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Understanding Food Waste Behavior and Ways To Influence Positive Change and Waste Reduction

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UNDERSTANDING FOOD WASTE BEHAVIOR AND WAYS TO INFLUENCE POSITIVE CHANGE AND WASTE REDUCTION

by

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ABSTRACT

Environmental problems such as pollution, climate change, and food waste can be influenced by social attitudes and human behavior. Solutions to address environmental problems involve a series of actions by society and individuals, which can prove difficult to implement because changes induced by pro-environmental behavior often cannot be seen immediately by individuals or may not generate appreciable, direct benefits. The purposes of the quantitative correlational study are threefold: first, examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct. Ajzen's theory of planned behavior (TPB) provided the theoretical framework. Data were collected from a stratified sample of 200 individuals with at least three household members responsible for food purchases. Household size, educational attainment, and race/ethnicity were significant predictors of behavioral intent to reduce food waste. For behavioral intent (TPB total score) to reduce food waste, household size was negatively correlated, and only Whites were positively correlated; taken together household size (9.7%) and race-White (2.9%) accounted for 12.1% of the variation in TPB total score. Household size (5.5%) and high school education (2.5%) together accounted for 8.9% of the variation in behavioral intent to reduce food waste. Finally, annual household income over $162,000 (12.7%), age (12.2%), Asian-race (3.3%), and gender-female (0.9%) for a total

explained variation in food waste percentage of 29.3%. Taken together with household income, findings suggested younger, wealthier households with children were most likely to waste food. For this final model, the explained variation in food waste percentage accounted for by demographic variables was substantially higher than all other dependent variables by more than a factor of two. Recommendations to reduce consumer food waste interventions focused on school-based interventions, socio-demographic-based public service messaging.

Keywords: Consumer food waste, theory of planned behavior, school-based interventions, demographic factors in food waste, environmental concerns

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CHAPTER 1: INTRODUCTION

Approximately 40% of the postharvest food supply in the United States is wasted at an annual cost of $165 billion (Neff et al., 2015). Consumer food waste is an enormous avoidable misuse of limited planetary resources and diminishes sustainability (Neff et al., 2015). Wasted food in North America accounts for an estimated 20% to 35% of all freshwater consumption, 7% to 31% of cropland used for food production, up to 30% of all phosphate fertilizer used, and is the single largest component of municipal solid waste (Conrad et al., 2018; Hebrok & Heidenstrom, 2019). Research on reducing consumer food waste offers a variety of solutions to address the problem, including raising individual awareness, quantifying food waste, and explaining practices that drive waste (Porpino, 2016). Interventions aimed at increasing individual awareness address some but not all the complex factors that cause food waste. For example, raising awareness does not effectively change purchasing and consumption processes in practice. The study examined food waste through a behavioral lens using the theory of planned behavior (TPB) to provide a theoretical framework to understand factors that influence behavioral intent to reduce food waste (Ajzen, 1991).

Background, Context, and Theoretical Framework

Consumer food waste behavior derives from complex, sometimes conflicting motivations (Quested et al., 2013). An important consideration for understanding waste is evaluating it through a behavioral economics lens. Evans (2012) found causes for food waste are not readily amenable to rational and deliberate models of intervention that policymakers and campaigners are currently deploying. Instead, everyday purchasing and consumption practices are motivated by a variety of influences such as convenience,

habitual behavior, diet and health concerns, perceived value for money, hedonism/lifestyle, and social responsibility perceived through subjective norms (Vermeir & Verbeke, 2006). These norms, beliefs, habits, and motivations are formed over a lifetime of experience and play a prominent role in the management of food waste.

A quantitative study by Neff et al. (2015) used a nationally representative sample of 1,010 individuals revealed environmental awareness ranked last among 10 choices, with only 10% ranking it as important. Explanations for the lack of concern for the significant environmental impact of food waste included (a) a lack of knowledge, (b) denial or a desire to avoid thinking about the environmental consequences, and (c) little personal utility from an altruistic environmental behavior (Neff et al., 2015). Although Neff et al. relied on self-report data, which is often unreliable, the study was stratified to reflect the U.S. by gender, ethnicity, age, and income.

Prosocial and pro-environmental attitudes significantly predicted lower food behavior (Qi & Roe, 2016). Qi and Roe (2016) conducted a quantitative explanatory study using an online survey supplemented by phones calls. Multivariate regression analysis and factor analysis related awareness, attitudes, and opinions to food waste behavior for 100 individuals chosen to represent the U.S. population based on age, gender, education, race, and income. Multivariate regression analysis revealed a significant ($p = .02$) positive association between household income and disposing of uneaten food to capture the perceived personal benefits of a lower probability of foodborne illness, and to improve freshness and taste. This finding suggested food waste is perceived as a luxury item that outweighs the social costs for higher-income

households. Food waste reduction was perceived as prosocial by over 50% of respondents and pro-environmental by more than 40% of respondents (Qi & Roe, 2016).

Researchers have suggested consumer knowledge and awareness of how food waste impacts the environment may reduce household-level food waste (Porpino, 2016; Stancu et al., 2016). In addition, researchers found Americans have low levels of environmental knowledge (with considerable variation across topics) and, despite reported concerns about the environment, their levels of action are low (Abdelradi, 2018; Barone et al., 2019). Taken together, knowledge and concern are commonly found to be important, but insufficient predictors of behavioral change concerning sustainability (Qi & Roe, 2016).

In summary, food waste involves complex, often conflicting, human behavior and is not particularly amenable to rational models of intervention for policymakers and activists. Several scholarly researchers suggested that concerns over pollution, climate change, and sustainability influence behavioral intent to waste food (Barone et al., 2019; Neff et al., 2015; Watson & Meah, 2012). Competing needs of convenience, subjective norms, and private benefits made societal cost of food waste a minor consideration. Subjective norms regarding being a good provider were more important than cost-saving or environmental sustainability (Barone et al., 2019; Watson & Meah, 2012). Neff et al. (2015) suggested low awareness of the impact of food waste on environmental sustainability contributed to the low proportion of participants reporting an environmental concern.

Problem Statement

Consumer food waste reduction in the United States is both a moral and global sustainability imperative (Mariam et al., 2020). Driving the urgency of this moral dilemma are two converging global concerns: the economics of food production and the environmental impact of disposal (Conrad et al., 2018). U.S. consumers waste approximately 20% of all food purchased annually, or 245 pounds per person (Conrad et al., 2018), which absorbs environmental resources and diminishes sustainability (Barone et al., 2019). For example, organic matter from food waste generates an estimated 6% of all U.S. greenhouse gas emissions and fuels 16% of methane emissions in landfills (Poore & Nemecek, 2018). Importantly, methane has 25 times the effect on global temperature increases as carbon dioxide (Lashof & Ahuja, 1990).

Purposes of the Study

The purposes of the quantitative correlational study were threefold: first, examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct. As such, the study aims to identify those demographic factors with the most potential to impact pro-environmental individual behavior as a first

step toward developing interventions to reduce consumer food waste individual behavior and to increase sustainability.

Research Questions

RQ1: What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents?

RQ2: To what extent, if any, can variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control) be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity**?**

RQ3: To what extent, if any, can variation in (a) overall behavioral intent (Total TPB survey score) to reduce household consumer food waste, (b) next 30-day behavioral intent to reduce food waste, and (c) food waste percentage be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

Rationale, Relevance, and Significance of the Study

Rationale for a Quantitative Methodology

A quantitative methodology was used to examine the relationships among environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste. Quantitative studies are appropriate for research with well-defined variables, empirical data, valid and reliable data collection instruments, and inferential statistics to examine relationships to a degree of scientific certainty (Leedy et al., 2019). Quantitative methods involve systematic procedures for data collection and analysis that yield repeatable and generalizable results

(Vinson, 2019). Quantitative methods enable hypothesis formation and testing using empirical data. Based on the desire to add to the empirical body of knowledge on household food waste reduction, a quantitative methodology was an appropriate choice.

Significance and Goals of the Study

Consumer food waste behavior is complex and often the result of conflicting family, individual, and social motivations (Barone et al., 2019; Quested et al., 2013). Scholarly studies on consumer food waste focused primarily on role conflict, morality, and food safety risk (Evans, 2012). Role conflict is derived from an individuals' need to be perceived as a good provider of a healthy and safe diet and the need to spend within the family budget, and societal norms (Neff et al., 2015). Societal norms include providing healthy and nutritious meals, and more recently environmental sustainability (Barone et al., 2019). Neff et al. (2015) suggested low awareness of the impact of food waste on environmental sustainability contributed to the low environmental concern.

This study advanced knowledge on the antecedents of household food waste behavior as described by the theory of planned behavior (Ajzen, 1991). This study aims to refine more specifically whether environmental attitudes, subjective norms, perceived behavioral control, and behavioral intent influence behavior to reduce household consumer food waste. Study findings may inform decision-making processes for public policy makers, food producers, grocery store staff, and individuals making daily decisions regarding food waste and environmental sustainability.

Theoretical and Conceptual Bases of the Study

A quantitative correlational study was employed using the TPB as a framework to address three research questions (Ajzen, 1991). Two studies informed the methodology,

research design, and survey instrument for data collection; the first is the Macovei (2015) study on pro-environmental behavior, and the second is the Ting et al. (2019) study on environmental consciousness. Macovei employed constructs from Ajzen's TPB (i.e., environmental attitude, subjective norms, and perceived behavioral control) to explain the change in energy conservation behavior. Macovei found a strong positive correlation between perceived behavioral control, subjective norms, and attitude and reduced energy consumption.

Ting et al. (2019) conducted a quantitative causal study on a sample of 425 hotel guests to examine the relationships between environmental attitude, subjective norms, perceived behavioral control, and behavioral intent to adopt green practices. Findings indicated a moderate positive correlation between environmental attitude, subjective norms, perceived behavioral control, and behavioral intent for the hotel guests to adopt green practices. By drawing on both studies, data collection was accomplished by adapting the 10-item Ting et al. survey based on the TPB to measure green consumer behavior. The dependent variables are environmental attitude (EA), subjective norms (SN), perceived behavioral control (PBC), overall behavioral intent, next 30-day behavioral, and actual food waste percentage. This study extended the research by Macovei (2015) and Ting et al. to include a principal element of sustainability, food waste behavior.

Definitions of Terms

Behavioral Intent

Behavioral intent refers to environmental attitudes, subjective norms, and perceived behavioral control that influences a given behavior wherein the stronger the intent the more likely the behavior is manifest (Ajzen, 1991).

Environmental Attitude

Environmental attitude refers to the degree to which a person has a favorable or unfavorable evaluation of reducing food waste behaviors (Schanes et al., 2018).

Household Consumer Food Waste

Household consumer food waste refers to uneaten human foods left to spoil and edible portions of foods that are discarded (Bernstad, 2014).

Perceived Behavioral Control

Perceived behavioral control refers to the extent one believes a behavioral change can create an expected benefit, and an estimate of the difficulty to perform the behavior of interest (Ajzen, 1991).

Subjective Norms

Subjective norms refer to an individual's beliefs about whether peers and people of importance approve of a particular behavior based on a desire to conform with social expectations (Ajzen, 1991).

Assumptions, Limitations, Delimitations

Food waste studies, in general, rely on self-reported information, which has proven to be often unreliable (Leedy et al., 2019). As participants often have strong intentions to reduce waste, this could lead to response and desirability bias in the results.

Respondents underreport food waste levels and over-report their efforts to reduce waste (Neff et al., 2015). There is no consistent measurement of food waste and reporting and tracking it can become tedious. This study data collection relied on self-reported data for responses to the TPB survey.

Summary and Organization of the Remainder of the Study

U.S. consumer food waste is an avoidable misuse of limited planetary resources, costs $165 billion annually, and diminishes sustainability (Neff et al., 2015). Wasted food consumes 20% to 35% of available freshwater, up to 31% of cropland used for food production, up to 30% of all phosphate fertilizer used, and contributes to municipal solid waste (Conrad et al., 2018; Hebrok & Heidenstrom, 2019). The purposes of the quantitative correlational study were threefold: first, examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct. A quantitative correlational approach was used, using the theory of planned behavior as a framework to advance knowledge regarding factors that form the intent to reduce consumer food waste.

