8-2022

The Relationship Between Psychosocial Factors and Food Waste-Related Behaviors Among College Students

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The Relationship Between Psychosocial Factors and Food Waste-Related Behaviors Among College Students

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Agricultural, Food & Life Sciences

by

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August 2022
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Abstract

Food waste is a significant environmental, economic, and social issue, with younger consumers as the most significant contributors. Specific behaviors, like over-purchasing food and misusing date labels, result from a complex interaction between social and psychological factors, which influence food waste among this demographic. The purpose of this study was to identify the psychosocial factors influencing food waste behaviors among college students at the University of Arkansas. Guided by the Theory of Planned Behavior, this study utilized online and face-to-face quantitative surveys, distributed to students enrolled at the University of Arkansas in the spring of 2022. Demographics, attitudes, subjective norms, perceived behavioral control, and behaviors were descriptively described prior to correlational and regression analyses. Results showed that demographic variables were all significantly correlated ($p \leq 0.05$) with at least one construct variable. Additionally, the regression model predicting food waste behaviors was only able to explain 15.6% of the variance for food waste-related behaviors among college students at the University of Arkansas. Although the relationships between attitudes, perceived behavioral control and food waste-related behaviors found in this study were significant ($p \leq 0.001$), the instrumentation had low internal consistency. Therefore, it is recommended that future researchers develop their instrument by garnering salient beliefs from the targeted demographic prior to survey development. The researcher also suggests partnering with the Razorback Food Recovery Program and Chartwells Dining Team on the University of Arkansas campus to communicate the effects of food waste to raise awareness and positively influence food waste-related behaviors.

Acknowledgments

I would like to extend my sincere appreciation to my major advisor, Dr. Donna L. Graham, for accepting me as her student and for her guidance and support throughout my academic journey. Her patience, keen insight, and helpful advice have richly enhanced this experience. I am also greatly indebted to Dr. Donald Johnson and Dr. George Wardlow for serving on my graduate committee and for their assistance in completing this research project. Their invaluable assistance with statistical analyses and their specific attention to research design and methodology helped more than they will ever know. Thank you. Lastly, I want to thank the entire AECT faculty and staff for their willingness to provide assistance whenever asked. You all are greatly appreciated.

Dedication

This body of work is dedicated to my family. I thank my loving parents, Horace and Denita, for their continuous prayers as well as their unyielding emotional and financial support. I am forever grateful to have had their continuous support during my journey of self-discovery. I am grateful to my siblings, Jonathan and Laura, for always showing their concern for my well-being and offering much-needed distractions. To my cousin, Sydney, thank you for uplifting me even while you dealt with the ebb and flow of medical school. To my dearest friend, Dillion, thank you for always being there and making sure I remained focused; you mean the world to me. Lastly, to my grandparents, Dave & Marian Wright and Alfonzo & Berniece Reed. Undoubtedly, I know your prayers are why I have made it to this point in my career; I have kept each of you in my heart every step, and I pray you will continue to lead me in the direction I should go. I pray that I have made all of you proud. I love you all dearly.

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Chapter 1. Introduction

Statement of the Problem

Food waste, as defined by the United States Department of Agriculture (USDA), is a reduction in edible food mass that occurs at the end of the food supply chain at the retail and consumer level (Buzby, Farah-Wells & Hyman, 2014). Food waste is a significant environmental, economic, and social issue (Devin & Richards, 2018). Globally, 1.3 billion tons of food are lost yearly (Food and Agriculture Organization [FAO], 2019), with industrialized and developing countries responsible for 630-670 million tons (Gustavson et al., 2011). In the United States, food waste makes up nearly 15% of the municipal waste stream, with Americans disposing of over 0.6 pounds of food waste per person per day (Thyberg & Tonjes, 2016). Food waste creates a considerable environmental problem. Typically, disposed foods eventually end up in landfills, making food waste responsible for a significant amount of fugitive greenhouse gas (GHG) emissions from landfills (Lee et al., 2017). Food waste has exhibited the highest methane potential among municipal solid waste (MSW) constituents (Chickering et al., 2018). Since landfills account for 34% of all human-related methane emissions in the United States (Gunders, 2012), decreasing food waste in landfills would help reduce methane gas emissions. When suboptimal produce fails to come to market or leftovers end up in the trash bin, the fresh water and other natural resources used to produce the food are squandered (Buzby et al., 2014; Hall et al., 2009). With concerns about global warming, food waste adds a layer to an already complex situation. In addition to the environmental and societal impacts, food waste has a far-reaching economic impact. The USDA has reported an annual estimated cost of food waste in the United States as 161 billion dollars (USDA, 2019).

With the global population projected to reach 9.8 billion by 2050 (United Nations, 2017), the over-exploitation of natural resources and increasing demand for food present a significant

threat to environmental and societal welfare (Wakefield & Axon, 2020). In the United States, approximately 30 million acres of land and almost 4.2 trillion gallons of water are misused each year due to wasted food (Conrad et al., 2018.) The willingness of consumers to voluntarily participate in reducing food waste behaviors may enhance the food waste initiatives and play an essential role in the sustainability of the food supply.

The cause and consequences of food waste is a multi-tiered issue in many countries, especially high-income countries like the United States and the United Kingdom, where consumers are the most significant single contributors (Griffen, Sobal, & Lyson, 2009). Several organizations have focused their efforts on finding solutions to this phenomenon. In the United States, governmental agencies like the Environmental Protection Agency (EPA), Food and Drug Administration (FDA), and the USDA have created a joint effort known as the Federal Interagency Food Loss and Food Waste Collaboration. This collaboration has outlined six priority areas covering the most pertinent aspects of food loss and waste. Priority four seeks to eliminate confusion on food safety, food date labels, and food donations which often result in food loss and waste at retailers and homes (EPA, 2019).

The primary reasons for food waste in homes include over-purchasing food and not using food promptly (Aschemann-Witzel et al., 2015). As such, consumer education regarding food date labels like "best by/use by," combined with messages to use freezing to preserve food where appropriate, may ultimately empower consumers to waste less safe, edible food (Kavanaugh & Quinlan, 2020). Leib et al. (2016) report that there are no federal regulations for food date labels in the United States, and state-level regulations are either non-existent or inconsistent. Since date labels are not regulated, each state sets its standards leading to consumer confusion.

Factors like misunderstanding food date labels, over-purchasing, and preparing too much food are behaviors resulting in food waste. These behaviors result from a complex interaction between social and psychological factors influencing food waste, yet they remain an understudied area of this phenomenon. The combination of social and psychological factors is referred to as psychosocial factors, which have been shown to influence an individual psychologically and socially and describe an individual's social environment (Thomas et al., 2020).

Although the literature indicates that consumers are the most significant contributors to food waste, research focused on specific behaviors is limited, especially for emerging adults (Neff et al., 2015; Qi & Roe, 2016; Stancu et al., 2016). Examining emerging adults is important because past studies have shown that individuals in this age group, specifically those between the ages of 18 to 29, are significant contributors to food waste and are more prone to waste food than older age groups (European Commission, 2014; Mondejar-Jiminez et al.,2016; Parfitt et al., 2010; Pearson et al., 2013). College students, as emerging adults, are developing attitudes and behaviors about food choices and waste that will influence life behaviors. While food loss and food waste studies have increased in recent years (Spang et al., 2019; Xue et al., 2017), more work on this age group needs to be done (Hodgins and Parizeau, 2020). Despite the magnitude of food waste, there is a lack of research on the determinants of food waste behaviors.

Statement of Purpose

This study identified the psychosocial factors influencing food waste behaviors among college-age students. Considering the propensity of young adults (18-29) to be more significant contributors to food waste than their older counterparts, college students are the ideal unit of analysis (Andenero et al., 2016). The current study addressed two primary questions and two relevant hypotheses derived from the review of the related literature. A description of the

questions, hypotheses, and statistical analyses used to test the null and alternative hypotheses (Creswell, 2014) is provided in Chapter III.

This lack of understanding about food waste behaviors raises the following research questions:

Question 1: Is there a relationship between the psychosocial factors of attitudes, subjective norms, and perceived behavioral control towards food waste-related behaviors and student demography?

Null Hypotheses:

H_0: There will not be a significant ($p < .05$) relationship between the psychosocial factors of attitudes, subjective norms, and perceived behavioral control and demographic variables regarding food waste-related behaviors among college students at the University of Arkansas.

Alternative Hypotheses:

H_1: There will be a significant ($p < .05$) relationship between the psychosocial factors of attitudes, subjective norms and perceived behavioral control, and demographic variables regarding food waste-related behaviors among college students at the University of Arkansas.

Question 2: Is there a single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control that explains a significant portion ($p < .05$) of the variance in food waste-related behaviors of college students?

Null Hypotheses:

H_0: A single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control will not explain a significant portion ($p \leq .05$) of the variance in food waste-related behaviors among college students at the University of Arkansas.

Alternative Hypotheses:

H_1: A single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control will explain a significant portion ($p \leq .05$) of the variance in food waste-related behaviors among college students at the University of Arkansas.

This study may offer implications for individuals and organizations contemplating designing food waste interventions. Given the complexity of food waste and its far-reaching impacts, this study aligns with the American Association for Agricultural Education's (AAAE) National Research Agenda Priority Area 7: Addressing Complex Problems (Roberts et al., 2016).

Limitations

The University of Arkansas – Fayetteville currently has a student population of 29,068, comprised of 83.5% undergraduate students, 15.2% graduate students, and 1.3% of Law and students identifying as "other" during the 2021-2022 academic school year (University of Arkansas, 2021). Because this research involved current students at the University of Arkansas, findings could not be generalized beyond the given population. Additionally, although this study used hypothesis testing, the sampling was not random, so the findings were not generalizable to the University of Arkansas student population.

Chapter 2. Literature Review

Introduction

This study identified some psychosocial factors influencing food waste-related behaviors among college-age students at the University of Arkansas. This research utilized The Theory of Planned Behavior (TPB) to assess these psychosocial factors as a theoretical framework. TPB is used to explain human behavior based on three determinants: attitude, subjective norms, and perceived behavioral control (Ajzen, 1991) and is often used to study consumer behavior as it relates to food (Kassem et al., 2003; Tarkianen & Sundqvist, 2005; Shah & Mohamed, 2011; El Khory et al., 2019; Cembalo et al., 2019). Therefore, the use of TPB for this study was deemed most appropriate.

Defining Food Loss and Food Waste

One-third of food produced for human consumption is lost or wasted each year, the equivalent of 1.32 billion tons globally (Gustavsson et al., 2011). Although waste is an unavoidable by-product of most human activity (Jaybhaye & Bhalerao, 2016), some of the losses experienced are entirely avoidable. Food waste from products destined for human consumption falls into two categories: recoverable or non-recoverable food (Buzby et al., 2014). Recoverable food can be crops left in the field after being harvested, unsold cosmetically rejected produce, excess prepared food from restaurants, and damaged retail food products (Buzby & Hymen, 20

12). Food waste that is not recoverable includes diseased livestock or produce, rotten food, plate waste from restaurants or institutional food settings, in products discarded when processing foods (Buzby & Hymen, 2012).

Confusion exists because non-recoverable losses can be classified as either food loss or food waste. It is classified as *food loss* when losses happen close to the agricultural stage due to logistical limitations, lack of infrastructure, poor market access, or deficient transportation.

