never dispose food. However, Portuguese citizens with food disposal almost every day do not necessarily have the lowest scores for evaluated solutions – as household planning, storage and preparation data, and labeling are much more relevant for these consumers than their Colombian counterparts. From Schiffman (2004), it can be assumed that the attitude that the Portuguese people have towards food waste is different than the Colombian citizens, since attitudes reflect the opinions towards elements in their environment, including food waste reduction solutions. It is an important factor for the Portuguese government to consider, as it portrays a great advantage in comparison to undeveloped countries. These results are shown in table 4.23.

Food waste Frequency	Moral Norms	Best Before Labeling	Storage Preparation Data	Household Planning	Portion Size Estimation	Food Conservation
1 - Never	6.25	5.40	5.00	5.80	5.80	6.00
2 - Once in a couple of months or less	5.99	5.35	5.26	5.17	5.48	5.74
3 - Few times a month	5.87	4.87	5.03	5.21	5.21	5.19
4 - Once a week	5.45	5.31	5.58	5.19	5.38	5.31
5 - Few times a week	5.71	5.04	5.07	5.18	6.00	5.46
6 - Almost everyday	5.35	5.40	5.30	5.90	5.00	5.20

Table 4.23 –Comparison of food waste reduction frequencies versus actions for food waste reduction and moral norms in Portugal

5. CONCLUSIONS

Global concerns exist around food security and its direct influence on economic, environmental, and social challenges. Therefore, to achieve the Sustainable Developing Goal from the UN of reducing food waste by 50 percent by 2030, consumers must play an important part of the strategies and any successful plan, whether by directly modifying their food waste habits at household level or by influencing other participants along the food supply chain to minimize food waste. This study examined the influence of Moral Norms over the perception and behavior of consumers to generate food waste in their households considering two populations: Portugal and Colombia as case studies. Governments must acknowledge the necessity to establish proper measures as well as coherent action plans to tackle food waste solutions according to each stage of the Food Supply Chain, without losing the fact that the consumption part of FSC accounts for a representative portion of food losses and waste. Therefore, household's awareness and education of the quantity of food wasted and best practices should receive significant attention to tackle this matter.

It was proven in the results of this study that there is a relationship between Moral Norms and food waste frequency in Portuguese and Colombian households. Even though the correlation was small in all cases, it provides an important insight for governments and policy makers to develop and mobilize strategies at consumption level by influencing consumer perception about the importance of food waste reduction through allusions to guilt. Consequently, a set of psychographic antecedents is needed to achieve adoption of food waste reduction behaviors, where moral norms is one among numerous levers that will allow governments to generate solutions that bypass the citizens' intention to reduce food waste and lead them to take concrete action.

Secondly, the influence of moral norms over the willingness to adopt measures for food waste reduction was tested and proven to exist. Interestingly, the influence of moral norms over this intention is classified as moderate in Colombia, while it is considered weak in Portugal. In line with this, Colombian citizens also showcased higher openness on evaluated solutions, where regulatory, educational and social programs will be needed for stimulating the adoption of aforementioned programs and their intended behaviors. It is also important to note how measures do not necessarily need to be generic, as the needs of each society proved to have small but important differences on evaluated actions.

Lastly, moral norms revolving around food waste behavior were evaluated for both countries in this case study – proving how moral norms in Portugal are higher than in Colombia. Regardless of this difference, moral norms are high for both countries and evidence how both societies experience guilt when wasting food. Despite this, research found how independent of individuals feeling guilt, consumers' intention to not reduce waste is diminished when exposed to preferences and externalities. Hence, governmental efforts need to be continuous and consistent in order to achieve long-term results for the UN's Sustainable Developing Goal, especially in cases of developing countries, like Colombia, where moral norms tend to be lower than in developed countries.

6. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The present study encountered a series of limitations that open opportunities for future research. Firstly, future studies are encouraged to assess food waste by using a combination of qualitative and quantitative research that compares consumers' perceptions of food waste generation with the actual amount of food disposed of in their households. As a result, the social desirability bias is avoided, in which respondents are more likely to report on what they believe than in what in reality was wasted (Williams H., 2012). This will help develop a better estimation using ratio and interval variables instead of ordinal measurements.

On the same topic, when ordinal measurements cannot be avoided, it is recommended for future studies to use rating scales of 5-point or above, as a small set of questions in this study were constructed based on existing literature with 3-point rating scales that reduced the possibility to find more reliable insights through a wider range of responses.

Another important limitation for future researchers is that this study is correlational and not causal, therefore it cannot be confirmed for sure that Moral Norms causes less Food Waste and Loss. Although these two variables are related, there might be a third variable that causes both well and it has not been taking into the account within the present research.

Another limitation of this research was discussed in the methodology, stating how the data presented a bias towards the Colombian sample as from the total, 60% of the sample contains records from this country. For future research, it is recommended to use sampling methods and incentives that allow acquiring a more balanced dataset between countries being compared.

Furthermore, future researchers are motivated to conduct research where social, political, or economic issues affecting consumption behavior and perception from respondents can be controlled, as this study coincided both with the Covid19 pandemic period and the 2021 Colombian strikes. In line with findings from previous literature, a construct like moral norms has a degree of volatility when food scarcity is present and food security is not guaranteed.

Finally, it is recommended for future researchers to understand the limitations existing around information access. Reliable and updated data require investment from governments and public organizations, which in many cases results in outdated information or with limited access.

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8. APPENDIX

Block	Questions and Statements	Abbreviated name	Scale
Moral Norms	Wasting food would make me feel guilty about people who do not have enough food	MN1	7-points Likert scale
	Wasting food would make me feel guilty about the environment	MN2	7-points Likert scale
	Wasting food would give me a bad conscience	MN3	
	I consider food-wasting behavior is immoral	MN4	7-points Likert scale
Grocery and Shopping Behavior	How often do you usually purchase food or groceries?	SB1	Almost everyday/Two times per week/Once a week/Every three weeks or more/ Never or Rarely
	How often do you use a shopping list?	SB2	
Food Waste Generation	How often do you throw food away at home? (whether it is raw, prepared, vegetables & fruits, or food you ordered from delivery-takeout)	FWG1	Almost everyday /Two times per week/Once a week
	Which are the main factors that influence you to throw away food within your household? Please indicate the extent of influence.	FWG2	3-points Likert scale
	Food expired (label)/Food has mould/Food has bad smell, taste or aspect/Food stored in the fridge or cabinet for too long/Bulked purchasing due to promotions/My consumption was miscalculated during shopping groceries/I prefer not eating the same food so often	FWG2	3-points Likert scale
	Having better and clearer information on interpreting and reading "best before" or "best by" dates would help me waste less food	FWG7	7-points Likert scale
	Having better and clearer information regarding storage and preparation on food product labels would help me waste less food	FWG7	7-points Likert scale
	Having better shopping planning by your household would help me waste less food	FWG7	7-points Likert scale
	Having better estimation of portion sizes (how much food is prepared/ordered) would help me waste less food	FWG7	7-points Likert scale
	Using the freezer to conserve food longer would help me waste less food	FWG7	7-points Likert scale
	From all the food waste that is generated within your household, where would you say the majority of it comes	FWG8	7-points Likert scale
	Delivery or Takeaway - Home-Cooked food - Homegrown	FWG8	7-points Likert scale
Sociodemographics	In which country do you reside?	SD1	
	How many people compose your household? (Number of elements, including yourself)	SD2	
	What is your household composition (members)?	SD3	
	What is your highest academic qualification?	SD4	
	What is your field of education or background?	SD5	
	What is your age? (Please only indicate a number)	SD6	
	Frequency of cooking lunch or dinner at home within a regular week	SD7	
	Have you experienced food insecurity or food scarcity during the last month?	FI	

Table 8.1 – Questionnaire English version