The remainder of this study is organized by chapters. Chapter 2 describes the TPB and how behavioral intent is formed to address household food waste. Food waste

literature is summarized and synthesized to describe the phenomenon of food waste and identify a gap in the literature for the study. Chapter 3 details methodological and design elements, population and sampling, data collection and analysis, and ethical considerations. The TPB survey instrument's validity and reliability are discussed. Chapter 4 will analyze the data from the study. Chapter 5 will provide a summary of the conclusions and recommendations.

CHAPTER 2: LITERATURE REVIEW

The literature review is divided into three major sections. The first major section describes the theoretical framework developed by Ajzen (1991) entitled the theory of planned behavior (TPB). The second section synthesizes *Food Waste Research* by causes and interventions:

Food Waste Research

- Causes of Consumer Food Waste Behavior
  - Sociodemographic Factors
  - Role Conflict
  - Moral Concerns
  - Religion
  - Food Safety Risk
- Consumer Food Waste Interventions
  - Food Waste Awareness
  - Direct Behavioral Interventions
  - Food Sharing
  - Prompts

Several key insights were derived from a review of scholarly research on U.S. food waste. First, Neff et al. (2015) found low awareness of the impact of food waste on environmental sustainability significantly contributed to food waste behavior in the United States. Neff et al. confirmed earlier research by Farr-Wharton et al. (2014) who concluded environmental concerns ranked last in the conscious concerns for Americans. Second, there was a gap in research regarding how individuals form behavioral intent to

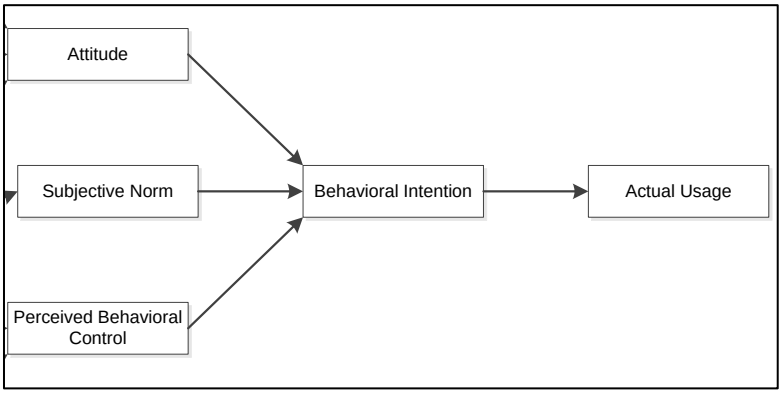
waste food as a guide for creating interventions (Stockli et al., 2018a). Third, the few studies addressing consumer food waste behavior concluded that it is driven by complex, often conflicting motivation (Quested et al., 2013).

Theoretical Framework

The research behind the TPB posited behavioral intent is a function of individuals' attitudes, subjective norms, and perceived behavioral control. As depicted in Figure 1, the TPB is based on the following constructs: environmental attitude (EA), subjective norms (SN), and perceived behavioral control (PBC; Ajzen, 1991). According to the research behind TPB, individuals form behavioral intent by engaging in conscious behaviors prior to action (Ajzen, 1991). Ajzen (1991) posited behavioral intent is influenced by perceptions the behavior has the expected outcome based on an evaluation of risks and benefits. The TPB predicted food waste reduction behavior was related to the perspectives of both household cost reduction and social benefits of improved sustainability (Bandura, 1977). There are social benefits of not wasting resources to produce wasted food and an environmental benefit to avoid food being sent to landfills.

Figure 1

Diagram of Theory of Planned Behavior



Attitude involves the degree to which a person has a favorable or unfavorable evaluation of reducing food waste behaviors (Ajzen, 1991). It entails consideration of the outcomes of performing behaviors. Attitude includes opinions one has about their behavior. Consumers make decisions by conducting cost-benefit analyses and selecting courses of action that maximize expected net benefits. Factors such as attitude formation, relative advantage, complexity, and compatibility influence attitudes (Eagly & Chaiken, 1993). Attitudes are developed by past experiences and beliefs. Associating certain attributes, objects, or events with the activity forms the approach to the activity. If favorable consequences are associated with past experiences, the action is viewed as favorable. If negative consequences are experienced, it is viewed as unfavorable (Ajzen, 1991).

Subjective norms refer to an individual's beliefs of others' perceptions and a desire to conform (Ajzen, 1991). Relationships with others exert considerable influence over behavioral change. Issues considered important to others, whether personal or professional, affect attitudes and behavioral intent through subjective norms (Eagly &

Chaiken, 1993). Subjective norms are a critical factor for changes in food waste behavior; food practices are based on decision-making processes that engage consumers through their desires and needs and perceived social responsibility (Farr-Wharton et al., 2014). Understanding and addressing subjective norms in communities is necessary to create strategies and tactics to adjust attitudes and promote behavioral change.

Perceived behavioral control refers to the extent one believes a behavioral change can create an expected benefit (Ajzen, 1991). Perceived behavioral control refers to an individual estimate of the difficulty to perform the behavior of interest (Ajzen, 1991). Perceived behavioral control consists of self-efficacy belief, which is the degree of confidence a person possesses in the face of obstacles and barriers (Ajzen, 1991). Simply put, it is the self-confidence in a person's ability to change. Perceived external barriers are those external factors, which may not allow a person to reach a goal. Increased self-efficacy improves motivation to initiate behavioral change, and to the extent, perceived controls are realistic, and may predict the probability of a successful behavioral attempt (Ajzen, 1991). Perceived behavioral control can also be affected by the value to which learning PBC affects the user's personal life and their ability to leverage that skill set. A limitation of PBC is it considers whether a user believes they can perform the task rather than the user's capability. Perceived behavioral control may not be realistic when a person has little information on the behavior or when requirements or resources have changed (Ajzen, 1991).

Review of the Literature

Food Waste Research

Causes of Consumer Food Waste Behavior

In the Neff et al. (2015) study, the most important motivations for food waste reduction were budgetary concerns, social and environmental impact. This study surveyed 1,010 participants who were structured to match the U.S. demographically. Neff et al. suggested low awareness of the impact of food waste on environmental sustainability contributed to the low proportion of participants reporting an environmental concern. Given the large representative sample of the Neff et al. study, it gives more weight to the findings. The findings also confirmed the earlier research of Farr-Wharton et al. (2014), in that environmental concerns ranked last, with just over 10% of respondents rating them as especially important. Consumers are bothered by wasted food; they are aware of the cost-benefit, but the environmental impact is not clearly understood.

Qi and Roe (2016) identified guilt as playing a critical role in self-regulation and a key function to motivate behaviors consistent with perceived standards. Neff et al. (2015) noted 60% of their sample agreed they should reduce waste, expressing guilt as a motivating factor. The Qi and Roe along with Neff et al. studies are two of the largest and most widely cited studies on food waste behavior, and both confirmed the impact of guilt on food waste behaviors. Consumers experience a moral struggle when they waste food. A pathway to reduce food waste could begin with awareness combined with the guilt associated with compromising a moral norm because positive awareness alone may not be sufficient in creating meaningful change in behavior.

Barone et al. (2019) examined the relationship between an individual's value system and food waste behavior to develop interventions to reduce food waste. Using the TPB, researchers examined three potentially conflicting food goals: (a) being a good provider, (b) concerns over health risks, and (c) a healthy diet. The researchers hypothesized food waste behavior was driven by goal conflicts. Findings indicated limiting food waste can conflict with norms of hospitality, being seen as a good provider, or the part food plays in holiday or personal celebrations. Subjective norms were reported in the Barone et al. (2019) study as more important than less tangible benefits of cost-saving or environmental sustainability.

Normative beliefs of consumers, developed throughout their lifetimes, form the basis for judgments about whether food is acceptable to eat. Beliefs break down into the following major categories: (a) institutional knowledge and (b) embodied habits. Medical experts, nutritional guidelines, and explicit rules such as date labels, written guidelines, media, or government organizations, provide institutional knowledge. Embodied habits consist of sensory evaluations such as seeing, smelling, tasting, and previous experiences (Gram-Hanssen, 2011). The contrast between food safety and sensory appeal is interesting as it is a perfect example of the clash between institutional knowledge and embodied habits.

Principato et al. (2021) observed that household size was almost perfectly correlated with the number of children, one can assume that behavioral intent to reduce food waste decreases as the number of children in the household increases. Principato et al. (2021) suggested that the effect may be a function of children tending to be finicky eaters resulting in more wasted food. The knowledge that children were associated with

food waste suggests that interventions might be aimed at raising children's awareness of the impact of their food waste behavior on the environment.

In an experimental study of 292 student and parent dyads, Lawson et al. (2019) found that school-based environmental education programs effectively raised the climate change concerns of their parents. The authors suggested that children's beliefs were able to "inspire adults towards higher levels of climate concern" (p. 458). Trans-generational knowledge transfer from children to parents was effective at changing parents' perceptions regarding environmental issues. Findings suggested that daughters were especially effective at influencing parents' opinions. Results suggest that intergenerational learning may overcome barriers to increasing climate change awareness, increase the level of concern, and inspire action.

One area of confusion consistently identified in the literature is date codes, especially on dairy products (Wilson et al., 2017). Limited understanding of "sell by" and "use by" date labels on food packages contributes to food waste. Date code expiration adds confusion, uncertainty, and fear among consumers. It is a trigger for consumers who perceive food as inferior or even dangerous. There are legitimate health risks for spoiled food, particularly for young children with underdeveloped immune systems and people over age 65 who may experience age-related declines in sensory function. Consumers can challenge the date code system with embodied knowledge (e.g., sight, smell, taste).

Challenging the date code system can create confusion and tension between systems that lead to waste due to uncertainty. The literature referred to this tension; consumers are confused by the different labeling systems (Hebrok & Heidenstrom, 2019). More than two thirds of respondents (69%) agreed that "sell by" and "use by"

dates on food packing are poor indicators for food illness threats (Qi & Roe, 2016). This also highlighted normative beliefs consumers form over a lifetime of experience. To some, once the date code reaches expiration, the product is unsafe, while others apply practical sensory examination and may form a different conclusion. Although researchers have pointed out date labeling causes waste, public policy is just slowly addressing this issue. To notify consumers exactly when fresh produce has gone bad, innovators are developing sensors that indicate product freshness to stop food from being prematurely discarded (National Academies of Sciences, Engineering, and Medicine, 2020).

In summary, consumer food waste behavior is driven by complex and often conflicting motivations (Quested et al., 2013). Evans (2012) suggested food waste behavior was not particularly amenable to rational models of intervention for policymakers and activists. Scholarly research on consumer food waste focused primarily on role conflict, morality, and food safety risk (Evans, 2012). Role conflict is derived from an individuals' need to be perceived as a good provider of a healthy and safe diet and the need to minimize cost while sustaining the environment. The researchers hypothesized food waste behavior results from individuals experiencing goal conflicts. Subjective norms regarding being a good provider were substantially more important than cost-saving or environmental sustainability (Barone et al., 2019; Watson & Meah, 2012). Neff et al. (2015) suggested low awareness of the impact of food waste on environmental sustainability contributed to the low proportion of participants reporting an environmental concern. Findings confirmed Farr-Wharton et al.'s (2014) study in that environmental concerns ranked low relative to other motivations to reduce food waste. Reducing food risk was related to role conflict, particularly regarding leftovers or foods

that passed expiration dates (Watson & Meah, 2012). Food poisoning was the primary concern for discarding less than fresh food (Qi & Roe, 2016).

Sociodemographic Factors

Qi and Roe (2016) conducted a quantitative explanatory study using an online survey supplemented by phones calls. Multivariate regression analysis and factor analysis related awareness, attitudes, and opinions to food waste behavior for 100 individuals chosen to represent the U.S. population based on age, gender, education, race, and income. Multivariate regression analysis revealed a significant (p = .02) positive association between household income and disposing of uneaten food to capture the perceived personal benefits of a lower probability of foodborne illness, and to improve freshness and taste. This finding suggested food waste is perceived as a luxury item that outweighs social costs for higher-income households.