However, the FAO defines food loss as a decrease in edible food mass throughout the part of the food supply chain that specifically leads to edible food for human consumption (Gustavsson et al., 2011). Food loss may also occur from natural shrinkage, cooking processes, damage from mold, pests, inadequate storage, plate waste, and consumer or retail food waste (Buzby et al., 2014). As produce makes its way through the food supply chain, the decision to toss or discard food products is primarily based on these characteristics but tends to vary depending on the food group. For example, Kamal et al. (2021) report that fruits and vegetables showed less loss than tubers and roots. This loss represents wasting food commodities and indirectly wastes critical resources such as land, water, fertilizers, chemicals, energy, and labor (Sagar et al., 2018).

Definitions of food waste are not universally agreed upon (Lebersorger & Schneider, 2011), which makes studying and quantifying food waste difficult (Buzby & Hyman, 2012). These definitions change based on the materials, production means, and management approaches (Gjerris & Gaiani, 2013). For example, the USDA describes food waste as a component of food loss that occurs when an edible item goes unconsumed at the retail or consumer stage (Buzby et al., 2014). However, the FAO defines food waste and food losses together and explains that they occur at the end of the food supply chain by retailers and consumers (Gustavsson et al., 2011). For some, food waste excludes products in the food supply chain that are not edible or directed for human consumption (Buzby et al., 2014; Gustavsson et al., 2011; Parfitt et al., 2010). Figure 1 shows the distinction between food losses and food waste. Food lost while on-farm, packaging, processing, storage or distribution, and transportation can be described as food loss. Food lost after being sold to consumers in grocery stores and restaurants or within the consumer household can be described as food waste. Regardless of the definition, food losses and food waste play an essential role in food security and influence the use of natural resources, impacting climate

change (Wahlen & Winkel, 2017). For this study, *food waste* is defined as the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food service providers, and consumers (FAO, 2019).

Figure 1

Food loss vs. food waste is classified by area of loss in the supply chain.

Extent of food loss and food waste

Food waste is a significant environmental, economic, and social issue (Devin & Richards, 2018). Globally, 1.3 billion tons of food are lost yearly (FAO, 2019), with industrialized and developing countries responsible for roughly 670 and 630 million tons, respectively (Gustavson et al., 2011). Food waste generation is related to income in some industrialized countries. Food losses - typically caused by unstable food supply chains and improper storage of postharvest or processed commodities, are much more common in developing countries than in affluent economies (Lyndhurst, 2007; Secondi et al., 2015, Mak et al., 2020). Conversely, Parfitt et al.

(2010) report that post-consumer food waste is the highest overall loss in affluent countries. Aesthetics and arbitrary sell-by dates may influence post-consumer food waste. Culture and personal choice also affect decisions regarding what is too good to throw away, and these perceptions can change over time (Thyberg and Tonjes, 2016).

Extent of consumer food waste

In many cases, the food tossed into our nation's landfills is wholesome, edible food (EPA, 2019). Total United States food loss from the retail and consumer stages is 31% for dairy, 28% for eggs, 29% for fruits, 30% for vegetables, 27% for meats, 39% for seafood, 31% for grains, 15% of nuts, and 38% of fats and oils (Buzby et al., 2014). Organizations like the Natural Resources Defense Council (NRDC) have assessed the contributing factors and behaviors at each stage of the production process to determine the exact cause of this avoidable waste. The five (5) leading factors of food waste at the household level in North America are lack of awareness, confusion over date labels, spoilage, impulse and bulk purchases, poor planning, and overconsumption (NRDC, 2012). These outcomes differ little from what other researchers and organizations have identified. For example, the Waste and Resources Action Program (WRAP) (Ventour, 2008), based in the United Kingdom, has also assessed household food waste contributors. Of the 33 contributors found in the study, seven stood out as primary reasons for food waste:

- Buying too much food in general, mainly driven by special offers
- Buying more perishable products as part of healthier eating patterns and food experimentation
- Not eating the foods that need to be eaten first, as consumers opt for what they like eating over what they have at home

• Cleaning out cupboards, fridges, and freezers to dispose of old, forgotten, or unwanted food products

• High sensitivity to food hygiene and the guidance dates on food labeling

• Preparing too much food in general

• Dissatisfaction with food taste – especially food left by children (Lyndhurst, Cox & Downing, 2007, p. 2).

While these factors are more detailed than the EPA list, there is a commonality in the previously identified reasons for consumer food waste in the United States studies. According to Gunders (2012), most Americans waste more than 20 lbs. of food per month. In a study published by the Economic Research Service (ERS), Americans throw away approximately 25% of the food they bring home (Buzby et al., 2014). In addition to monetary losses for the economy food waste also represents a significant monetary loss for consumers (Baker et al., 2009; Buzby et al., 2014; Neff et al., 2015; Stefan et al., 2013). An average American family of four discards an estimated $1,500 worth of food each year, amounting to roughly $371 per person (Cheung, 2018). Food groups most commonly wasted and associated with the highest values of monetary loss are meats, poultry, and fish at $128/year per capita, vegetables at $66/ year per capita, and dairy at $60/year per capita and make up 68% of total consumer waste in the United States (Buzby et al., 2014).

Based on this information, the causes of food waste are complex and operate at several inter-related levels in the supply chain (High-Level Panel of Experts (HLPE), 2014; Mena et al., 2014; Parfitt et al., 2010). Toma et al. (2017) believe that actions taken upstream in the food supply chain may affect the amount of waste produced downstream, including households. Along with the potential remedies identified by the NRDC study, it would be helpful for

researchers to explore the specific psychosocial factors, like attitudes and behaviors, which contribute to food waste.

Impact on food security

Food waste also has major consequences for food security (Buzby et al., 2014; Neff et al., 2015) and results in several environmental impacts. While Americans dispose of millions of tons of food, the USDA estimates that 11.8 % of American households- about 15 million households- had difficulty providing enough food for all their family members due to a lack of resources in 2017 (Coleman-Jensen et al., 2018). In a world scarce of natural resources and experiencing high levels of poverty, food waste adds additional concern with more than 2.2 billion people near or living in poverty (United Nations Development Program [UNDP] (2014).

In the developed world, particularly the United States, volume, availability, accessibility, affordability, and caloric density of food have led to increased overconsumption and waste (Rozin, 2005; Blair and Sobal, 2006). The perceived logic is that the more money at an individual's disposal, the more likely they are to overconsume and waste. With the United States being one of the wealthiest countries in the world, it is not surprising that these contributing factors exist. Reclaiming wasted food could feed the 42 million Americans facing food insecurity three times over (Gunders, 2017). Furthermore, a study by Dou et al. (2016) concluded that food waste reduction at an attainable and reasonable rate of 20% would not only feed millions of people but would save more than the annual increase in total food production. From a global perspective, this would also be helpful for the growing world population. The United Nations (U.N.) has projected that the food supply should increase by 60% from 2009 to 2050 (Dou et al., 2016; Neff et al., 2015; Parfitt et al., 2010) to meet world food demands. Reducing food waste can also help mitigate or offset this need by preventing or recovering significant resource losses

(Baghersadeah et al., 2014; Buzby & Hyman, 2012; Dou et al., 2016; Neff et al., 2015; Qi & Roe, 2016).

Use of date labels and effect on food safety

One primary driver of food waste among emerging adults is misunderstanding food date labels (NSW, 2012). Food product data labeling is generally classified as "open" or "closed." Open date labeling with terms such as: "sell by," "best by," "best if used by," or "best before," "freeze by," "use by," "baked-on," and "packed on," is for indicating to retail personnel and consumers the shelf life of the product for optimum quality and stock rotation (Newsome et al., 2014). Even though this system is intended to be used and understood by consumers and those working in the supply chain, it is more effective for stock rotation in retail chains (Newsome et al., 2014). Terms commonly used in open date labeling in the United States as defined by the Food Marketing Institute [FMI] and Grocery Manufacturers Association [GMA] (2007) and the National Institute of Standards and Technology [NIST] (2013) include:

- Sell by - The date, determined by food manufacturers, by which the food at retail should be sold unless it is frozen before or upon reaching the date. There is a period beyond this date that the product is usable before the quality is less than the manufacturer's standards for consumer acceptance. Typically, one-third of the product's shelf-life remains after the sell-by date for consumer use in the home (ift.org). Many manufacturers will credit the store for the past-date product, especially if donated to food banks or food salvage stores.
- Use by- The date, determined by the product manufacturer, by which the product should be consumed. In addition, retail packaging of certain reduced-oxygen packaged foods requires labeling with use-by dates in conjunction with time limits for refrigerated shelf life. The product should be discarded after the use-by date.

• Best by, best if used by, best if used before, or best before- Dates by which the product should be consumed for ideal quality. These may be combined with a freeze-by statement (for example, best if used by X or "can be frozen but must be within X days if taken from the freezer"), which is becoming a commonly used phrase with poultry and fish (Newsome et al., 2014, pp. 746-747).

Food waste resulting from misunderstanding food date labels also affects food safety. Although there is no consistent definition of food safety, it can essentially be food free of harmful elements. Food date labels are not an exact science. So, not only do consumers misinterpret the meaning of food date labels, but they may also use them to measure food safety. Based on current standards, this is not an accurate interpretation of food date labels. However, when date labels were first established, the labeling system would give consumers an indication of freshness. The codes were initially designed to aid in controlling food inventories and assist in product recalls, such as for contaminated foods (The Office of Technology Assessment [OTA], 1979). Since that is no longer how they are used, this poses an issue to consumer health.

The shelf-life of food is the period before the product becomes unacceptable for consumption from sensorial, nutritional, or safety perspectives (Labuza & Fu, 1993). Based on which food date label term the consumer interprets and the food product, they could ingest food that has passed its shelf life. The food date label associated with shelf life and food safety is the expiration date. Although studies have shown that the expiration date is most commonly recognized and understood, this does not mean that consumers immediately discard expired food products. Quality indicators like color, smell, and texture are all components of food safety, which should also be considered before a consumer decides to discard any uneaten food product.

Emerging Adults

The theory of emerging adulthood, proposed by Arnett (2000), is defined as a period of development from late adolescence through the twenties (18-29), with a particular focus on ages 18-25 (Arnett, 2000, 2014). It should be noted that Arnett (2000) warned readers about the effects of heterogeneity within this demographic. He stated:

> The heterogeneity of emerging adulthood represents both a warning and an opportunity for those who wish to study this age period. The warning is to be cautious in making sweeping statements about emerging adults. Almost always, such statements need to be qualified by mentioning the heterogeneity of emerging adulthood. The opportunity is that this heterogeneity makes emerging adulthood an especially rich, complex, dynamic period of life to study (Arnett, 2000, p. 477).

While keeping this in mind, researchers have found some homogeneity in this group's characteristics, practices and behaviors. According to relevant literature, age is negatively correlated with food waste behavior (Quested et al., 2013; Lorenz et al., 2017) as young people spend less time cooking and prefer fast food, while older people tend to have more cooking skills and more time to engage in cooking activities (Ellison & Lusk, 2018). For example, research conducted by the European Commission, the Australian government, and organizations like the FAO collectively report that younger individuals aged 15-24 are among the most significant contributors to food waste and more likely to engage in behavioral practices that facilitate food waste (European Commission, 2014; Mondéjar-Jiménez et al., 2016). Practices like frequently buying fast food, seldom cooking food, and having no idea about food materials cause young individuals to have a low awareness of food waste and mistakenly believe that they have not caused much waste (Nikolaus et al., 2018). Researchers in Poland found that while university students were familiar with the negative outcomes of food waste, this did not impact their

behavior. Ultimately, the authors determined that this resulted from limited experience with food management (Radzyminska, Jakubbowska & Staniewska, 2016). In addition to limited food management experience, Aschemann-Witzel et al. (2015) found that greater spontaneity and convenience may influence these behaviors among younger individuals. Similarly, an investigation in a United Kingdom college setting found that the "on-the-go" culture of campuses disrupted any intentions to decrease food waste among students (Lazell, 2016). The commonality amongst geographical locations suggests that drivers of food waste, particularly behavioral ones, are similar in many societies and are likely applicable to other developed countries (Stancu et al., 2016; Stefan et al., 2013).