Grasso et al. (2019) investigated sociodemographic predictors of food waste behavior among consumers in two European countries: Denmark (n = 1,518) and Spain (n = 1,511). Associations between food waste behavior and age, sex, educational attainment, marital status, employment, and household size were examined. Structural equation modeling based on confirmatory factor analysis divided activities into two categories: shopping routines and food preparation. Findings indicated that those being older, unemployed, and working part-time wasted less food in both countries. In Denmark, being male was associated with wasting more food. Living in a household with four or more people was associated with less food waste behavior (Grasso et al., 2019). These results suggest a modest predictive value for sociodemographic characteristics for food waste behavior in Europe.

Elimelech et al. (2019) surveyed 169 households in Israel to examine sociodemographic drivers of reported and measured food waste. The authors found that sociodemographic factors affecting self-reported and measured food wastage were not necessarily the same. Household size affects only measured food wastage. Source separation behavior negatively affects self-reported and measured food wastage, while environmental attitudes have a negative effect only on self-reports.

Role Conflict

Barone et al. (2019) examined the relationship between an individual's value system and food waste behavior to develop interventions to reduce food waste. Using the theory of planned behavior, researchers examined three potentially conflicting food goals: (a) being a good provider, (b) concerns over health risks, and (c) a healthy diet. The researchers hypothesized that food waste behavior was driven by goal conflicts. Findings indicated limiting food waste can conflict with hospitality, being seen as a good provider, or the part food plays in holiday or personal celebrations. Social norms were reported in Barone et al.'s (2019) study as more important than less tangible benefits of cost-saving or environmental sustainability. The study was conducted in Italy with a sample of 172 adult consumers. The researchers concluded that being a good provider, having a healthy diet, concerns over health risks, and buying larger packages to save money, were the key factors that conflicted with the goals of reducing food waste.

Moral Concerns

Qi and Roe (2016) discussed the moral dilemmas of food waste. The act of wasting food is bothersome in that it challenges important consumer values such as wasting money, moral tenets, environmental concerns, and religious beliefs. They

suggested that food waste involved tradeoffs between values and established behaviors. Qi and Roe found that three quarters of respondents expressed feeling guilt when throwing away food. Qi and Roe's (2016) and Neff et al.'s (2015) studies are two of the most widely cited studies relative to food waste behavior. Both studies frame the behavioral aspects and motivations around food waste. However, neither study took the extra step of identifying how to motivate consumers to change behavior.

Neff et al. (2015) conducted a quantitative study of attitudes on food waste with a sample of consumers reflecting the U.S. population for age, income, ethnicity, and gender. The survey was administered to a nationally representative panel of 1,010 participants. Study findings indicated 52% of respondents reported discarding food bothered them, and 9% said it did not bother them at all. In Neff et al.'s (2015) study the most important motivations for food waste reduction were financial and being a good role model, with 22% of participants reporting the environmental impact of food waste was a concern. Neff et al. (2015) suggested that low awareness of the impact of food waste on environmental sustainability contributed to the relatively low proportion of participants reporting an environmental concern. Findings confirmed the earlier research of Farr-Wharton et al. (2014), in that environmental concerns ranked last, with just over 10% of respondents rating them as especially important. Consumers are bothered by wasted food; they are aware of the cost-benefit, but the environmental impact is not clearly understood.

Qi and Roe (2016) identified guilt as a critical role in self-regulation and a key function as a motivator to keep behaviors in line with perceived standards. Neff et al. (2015) noted 60% of their sample agreed they should reduce waste because of guilt. Consumers experience a moral struggle when they waste food. A pathway to reduce food

waste could begin with awareness combined with the guilt associated with compromising a moral norm because positive awareness alone may not be decisive in creating meaningful change in behavior.

Although most consumers prefer not to waste food, nearly all consumers waste at least some food (Le Borgne et al., 2021). When food is wasted, so too are land, water, labor, and energy used to produce, process, transport, store, and prepare wasted food. examined the relationships between concern for food waste (CFW), and actual food waste volumes. Study findings indicated that individual/interpersonal concerns significantly predicted food waste reduction, while global sustainability concerns had no effect on food waste volume. The study recommended that public policy makers and managers aiming to reduce consumer food waste focus the effort on behaviors through individual/interpersonal CFW, more specifically, financial concerns, food involvement, food education (Le Borgne et al., 2021).

Religion

Islam and Christianity, two of the world's largest religions, each specifically identify the wasting of food as sinful behavior (Abdelradi, 2018; Aschemann-Witzel et al., 2015). In the case of Islam, in the Holy Quran, which is the word of Allah (God), Chapter 7, Verse 31 is, "And eat and drink, but do not waste. Indeed, He likes not the wasteful." Additionally, in the same chapter and verse, the prophet Muhammad stated, "nothing is worse than a person who fills his stomach. It should be enough for the son of Adam to have a few bites to satisfy his hunger. If he wishes more, it should be one third for his food, one third for his liquids, and one third for his breath." In the case of Christianity, the Holy Bible stated, "Do not join those who drink too much wine or gorge

themselves on meat, for drunkards and gluttons become poor, and drowsiness clothes them in rags" (Proverbs 23:20-21). Religion supports the moral reasoning behind minimizing waste, but respondents' perceptions between beliefs and waste were considered not the actual religious behavior of the participant (Abdelradi, 2018; Aschemann-Witzel et al., 2015).

The role of religion has been studied, in-depth, in association with food waste. Yoreh and Scharper (2020) noted that religions rooted in Abrahamic traditions all were rooted in a history that indicated wastefulness should be avoided. From the root Abrahamic tradition, creation was a product of the divine to be watched over appropriately by humankind. There should be a concern for the proper maintenance of the natural environment, and for ensuring just distribution of the earth's resources, which could be damaged if people overconsumed and potentially robbed resources that could be used by others.

Yoreh and Scharper (2020) indicated that Abrahamic religions are concerned with the equal distribution of resources, and therefore the reduction of food waste, and yet there is variance in how religion shapes food waste behavior. Within the Arab world alone, there was high variance in how people dealt with food waste (Abiad & Meho, 2018). However, this should not come as a surprise, the geographic Arab world encompasses a highly diverse amount of land, not only geographically but also culturally. Given the wide distribution of Arabs across so many countries, there was an accompanying level of variance in technology, economy, and various local cultural trends that all impacted the relationship between food waste and religion. As such, apart from religion, there are likely many other factors shaping food waste behavior.

Elshaer et al. (2021) suggested that the relationship between religiosity and food waste intention was indirect and mediated. The researchers indicated that while there was a connection between religiosity and food waste intention, the relationship was mediated by variables such as subjective norms, perceived behavioral control, and attitudes. There was, therefore, another indication that the relationship between religion and food waste was not a direct one (Elshaer et al., 2021).

Minton et al. (2020) indicated that there was value in understanding religion's impact on food waste. The researchers argued that different manifestations within religious beliefs influenced the degree of food waste (Minton et al., 2020). For instance, in cultures with more restrictive religious norms, there were higher levels of food waste. Yet in contrast, less restrictive but more supportive religious norms were associated with reduced food waste.

A second study conducted by Minton et al. (2020) validated prior findings and ruled out alternative explanations. The authors found that strength of religious faith predicted food waste behavior (Minton et al., 2020). Those with higher religiosity were more likely to respond to messages that indicated damage to the wider world would be prevented. As such, appealing to this group's religious nature by indicating environmental damage could be done but prevented through a reduction of food waste, might be a means for reducing food waste within this segment of the population.

Reinforcing the statements by Minton et al. (2020), Elhoushy and Jang (2021) also indicated there was a strong relationship between religiosity and food waste reduction intention. The researchers noted that consumer attitudes toward a wide variety of prosocial actions, such as levels of activism, were associated with higher levels of

religiosity (Elhoushy & Jang, 2021). Religiosity was linked to consumers' activism, general attitudes, and both personal and subjective norms linked to reduced waste. Yet the relationship was complex, with religiosity again emerging as strongly linked to food waste reduction intentions. Within this study, that relationship was only partly mediated, this time by both personal norms and consumer activism; yet, consumer attitudes and subjective norms did not mediate the relationship (Elhoushy & Jang, 2021).

In sum, there is no straightforward relationship between religion and food waste (Abiad & Meho, 2018; Elhoushy & Jang, 2021; Minton et al., 2020; Yoreh & Scharper, 2020). There were conflicting and complementary studies regarding the relationship between religion and food waste and in many cases, the association between the two was mediated by other factors. The sum of the research into this area, therefore, indicated that further research was warranted to further clarify the relationship between religion and food waste, with a particular focus on how the degree of religiosity and the role of mediating factors all influence food waste.

Food Safety Risk

Reducing food waste and reducing food risk often conflict (Watson & Meah, 2012), particularly with leftovers or foods that have passed expiration dates. Qi and Roe (2016) used regression analysis and found 70% of the sample worried about food poisoning when making discard decisions. Consumer's food waste is based on acquired knowledge and experience with food (Farr-Wharton et al., 2014). Consumer beliefs, values, and negative experiences can drive behavior and encourage the premature disposal of food. Norms learned over a lifetime especially related to food safety may be difficult to change.

Hebrok and Heidenstrom (2019) found participants assessed the level of risk food posed to their health and the pleasure of eating, before deciding on the edibility of food. This study consisted of fieldwork following a small sample of 26 Norwegian families. As it was a small study, the transferability of results is somewhat limited, but it did highlight insecurities about risk assessments often lead to food waste. Normative beliefs of consumers developed throughout their lifetimes form the basis for judgments about whether food is acceptable to eat. The beliefs break down into the following major categories: (a) institutional knowledge and (b) embodied habits. Medical experts, nutritional guidelines, and explicit rules such as date labels, written guidelines, media, or government organizations provide institutional knowledge. Embodied habits consist of sensory evaluations such as seeing, smelling, tasting, and previous experiences (Gram-Hanssen, 2011). The contrast between food safety and sensory appeal is interesting as it is a perfect example of the clash between institutional knowledge and embodied habits.

One area of confusion consistently identified in the literature is date codes, especially on dairy products (Wilson et al., 2017). Limited understanding of date labels on food packages (e.g., sell by, use by, best before) leads to discarded food. Date code expiration adds confusion, uncertainty, and fear among consumers. It is a trigger for consumers who perceive food as inferior or even dangerous. There are legitimate health risks for spoiled food, particularly for young children with underdeveloped immune systems and people over age 65 who may experience age-related declines in sensory function. Consumers can challenge the date code system with embodied knowledge (e.g., sight, smell, taste).

Subjective norms are more important than cost-saving, or environmental sustainability (Barone et al., 2019; Watson & Meah, 2012). Neff et al. (2015) suggested that low awareness of the impact of food waste on environmental sustainability contributed to the low proportion of participants reporting an environmental concern. Findings confirmed Farr-Wharton et al. (2014) found that environmental concerns ranked low relative to other motivations to reduce food waste. Reducing food risk was related to role conflict particularly regarding leftovers or foods past their expiration dates (Watson & Meah, 2012). Food poisoning was the primary concern for discarding less than fresh food (Qi & Roe, 2016).

Consumer food waste behavior is driven by complex and often conflicting motivations (Quested et al., 2013). Evans (2012) suggested food waste behavior was not particularly amenable to rational models of intervention for policymakers and activists. Scholarly research on consumer food waste focused primarily on role conflict, morality, and food safety risk (Evans, 2012). Role conflict is derived from an individuals' need to be perceived as a good provider of a healthy and safe diet and the need to minimize cost while sustaining the environment. The researchers hypothesized food waste behavior results from individuals experiencing goal conflicts (Barone et al., 2019; Watson & Meah, 2012). Neff et al. (2015) suggested low awareness of the impact of food waste on environmental sustainability contributed to the low proportion of participants reporting an environmental concern. Findings confirmed Farr-Wharton et al.'s (2014) study in that environmental concerns ranked low relative to other motivations to reduce food waste. Reducing food risk was related to role conflict, particularly regarding leftovers or foods

that passed expiration dates (Watson & Meah, 2012). Food poisoning was the primary concern for discarding less than fresh food (Qi & Roe, 2016).

Consumer Food Waste Interventions

There has been little research into interventions targeting food waste in the home. Stockli et al. (2018b) noted that traditionally, any intervention meant to stop food waste in the home was limited to awareness-raising education intervention. These interventions came in the form of informative literature. Their conclusions were based on a systematic review of the past literature on the topic, and they concluded that further research was needed to stop food waste in the home not outside the home during the shopping experience.