Emerging adulthood is also characterized by identity exploration, self-focus, the rise of new possibilities, shifting responsibilities from children to adults, and instability due to changing careers, friends, and living conditions (Arnett, 2014). These characteristics can largely be considered role explorations, which Arnett (2000) proposed only exists in developed countries as the culture allows young individuals prolonged periods of independence. These behaviors can sometimes be observed in college students as well. In many cases, college students are partaking in transitioning to independence, which is also a critical time in which a person forms long-lasting habits (Jung, Shin & Dougherty, 2020). Therefore, it can be deduced that beliefs and ideas about food during college often lay the foundation for food choices later in life (Wilkins et al., 2000; Brown et al., 2005; Nelson et al., 2008; Pelletier et al., 2014) and can be attributed mainly to their social groups. In prior studies, surveying adolescents and emerging adult samples have shown that perceptions of friends' attitudes and behaviors are associated with one's similar attitudes and behaviors (Eisenberg and Nuemark-Sztainer, 2010; Keel et al., 2013; Rosenrauch et al., 2017; Miething et al., 2018; Leahey et al., 2011). These findings give credence to the

assumption that friends influence individuals, and their opinions are therefore important to them. The development of friendships and social networks represent a suitable frame for studying the spread and clustering of social behaviors, norms, and attitudes (Miething et al., 2018).

Additionally, targeting emerging adults in a university setting is beneficial as it provides a microcosm that is excellent for developing and implementing specified and targeted behavioral interventions (Alattar et al., 2020). Universities tend to have a high degree of social influence, as some policies and activities are piloted there and then promoted to society after achieving significant results (Tsai, Chen, & Yang, 2020). Therefore, studying this group and developing interventions based on the findings presents a unique opportunity for researchers. However, before any interventions can be implemented, existing attitudes and behaviors among this group must first be determined.

Drivers and Determinants of Consumer Food Waste

Despite finding that consumers are the most significant contributors to food waste, studies focusing on the factors influencing this phenomenon are limited. For example, researchers like Qi and Roe (2016) and Stancu et al. (2016) have found that studies focusing on the factors that influence consumer food waste are limited compared to the body of research on the consequences of the phenomenon. Most of the existing literature is focused on the extent of food loss rather than the factors that drive those losses (Stefan et al., 2013). Factors like misunderstanding food date labels, over-purchasing, and preparing too much food align with behaviors and choices. These behaviors and choices can be defined as psychosocial factors, which have been shown to influence food waste behaviors but remain an understudied area of the phenomenon.

Psychosocial factors

Psychosocial factors are characteristics or factors that influence an individual psychologically and socially (Thomas et al., 2020). Research from the United States, United Kingdom., and European Union have identified psychosocial factors as key drivers of consumer food waste. Numerous studies have established the importance of understanding these factors and their impact on consumer food waste (Graham et al., 2014; Mondéjar-Jiménez et al., 2016; Neff et al., 2015; Qi & Roe, 2016; Quested et al., 2013b). For example, in 2013, the European Commission conducted a Eurobarometer survey that specifically addressed consumer food waste, intending to clearly understand European attitudes, perceptions, and behaviors related to waste management and resource efficiency (European Commission, 2014).

The Eurobarometer surveys are a series of large-scale public opinion surveys conducted across the E.U. since 1973, forming one of the largest survey databases in the world (European Commission, 2014), conducted in over 28-member states of the European Union. After interviewing more than 26,000 citizens, the data revealed that younger individuals aged 15-24 were more likely to waste food. Only 44% reported that they wasted 5% or less of food purchased, and 72% of respondents aged 55 and older reported they wasted 5% or less of their food purchased (European Commission, 2014). In the same study, younger respondents had the highest amounts of self-reported food waste, with 37% reporting that they likely wasted 6-15% of food and 13% reporting they likely wasted 16-30% of the food they purchased (European Commission, 2014).

A similar study seeking to understand better the knowledge, attitudes, perceptions, and behaviors of Australians regarding consumer food waste was conducted in 2009 by the Environmental Protection Authority of the Government of New South Wales (NSW). This food waste avoidance study was conducted under a campaign called *Love Food Hate Waste*. Over

1,200 households were interviewed through an online survey distributed to NSW residents aged 16 and older (NSW, 2012). Like the previous study, this survey revealed that younger consumers aged 18-24 were among the most wasteful household demographic (NSW, 2012).

Food waste-related behaviors

Food-related behaviors and routines are fundamental components of the food provisioning process (FPP) (Jensen et al., 2012; Stancu et al., 2016). The FPP describes a series of food-related behaviors that consumers will perform, from acquiring and preparing food to post-consumption actions, like food disposal. The interrelated behaviors, decisions, and actions made throughout the FPP, which are affected by psychosocial factors, influence how much food consumers waste (Quested et al., 2013b; Stancu et al., 2016; Stefan et al., 2013). Even choices and actions made in the early stages of the FPP will likely impact the amount of food wasted. For example, the ability of consumers to balance their purchased and consumed amounts of food is closely related to the behavioral practices and routines that they have built around their daily activities (Cheung, 2018). Engagement in behaviors such as meal planning and checking refrigerators and cabinets prior to food purchasing would reduce the likelihood of over-purchasing and, consequently, food waste (Quested et al., 2013b; Stancu et al., 2016; Stefan et al., 2013). Current research suggests that the best models for predicting food waste consider psychosocial factors and behavioral practices (Graham et al., 2014; Quested et al., 2013; Stancu et al., 2016; Stefan et al., 2013). This view is further supported by research conducted by the FAO and WRAP, identifying psychosocial factors such as attitudes, awareness, and perceptions to be significant contributors to food waste (Lyndhurst, 2011; Quested et al., 2013; Stancu et al., 2016; Stefan et al., 2013). Based on the recommendations from previous research to consider psychosocial factors and behavioral practices to predict food waste and the frequent use of TPB

to study consumer behavior as it relates to food, the TPB is one of the most fitting theoretical frameworks for this study.

Theoretical Framework

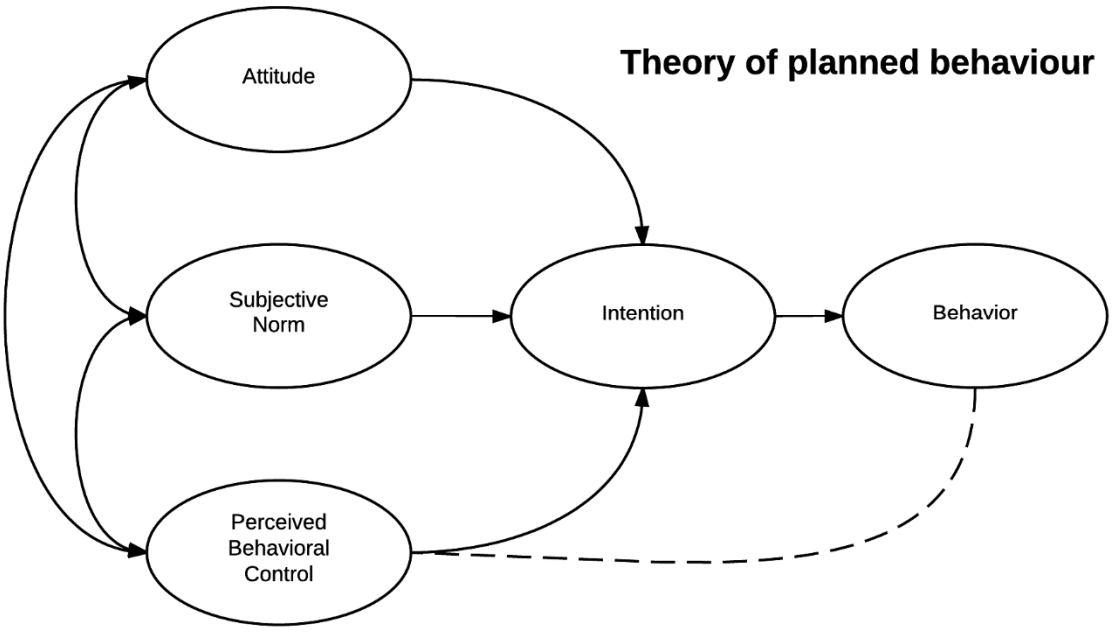
This study used the Theory of Planned Behavior (TPB) as a theoretical framework. It is argued that investigations into the determinants of potentially modifiable behaviors should be theory-driven, as theoretical frameworks can identify causal processes, which can guide the development of behavioral interventions (Michie & Abraham, 2004; Steg & Vlek, 2009). Further, previous literature demonstrates that food waste does not respond to a single behavioral dimension but emerges from a wide variety of actions and motivators (Evans, 2011; Quested et al., 2013; Secondi et al., 2015; Setti et al., 2016; UNEP, 2014). The Theory of Planned Behavior (Ajzen, 1988, 1991) is a well-established model which specifies cognitive antecedents of behavior. Specifically, the TPB states that three considerations guide human behavior: attitude, subjective norms, and perceived behavioral control. Ideally, these three considerations or constructs are measured as aggregates because they represent a more valid measure of the underlying behavioral disposition than any single behavior or item within a survey (Ajzen, 1991).

To predict whether a person intends to do something (behavior), one needs to know whether the person is in favor of doing it (attitude), how much the person feels social pressure to do it (subjective norm), and whether the person feels in control of the action in question (perceived behavioral control) (Francis et al., 2004). These predictors are relatively accurate in predicting intentions, which is the central theme of TPB. According to Ajzen (1991) and previous studies, intentions and perceived behavioral control correlate well with behavioral performance. Figure 2 shows a conceptual model of the theory and how each construct is an

antecedent of intention, which leads to behavioral performance. Attitude, subjective norm, and perceived behavioral control precede intention. The intention then leads to behavior. Ajzen (1991) stated, “Intentions are assumed to capture the motivational factors that influence behavior; they indicate how hard people are willing to try and how much effort they plan to exert to perform a behavior” (p. 181).

Figure 2

The Theory of Planned Behavior Model (Ajzen, 1991).



Source: In "The theory of planned behavior,” I. Ajzen, 1991, *Organization of Behavior and Human Decision Processes*, *50*, 179-211.

Fishbein and Ajzen (1975) defined *attitude* as a learned predisposition to respond in a consistently favorable or unfavorable manner to a given object, concept, or idea. These attitudes are formed by an individual’s learned values and beliefs (Asiegbu et al., 2012; Fishbein & Ajzen, 1975), and because attitudes generally form over a long period, they are consistent and often

highly resistant to change (Asiegbu et al., 2012; Krech et al., 1962). According to Stancu et al. (2016), studies have shown that favorable attitudes towards sustainability and negative attitudes towards food waste translate into stronger intentions to reduce food waste. These stronger intentions will then translate into increased engagement in behaviors that facilitate reduced food waste (Stancu et al., 2016). These findings further align with the expectations of the TPB (Fishbein & Ajzen, 2011). Empirical findings have also suggested a strong correlation between attitudes and intentions in various studies. For example, a study by Stefan et al. (2013) surveyed 244 Romanian consumers and found that consumer attitudes largely determined intent regarding food waste. Negative attitudes towards food waste exerted a significantly positive effect on the intent not to waste food, while lack of concern exerted a significantly negative effect (Stefan et al., 2013). Similarly, Cheng (2018) found that among 271 emerging adults, attitudes were significantly correlated with food waste-related behaviors, particularly with date label use, leftover use, and planning.

In a separate exploratory study by Mondejar-Jimenez et al. (2016), researchers investigated the complexities of food waste behaviors using the TPB. Two groups of Italian and Spanish youth (n = 380) were selected, as they were the population identified by researchers as most inclined to waste food. Because this study focused on household food waste, the participants were only young people that lived at home, of which 58% were females. The line of questioning and the chosen demographic were necessary because, in this community, there is a high adherence to the Mediterranean Diet – a dietary pattern recognized as environmentally-sustainable and characterized by high consumption of perishable products such as fish, fruits, and vegetables (Mondejar-Jimenez et al., 2016). The results showed that concern, moral attitude, and perceived behavioral control played a significant role in intention.

Moreover, the use of the TPB in this exploratory research study accurately determined food waste generation and prevention. Over a third of the variability in youth behavior toward food waste is explained by components related to the behavioral model (Mondejar-Jiminez et al., 2016). The appropriateness of the decision to divide attitudes towards food waste into moral attitudes and concerns was confirmed by the significant role played by the two components in influencing the intention to reduce food waste.

Additionally, subjective norms, expressed in terms of practices and behaviors, carried out frequently and occasionally in the individual's households, have a direct and positive effect on individual behavior. This finding led the researchers to conclude that good examples set by the family can positively influence youths to reduce food waste, which they will use to set a good example for their offspring. For context, *subjective norms* are defined as an individual's recognition and acceptance of other people's behavioral expectations. As it relates to food waste, this is translated into the extent to which people deemed important or essential to the individual would approve or disapprove of the individual's wasteful behavior (Graham-Rowe et al., 2015; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016). This is an injunctive belief since the individual would be considering the approval of a particular group or individual. On the other hand, descriptive beliefs refer to the individual considering what people important to them would do in a particular situation. For example, one of the youths in this study considering what their parent would do with leftovers from the night before could be defined as a descriptive belief. While the approval of certain people or considering what the people who are important to them would do has a positive effect on an individual's behavioral performance, there is still a need for an individual to feel they can perform a behavior.

In the same study by Mondejar-Jiminez et al. (2016), it was observed that perceived behavioral control had a significant effect on both intentions to reduce food waste and positive behavior, as foreseen by the original scheme of the TPB. *Perceived behavioral control* is an individual's perception of the extent to which behavior performance is easy or difficult (Ajzen, 1991). Interestingly, perceived behavioral control can be divided into perceived self-efficacy and perceived controllability (Vamvaka et al., 2020). Perceived self-efficacy is the general category for assessing perceived behavioral control, defined as the "ease or difficulty of performing the behavior" (Ajzen, 1991, p. 188). Perceived self-efficacy is also considered complex as it refers to an individual's internal control (Tarkiainen & Sundqvist, 2005). Conversely, perceived controllability deals with an individual's external control, such as having the actual possibility to perform the behavior. For example, if one of the youth in this study incorrectly stored food causing it to go to waste, that would be an issue of perceived controllability. Regardless of which perceived behavioral control category is measured, a favorable attitude and a supportive subjective norm are said to lead to a favorable behavioral intention (Ajzen, 2020).

In a separate study, researchers decided that school cafeterias worldwide offer a microcosm to educate on food and nutrition skills and change-related behavior (Allattar et al., 2021). The researchers developed a food waste diversion program for school cafeterias. The program developed for this study is "No Scrap Left Behind" and was developed, piloted, and assessed based on measures of both direct and indirect food waste behavior and attitudes, knowledge, and emotions related to food waste. Although this study did not explicitly utilize the TPB, it measured similar constructs of the model. Respondents reported their knowledge, attitudes, emotions, beliefs, and behaviors related to food waste in 30 Likert-type questions and three written response questions. Although the overall survey was developed based on a previous

study by Allattar et al. (2020), food knowledge was measured using items from previous food waste studies (Leib et al., 2017; Quested et al., 2013) and questions on specific campus-related food waste diversion knowledge (Pelletier et al., 1999; Whitehair et al., 2013). Results showed that participants had positive attitudes toward food waste reduction, engaged in food waste diversion actions, had some knowledge of the impacts of wasted food, and considered their actions necessary to waste reduction. Food waste per student decreased 28% over the first year of programming and 26% in the following year when measured a week before and a week after programming. Results also indicated that students were poised for food behavior change and that related programming did impact behavior in the short term. Programming may, therefore, help improve student attitudes and skills to develop long-term change.

Compared with other research on cafeteria programming, results suggest that food waste diversion programming can positively impact students' dispositions and behaviors and may be more effective when tailored to a specific population. Additionally, in this population, attitudes and dispositional factors related to reducing food waste were already high and only slightly changed after programming. Similar to a study conducted by Whitehair et al. (2013), the participants in this study were significantly more likely to think about food waste reduction and to put effort into food waste reduction by the end of the programming year. So, although this study did not use TPB, assessments of these constructs were able to draw conclusions and student food waste-related behaviors.

TPB has also been widely used in other areas of interest like water conservation and instructional communication. Wise (2020) used TPB to predict the future intentions of selected college students ($N = 252$) to engage in public-sphere water conservation behaviors. Demographic characteristics like age, gender, academic classification, major, home community,

political orientation, and attitudes and behaviors were all included in the theoretical model. The findings from a bivariate analysis showed that political orientation, age, gender, lack of agency, and subjective norms were the most significant predictors of future intentions (Wise, 2020). However, gender, lack of agency, and subjective norms were significant predictors of future intentions, explaining 36.7% of the variance (Wise, 2020).

Burns et al. (2018) used the instructor confirmation-interaction model (Ellis, 2000) and the Theory of Planned Behavior in the instructional communication context to discover how instructors could cultivate positive student attitudes and increase beliefs that interactions with instructors would be beneficial in the future. In an introductory communication course, surveys were distributed to 343 college students (41.7% male and 58.1% female). Results showed that teacher confirmation was significantly related to attitudes toward communicating with an instructor, subjective norms, and perceived behavioral control. Subjective norms and perceived behavioral control were also positively related to students' behavioral intention to communicate with the instructor. However, results revealed that attitudes toward communicating did not predict students' behavioral intention to communicate with instructors. It was recommended that future models examine a more contemporary, hi-tech representation of attitude toward student-instructor interactions as it may significantly affect students' behavioral intent to communicate with them.

Studies have also shown the TPB to be an adequate theoretical basis for pro-environmental workplace behavior. More specifically, it has shown to be effective in studies regarding employee green behavior (EGB). EGB refers to all the environmentally sustainable behaviors implemented by employees in the workplace (Ones & Dilchert, 2012). For instance, Greaves et al. (2013) found that attitudes, subjective norms, and perceived behavioral control

explained 68% of the variance in switching off computer intentions, 56% of the variance in recycling intentions and 55% of the variance in video conferencing intentions among public employees (n = 449). Similarly, Yuriev, Boiral, and Guillaumie (2020) reported that attitudes, subjective norms, and perceived behavioral control predicted 79% of the variance in nonacademic employee intention to use alternative transportation to travel to work.

In addition to the previously mentioned fields, the TPB has also been studied in health and banking. Regarding health-related studies, Dumitrescu et al. (2011) aimed to use the TPB to predict the intention to improve oral health behaviors among medical students (n = 153). Participants completed a questionnaire assessing intentions, attitudes, subjective norms, perceived behavioral control, oral health knowledge, and current hygiene behaviors. Results showed that attitude, perceived behavioral control, and oral health knowledge were predictors of intention to improve oral health behaviors (Dumitrescu et al., 2011). Together, these variables explained 52% of the variance in intention to improve oral health behaviors. These findings were similar to previous studies, which found that TPB variables accounted for 27%-34% of the variance in dental hygiene behavior (Armitage & Connor, 2001; Godin & Kok, 1996; Buunk-Werkhoven et al., 2011). Godin and Kok (1996) have also conducted studies regarding addictive behavior, clinical screening, physical activity, driving behavior, HIV/AIDS-related behavior, and oral hygiene. In banking, one study by Leavell (2016) investigated the relationship between intention, attitude, subjective norms, perceived behavioral control, and intrinsic motivation for referring banking services. The results showed that subjective norms ($p < .001$) and perceived behavioral control ($p < .001$) significantly explained the variance in intention ($r = 0.38$, $p < .001$). Additionally, subjective norms ($p = .019$), perceived behavioral control ($p < .011$) and

intrinsic motivators ($p < .001$) were significant in explaining the variance in intention ($r = 0.53$, $p < .001$).

The efficacy of the TPB can be attributed mainly to the changes done to the previously used theoretical framework used to predict behavior known as the Theory of Reasoned Action (TRA). The Theory of Reasoned Action is based on the proposition that an individual's behavior is determined by the individual's behavioral intention (B.I.), which provides the most accurate prediction of behavior (Fishbein & Ajzen, 1975). Because the central theme of TRA and TPB is an intention, TPB is considered an extension of the TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) made necessary by the original model's limitations in dealing with behaviors over which people have incomplete volitional control (Ajzen, 1991). For context, volition refers to the capacity of humans and other animals to initiate actions based on internal decisions and motivation rather than external stimulation (Haggard & Lau, 2013). Moreover, the TRA strictly covered only attitudes, norms, and intentions as determinants of behavioral performance. As research continued to develop, Ajzen saw the need to include additional variables, namely control beliefs, which further influenced intention, the antecedent of behavioral performance. Chang (1998) explains, “The difference between these two theories is that the Theory of Planned Behavior has added perceived behavioral control as the determinant of behavioral intention, as well as control beliefs, which affect the perceived behavioral control" (p. 1826). Even with these modifications to the framework, there are some conflicting outcomes as it relates to TPB.

While the TPB can be applied to understand general categories of behavior, it was not designed to predict outcomes; instead, it was designed with single behaviors in mind (Thompson et al., 2020). Since food waste at the consumer level is a recent research topic, the factors driving household food waste are still under analysis and discussion (Secondi et al., 2015;

Papargyropoulou et al., 2016). Because this research focus remains an emerging approach, finding an appropriate framework to explain this phenomenon is quite challenging (Quested et al., 2013). However, empirical evidence suggests that TPB is sufficient in measuring behavioral intention, which is the antecedent of behavioral performance. Therefore, the TPB applies to this study as it sought to determine emerging adults' behavioral performance (food waste) at the University of Arkansas.

Chapter 3 Methodology

Introduction

The following chapter outlines the methodology used in this study: a restatement of purpose and research hypotheses, research design, selection of participants, instrumentation, data collection, and data analysis.

Purpose

The purpose of this study was to identify the psychosocial factors influencing food waste behaviors among college students at the University of Arkansas. Using a theoretical framework from Ajzen (1991), this study tested the Theory of Planned Behavior model and sought to determine if psychosocial factors, like attitudes, subjective norms, and perceived behavioral control, were predictors of students' food waste-related behaviors. Additionally, this study tested the correlation between attitudes, subjective norms, perceived behavioral control, and food waste-related behaviors. Thus, the researcher hypothesized that:

H_0: There will not be a significant ($p < .05$) relationship between the psychosocial factors of attitudes, subjective norms and perceived behavioral control and demographic variables regarding food waste-related behaviors among college students at the University of Arkansas.

H_1: There will be a significant ($p < .05$) relationship between the psychosocial factors of attitudes, subjective norms, and perceived behavioral control, and demographic variables regarding food waste-related behaviors among college students at the University of Arkansas.

H_0: A single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control will not explain a significant portion ($p \leq .05$) of the variance in food waste-related behaviors among college students at the University of Arkansas.

H_1: A single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control will explain a significant portion ($p \leq .05$) of the variance in food waste-related behaviors among college students at the University of Arkansas.