Calvo-Porral et al. (2017) emphasized the viability of education intervention to stop food waste. Their conclusions were based on research into the impact of marketing variables. The researchers concluded that various marketing approaches could be a powerful means of reducing food waste. The importance of marketing as an intervention was also noted by Aschemann-Witzel et al. (2015), who argued that food marketing sends important messages to the consumer. Using three individual case studies, the researchers gauged how messaging influenced consumer attitudes toward food waste and indicated that marketing may be an important aspect of halting food waste in the home.

There was a consistent emphasis on awareness-raising education marketing in the literature. Kim et al. (2020) conducted a mixed-methods study that included both surveys and interviews among individuals to gauge their perspectives on marketing efforts to reduce food waste. The Kim study differentiated between passive marketing (e.g., watching television) and interactive social media. This study indicated that social media

marketing could be an effective means of reducing consumer end food waste. Social media marketing was specifically pointed to as the form of marketing necessary since it required an interactive component with participants. Social media requires the participant to be active by commenting, posting, liking activities. In contrast, mass media, like television advertising or radio, require no active participation on the part of the consumer. This active engagement helped to make social media messages substantially more effective.

Block et al. (2016) indicated that stopping consumer food waste may require first understanding food waste at each stage of the consumer decision-making process. Consequently, the researchers recommended that what first needed to occur was a comprehensive understanding of when and why food waste occurred. This arose out of a review of the existing literature that indicated a lack of clarity regarding why exactly consumers waste food. For interventions to be effective they need to be matched with a specific behavior at each stage of the consumer decision-making process. This research was similar to statements by Moreno et al. (2020) whose food waste research indicated there was a lack of research at the consumer level to explicitly state why it occurred. The implication from the literature was, therefore, food waste at the consumer level first had to be more comprehensively understood before interventions could be effectively developed.

As noted by Qi and Roe (2016), changing beliefs is the prerequisite to changing behavior and pointed to conflict consumers feel when assessing whether behavioral change is necessary and justified. Challenging established beliefs to change the intent and behavior was part of all the studies. Barone et al. (2019) emphasized the importance of

the consumer's established value system and went a step further in identifying that those conflicting goals were an inhibitor to changing beliefs, values, and behavior. Barone et al. (2019) identified the conflicting priorities as the main barrier to successful consumer food waste behavioral change.

Of personal interest to me is the impact large club store packages have on waste. Ailawadi et al. (2018) studied the effect of large club store packages on caloric intake but did not connect large club packages to the impact on food waste. Accurately measuring food waste is also difficult given the variations in weights and values. The Conrad et al. (2018) study used a complicated formula based on food intake statistics to create broad measurements for waste associated with their study.

In sum, regarding research on interventions designed to reduce food waste, five efforts have been studied with various levels of depth: (a) awareness-raising, (b) direct behavioral intervention, (c) food sharing practices, (d) prompts, and (e) the role of social media. While awareness-raising dominates current interventions research, it has inherent limitations that other interventions may be able to overcome.

Food Waste Awareness

Several quantitative scholarly studies exist on the effect of awareness-based food waste interventions (Khalil et al., 2021; Pinto et al., 2018; Soma et al., 2020). The research on awareness indicates a small but significant effect on food waste behavior. Available governmental data on the efficacy of awareness policies was anecdotal, lacked output measurements at the edible food level, and focused on inputs and aggregate garbage volumes by weight rather than actual edible food waste measurement (Gunders & Bloom, 2017; Reisch et al., 2013).

Pinto et al. (2018) indicated that even simple awareness messages may be sufficient for improving food awareness and reducing food waste. The researchers noted that in a study of a university canteen, even a simple, direct message was enough to raise awareness (Pinto et al., 2018). Informative posters displayed in the canteen used direct, simple messages, and similarly simple suggestions regarding how to prevent food waste. This was enough to reduce food waste by 15%, with participation in the reduction program spanning more than 70% of the participants.

Soma et al. (2020) compared three information-based delivery methods over a 12-week period. The first method was a relatively passive approach, including printed booklets, and a fridge magnet with a food waste tip (i.e., passive group). The second method was the first method supplemented by an invitation to attend a series of four community workshops with presentations on food waste reduction, group discussions, group activities, watching videos together, and small prizes for correct answers (i.e., workshop group). The third method was the first method augmented by an online game (i.e., game group). In addition to information materials, participants were invited to play an online quiz game with five trivia questions each week regarding how to reduce food waste at home. Each participant could earn 10 points per week (12-week game) for correct answers and were rewarded with a $20 grocery gift card if they accumulated 120 points or a $10 grocery gift card if they accumulated 60 points at the end of the 12 weeks.

Waste audits were conducted before and after the 12-week campaigns collecting the contents of garbage and organics bins set out at the curbside and sorted samples into primary categories of edible food waste, inedible food waste, and nonfood waste. The precampaign sample included 164 waste audits and postcampaign 146 waste audits were

completed due to attrition. Precampaign, an average of 1.1 to 1.5lb. per capita per week was discarded edible food waste. The amount of edible food waste per capita per week produced by the game group was about 20% overall, the game group was 30% lower than the other two groups (p = .07). Based on focus groups postcampaign, the game group was more motivated and engaged by the opportunity to compete to earn prizes. Although the monetary incentive was small, the use of games for advancing food waste knowledge and behavior is a promising intervention. Outcome variables were reliable due to an external audit of the actual edible food waste from family disposal containers; however, significance of .07 implies a low level of confidence in findings.

Khalil et al. (2021) examined the relationship between precise knowledge of edible food waste per person and actual food waste. The study indicated that providing precise measurement of food waste predicted a reduction in actual food waste, moderated by how the message was framed (Khalil et al., 2021). Not only was it the food waste information was important, but so was how the information was framed. This helped improve not only awareness of food wastage but positive reception to that message, which may lead to reductions in food waste.

Septianto et al. (2020) explored a specific type of messaging referred to as loss and gain frames. A *loss* frame is a form of raising awareness of food waste in which the message focuses on what could be lost, such as increased environmental damage from food waste. A *gain* frame is a form of raising awareness of food waste in which the message focused on reduced environmental damage. In both cases, the message is oriented around environmental damage resulting from food waste. However, whether that message focused on loss or gain could have various impacts on whether a person wanted

to reduce their food wastage (Septianto et al., 2020). This was consistent with the work of Khalil et al. (2021), who noted that numerical data impacted care about food waste in separate ways depending on whether a loss or gain frame was used.

There is often a lack of awareness of how much food is wasted. In one examination of how individuals determine their level of food waste, Giordano et al. (2019) indicated that there was a significant disparity between how much participants perceived they wasted food depending on how the measurement was taken. The authors recruited a stratified nonrandomized sample of 388 families who completed a 12-week food purchase and waste diary. Participant estimates of edible food waste volume preintervention were compared to food diaries. Preintervention edible food waste estimates were 65% to 90% lower than postintervention food diary volumes. Food waste awareness was low relative to food diary estimates. Although the study sample was large and diverse, self-report measures of difficult to measure items, such as food waste, have low levels of reliability (Leedy et al., 2019).

One circumstance in which food waste can be prevalent is in waste while dining out (Stockli et al., 2018a). When eating out in the United States, it is not unusual for individuals to eat only a portion of the meal, leaving the rest to waste. Stockli et al. (2018a) hypothesized informational prompts about food waste might motivate consumers to waste less food. Several messages were evaluated for efficacy to reduce food waste. Findings indicated virtue signaling (i.e., normative) messaging rather than solely informative messages were more likely to reduce waste following restaurant meals. Normative messages were significantly more effective than informational messages in diners requesting a to-go box to keep food for later use. Diners exposed to such prompts

were more likely to take their leftovers with them following their meals. Such findings indicated a potential for reducing food waste following meals at restaurants and similar establishments. A significant study limitation was the absence of a measure restaurant take-home food was subsequently wasted.

A study of 1,050 restaurant owners indicated that in 63% of cases, there was low awareness of how much food was being wasted (Lang et al., 2020). Those restaurant owners who were more likely to be aware of their food waste were younger. Older restaurant owners were less likely to be aware of their food waste. Additionally, male restaurant owners were more likely to have more awareness of food waste than female owners (Lang et al., 2020). This study was focused on restaurant owners rather than consumers, but it held interesting insights for the current study. First, it demonstrated that despite the clear financial interests, even restaurant owners may not be aware of the degree of their food waste. Second, the study also indicated that there may be certain demographic differences in food waste awareness (Lang et al., 2020).

Social Media

Young et al. (2017) examined whether social media could be a tool for reducing consumer food waste. The researchers examined the impact of social media, emails, and retailer and magazine messaging on food waste behavior when compared to a control group. During the study, the researchers examined the social influence of Facebook pages through which customers interacted. The researchers also examined how information delivered digitally in email influenced behavior. The researchers found both approaches were effective at significantly changing self-reported food waste behavior. Changes in behavior seemed to be partly a product of digital messaging and partly a result of

interactions allowed between consumers on digital platforms, suggesting that messages could be integrated and discussed among recipients. In comparison, those who received their messaging did not report significant changes in their food waste behavior, like the control group in the study. The major caveat in the study was while digital messaging may be powerful regarding influencing behavior, face-to-face interactions remained even more potent. For purposes of reaching a mass audience, digital messaging may be more practical.

Although there is some promise in the use of social media to reduce food waste, there have also been several concerns brought up about using social media effectively to reduce food waste. Young et al. (2017) cautioned that social media may not be the most effective means of reducing food waste. Grainger and Stewart (2017) responded to the idea that social media may not be the most effective means of raising awareness of food waste and reducing total food waste.

Instead, Grainger and Stewart (2017) indicated that the findings presented by Young et al. (2017) may have been arrived at using an insufficient sample, bringing into question the validity of the findings. In contrast, there were multiple indications in the literature that social media may be a means of reducing food waste. Sutinen and Narvanen (2021) indicated that social media could be used in a variety of ways as part of a social marketing campaign to raise food awareness. The researchers indicated that there was significant potential for social media to be an important tool in reducing food waste and that different discourses were developed to target different groups to reduce food waste (Sutinen & Narvanen, 2021).

Overall, there was a general lack of investigation into the role of social media and the reduction of food awareness. However, at least one other study, Lahath et al. (2021), indicated that social media may encourage food waste when not explicitly targeted toward reducing food waste. The researchers noted that people with certain personality types, such as neuroticism and tendencies toward impulse buying, may be more oriented toward food waste. These traits facilitated the connection between social media and food waste. The use of social media was positively associated with food waste, but this relationship was mediated by psychological traits. As such, when considering what may lead to food waste, when designed to do so, social media must be taken into consideration despite its potential role in reducing food waste. The literature on awareness some noted complex behavioral forces at work. Increased awareness, prompts, and effective social media communication and marketing were most frequently studied.

Direct Behavioral Interventions

Hebrok and Heidenstrom (2019) contended increasing awareness is insufficient because complex processes cause food waste and awareness alone does not change the processes in practice. Food waste involves complex daily behaviors across multiple disciplines, such as social, environmental, and economic. Hebrok and Heidenstrom viewed food waste through a behavioral lens; food waste cannot be an activity in itself; it instead is a result of many behavioral practices. As noted by the theory of planned behavior, consumers assume multiple, sometimes conflicting roles regarding food waste.

Behavioral change regarding food waste should be viewed from a systems approach, rather than considering food waste in and of itself. Hebrok and Heidenstrom (2019) advocated for interventions that understand and enable an immediate change in

daily practices. The emphasis was on understanding how food is handled, stored, and moved in and out of the refrigerator. By changing short-term habits, longer-term behavior changes.

Yet, there were complications in any assessment taken in the home even should awareness increase. Visschers et al. (2016) noted that there were barriers to accurate self-reporting on food waste in the household. The researchers used surveys to gauge different personality types and correlated those against given amounts of food waste, indicating that food waste could be predicted as a function of personality traits. However, this only further emphasized the difficulty of addressing food waste since it suggested needing to address the personality of individuals specifically to deal with food waste. Roodhuyzen et al. (2017) further complicated this by indicating that consumer food waste was partly a result of factors far larger than personality and the household but could lie in social-level factors. This conclusion was reached based on a synthesized literature review of multiple factors that influenced individual attitudes and revealed that people may commit acts of food waste due to complex factors that extended from the social level to the personal level.

Food Sharing

Few researchers have examined the potential for food sharing to reduce food waste. Morone et al. (2017) conducted a food sharing intervention to reduce persistent household food waste, a topic in only a few other studies. Morone et al. employed a controlled quantitative pretest-posttest research design to study five individuals separately as they experienced shopping, cooking, and eating food. This was compared to group behavior where the same five participants shared food purchases, preparation, and

consumption experiences. Data were collected from the individuals for a week under two different conditions. For the control group, all five participants received a $70 budget to purchase, prepare, and eat food in Week 1. The control group was asked to maintain practices for purchasing food, cooking, and consumption according to their regular food consumption habits. In Week 2, the treatment group of the same five individuals was asked to purchase, prepare, and consume all meals together.

Although there was no significant change in the quantity of food waste volume between the control and treatment groups, the authors concluded significantly more food was purchased for the food sharing group (Morone et al., 2017). In addition, the cost per calorie purchased dropped for the sharing group. The concept that sharing food would reduce waste by creating opportunities for others to consume leftover food was not confirmed. Findings indicated food behavior is amenable to change in social groups. Specifically, consumers had to be aware of the environment and economic practices that generated waste and develop group accountability to reduce waste. Awareness can help to develop skills that reduced waste and engage in collaborative behaviors that led to effective food sharing. Morone et al. (2017) indicated shared learning may be a way to reinforce best practices through group accountability like food sharing and shared sensitivity to the economic and environmental consequences of waste. Developing a deeper understanding of consumer routines and habits then targeting specific interventions to change those behaviors may be the most practical and effective course of action.

Prompts

The concept that prompts might be useful for encouraging food waste reduction was suggested by Von Kameke and Fischer (2018), who indicated reducing food waste in the home might be encouraged if consumers were presented with nudges to encourage them to save their food. In their book, Thaler and Sunstein (2009) described a nudge as to how consumers can make better decisions through the design of environments that nudge or push consumers when temptation becomes greatest. Examples of nudges that reduce food waste are creating a shopping list and buying only what is on the list or organizing the refrigerator to avoid expired food (Farr-Wharton et al., 2014). Researchers noted there were decisive moments that led to increased or decreased food waste each day (Hebrok & Heidenstrom, 2019). The researchers broke these moments into five categories including (a) acquiring, (b) storing, (c) assessing, (d) valuing, and (e) eating.

Summary

By changing daily habits and practices food waste can be reduced. Habits and practices have been formed through a variety of sociological and behavioral pressure and are difficult to change. Increased awareness and effective social media communication and marketing may prove effective means of altering behavior. A limitation for food waste studies, in general, is reliance on self-reported information. Participants often have high intentions to reduce waste, which could lead to response and social desirability bias in the results. As consumers, guilt factors into social pressures to underestimate household waste and overstate efforts. In the theory of planned behavior construct, if consumers do not think they have a problem, they may think the belief and evaluation of the outcome may not be worthy of their effort.

Food waste studies have examined waste through a series of self-report surveys and literature reviews. Many recent studies into food waste interventions were based on previously published literature. In actual practice, there has been little concrete measurement of household food waste and few responsive interventions meant to reduce that waste. What remains is little or no direct observational measurement of food waste in the household, nor attempts to intervene and reduce consumer food waste. Future research using quantitative research designs is needed to advance knowledge on consumer food waste as a predicate for developing a more successful intervention to reduce food waste. However, as with most complex human behavior, robust quantitative research designs are difficult to implement.

Consumer-specific data on actual waste figures are difficult to determine. Consumer information is based on opinions and answers to surveys. There is no consistent unit of measure for food waste and no established quantifiable measurement. Reporting food waste at the consumer level can be tedious. Consumers have constant interaction with food throughout the day. Asking them to stop, measure and record waste is time-consuming and hard to do accurately.

Since food consumption is universal, a cost-effective intervention would likely involve some combination of awareness and prompts. While the systematic review of the quantitative literature was not targeted specifically at food waste, findings applied to food waste behavior. Based on the existent literature, altering food waste behavior may require substantial resources and sustained effort to produce measurable change. Because the study of food waste is a rather new phenomenon most studies begin with the importance of raising awareness. As the literature highlighted, awareness alone does not motivate

consumers to alter their behaviors. Understanding the reasons for the behavior may allow researchers to address effective interventions. The future of food waste analysis needs to be focused on in-home quantifiable measurements of waste combined with a deeper understanding of the behavioral drivers and effective interventions.

Developing a deeper understanding of consumer routines and habits then targeting specific interventions to change those behaviors may be the most practical and effective course of action. Chapter 3 describes in detail the research methodology, design data collection and analyses, and ethical considerations. The research questions were derived from the problem statement and study purpose, which can contribute to the extant literature by quantifying relationships between environmental attitude, subjective norms, perceived behavioral control, and behavioral intent to reduce household consumer food waste and additional relevant demographic factors.

CHAPTER 3: METHODOLOGY

This chapter describes in detail the research questions, research design, sample size and power calculations, variable operationalization, instrumentation, data collection and analysis, and ethical considerations. The purposes of the quantitative correlational study were threefold: first, examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct.

The research questions were derived from a thorough literature review on the topic of domestic U.S. food waste sources, habits, and interventions. The study aimed to examine food waste data from those experiencing the phenomenon to develop implications, recommendations, and form conclusions.

Research Questions

RQ1: What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents?

RQ2: To what extent, if any, can variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude,

subjective norms, and perceived behavioral control) be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

RQ3: To what extent, if any, can variation in (a) overall behavioral intent (Total TPB Survey score) to reduce household consumer food waste, (b) next 30-day behavioral intent to reduce food waste, and (c) food waste percentage be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

Research Methodology

A quantitative methodology was used to examine the relationships among environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste. Quantitative studies are appropriate for research including defined variables, empirical data, valid and reliable data collection instruments, and inferential statistics to examine relationships to a degree of scientific certainty (Leedy et al., 2019). Quantitative methods involve systematic procedures for data collection and analysis that yield repeatable and generalizable results (Vinson, 2019). Quantitative methods enable hypothesis formation and testing using empirical data.

Qualitative and mixed-method methodologies were considered. Qualitative research is typically employed when there is little or no knowledge of a phenomenon. Deep, richly textured data is needed to address complex social interactions, and empirical data is not a practical consideration (Vinson, 2019). Considerable research exists describing household food waste; however, few quantitative studies involving processes that cause food waste are available (Neff et al., 2015; Qi & Roe, 2016). Based on the

desire to add to the empirical body of knowledge on household food waste reduction, a quantitative methodology was an appropriate choice.

Research Design

A quantitative correlational nonexperimental research design was employed to address the relationship between behavioral intent to reduce household consumer food waste and TPB subscores, as well as the overall behavioral intent construct. This research design is an appropriate choice based on the following factors: variables are clearly defined and empirically measurable, hypotheses can be tested using inferential statistics, adequate sample size can economically be recruited, and there is a desire to generate statistically significant findings (Leedy et al., 2019). Qualitative studies, which involve richly textured data collected using interviews, direct observation, and document review, were considered, and rejected due to the desire for potentially generalizable results. Based on the research questions and study purpose, a quantitative correlational nonexperimental research design is an appropriate choice (Leedy et al., 2019).

Population and Sample Selection

The study population was the 47.5 million households in the United States with at least three individuals, and where the participant is the primary food purchaser (U.S. Census Bureau, 2020a). A sample of 200 individuals living in a U.S. household with at least three individuals and responsible food purchasing and preparation decisions were recruited to participate. Two questions were used to ensure the participants are U.S. citizens: (a) Are you a U.S. citizen? and (b) Did you vote in the last U.S. election? G*Power 3.1 software was used to calculate the minimum sample size to power the study at 95% based on the following assumptions: Pearson correlation and stepwise multiple

regression statistics, medium effect size ($\alpha = .05$, $\beta = .95$), and two-tailed test (Faul et al., 2009). Assumptions used to calculate minimum sample size are typical for social sciences research (Faul et al., 2009). The Survey Monkey Audience Service was used to identify and recruit individuals that meet the inclusion criteria from a 35-million U.S. member database.

Instrumentation

The study examined the theory of planned behavior (TPB) constructs that potentially influence the behavioral intent to reduce household consumer food waste using the TPB-Questionnaire (TPB-Q), as developed by Davis et al. (2002). The TPB-Q was developed and validated to empirically measure factors that influence the behavioral intent of a broad range of human behavior. For this study, the behavioral intent to reduce household consumer food waste and its various subconstructs served as the dependent variables and select demographic measures that may influence behavioral intent are the independent variables.

Behavioral intent is divided into three subconstructs by the TPB-Q: attitudes, subjective norms, and perceived behavioral control (Davis et al., 2002). The TPB-Q was used to collect data for each factor individually, and a total score was totaled from the three subconstructs (or factors). The TPB-Q has been adapted to reflect the dependent variable, behavioral intent to reduce household consumer food waste, and independent variables of attitudes, subjective norms, and perceived behavioral control. The original TPB-Q language was retained, and the object of each item was changed to reflect food waste behavior. The TPB-Q has been adapted to examine a variety of human behaviors, including Facebook

user engagement (Sanne & Wiese, 2018), recycling behavior (Tonglet et al., 2004), and choice affecting sustainability (Bauer et al., 2018).

Validity

The primary measure of the validity of the TPB-Q is the instrument's power to predict behavioral intent and subsequent behavior. A variety of constructs and concurrent validity studies found the instrument produced concordant results (Botetzagias et al., 2015). A study of 422 undergraduate students indicated, using AMOS factor analysis, that the TPB-Q explained between 51% and 66% of the variance in behavioral intentions, and subsequent behavior in all five regression models (Courneya et al., 2006).

Reliability

The TPB-Q is a 16-item instrument involving responses to statements using a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. The TPB-Q was validated and found to be reliable in two separate studies comprised of more than 150 participants in two industries, with a Cronbach's alpha between 0.71 and 0.82 (Davis et al., 2002). Attitudes were assessed by a series of evaluative semantic differential scales using factor analysis ($\alpha = .82$; coefficient of stability = .51). A 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree* was be used to measure organizational adoption. Subconstruct scores for each of environmental attitudes, subjective norms, and perceived behavioral control were calculated as the mean of four items from the TPB-Q. The total score for the TPB-Q equals the sum of the scores for the 16 subconstruct items.

Data Collection and Management

Data collection was conducted using a SurveyMonkey portal page that included an Informed Consent Form, modified TPB-Q, and demographic items (see Appendix A). Data collection started with potential participants agreeing to the informed consent form. Study variable data was downloaded from the Survey Monkey portal to a spreadsheet and examined for outliers and missing data (Leedy et al., 2019). Data was then transferred to SPSS 27® for data analysis.

Data Analysis Procedures

The study sample was characterized using descriptive statistics (i.e., means, standard deviations, frequencies, and percentages), and each research question was addressed:

RQ1: What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents?

To address Research Question 1, first, a frequency matrix by construct was calculated and reported. The number of participants that answered each survey item, from *disagreed strongly* to *agreed strongly*, were summed up and reported next to each survey item. Second, the mean and standard deviation for each of environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent for all participants. Each table is described and analyzed to address Research Question 1.

RQ2: To what extent, if any, can variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude,

subjective norms, and perceived behavioral control) be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

Stepwise multiple regression analysis was conducted using SPSS 27® to address Research Question 2. This technique involves using the select demographic measures as predictor variables to explain variation in the three TPB factors or subconstructs (i.e., environmental attitude, subjective norms, and perceived behavioral control). This was accomplished at the $p \leq .05$ levels of statistical significance and reported F and t statistics as well as the R^2 and adjusted R^2.

RQ3: To what extent, if any, can variation in (a) overall behavioral intent (Total TPB Survey score) to reduce household consumer food waste, (b) next 30-day behavioral intent to reduce food waste, and (c) food waste percentage be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

The analytical techniques used to address this final research question are, in essence, the same as those described in the second research question, with one notable exception. Instead of specifying three separate regression models—one for each factor—in this research question, only the total score for the entire construct was used as the dependent variable, so there was only one regression to specify and then estimate.