Research Design

This research employed a quantitative, non-experimental approach based on the determined research hypothesis. Non-experimental, correlational designs seek to study relationships by observing or measuring the variables of interest (Cozby, 2011). The variables of interest are psychosocial factors, such as attitudes, subjective norms, and perceived behavioral control, as they relate to food waste-related behaviors, as well as age, gender, major, classification, the responsibility of meal preparation, and the frequency of eating out each week. Moreover, a correlational research design was used since the identified variables predicted food waste-related behaviors. Correlations not only allow researchers to investigate numerous relationships between numerous variables at one time, but they can also display multiple types of relationships, give information on the strength of those relationships, and determine whether they are positive or negative.

Furthermore, a multiple regression design was deemed most appropriate because we used several variables to predict food waste-related behaviors. Additionally, a non-experimental research design's distinct characteristic asks participants to describe their behavior (Cozby, 2011), thus justifying using a self-administered survey as an instrument. This investigation is also classified as an instrumental case study because the University of Arkansas is a naturally bounded system (Stake, 1995) focused on enrolled students.

Selection of Participants

A sample of undergraduate and graduate courses within the College of Agricultural, Food and Life Sciences, taught during the spring of 2022 semester, at the University of Arkansas – Fayetteville were selected for this study. Courses with larger enrollments were selected because the students represented diverse majors on campus. The population for this study was the 29,068 students enrolled at the University of Arkansas during the 2021-2022 school year, with any student between the ages of 18-29 - also known as an emerging adult - eligible to be randomly selected from the intact university courses. Individual students in this demographic were the chosen unit of analysis because the brain is still developing during one's 20s, gradually becoming capable of mature judgment, better self-control, and more reliable behavior (Knight, 2017). Emerging adults are shifting from dependence on others regulating their lives to self-regulated behavior and personal control over life events (Arnett & Tanner, 2006). Moreover, research conducted by the European Commission, the Australian government, and organizations like the FAO collectively report that younger individuals aged 15-24 are among the most significant contributors to food waste and more likely to engage in behavioral practices that facilitate food waste (European Commission, 2014; Mondéjar-Jiménez et al., 2016). One central assumption is that while college students at the University of Arkansas are aware of food waste, they are unaware of how their attitudes and behaviors may directly contribute to this phenomenon.

The predetermined sample size was calculated to be a minimum of 160 individual participants, based on an anticipated effect size of $f^2 = 0.15$ and statistical power of .95, an alpha of 0.05, and 8 potential predictors. The eight potential predictors were: attitudes, subjective norms, perceived behavioral control, gender, classification, the responsibility of meal preparation, and the frequency of eating out each week. Based on the sample size, intact university classes with more than 75 students were targeted. This approach shortened the data

collection period but also controlled for response rate since studies have found that online surveys have an 11% lower response rate than other strategies (Manfreda et al., 2008). After approval from the University of Arkansas Institutional Review Board (IRB), the researcher was provided with a list of courses within the Dale Bumpers College of Agricultural, Food & Life Sciences. The list comprised eleven courses, all of which had 75 to 250 students enrolled. Each instructor of record was contacted via email, provided identifying information about the researcher and the purpose of the study and asked permission to administer the survey to students. Of the eleven instructors, seven agreed to the email request.

Instrumentation

The instrument chosen for this study was a researcher-developed survey containing statements related to the constructs found in TPB. The survey for research question one was designed to measure college students' attitudes, subjective norms, perceived behavioral control, and other demographic-related questions. The instrument utilized to answer research question two included an additional ten items, which assessed students' food waste-related behaviors. Using a survey in this study was the appropriate approach, as it is often used to describe and explore human behavior (Singleton & Straits, 2009).

Students were administered a survey of 30 items with Likert scales and six demographic questions requiring multiple choice or written answers to answer research question one. The survey had four main sections: attitudes, subjective norms, perceived behavioral control, and demographics. The first section assessed attitudes and required students to respond to a series of affective statements regarding food waste. Items like "I believe that planning meals in advance reduces food waste" and "I do not worry about the amount of food I throw away" were used. The second section assessed students' subjective norms, where students were presented with

cognitive and affective statements regarding external influences related to food waste-related behaviors. Subjective norms statements were, “I feel socially pressured to reduce food waste” and “Most people my age waste edible food."

Similarly, the third section assessed students perceived behavioral control with cognitive and affective statements related to their self-efficacy to reduce food waste. These statements were like, "I am completely capable of storing food properly, so it does not go to waste," and “Throwing away edible food would be difficult." Lastly, the fourth section covered basic background information like students' age, gender, classification, major, and what a typical week looks like in their life. Students were also asked if they were responsible for preparing more than 50% of their meals each week, to which they could respond either "yes" or "no." Additionally, they were asked how often they eat out, to which they could respond, "0-2 times", "3-6 times", "7-10 times," or "More than ten times per week."

All Likert-type questions were given a four-point response scale that ranged from “Strongly disagree” to “Strongly agree," with no middle anchor point. Typically, a five-point scale allows for sufficient variation without risking participants' reluctance to choose extreme answers on a broader scale (Boslaugh, 2013). However, a four-point Likert scale was made to extract a specific response from college students with no ambiguity. Aside from essential background information, students were not asked for any identifying information to maintain anonymity. Before administering the final survey to student participants, the researcher conducted cognitive interviews with three students, two domestic females and one international male student within the target demographic, to ensure readability and determine if any ambiguity existed. Before administering the survey to the target population, the instrument was also pilot tested with a group of graduate students in the researcher’s department. Additionally, faculty

members were consulted to establish the content validity of the instrument prior to data collection (Alattar et al., 2020).

For research question two, students were given 40 items with Likert scales and six demographic questions requiring multiple choice or written answers. The survey contained five main sections: attitudes, subjective norms, perceived behavioral control, food waste-related behaviors, and demographics. The sections assessing attitudes, subjective norms, perceived behavioral control, and demographic information contained the same items utilized in the survey for research question one. However, section four measured actual food waste behaviors using cognitive and affective statements. For example, students were asked questions like, "I use the date label on a food product to determine if I should discard it," and "I ask for a "to go" box when I cannot eat all the food I order at a restaurant. “These Likert-type questions were given a four-point response scale that ranged from “Never," "Seldom," "Often," and "Almost Always." Faculty members were consulted to establish the content validity of the instrument prior to data collection (Alattar et al., 2020). However, statistical analyses were also performed to determine instrument reliability. More specifically, coefficient alpha (Cronbach, 1951) levels were used to determine internal consistency. For research question one, the constructs within the instrument yielded Cronbach’s alpha levels of 0.81, 0.57, and 0.68 for attitudes (A), subjective norms (SN), and perceived behavioral control (PBC), respectively. For question two, Cronbach’s alpha levels for the constructs within the instrument were 0.80, 0.49, 0.51 and 0.43 for attitudes (A), subjective norms (SN), perceived behavioral control (PBC), and behaviors, respectively.

Data Collection

The researcher obtained approval from the IRB at the University of Arkansas before the study was conducted. The students were provided information regarding the researcher and the

study's purpose and were advised of their right to participate. In the survey introduction, students were informed that they could withdraw from the survey at any time before submission and that by continuing with the survey, they would be giving implied consent to participate in the study. Additionally, students were advised that due to the anonymous nature of the data collection, after survey results were submitted, they would not be able to withdraw from the study. After receiving approval from the instructors of record, the survey was administered from April 1 -15 of the spring 2022 semester. During this time, the survey was administered both in-person and online. Two of the seven classes had more than 250 students enrolled, and based on the suggestion of the professors, an online version of the paper-based survey was more appropriate. The online survey, developed in Qualtrics (2019), was open to any student enrolled in the selected classes with access to the direct link. Respondents were given the option to pause the survey and continue at a late time.

To investigate research question two, 120 surveys administered in this study were distributed 100% online. The data collection period lasted from April 29 – May 17. An anonymous Qualtrics link was provided to two Agricultural Education, Communications, and Technology Department instructors, who then distributed it to their students. A Qualtrics QR code was also provided at an on-campus Food Recovery event and posted in the campus bookstore for students to scan and complete at leisure. Data from the completed surveys were kept anonymous; paper surveys were stored in a locked cabinet, and online survey data were stored on password-protected devices, both accessible only to the researcher. Per IRB guidelines, the data will be stored for three years. To further protect the anonymity of students, they were not allowed to provide any identifying details, such as name, student identification number, or

birthday within the survey. During face-to-face administration, students were asked not to put any identifying information on their submitted documents.

Data Analysis

The data obtained from both studies were analyzed using SAS statistical software (SAS Institute Inc., 2013). For research question one, the demographic data (age, gender, classification, and college major) were analyzed using descriptive statistics. Descriptive statistics, frequencies, and means were also used to analyze and describe attitudes, subjective norms, and perceived behavioral control data. Data were also analyzed using multiple regression to determine the correlation between each pair of variables. The researcher then examined the correlation output to identify the predictor variables to include in the regression model. The rationale was then provided for any predictor variables not included in the regression model. Uniqueness indexes were calculated for predictor variables statistically significant ($p < 0.05$).

Chapter 4. Results

This chapter presents the results from research questions one and two, as detailed in Chapter III. Guided by the hypotheses for this study, findings include a description of the respondents (n = 804) on the demographic variables of age range, gender, academic classification, whether they are responsible for preparing more than 50% of their meals each week, and how often they eat out each week. For question two, the results of the analyses of the relationship of the construct variables to food-waste behaviors are discussed. Descriptive statistics and multiple regression analysis were used to satisfy these study objectives. The results are presented in five sections: demographic information on college students, descriptive statistics regarding the score on each construct, correlations between constructs for the entire sample, and regression models predicting actual food waste behaviors based upon significant correlations for the entire sample.

Research Question 1

Demographics

Of the 804 respondents, more than half (78.67%) identified as female, while those identifying as males accounted for 19.28%, and 1.51% were respondents identifying as "other." Respondents that reported academic classification (n = 800), were made up of 29.6% freshman, 36.0% sophomores, 19.5% juniors, 14.0% seniors, 0.5% graduate students, and less than 1.0% law and "other" students, respectively. Because this research focused specifically on individuals between the ages of 18-29, participants were to respond either "yes" or "no." The results showed that a large majority (98.5%) of respondents fell within that age range, while 1.44% did not.

As shown in Table 1, more than half of the respondents (55.5%) reported that they were responsible for preparing 50% or more of their meals each week. Similarly, when asked about their frequency of eating out, slightly more than half of the respondents (50.1%) indicated eating out 0-2 times each week.

Table 1

Student demographic characteristics

Baseline Characteristics	*n*	%
Gender		
Female	627	78.67
Male	158	19.28
Other	12	1.51
Classification		
Freshman	237	29.63
Sophomore	288	36.00
Junior	156	19.50
Senior	112	14.00
Graduate	4	0.50
Law	1	0.13
Other	2	0.13
Age		
Between 18-29	789	98.75
Not between 18-29	10	1.25
Frequency of Food Prep at Home	444	55.50
More than 50%	355	44.38
Less than 50%		
Frequency of Takeout		
0-2	401	50.19
3-6	329	41.18
7-10	55	6.88
> than 10	14	1.75

Attitudes, Subjective Norms, and Perceived Behavioral Control Variables

Three construct variables were measured in this survey: attitudes (A), subjective norms (SN), and perceived behavioral control (PBC). The construct variables were measured on a Likert scale ranging from 1 to 4, where 1 was "Strongly Disagree," and 4 was "Strongly Agree."