Ethical Considerations

This study was submitted to the University of San Diego's Institutional Review Board (IRB) for approval (see Appendix B). The Belmont Report's ethical principles and guidelines for research involving human subjects provided the guidelines for respect of participants, beneficence, and justice (Sims, 2010). Abiding by the ethical principles assisted in resolving the ethical problems surrounding the conduct of research with

human subjects, and its' relevance and applicability continue nearly 4 decades later (Friesen et al., 2017). Participants signed an informed consent form online before completing the TPB-Q. Survey participation is voluntary. Participants may have withdrawn at any time, and no compensation was available for participating. No personally identifiable information was collected. Data will be stored on a password-protected media drive for 3 years after completion of this study, after which all data will be deleted.

Limitations and Delimitations

Research study limitations are characteristics inherent to the choice of a research design or methodology that may affect the generalizability, reliability, repeatability, or interpretation of the study findings (Leedy et al., 2019). The primary limitations of quantitative correlational research designs are the absence of attribution of causality and confounding variables (Leedy et al., 2019), as multiple regression analysis indicates whether variables are associated, positively or negatively, but without attributing causality. In addition, unknown covariates may have greater explanatory value than predictor variables chosen for the study, and of course, small sample sizes and a limited duration for data collection also limit the generalizability of the findings.

Summary

The purposes of the quantitative correlational study were threefold: first, examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household

consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct. A quantitative methodology correlational approach was used to relate environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste. Descriptive statistics were used to characterize the study sample and address Research Question 1. Pearson correlation coefficients, or Spearman's rho for nonparametric data, were conducted and analyzed to address Research Question 2 and Research Question 3. Belmont principles guided interactions with human subjects, data were held confidential, and all study data and notes will be stored in a password-protected media drive.

CHAPTER 4: DATA ANALYSIS AND RESULTS

Consumer food waste reduction in the United States is both a moral and global sustainability imperative (Mariam et al., 2020). Driving the urgency are two converging global concerns: the economics of food production and the environmental impact of waste disposal (Conrad et al., 2018). U.S. consumers waste approximately 20% of all food purchased annually, or 245 pounds per person (Conrad et al., 2018), which absorbs environmental resources and diminishes sustainability (Barone et al., 2019). A quantitative methodology was used to examine the relationships among environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste.

The purposes of this correlational study were threefold: first, to examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; second, to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and finally, to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste construct. The research questions that guided this study were:

RQ1: What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents?

RQ2: To what extent, if any, can variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control) be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

RQ3: To what extent, if any, can variation in (a) overall behavioral intent (Total TPB Survey score) to reduce household consumer food waste, (b) next 30-day behavioral intent to reduce food waste, and (c) food waste percentage be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

The remainder of Chapter 4 includes descriptive findings, which characterize the study sample; data analysis procedures that describe statistical procedures employed to address each research question; results by research question presented without opinion nor interpretation; and finally, a chapter summary.

Descriptive Findings

The general study population was the 47.5 million households in the United States with at least three individuals, and the sample was stratified by age, annual household, income, gender, highest educational attainment, household size, and race/ethnicity-based on U.S. Census Bureau (2020a) data. Ultimately, 200 individuals responded and met the required inclusion criteria: must be a household in the United States with at least three individuals, all household members must be U.S. citizens, and the respondent must be the individual responsible for food purchasing and preparation decisions. In addition to completing a 12-item theory of planned behavior survey, respondents were also asked about their age, annual household gender, highest educational attainment, household size,

and race/ethnicity. The results were calculated and reported as frequencies in Tables 1 through 6.

As shown in Table 1, most participants were between the ages of 31 and 45, and only 5% were 60 and older. The differences in mean age and 2020 Census proportions were explained by the inclusion criteria, which required a minimum household size of three individuals. The sample mean household size was 3.83 compared to the 2020 Census average of 2.49 (U.S. Census Bureau, 2020b). The study sample was over-weighted for the age ranges of 20 to 45, which are the child-rearing years and tend to have higher-than-average household sizes (U.S. Census Bureau, 2020b).

Table 1

Age Range of Study Participants

Age range	*n*	%	2020 Census (%)
20 to 30	45	22.5	14.1
31 to 45	105	52.5	31.9
46 to 60	38	19.0	25.4
60+	12	6.0	16.3

Note. $N = 200$.

Table 2 depicts the sample annual household income. More than two thirds of the sample earned more than the median U.S. annual household income of $67,521 (U.S. Census Bureau, 2020b).

Table 2

Annual Household Income Range of Study Participants

Annual household income	*n*	%
Up $62,200	62	31.0
$62,001 to $120,000	99	49.5
$120,000+	39	19.5

Note. N = 200.

As shown in Table 3, more than half the sample's educational attainment was a bachelor's degree or higher (U.S. Census Bureau, 2020b). The sample was over-weighted for educational attainment by approximately 10%. The sample was better educated than an average U.S. citizen.

Table 3

Educational Attainment of Study Participants

Educational attainment	*n*	%	2020 Census (%)
High school diploma	41	20.5	27.8
Some college	46	23.0	27.0
Bachelor's degree	91	45.5	22.5
Graduate/professional degree	22	11.0	13.1

Note. N = 200.

Table 4 shows the gender composition of the sample, which overrepresented females compared to the U.S. population that is 51% female (U.S. Census Bureau, 2020b). This overrepresentation may reflect the inclusion criteria, which required respondents to be responsible for managing food purchases. According to the research,

27% of all women with children are stay-at-home mothers, which would skew the sample toward females (Pew Research Center, 2019).

Table 4

Gender of Study Participants

Gender	*n*	%
Female	118	59
Male	75	37.5
Other	7	3.5

Note. $N = 200$.

Table 5 is a sample household-size frequency table. The sample mean household size was 3.83 compared to the 2020 Census mean of 2.49 (U.S. Census Bureau, 2020b). The study sample was overrepresented for household sizes of four and above.

Table 5

Household Size of Study Participants

Household size	*n*	%
Three	76	38.0
Four	87	43.5
Five	33	16.5
Six	4	2.0

Note. $N = 200$.

Table 6 shows the race/ethnicity of the participants (U.S. Census Bureau, 2020b). The study sample race/ethnicity distribution closely reflected 2020 Census proportions,

with White participants being slightly underrepresented and African American participants being slightly overrepresented.

Table 6

Race/Ethnicity of Study Participants

Race/ethnicity	*n*	%	2020 Census (%)
African American	31	15.5	12.4
Native American	1	0.5	1.1
Asian	13	6.5	6
Hispanic/Latino	37	18.5	18.9
White	118	59	61.6

Note. $N = 200$.

Results by Research Question

Research Question 1

What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents?

For each of the constructs and key measures (i.e., environmental attitudes, subjective norms, perceived behavioral control, behavioral intent, and proportion of food waste), sample means, and standard deviations are presented in Table 7. The higher the TPB total score and subscore the greater the behavioral intent to reduce food waste. The greatest deviation from a neutral score of four was reported for perceived behavioral control ($M = 3.66$), and behavioral intent over the next 30 days ($M = 5.13$). The mean and standard deviation for food waste percentage equaled 17.15% ($SD = 7.66$), which was

substantially below previous estimates of 30% to 40% (Neff et al., 2015; Principato et al., 2021).

Table 7

Mean and Standard Deviation by Dependent Variable

Variable	*M*	*SD*
Environmental Attitudes	4.08	1.04
Subjective Norms	4.14	1.63
Perceived Behavioral Control	3.66	0.89
Overall Behavioral Intent	3.96	1.08
Behavioral Intent Next 30 Days	5.13	1.19
Food Waste Percentage	17.15%	7.66%

Research Question 2

To what extent, if any, can variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control) be explained by age, annual household income group, educational attainment, gender, household size, and race/ethnicity?

To address Research Question 2, a stepwise multiple regression analysis was conducted with food waste percentage as the dependent variable, and age, annual household income, educational attainment, gender, household size, and race/ethnicity as independent variables. Annual household income group, educational attainment, gender, and race/ethnicity were treated as dummy variables.

As shown in Table 8, there were three significant variables in the model (i.e., household size, race – Asian, and income below $62,000) and all three were significant at

$p < .05$ level. Adjusted R^2 of .13 suggested 13% of the variation in food waste percentage was explained by the model. Household size had a negative effect, in that larger households were associated with decreased environmental attitudes. Individuals that self-identified as Asian had environmental attitudes that were two thirds of a point less than non-Asians, while individuals with incomes below $62,000 were associated with slightly less than one third of a point lower score on their environmental attitudes.

Table 8

Environmental Attitudes Stepwise Regression Coefficients

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	Std. error	Beta	*t*	Sig.
(Constant)	5.99	.35	--	16.89	.00
Household size	-.46	.09	-.34	-5.20	.00
Race – Asian	-.67	.21	-.16	-2.40	.01
Income below $62,000	-.30	.14	-.13	-2.05	.04

Note. $R^2 = .14$; adjusted $R^2 = .13$.

Regarding the subjective norms construct, as shown in Table 9, household size, race – White, and race – Hispanic/Latino accounted for 13% of the variation in subjective norms. As was true with environmental attitudes, increases in household size were associated with lower subjective norm scores; specifically, social norm scores fell by .59 points for each additional household member. Individuals that self-identify as White had subjective norm scores that were about a quarter of a point greater than Hispanics/Latinos and almost an entire point higher than everyone else.

Table 9

Subjective Norms Stepwise Regression Coefficients

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	Std. error	Beta	*t*	Sig.
(Constant)	5.74	.60	--	9.55	.00
Household size	-.59	.14	-.28	-4.20	.00
Race – White	.93	.26	.28	3.47	.00
Race – Hispanic	.68	.33	.16	2.02	.04

Note. R^2 = .14; adjusted R^2 = .13.

As far as the final construct of perceived behavioral control, the final regression explained the least amount of the sub-construct regressions, or 6.0% of the variation. As shown in Table 10, only two independent variables were significant: identifying as White and household size. Increases in household size were again associated with decreases in perceived behavioral control. Individuals that self-identified as White had a perceived behavioral score slightly lower by one third of a point than all other races/ethnicities.

Table 10

Perceived Behavioral Control Stepwise Regression Coefficients

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	Std. error	Beta	*t*	Sig.
(Constant)	4.20	.33	--	12.48	.00
Race – White	.31	.12	.17	2.44	.01
Household size	-.19	.08	-.16	-2.34	.02

Note. R^2 = .06; Adjusted R^2 = .06.

Research Question 3

To what extent, if any, can variation in (a) overall behavioral intent (Total TPB Survey score) to reduce household consumer food waste, (b) next 30-day behavioral intent to reduce food waste, and (c) food waste percentage be explained by age, annual household income, educational attainment, gender, household size, and race/ethnicity?

To address Research Question 3, stepwise multiple regression analysis was conducted with three different measures of food waste as the dependent variable, and age, annual household income group, educational attainment, gender, household size, and race/ethnicity as independent variables. Behavioral intent was defined in three ways for this last research question: (a) overall behavioral intent as measured by TPB total score, (b) next 30-day behavioral intent to reduce food waste, and (c) reported food waste percentage so that three separate regression analyses were conducted—one for each of the three different ways.

Regarding overall behavioral intent, Table 11 shows household size and White race accounted for 12.0% of the variation on overall behavioral intent (TPB total score) to reduce food waste. As household size increased overall behavioral intent decreased by about four tenths of a point. Individuals who self-identified as White had a perceived behavioral intent score that was lower by slightly more than one third of a point than everyone else.

Table 11

Overall Behavioral Intent Stepwise Regression Coefficients

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	Std. error	Beta	*t*	Sig.
(Constant)	5.22	.39	--	13.34	.00
Household size	-.39	.09	-.28	-4.16	.00
Race - White	.40	.14	.18	2.75	.00

Note. R^2 = .13; Adjusted R^2 = .12.

Focusing on the next 30-day behavioral intent to reduce food waste, two independent variables were significant: household size, and high school education. Together these two variables explained 8% of the variation in the next 30-day behavioral intent to reduce food waste. Again, increases in household size were associated with lower scores on the reduction measure, as were those with a high school degree whose scores were lower by about a half a point as compared with those with greater educational attainment.

Table 12

Next 30-Day Behavioral Intent Stepwise Regression Model Summary

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	*Std. error*	*Beta*	*t*	*Sig.*
(Constant)	6.67	.41	--	16.23	.00
Household size	-.37	.10	-.24	-3.61	.00
High school education	-.50	.20	-.17	-2.52	.01

Note. R^2 = .09; Adjusted R^2 = .08.

The final dependent variable used to address this research question examined the determinants of the percentage of food waste. As shown in Table 13, the variables of annual household income over $162,000, age, race - Asian, and female accounted for 29.3% of the variation in food waste percentage. The explained variation in food waste percentage was substantially higher than the other two dependent variables more than twice the explained variation of overall behavioral intent. Increases in the age of respondents were associated with less food waste, and the percentage of food waste percentage decreased by one third of a point per year. Individuals who reported an annual household income of $162,000 or greater had food waste that was 7.42% higher than everyone else. For individuals who self-identified as Asian, food waste was 6.3% less than other races/ethnicities, and women reported wasting 1.9% more food than men.

Table 13

Food Waste Percentage Stepwise Regression Coefficients

	Unstandardized coefficients		Standardized coefficients		
Model	*B*	Std. error	Beta	*t*	Sig.
(Constant)	26.81	2.13	--	12.55	.00
$162,000+ household income	7.42	1.18	.38	6.28	.00
Age	-.32	.05	-.36	-6.06	.00
Race - Asian	-6.34	1.86	-.20	-3.39	.00
Female	1.91	.97	.12	1.97	.05

Note. R^2 = .307; Adjusted R^2 = .293.

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Consumer food waste reduction in the United States is both a moral and global sustainability imperative (Mariam et al., 2020). Driving the urgency of this moral dilemma are two converging global concerns: the economics of food production and the environmental impact of disposal (Conrad et al., 2018). U.S. consumers waste approximately 40% of all food purchased annually, or 245 pounds per person (Conrad et al., 2018), which absorbs environmental resources and diminishes sustainability (Barone et al., 2019). Food waste accounts for 20% to 35% of all freshwater consumption, while farmland phosphate fertilizer runoff causes harmful algae blooms that deplete waterways of oxygen, resulting in dead zones that damage ecosystems vital for aquatic life (Maharajan et al., 2021).

Food waste behavior is often complex, and the result of conflicting family, individual, and social motivations (Barone et al., 2019; Quested et al., 2013). Role conflict is derived from an individuals' need to be perceived as a good provider of a healthy and safe diet while spending within the family budget and conforming to social norms (Neff et al., 2015). Social norms include providing healthy and nutritious meals and more recently environmental sustainability (Barone et al., 2019). Research on reducing consumer food waste offers a variety of solutions, including quantifying food waste and explaining practices that drive waste (Porpino, 2016). Although extant studies on food waste suggest that raising awareness can effectively change actual food waste, each study had significant limitations.

Scholarly studies on consumer food waste focused primarily on role conflict, morality, and food safety risk (Evans, 2012). Researchers suggested that consumer

knowledge and awareness of how food waste impacts the environment influences consumer food waste (Barone et al., 2019; Porpino, 2016; Stancu et al., 2016). Taken together, knowledge and awareness are most frequently cited as impactful (Qi & Roe, 2016).

The purposes of this quantitative correlational study were threefold: (a) to examine environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste among a sample of consumers; (b) to examine the extent to which select demographic measures can explain variation in the three subdimensions of the behavioral intent to reduce household consumer food waste (i.e., environmental attitude, subjective norms, and perceived behavioral control); and (c) to examine the extent to which these select demographics can explain variation in the overall behavioral intent to reduce household consumer food waste and actual food waste.

The theory of planned behavior (TPB), as developed by Ajzen (1991), provided the theoretical framework that guided this study. The TPB posits that before initiating a behavior, a complex process forms behavioral intent, which is a function of individuals' attitudes, subjective norms, and perceived behavioral control. Individuals form behavioral intent by engaging in a conscious thought process based on choices and experiences. Ajzen (1991) posited behavioral intent is influenced by the expected outcome based on cost-benefit analysis. The TPB predicts that behavioral change occurs when an individuals' perceptions of the costs, or benefits, have changed. Individuals' perception of environmental sustainability is sufficient to reduce the behavior.

A quantitative correlational study was used to examine the relationships among environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste. The study population was the 47.5 million households in the United States with at least three individuals, and where the participant is the primary food purchaser (U.S. Census Bureau, 2020a). Two hundred individual participants were selected in a purposeful manner that approximated the U.S. population by age, annual household income, educational attainment, gender, household size, and race/ethnicity. The inclusion criteria were living in a U.S. household with at least three adult individuals, all household members being U.S. citizens, and being the primary person responsible for food purchasing and preparation decisions.

Data collection was accomplished using the Theory of Planned Behavior Questionnaire (TPB-Q) for dependent variables of attitudes, subjective norms, perceived behavioral control, and total behavioral intent. A demographic survey was employed to collect the independent variables of age, annual household income, educational attainment, gender, household size, race/ethnicity, actual percentage of food waste, and intent to change behavior over the next 30 days. Data were collected using online surveys.

Data analysis for Research Question 1 was addressed using a frequency matrix TPB-Q response. The percentage of participants that answered each survey item, from *strongly disagree* to strongly *agree*, were calculated, and reported for each survey item. Second, the mean and standard deviation for environmental attitudes, subjective norms, perceived behavioral control, overall behavioral intent for all participants, and actual food waste percentage were calculated. Research Question 2 and Research Question 3 were

addressed by conducting stepwise multiple regression analysis. Significance was set at $p \leq .05$ for F statistics, t-test statistics, as well as the R^2 and adjusted R^2. Results were presented by research question in written and tabular form. The remainder of Chapter 5 is devoted to summarizing and synthesizing findings presented in Chapter 4, followed by a discussion of the potential implications for policymakers and future researchers.

Summary of Results

The first research question addressed the TPB-Q constructs as follows: What are the environmental attitudes, subjective norms, perceived behavioral control, and overall behavioral intent to reduce household consumer food waste in a sample of respondents? The present study findings indicated that the higher the TPB total score and subscore the greater the behavioral intent to reduce food waste. The greatest deviation from a neutral score of four was reported for perceived behavioral control (M = 3.66, SD = 1.19). Subjective norms, environmental attitudes, and total behavioral intent scores for the entire sample were in a tight range between 3.96 and 4.14. Separately, the mean for the percentage of food waste equaled 17.15% (SD = 7.66), which was substantially below previous estimates of 30% to 40% (Neff et al., 2015; Principato et al., 2021).

In terms of overall behavioral intent to reduce food waste, behavioral intent was defined in three ways for the final research question: (a) overall behavioral intent as measured by TPB total score, (b) next 30-day behavioral intent to reduce food waste, and (c) reported food waste percentage. For overall behavioral intent (i.e., TPB-Q total score) to reduce food waste, household size was negatively correlated, and only White participants were significantly positively correlated; taken together household size (9.7%) and race -White (2.9%) accounted for 12.1% of the variation in TPB-Q total

score. Household size (5.5%) and high school education (2.5%) together accounted for 8.9% of the variation in behavioral intent to reduce food waste. Finally, annual household income over $162,000 (12.7%), age (12.2%), race - Asian (3.3%), and gender - female (0.9%) combined was a total explained variation in food waste percentage of 29.3%.

Food Waste Percentage

Reported food waste percentage refers to the ratio of food discarded without being eaten to the amount of food purchased. The survey item was, “What percentage of food in your household is wasted in an average month?” Results from the stepwise regression indicated age, household income, gender, and race/ethnicity significantly predicted food waste percentage. Significant demographic variables explained 29.3% of the variation in food waste percentage, a relatively large effect size. The size of the explained variation was surprising as one rarely finds a set of demographic variables as predictive.

Age

Age was negatively correlated with the reported food waste percentage, with a reduction of 0.3% per year of age. This implies that a 20-year difference in age changes food waste percentage by 6%, which is nearly one third of the overall average of 17.1%. Younger respondents’ food waste percentage was higher than older respondents, who presumably were more careful with their resources. Along with household income, findings suggested younger, wealthier households with children were more likely to waste food. This knowledge can inform public policy decision makers and school boards tasked with designing and implementing food waste reduction strategies. This finding

was consistent with prior research on the relationship between age and food waste percentage (Grasso et al., 2019; Principato et al., 2021; Qi & Roe, 2016).

Household Income

Respondents with $162,000 and over annual household income category reported a mean food waste percentage of 34.2%, or twice as high as the overall mean of 17.1%. Principato et al. (2021) suggested wealthier households may treat food waste as a luxury item. Whatever the cause, the $162,000 and over annual household income category represents the largest opportunity in terms of the magnitude to reduce percentage food waste. The potential in terms of the volume of food waste is dampened by the fact that only 16% of U.S. households qualify. The $162,000 and over category accounted for 13.2% of the variation in reported food waste percentage, and 25.6% of the variation when combined with age. The majority of the existing research confirmed this study's finding that higher-income households' food waste percentage is greater than lower-income families (Principato et al., 2021; Qi & Roe, 2016). Some research suggested that food waste is considered a luxury item in that fresh food is tastier and less likely to cause illness (Grasso et al., 2019). Income accounts for the largest portion of the variation in the percentage of food waste at 13.2%, confirming the majority of extant research on the relationship between food waste and income.

Race/Ethnicity

Race/ethnicity accounted for 2.7% of the variation in food waste percentage, and only the Asian group was significantly different than the mean food waste percentage for other races/ethnicities. The mean food waste percentage was 6.4% less than the mean for

the group of 26.8%. This finding was consistent with earlier research (Stancu et al., 2016).

Household Size

Household size was a significant negative predictor of all three subdimensions of the TPB-Q, overall behavioral intent, and 30-day behavioral intent, which had medium to large effect sizes. This finding was consistent with earlier research (Principato et al., 2021). Principato et al. (2021) observed that household size was almost perfectly correlated with the number of children, one can assume that behavioral intent to reduce food waste decreases as the number of children in the household increases. Principato et al. (2021) suggested that the effect may be a function of children tending to be finicky eaters resulting in more wasted food. The knowledge that children were associated with food waste suggests that interventions targeting large households may be a fruitful target for public policy makers.

Subjective Norm

Subjective norm refers to an individual's beliefs of others' perceptions and a desire to conform to societal expectations (Ajzen, 1991). An example of item one of the TPB-Q nicely illustrates the subdimension: "Most people who are important to me think that I should reduce household food waste." Results from the stepwise regression for subjective norms found household size and race to be statistically significant predictors of subjective norms. Together, all of the significant independent variables explained 14.7% of the variation in subjective norms. Household size, race, and income groups had a social norm score of 5.74 of a possible survey score of seven (*strongly agree*). Individuals that self-identify as White had subjective norm scores that were about a

quarter of a point greater than Hispanics and almost an entire point higher than everyone else. The mean subjective norm score increased by two thirds of a point for individuals who self-identified as Latino/Hispanic. Earlier research regarding subjective norms on food waste and race was consistent with present findings (Principato et al., 2021).

Perceived Behavioral Control

Perceived behavioral control refers to the extent one believes a behavioral change can create an expected benefit (Ajzen, 1991). An example of item one of the TPB survey illustrates the subdimension: "I am confident I can reduce food waste." Results from the stepwise regression for subjective norms found household size, and race to be statistically significant predictors of perceived behavioral control. All significant independent variables explained 6.5% of the variation in PBC. Independent variables explained little of the variation in PBC scores and were tightly grouped around neutral. No earlier studies reviewed race and household size with PBC, so these findings are new in the empirical literature.

Overall Behavioral Intent

Overall behavioral intent refers to motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior is performed (Ajzen, 1991). The score for overall behavioral intent was the mean of the sub scores for environmental attitudes, social norms, and PBC. Results from the stepwise regression for overall behavioral intent found household size and race to be statistically significant predictors of overall behavioral intent. Together these variables explained 13% of the variation in overall behavioral intent. This finding was consistent with earlier research by Ajzen (1991) and Neff et al. (2015).

30-Day Behavioral Intent

30-day behavioral intent refers to motivational factors that influence a given behavior over the next 30 days where the stronger the intention to perform the behavior, the more likely the behavior is performed. The survey item was: "I intend to reduce household food waste over the next month." The score for 30-day behavioral intent was the mean for this individual item. Results from the stepwise regression for 30-day behavioral intent found household size and educational attainment to be statistically significant predictors of 30-day behavioral intent. All the significant independent variables together explained 8.9% of the variation in overall behavioral intent. The group mean overall behavioral intent score was 6.56, which was diminished by .38 for each additional member of the household and by .50 for the high school graduate group. No prior scholarly research addressed this variable, and the results explained a similar amount of the variation as overall behavioral intent.