Given this scoring system, attitudes, subjective norms, and perceived behavioral control could range from a minimum of 1 to a maximum of 4. The sample (n = 804) had overall mean scores of 2.85 (SD = 0.28), 2.6 (SD = 0.32) and 2.8 (SD = 0.33) for A, SN and PBC, respectively. This section presents the mean results for each item in each construct.

Attitudes (A)

Students responded to ten items assessing their attitudes towards food waste. As indicated by the mean scores in Table 2, most students responded favorably to items relating to attitudes towards certain food waste behaviors. For example, respondents had the highest mean score for the item "I feel that eating leftovers helps reduce food waste" (M = 3.54, SD=0.58), followed by "I believe wasting edible food contributes to food waste" (M = 3.42, SD=0.63) and "I believe checking my pantry before shopping reduces food waste" (M = 3.41, SD=0.62). Some items like, "I do not worry about the amount of food I throw away" were negatively worded and therefore had the lowest mean score (M = 1.82, SD = 0.73). However, all negatively worded items were reverse coded prior to statistical analysis. Although respondents had an overall positive outlook on food waste, the mean score for the item "I feel guilty or bothered when I throw away edible food" was relatively low (M = 3.04, SD=0.75).

Table 2

Students' Attitude Towards Food Waste

Statement	*n*	*M*	*SD*
I feel guilty or bothered when I throw away edible food	803	3.04	0.75
I believe that planning meals in advance reduces food waste	804	3.12	0.65

Table 2 (Cont)

I believe checking my pantry before shopping reduces food waste	804	3.41	0.62
I feel that eating leftovers help reduce food waste	804	3.54	0.58
I feel good when I make shopping lists	804	3.36	0.68
I believe wasting edible food contributes to food waste	800	3.42	0.63
I believe household food waste is harmful to the environment	803	2.85	0.77
I do not feel that food waste is a real concern[a]	803	1.82	0.73
Throwing away uneaten food does not bother me[a]	801	1.94	0.8
I do not worry about the amount of food I throw away[a]	804	2.03	0.78

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores.

Subjective Norms (SN)

Regarding subjective norms or external influences, respondents were asked a total of ten items. The item worded, “My parents encourage me to eat leftovers," had the highest mean score (*M* = 3.41, *SD*= 0.67), followed by "Most people my age waste edible food" (*M* = 3.29, *SD* =

0.59) (Table 3). These responses indicate that respondents are influenced by their parents and have either witnessed or been told about their peers wasting edible food. The lowest mean score (M = 2.15, SD = 0.74) was associated with the item, “I feel socially pressured to reduce food waste," indicating that they disagreed with the statement. Similarly, respondents disagreed with the item, "Most people important to me disapprove of me preparing too much food" (M = 2.22, SD = 0.72). 59.20% agreed that most people important to them approve of them reducing food waste.

Table 3

Subjective norms (External Influences) of food waste behaviors

Statement	*n*	*M*	*SD*
Most people who are important to me approve of me reducing food waste	799	2.79	0.71
My friends think that I should reduce my food waste	799	2.26	0.68
My family thinks it would be a good idea for me not to waste edible food	798	3.00	0.68
Most people my age waste edible food	800	3.29	0.59
My professors want me to reduce food waste	798	2.71	0.73
My classmates do not think food waste is an important topic[a]	798	2.50	0.67
I feel socially pressured to reduce food waste	798	2.15	0.74

Table 3 (Cont)

My peers do not expect me to reduce food waste[a]	798	2.64	0.67
My parents encourage me to eat leftovers	798	3.41	0.67
Most people important to me disapprove of me preparing too much food	798	2.22	0.72

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores.

Perceived Behavioral Control (PBC)

In the final construct, respondents were asked ten items regarding their perceived ability to control food waste. As shown in Table 4, respondents agreed with the item "I am confident that I can put effort into reducing food waste" (M = 3.22, SD = 0.58). Respondents also highly agreed with the item, “I am completely capable of storing food properly so it does not go to waste” (M = 3.13, SD = 0.66). The high level of agreement with these items indicates that respondents not only believe they can try to reduce food waste but also perform certain behaviors that would prevent the issue. One negatively worded item, "In my opinion, wasting food is unavoidable," had a mean score of 2.50 (SD = 0.73). This score further indicates that respondents feel food waste is an avoidable issue. However, the negatively worded item, "Throwing away edible food would be difficult," had a mean score of 2.61(SD = 0.74), indicating a certain ease associated with discarding edible food.

Table 4

Students' Perceived Behavioral Control

Statement	*n*	*M*	*SD*
Avoiding household food waste in my home is up to me	799	2.99	0.73
I am responsible for controlling household food waste in my home	799	2.90	0.75
I am confident that I can put effort into reducing food waste	799	3.22	0.58
I am capable of only buying the exact amount of food my household needs	798	2.82	0.72
It is difficult for me to cook and prepare the exact amount of food my household will eat[a]	799	2.72	0.75
Whether I reduce household food waste is not entirely up to me[a]	798	2.66	0.72
In my opinion, wasting food is unavoidable[a]	797	2.50	0.73
Throwing away edible food would be difficult	794	2.61	0.74
It is possible for me only to buy food I will eat	799	2.98	0.66

Table 4 (Cont)			
I am completely capable of storing food properly so it does not go to waste	799	3.13	0.66

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores.

The second research question was to determine the relationships between constructs and demographic characteristics (age range, classification, gender, frequency of takeout, and responsibility of meal prep). Gender and responsibility of meal prep were dichotomized (yes = 1 and no = 2) while classification ("Freshman" = 1, "Sophomore" = 2, "Junior" = 3, "Senior" = 4, "Graduate" = 5, "Law" = 6, "Other" = 7) and frequency of takeout ("0-2 times" = 1, "3-6 times" = 2, "7-10 times" = 3, "More than 10 times a week" = 4) were recorded on an interval scale. Correlation analyses were conducted to determine which variables and constructs were significantly correlated to each other to satisfy the second research question of this study. The alpha level for testing correlations was set at 0.05. This section identifies demographic variables significantly correlated to the three constructs. A breakdown of the bivariate correlation analysis is shown in Table 5.

Table 5

Intercorrelations of Students' Attitudes, Subjective Norms, and Perceived Behavioral Control towards Food Waste with Demographics

Variable	Attitude	Subjective Norms (SN)	Perceived Behavioral Control (PBC)	Gender	Classification	Takeout	Food_Prep
Attitude[a]	1.00	0.40***	0.39***	0.11**	0.03 ^{NS}	-0.04^{NS}	-0.04^{NS}
SN[a]		1.00	0.38***	0.10**	0.03^{NS}	0.03^{NS}	-0.00^{NS}
PBC[a]			1.00	0.03^{NS}	0.12**	-0.11**	-0.21***
Gender[b]				1.00	0.06^{NS}	-0.11**	0.04^{NS}
Classification[d]					1.00	-0.05^{NS}	-0.20***
Takeout[e]						1.00	0.20***
Food_Prep[c]							1.00

a Coded as: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.
b Coded as: Non-response = 0, "Male" = 1, "Female" = 2.
c Coded as: "Yes" = 1, "No" = 2.
d Coded as: "Freshman" = 1, "Sophomore" = 2, "Junior" = 3, "Senior" = 4, "Graduate" = 5, "Law" = 6, "Other" = 7.
e Coded as: "0-2 times" = 1, "3-6 times" = 2, "7-10 times" = 3, "More than 10 times a week" = 4.
* ($p \leq 0.05$), ** ($p \leq 0.005$), *** ($p \leq 0.0001$)

Gender, Age, Classification, Takeout, and Food Preparation

Gender, classification, frequency of takeout, and responsibility of food preparation were all significantly correlated with at least one construct. Gender was significantly correlated ($p \leq 0.005$) with attitudes and subjective norms, with r values of 0.11 and 0.10, respectively. These values indicate a weak positive linear relationship. Classification, frequency of takeout, and responsibility of preparing meals were all significantly correlated with perceived behavioral control; their respective r values were 0.12, -0.11, and -0.21. These r values indicate weak negative linear relationships with the construct. Based on these results, the null hypothesis that there will be a significant relationship between psychosocial factors and demographic variables among the University of Arkansas college students was rejected.

Research Question 2.

This aspect of the study was conducted to test the null hypothesis that a single or linear combination of construct variables (A, SN, and PBC) would not explain a significant ($p \leq 0.05$) portion of the variance in food waste-related behaviors (Behaviors). Students identifying as female comprised 69.7% of the sample ($n = 120$); 95% of respondents were between the ages of 18-29; 29.1% of respondents were classified as sophomores; an equal response (46.6%) indicated that they eat out 0-2 times per week and 3-6 times per week, and 68.3% of all respondents indicated that they were responsible for preparing more than 50% of their meals each week. The sample ($n = 120$) had overall mean scores of 2.89 ($SD = 0.29$), 2.69 ($SD = 0.28$)

and 2.90 (*SD* = 0.30) and 2.79 (*SD* = 0.34) for A, SN, PBC and Behaviors, respectively. This section presents the mean results for each item in each construct.

Attitudes (A)

Students responded to ten items assessing their attitudes towards food waste. As indicated by the mean scores in Table 6, most students responded favorably to items relating to attitudes towards certain food waste behaviors. For instance, the item worded, "I feel that eating leftovers helps reduce food waste," had a mean score of 3.52 (*SD* = 0.57). The next highest mean score item was, "I believe wasting edible food contributes to food waste" (*M* = 3.43, *SD* = 0.65). The lowest mean score of 1.79 (*SD* = 0.74) was associated with the item, "I do not feel that food waste is a real concern," which indicates that respondents "strongly disagreed." Respondents also strongly disagreed with the items, "Throwing away uneaten food does not bother me" (*M* = 1.86, *SD* = 0.78) and "I do not worry about the amount of food I throw away" (*M* = 1.89, *SD* = 0.77).

Table 6

Students' Attitude Towards Food Waste

Statement	*n*	*M*	*SD*
I feel guilty or bothered when I throw away edible food	120	3.15	0.77
I believe that planning meals in advance reduces food waste	120	3.09	0.66
I believe checking my pantry before shopping reduces food waste	120	3.37	0.58
I feel that eating leftovers help reduce food waste	120	3.52	0.57

Table 6 (Cont)

I feel good when I make shopping lists	120	3.24	0.75
I believe wasting edible food contributes to food waste	120	3.43	0.65
I believe household food waste is harmful to the environment	120	2.90	0.79
I do not feel that food waste is a real concern[a]	120	1.79	0.74
Throwing away uneaten food does not bother me[a]	120	1.86	0.78
I do not worry about the amount of food I throw away[a]	120	1.89	0.77

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores

Subjective Norm (SN)

Students responded to ten items in terms of subjective norms or external influences. As shown in Table 7, the highest mean score (M = 3.24, SD = 0.70) was associated with the item, "My parents encourage me to eat leftovers," followed by, "Most people my age waste edible food" (M = 3.23, SD = 0.68). The item worded, "I feel socially pressured to reduce food waste," had the lowest mean score (M = 2.15, SD = 0.72), and "My friends think that I should reduce my food waste" had the second-lowest mean score (M = 2.32, SD = 0.68). Respondents disagreed with these two statements and with the statements "Most people who are important to me approve of me reducing food waste" (M = 2.84, SD = 0.73) and “Most people important to me disapprove of me preparing too much food” (M = 2.35, SD = 0.77).