Implications

This study aimed to determine sociodemographic and psychological factors that might contribute to food waste. To successfully reduce consumer food waste, it is essential to understand the factors influencing food waste behaviors (Grasso et al., 2019) as consumer food waste in the United States accounts for approximately 20% to 35% of all freshwater consumption, 7% to 31% of cropland used for food production, up to 30% of all phosphate fertilizer used, and is the single largest component of municipal solid waste, thereby threatening sustainability (Conrad et al., 2018; Hebrok & Heidenstrom, 2019).

Theoretical Implications

Although there are numerous and complex food waste drivers that are influenced by environmental attitudes, subjective norms, and perceived behavioral control, the sociodemographic factors included in this study accounted for an impressive 29.3% of the variation in food waste percentage. Sociodemographic factors predicted food waste better than the overall TPB score or any of the three subdimensions. Granted that the sociodemographic variables are powerful predictors of food waste, any theoretical framework is expected to add incremental predictive power to simple demographic factors. It is necessary to better understand the key determinants of wasteful consumer behavior to advance knowledge regarding the food waste phenomenon and craft successful interventions.

The TPB (Ajzen, 1991) has been used to explore food waste behaviors by a large number of researchers including this study; however, something was still missing from the theory. Although the theory demonstrated some predictive value from environmental attitudes and subjective norms, little incremental predictive value was derived from perceived behavioral control. Sociodemographic variables explained 30.6% of the variation as compared to a maximum for TPB variables of 13.5%.

Practical Implications

The practical implications of this study involve the predictive power of socioeconomic factors on food waste behavior. The findings of the present study can help develop or revise food waste reduction intervention strategies or tactics. Determining significant factors driving food waste is, of course, necessary to identify and manage opportunities to reduce food waste at the consumer level. Based on the relevant research

and findings from this study, several practical implications emerged based on behavioral intent and reported food waste.

Food Waste Intervention Recommendations (Direct and Indirect)

Recommendations Based on Direct Conclusions

Food waste conclusions and recommendations are based on both direct and indirect reasoning related to the research. Direct conclusions and recommendations are derived from statistically significant regressions analyses and indirect conclusions interpretation of results. Indirect conclusions and recommendations rely on a combination of direct observations, extant research, and certain assumptions. Several direct conclusions and recommendations emerged from the research.

Household Annual Income

There are two implications for findings for household income. First, the $162,000 and over annual household income category represented the largest opportunity in terms of the potential to reduce percentage food waste. However, the potential in terms of the volume of food waste reduction nationwide is limited by the fact that only 16% of U.S. households make more than $162,000 annually. Second, awareness interventions should take high income individuals for the greatest expected benefit. Most of the studies confirmed the present study's findings that higher-income households' food waste percentage is greater than lower-income families (Principato et al., 2021; Qi & Roe, 2016). Some research has suggested that food waste is considered a luxury item in that fresh food is tastier and less likely to cause illness (Grasso et al., 2019). Income accounts for the largest portion of the variation in food waste percentage at 13.2%. This study

confirms the majority of extant research on the relationship between food waste and income.

Race/Ethnicity

Race/ethnicity was significantly predictive of behavioral intent to reduce food waste; however, findings were mixed. Respondents that self-identified as White manifested significantly higher sensitivity to social norms, perceived behavioral control, and overall behavioral intent to reduce food waste. Interestingly, Asian participants reported lower environmental awareness but much lower food waste. In addition, Hispanic participants manifested higher sensitivity to social norms, and importantly, Young et al. (2017) suggested that campaigns that provide information on the behavior of others within the same definable group have proven effective for influencing others in that group to reduce food waste. The primary implication of the race/ethnicity finding is in relation to crafting interventions. Interventions targeting non-White and non-Asian cultural groups are more likely to produce significant results.

Recommendations Based on Indirect Conclusions

The following two recommendations are based on indirect conclusions. TPB messages to specific demographic groups could be effective in influencing intent: (a) Hispanic and Caucasian households were slightly positive for perceived behavioral control. This means they have a more favorable perspective, self-confidence in their ability to influence behavioral intent. (b) Caucasian and Hispanic households were more responsive to subjective norms meaning they can be affected or are persuaded by the influence of others. Based on both direct and indirect interpretation of the results the overall conclusion and recommendations for this study is household size considered with

income and age suggest younger wealthier households with children wasted more, were less amenable to the theory of planned behavior subdimensions, and had lower behavioral intent. Influencing higher income households with children offers the greatest opportunity to impact behavioral intent to reduce waste.

Another potential recommendation based on indirect conclusion is to closely associate food waste reduction with climate change. Tie together the common objectives of reduced methane emissions, wasted resources and food insecurity. Focus on communicating and persuading children to deliver the food waste story to influence family behaviors.

Recommendations for Future Research

School-Based Interventions

Lawson et al.'s (2019) study can easily be used as a model for school-based interventions designed to influence both parents and children. The potential for the transfer of knowledge, attitudes, or behaviors from children to parents may provide a promising pathway to overcoming entrenched parental opinions regarding environmental issues. Perhaps school-based interventions to raise awareness of the effect of food waste on the environment could mimic the success of climate awareness in convincing children of the importance of reducing food waste, and in turn, impact parents. Target specific interventions and customized messages towards specific ethnic groups. Supporting the study findings of effective theory of planned behavior messages directed at specific ethnic groups.

Public Policy

Few studies have demonstrated the efficacy of food waste interventions to reduce wasteful behavior (Reynolds et al., 2019). A systematic review of all scholarly research in the prior 5 years was needed to define the existing landscape, establish which are effective interventions, and highlight gaps in the existing efforts to identify missed opportunities. All school-based and public policy-based initiatives must be included, and the strength of the methodology understood, to identify successful elements for policy, practice, or implementation to derive the best results. The goal would be to create a comprehensive review of effective interventions for use by decision makers and researchers. Possible indirect initiatives could be to leverage school based environmental awareness campaigns to incorporate food waste into messaging. Establish which interventions effectively reduce wasteful behaviors. Add food waste reduction techniques and skills to school curriculum and conduct awareness and outreach programs to affluent Asian, Hispanic, and Caucasian families.

Replicate Present Study With Larger Sample Size and Other Themes

Replicate the present study with a larger sample size. Although the use of a stratified sample of 200 nationwide participants was quite rigorous, accounting for 29.3% of the variation in food waste using demographic factors is important and should form the basis for interventions. To ensure the intervention targets individuals that provide the most benefit, a replication study with larger sample size, and the addition of a social desirability scale, is appropriate before allocating monies toward any interventions.

Although demographic variables are useful in guiding public policy, more research is needed to understand the underlying forces that drive demographic differences

in food waste. Identify those interventions that effectively disrupt consumers daily habits and systems.

The following themes are suggested:

- Determine factors that influence families and behaviors within ethnicities. Understand what drives behaviors in affluent families.
- Develop ways to measure food waste by household.
- Opportunities exist to further breakdown the demographic categories. There are several subcultures within each demographic category. Breaking down each ethnicity into more precise subethnic groups. All Asians are not the same, Chinese, Japanese, Indian, Vietnamese, etc. The different cultures will tell unique positions by each subculture. The same could be said for Hispanic as that ethnicity breaks down into subethnicities.
- There are opportunities to break down consumer segments based on their relationship with food. Those consumers who prepare more at home versus those who dine out could be interesting subcategories to analyze. Rural versus urbanites could also be an interesting comparison.

Strengths and Weaknesses of the Study

A large body of research exists regarding the relationship between consumer food waste and sociodemographic factors (Elimelech et al., 2019; Grasso et al., 2019; Neff et al., 2015; Principato et al., 2021; Qi & Roe, 2016). However, self-reported food waste is a major limitation in most studies, as it often reflects social desirability, resulting in a substantial deviation between reported and actual food waste (Principato et al., 2021). Elimelech et al. (2019) used structural equation modeling on a sample of 169 individuals

in Israel and found self-reported food waste was a significantly underreported measured of food wastage. Principato et al. (2021) found self-reported food waste consistently underreported compared to actual food waste by 50% to 75%. Neff et al. (2015) found that three quarters of respondents believed they discarded less food than the average American. Therefore, the mean self-reported food waste of 17.1% in this study must be considered considering the tendency to underreport food waste, and research indicated that actual food waste in the United States is between 30% and 40% (Neff et al., 2015; Principato et al., 2021). As the primary findings from this study relate to self-reported food waste, the lack of a means to establish actual food waste was a weakness. The sample when broken down by ethnic subcategory is not a sufficient sample size to draw conclusions. Larger ethnic sample sizes would be needed. There may be social desirability bias when answering survey questions on environmental attitudes and intent to change. Both issues have high visibility and complying may affect answers. The strengths of the study were new contributions to the learnings of food waste behavioral intent. The study contributed to understanding demographic factors that correlate with food waste intent. The study provided specific data on ethnicity relative to the theory of planned behavior subdimensions and behavioral intent. The study also confirmed prior research on the effect of household size and household income on intent.

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APPENDIX A

Understanding Food Waste Behavior Survey

* 1.

University of San Diego

Combination Recruitment and Consent Form
For the research study entitled:
Understanding Food Waste Behavior

Hello,

My name is Dave Hubinger. I am a PhD student in the Psychology Department at the University of San Diego, San Diego, CA. I am conducting a research study about household food waste behavior and I would like to invite you to participate.

The purpose of this study is to identify factors that contribute to wasting food in one's household. You invited to participate because you are the primary food purchaser in a household of three or more people and a U.S. citizen.

If you decide to participate, you will be asked to complete an online survey once that takes about 15 minutes to complete. I will make statements like: "Reducing household food waste is rewarding". You will be asked to rate your level of a agreement, or disagreement, with each statement on a scale of 1 to 7.

You will also be asked a few questions about yourself, such as your: age, annual household income, educational attainment, ethnicity, number of people in household, professional affiliations.

This study involves no more risk than the risks you encounter in daily life. Your responses will be confidential and all your information will be coded with a number. Your email or IP address will be deleted, and nobody will know your identity. I will keep the study data for a minimum of 5 years.

· You will receive no compensation for your participation in the study.

Taking part in this study is optional. Choosing not to participate will have no effect on your employment status, grades, or any other benefits to which you are entitled. You may also quit being in the study at any time or decide not to answer any specific questions. Should you decide to participate, please print out a copy of this page for your record.

I will be happy to answer any questions you have about the study. You may contact me at davidhubinger@sandiego.edu). You can also contact the Institutional Review Board at IRB@sandiego.edu.

Thank you for your consideration.
Dave Hubinger

- ◯ I agree
- ◯ I disagree

Understanding Food Waste Behavior Survey

* 2. Reducing household food waste will positively impact the environment.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 3. Reducing household food waste is rewarding.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 4. Reducing household food waste is responsible.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 5. Reducing household food waste is important to sustainability.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 6. Most people who are important to me think that I should reduce household food waste

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 7. Important community members expect me not to waste food.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 8. Most people who are important to me consciously reduce household food waste.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 9. Close friends expect me to avoid household food waste.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 10. I have many opportunities to reduce household food waste.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 11. Reducing my household food waste is inconvenient.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 12. Local practices or rules provide satisfactory opportunities for reducing food waste.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 13. I am confident that I can reduce household food waste.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 14. I intend to reduce household food waste over the next month.

- 1 Strongly disagree
- 2 Somewhat disagree
- 3 Slightly disagree
- 4 Neutral
- 5 Slightly agree
- 6 Somewhat agree
- 7 Strongly agree

* 15. In an average month, what percentage of food in your household is typically wasted?

0% Proportion of food wasted 100%

* 16. What is your current age?

18 Age 65

* 17. Number of people in household including yourself.

3 Household size 10

* 18. What is your current annual household income?

- Up to $62,000
- $62,001 to $120,000
- Greater than $120,001

* 19. Please select the gender you most identify with.

- Female
- Male
- Other

* 20. What is your highest educational attainment?

- High School
- Some college
- Bachelor's degree
- Graduate or professional degree

* 21. Please select the race/ethnicity that you most identify with.

- African American
- American Indian/Native American
- Asian
- Hispanic/Latino
- White/Caucasian

APPENDIX B