Table 7

Students' External Influences Regarding Food Waste

Statement	*n*	*M*	*SD*
Most people who are important to me approve of me reducing food waste	120	2.84	0.73
My friends think that I should reduce my food waste	120	2.32	0.68
My family thinks it would be a good idea for me not to waste edible food	120	2.98	0.69
Most people my age waste edible food	120	3.23	0.68
My professors want me to reduce food waste	120	2.76	0.61
My classmates do not think food waste is an important topic[a]	120	2.51	0.72
I feel socially pressured to reduce food waste	120	2.15	0.72
My peers do not expect me to reduce food waste[a]	120	2.60	0.66
My parents encourage me to eat leftovers	119	3.24	0.70
Most people important to me disapprove of me preparing too much food[a]	120	2.35	0.77

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores.

Perceived Behavioral Control (PBC)

Students were asked ten items regarding their perceived ability to control food waste. As shown in Table 8, the item "I am confident that I can put effort into reducing food waste" had a mean score of 3.30 (*SD* = 0.56), indicating that respondents feel they are capable of at least putting effort towards mitigating the phenomenon. The second highest mean score (*M* = 3.15, *SD* = 0.55) was associated with the item, "I am completely capable of storing food properly so it does not go to waste. Interestingly, respondents disagreed with the item, "Throwing away edible food would be difficult" (*M* = 2.74, *SD* = 0.75), indicating that it would be easy for them to do so. This item, in particular, aligns with the literature suggesting that this age demographic quickly discards edible foods.

Table 8

Students' Perceived Behavioral Control Towards Food Waste

Statement	*n*	*M*	*SD*
Avoiding household food waste in my home is up to me	120	3.13	0.76
I am responsible for controlling household food waste in my home	120	3.05	0.79
I am confident that I can put effort into reducing food waste	120	3.30	0.56
I am capable of only buying the exact amount of food my household needs	120	2.80	0.77
It is difficult for me to cook and prepare the exact amount of food my household will eat[a]	120	2.69	0.85

Whether I reduce household food waste is not entirely up to me[a]	120	2.63	0.72

Table 8 (Cont)

In my opinion, wasting food is unavoidable[a]	119	2.48	0.69
Throwing away edible food would be difficult	119	2.74	0.75
It is possible for me only to buy food I will eat	120	3.03	0.64
I am completely capable of storing food properly, so it does not go to waste	120	3.15	0.55

Note. The items were measured on a Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.
[a] Negatively worded statements were reverse coded prior to calculating construct scores.

Food Waste Behaviors

To assess actual food waste-related behaviors, students responded to a total of ten items. Of those items, respondents agreed most with the item, "I ask for a "to go" box when I cannot eat all the food I order at a restaurant" ($M = 3.53$, $SD = 0.64$) (Table 9). The second highest mean score was associated with the item, “After meals, I save leftovers that I can eat later” ($M = 3.46$, $SD = 0.62$). Respondents disagreed most with the items, "I take more food than I can eat in buffet-style restaurants" ($M = 2.17$, $SD = 0.91$) and “I do not plan meals before shopping” ($M = 2.29$, $SD = 0.76$). Although respondents indicated they take specific measures to avoid food waste, such as asking for to-go boxes, saving uneaten food for leftovers, not taking more food than they can eat from a buffet, and planning meals before shopping, they disagreed with the item, "I take specific actions to prevent food waste" ($M = 2.64$, $SD = 0.68$).

Table 9

Students' Food Waste Behaviors

Statement	*n*	*M*	*SD*
I use the date label on a food product to determine if I should discard it	120	3.10	0.79
After meals, I save leftovers that I can eat later	120	3.46	0.62
I wind up throwing away leftovers I have saved in the fridge[a]	120	2.43	0.70
I do not plan meals before shopping[a]	120	2.29	0.76
I only buy food items I know I will eat	119	3.24	0.65
I take more food than I can eat in buffet-style restaurants	120	2.17	0.91
I take specific actions to prevent food waste	120	2.64	0.68
I discard uneaten food in dining halls and restaurants[a]	120	2.54	0.81
If given too much food, I discard any uneaten portion(s)[a]	120	2.52	0.81
I ask for a "to go" box when I cannot eat all the food I order at a restaurant	120	3.53	0.64

Note. The items were measured on a Likert scale: 1 = *Never*, 2 = *Seldom*, 3 = *Often*, 4 = *Almost Always*.

[a] Negatively worded statements were reverse coded prior to calculating construct scores.

Predicting Food Waste-Related Behaviors

As shown in Table 10, only A ($r = 0.28$) and PBC ($r = 0.34$) had a significant ($p \leq 0.05$) correlation with behaviors. Using descriptors suggested by Davis (1971), these correlations were low and moderate, respectively. Individually, attitude explained 7.5% of the variance, and perceived behavioral control explained 12.0% of the variance in behaviors. Additionally, there was a low correlation ($r = 0.26$) between attitude and perceived behavioral control (Davis, 1971).

Table 10

Inter-correlations between Attitudes, Subjective Norms, Perceived Behavioral Control, and Behaviors

Variable	Attitude	Subjective Norms (SN)	Perceived Behavioral Control (PBC)	Behaviors
Attitude	1.00	0.28*	0.26*	0.27*
SN		1.00	0.42*	0.12^{NS}
PBC			1.00	0.34*
Behaviors				1.00

*$p \leq .001$.

Because attitudes and perceived behavioral control had near-zero correlations and were significantly correlated with behaviors, these two variables were selected for testing in the multiple regression model predicting behaviors. The equation containing these two predictors explained 15.6% of the variance in Behaviors, $F(2, 114) = 10.51$, $p < .0001$, adjusted $R^2 = 0.14$. According to Cohen (1988), the adjusted R^2 represented a medium effect. The regression equation predicting behaviors is presented below.

$$\text{Behaviors}_{\text{Pred}} = 0.1557 + 0.0758\,(\text{Attitudes}) + 0.1201\,(\text{PBC})$$

As indicated by the regression equation, a one unit increase in attitude predicted a 0.07 increase in food waste related-behaviors, while a one unit increase in perceived behavioral control was associated with a 0.12 increase in food waste-related behaviors. Uniqueness indices were calculated, showing the unique variance explained by each predictor when controlling for the other predictor; attitudes explained 11.09% ($p \leq 0.05$) of the unique variance in behaviors, while perceived behavioral control explained 4.94% ($p \leq 0.05$) of the unique variance in behaviors. Based on these results, we rejected the null hypothesis that a single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control would not explain a significant ($p \leq 0.05$) portion of the variance in food waste-related behaviors.

Chapter 5. Summary, Recommendations and Conclusions

The purpose of this study was to identify the psychosocial factors of attitudes, subjective norms, and perceived behavioral control, influencing food waste behaviors among college students at the University of Arkansas. The first section of this chapter covers the conclusions of the results of this study. The second section offers recommendations for practice and future studies. The research questions that guided this study were:

1. Is there a relationship between the psychosocial factors of attitudes, subjective norms, and perceived behavioral control towards food waste-related behaviors and student demographics?
2. Is there a single or linear combination of the psychosocial factors of attitudes, subjective norms, and perceived behavioral control that explains a significant portion ($p < 0.05$) of the variance in food waste-related behaviors of college students?

Limitations of Study

The University of Arkansas – Fayetteville had a student population of 29,068 and was comprised of 83.5% undergraduate students and 15.2% graduate students during the 2021-2022 academic school year (University of Arkansas, 2021). This research was conducted on current students at the University of Arkansas, so the results should not be generalized beyond the given population. However, because the study used hypothesis testing, the findings were generalizable to the University of Arkansas student population. Additionally, this study used a face-to-face- and online survey design where random sampling was used for sample selection. While coefficient alpha levels for attitudes were relatively high in both studies, the remaining coefficient alpha levels may have been impacted because respondents were unfamiliar with the constructs or their respective content. Additionally, previous research studies showed that it is

much easier to assess attitudes, which could account for the higher alpha levels for this construct in both studies.

Demographics

The population for this study were students in the College of Agricultural, Food and Life Sciences between the ages of 18-29 and enrolled at the University of Arkansas during the 2021-2022 school year. In total, 835 responses were collected, of which 804 were usable. Females were 78.6% of the respondents, 98.5% fell within the 18-29 age range, and 55.5% were responsible for preparing more than 50% of their meals each week.

Theoretical Constructs (Attitudes, Subjective Norms, Perceived Behavioral Control)

Regarding attitudes, respondents agreed that eating leftovers and checking their pantries help reduce food waste. Results also showed respondents generally believe that wasting edible food contributes to food waste. While respondents seemingly understood that wasting edible food contributes to food waste, it seemed as though they did not fully understand the implications of food waste. For instance, respondents did not feel that household food waste is harmful to the environment. Once disposed of, food contributes to releasing 18% of the nation's methane emissions from landfills (US EPA, 2015), which has an adverse effect on the environment. Their disagreement with food waste causing harm to the environment, however, aligns with their general contention that food waste is not a genuine concern. Additionally, although they feel guilty or bothered when they throw away edible food, the mean response was relatively low. So, while student responses show mostly positive attitudes toward food waste, their disagreement with items seems consistent. This is also indicated by the Cronbach alpha score of 0.8.

Regarding subjective norms, or those influencing respondents' decision-making, the majority indicated that their parents encourage them to eat leftovers. The only other two items with a high level of agreement were that most people their age waste edible food (M =3.29, SD = 0.59), and their families think it would be a good idea for them not to waste edible food (M = 3.00, SD = 0.68). What stands out most is the indication that people in their age group waste edible food, which is consistent with the literature (European Commission, 2014; Mondéjar-Jiménez et al., 2016). Concerning the remaining seven items in the construct, respondents disagreed with feeling pressured socially to reduce food waste. Because this research collected quantitative data, it is unknown whether respondents interpreted "social pressure" as part of their social lives on campus or in friend groups/society. However, results also showed that their friends think they should reduce food waste. If we compare this item with not feeling pressured socially to reduce food waste, we could deduce that respondents considered their peers and friends rather than society. Regardless, it would be helpful to take a mixed-methods approach to any follow-up studies for clarity on these questions. When asked about their professors wanting them to reduce food waste, respondents indicated that their professors do not have much influence on their decision-making regarding food waste. Two items were negatively worded and were, therefore, reverse coded. Respondents felt that their peers expect them to reduce food waste, and their classmates think food waste is an important topic. The level of agreement with these items may result from students being previously enrolled in courses related to environmental sustainability.

Perceived behavioral control measured the self-efficacy respondents feel they have as individuals to reduce food waste. Respondents were confident they could put effort into reducing food waste and were completely capable of storing food properly so it does not go to waste. The

last item is promising, as proper food storage is part of the food provisioning process (FPP) (Jensen et al., 2012; Stancu et al., 2016), which describes a series of food-related behaviors consumers perform. These decisions and actions made throughout the FPP influence how much food consumers waste. Therefore, if they believe they can properly store food, this would indicate they are capable of not prematurely discarding otherwise edible food.

Interestingly, respondents disagreed that avoiding food waste in their homes is not up to them, even though more than half indicated they were responsible for preparing more than 50% of their meals each week. However, their disagreement with this statement is consistent with their disagreement about being responsible for controlling household food waste in their homes. These conflicting responses may result from living in shared spaces (dormitory, apartment,) but being responsible for preparing their meals. As it relates to shopping habits, results showed that it is possible for respondents only to buy the food they will eat, which is consistent with the literature as it relates to over purchasing. Over-preparation (Kantor et al., 1997; Quested & Johnson, 2009; Koivupuro et al., 2012; Williams et al., 2012; Beretta et al., 2013; Porpino, Parente & Wansink, 2015) and excessive purchase (Harrison et al., 1975; Koivupuro et al., 2012; Beretta et al., 2013; Ganglbauer, Fitzpatrick, and Comber 2013; Porpino et al., 2015) are commonly cited as antecedents of wasted food. Additionally, most felt that throwing away edible food would not be difficult. Similar to studies measuring food waste among college students, respondents indicated that they discard edible food based on personal preference. Other studies have also shown that younger individuals discard edible food due to burning or ruining food during preparation (Kavanaugh & Quinlan, 2020).

Intercorrelations between Demographics and Theoretical Constructs

Gender was significantly correlated ($p \leq 0.005$) with attitudes and subjective norms, with *r* values of 0.11 and 0.10, respectively. Classification, frequency of takeout, and responsibility of preparing meals were all significantly correlated with perceived behavioral control; their respective *r* values were 0.12, - 0.11, and - 0.21. These *r* values indicate weak negative linear relationships with the construct. As it relates to classification, as classification increases by one unit, so do the students' perceived behavioral control. This finding is consistent with the notion that older individuals tend to waste less or feel in control of wasting less food. Conversely, frequency of takeout and responsibility of preparing meals would have the opposite effect. The negative *r* values indicate that a one unit increase in a student eating outside of the home would result in a one unit decrease in perceived behavioral control, and a one unit increase in being responsible for preparing more than 50% of their meals would result in a one unit decrease in perceived behavioral control. Although not exact, the findings for these two variables are similar to findings from a study by Janssens et al. (2019) that reported that the lack of planning for food preparation is one of the most significant barriers to reducing food waste. Studies determining the relationship between college-aged students' demographics and psychosocial factors of food waste-related behaviors are limited. However, a few studies that have reported similar relationships between constructs found within this study. For example, Visschers et al. (2016) reported significantly correlated ($p < 0.01$) *r* values of 0.47, 0.47, and 0.24 for personal attitudes, perceived behavioral control, and subjective norms, respectively, intending to avoid food waste. Some studies have measured the correlation between socio-demographics and food waste. Results from a study by Stefan et al. (2013) reported *r* values of -0.14 ($p = 0.03$), -0.21 ($p = 0.001$), and 0.14 ($p = 0.02$) for awareness regarding the amount and cost of food waste, age and

household income, respectively. Most studies tend to show relatively low coefficients of correlations and are typically excluded from the structural model.

However, these observed low and negatively correlated relationships in this study, may be a result of the low reliability of the instrument. The calculated correlation will be lower than the actual population value when there is low reliability. Additionally, low reliability causes an underestimation of relationships among variables, which could increase the risk of Type II errors (Osborne & Waters, 2002). An interesting finding is that although the correlations between student demographics and theoretical constructs are weak and low, they were significant ($p \leq 0.005$). This significance may also result from low reliability, which tends to estimate associations as too high or too low. Therefore, the researcher suggests testing instrument reliability before developing a final survey, in which case, low coefficient alpha levels could be attributed to error scores which refer to "random and systematic occurrences that keep observed data from conveying the truth of a situation (Wetcher-Hendricks, 2006, p. 207)" rather than instrument reliability.

Research Question 2

Female students comprised 69.7% of the sample ($n = 120$), 95.0% were between 18-29, and 29.1% of respondents were classified as sophomores. An equal number of respondents (46.6%) indicated that they eat out 0 - 2 times per week and 3 - 6 times per week, and 68.3% of all respondents indicated that they were responsible for preparing more than 50% of their meals each week.

Theoretical Constructs (Attitudes, Subjective Norms, Perceived Behavioral Control) and Food Waste-Related Behaviors

Results from this research question were similar to the results from research question one. However, this research question included measuring food waste-related behaviors in addition to attitudes, subjective norms, and perceived behavioral control. These behaviors were also measured on a Likert scale ranging from 1 to 4. Most respondents agreed that eating leftovers, planning meals, and checking pantries before shopping helps reduce food waste. They also agreed that wasting edible food contributes to food waste. Respondents also agreed they feel good when making shopping lists and feel guilty or bothered when they throw away edible food. These findings, particularly respondents feeling guilty or concerned about discarding edible food, are consistent with results from previous studies. For example, Neff et al. (2015) found that 52% of respondents stated that discarding food "bothered them a lot." Respondents in this study also disagreed that household food waste is harmful to the environment. This finding is consistent with previous studies by Stancu et al. (2016) and Stefan et al. (2013), which found there was a lack of knowledge and awareness regarding the environmental impacts of food waste. Although attitudes do not always directly translate into behavior (Shrum, Lowrey & McCarty, 1995), their reported attitudes suggest there may be a need for individuals in this demographic to be taught the environmental effects of food waste.

Regarding external influences, most respondents cited that people their age waste edible food. Since 95% of respondents fell within the 18-29 age range, this finding is consistent with the literature stating that young adults contribute most to food waste. Respondents implied that their parents encourage them to eat leftovers, indicating that their parents' opinions still influence them. This assumption, however, could be better supported if respondents could provide a measure of how often they eat leftovers. Respondents reported that they did not feel socially pressured to reduce food waste. While not feeling pressured to reduce food waste may be seen as

positive, it may also indicate that more food waste awareness is needed on the University of Arkansas campus. One interesting finding was that respondents disagreed that most people important to them and their friends approve of them reducing food waste. Perhaps this suggests that most individuals within their social systems do not fully consider the effects of food waste or feel it is not a big problem, which is consistent with the literature (Graham-Rowe et al., 2014). This may also explain their general disagreement with the item related to people important to them disapproving of them preparing too much food. If they are not discouraged from preparing too much food and also encouraged to eat leftovers, this may suggest these decisions are intentional and learned behaviors. Lastly, respondents did not feel that their professors wanted them to reduce food waste. This finding could result from surveying a group of students with diverse majors, such as nursing or exercise science, which do not typically consist of courses related to food waste or environmental sustainability.

For perceived behavioral control, findings suggest that respondents are confident they can put effort into reducing food waste. This item relates to perceived self-efficacy and indicates that respondents have adequate internal control over mitigating household food waste. The positive result from this finding is promising as perceived behavioral control tends to have a significant effect on intentions to reduce food waste and positive behavior. Respondents also agree that it is possible for them only to buy the food they will eat. They can properly store food so it does not go to waste and are responsible for avoiding and controlling food waste in their homes. The finding that respondents can only buy the food they will eat is consistent with findings from a Canadian study (Parizeau et al., 2015), which sought to determine food waste-related beliefs, attitudes, and behaviors at the household level. Additionally, properly storing food so it does not go to waste is a broad concept, which could include keeping hot foods hot and cold foods cold or

freezing aging food to preserve it and potentially stop bacterial growth. This behavior could also include keeping appliances at proper temperatures. Assessing specific food storage behaviors may be necessary for follow-up studies. The agreement with these two items supports their understanding that they are responsible for and can control food waste in their homes. However, respondents citing they are in control of food waste in their home is inconsistent with findings from Graham-Rowe et al. (2014), which found that there is a perception that food waste is not an individual responsibility. This is promising for this particular sample of students feeling in control of their households. Interestingly, the results showed that respondents are incapable of only buying the exact amount of food their household needs and that throwing away edible food would not be difficult. These impediments could be associated with shopping issues like large package sizes, which are barriers to preventing household food waste (Quested et al., 2013; Williams et al., 2012; Evans, 2012). Conducting a qualitative study to determine their exact reasoning would be helpful in this context.

Lastly, respondents assessed their food waste-related behaviors. Results showed that they often ask for "to-go" boxes when they cannot eat all the food ordered at restaurants and save leftovers that they can eat later. In a study by the New South Wales Environmental Protection Authority (2012), 47% of survey participants reported that they sometimes or often saved leftovers only to throw them out later. In this study, however, only 30.25% of respondents usually throw away leftovers they intended to consume. Respondents also indicated that they plan meals before shopping. Individuals who tend to waste less food have better shopping planning routines, like making shopping lists and planning meals, and usually do not over-purchase food (Visschers et al., 2016). Although the aforementioned items relate to preventative actions towards reducing food waste, participants disagreed with the item related to taking

measures to reduce food waste; perhaps they do not understand the benefits of their behaviors in this context. Since it was previously found in this study that respondents "feel good" when making shopping lists and believe that planning meals in advance help reduce food waste, this assumption is supported. One major finding is that respondents use date labels on food products before discarding them. This is consistent with findings in other studies that report younger adults being more likely to report assessing the edibility of food products to date labels than their older counterparts (Kavanaugh & Quinlan, 2020). This practice is inconsistent with drivers for food waste, seeing as though the misinterpretation of date labels is commonly associated with discarding edible food (Aschemann-Witzel et al., 2015; Davenport, Qi & Roe, 2019; Parfitt et al., 2010; Porpino, Parente & Wansink, 2015; van Boxstael et al., 2014). A large majority of respondents also claim to seldom take more food than they will eat at buffet-style restaurants. While this finding seems positive, respondents have also been shown to underreport the amount of food they waste (Visschers et al., 2016). The items in this section of the survey provide a good baseline for measuring the frequency of these food waste-related behaviors among this demographic in a follow-up study.

Predicting Food Waste-Related Behaviors

The model predicting food waste behaviors was only able to explain 15.6% of the variance for food waste-related behaviors among college students at the University of Arkansas. According to Bartholomew et al. (2008), models that explain at least 20%-30% of variance are considered beneficial and useful due to the complexity of factors that influence human psychology and behavior. While the model did not meet this threshold, it serves as a baseline for future studies on this topic. Regardless, because attitudes and perceived behavioral control had near-zero correlations and were significantly correlated with behaviors, these two variables were

selected for testing in the multiple regression model predicting food waste-related behaviors. Individually, attitudes explained 11.09% ($p \leq 0.05$) of the unique variance in food waste-related behaviors, while perceived behavioral control explained 4.94% ($p \leq 0.05$) of the unique variance in food waste-related behaviors. Typically, TPB uses attitudes, subjective norms, and perceived behavioral control to predict behaviors ultimately, but this model was only able to use attitudes and perceived behavioral control. The direct impact of attitudes on intentions has been demonstrated in prior studies using TRA (Fishbein & Ajzen, 1980) and TPB (Ajzen, 1985; Fishbein & Ajzen, 1997), demonstrating that attitudes are a favorable predictor of food waste among this demographic. Additionally, Stancu et al. (2016) found that routine food waste was driven by food-related behavioral routines and perceived behavioral control. Similar outcomes were also mirrored in studies by Stefan et al. (2013). The exclusion of subjective norms is also consistent with previous studies. For instance, Tsai et al. (2020) found that subjective norms did not affect food waste-related behavioral performance. Mondejar-Jimenez et al. (2016) found similar results regarding food waste. Because subjective norms were not used in the regression model during linear regression analysis, it can be deduced that it is not a significant predictor of actual food waste-related behaviors, nor did it influence their behaviors in this study. However, subjective norms should not be ruled out as a predictor in future studies.

Recommendations

This study found that emerging adults at the University of Arkansas had positive attitudes toward engaging in food waste diversion behaviors. They are not readily influenced by their peers or family members but are primarily confident they can engage in behaviors that would reduce food waste. Some findings suggest that more information regarding the environmental effects of food waste is necessary.

In terms of instrumentation, other than attitudes, the constructs had low internal consistency. For research question one, the constructs within the instrument yielded Cronbach's alpha levels of 0.81, 0.57, and 0.68 for A, SN, and PBC, respectively. For research question two, Cronbach's alpha levels for the constructs within the instrument were 0.80, 0.49, 0.51, and 0.43 for A, SN, PBC, and Behaviors, respectively. Ajzen (2020) notes that investigators have encountered various theoretical and practical issues when trying to apply this conceptual framework in their research. More specifically, low internal consistency of instrument items from one study utilizing the Theory of Planned Behavior to the next is expected as these items are assessed at a specific time and within a particular place and change over time. Therefore, it is recommended that future researchers develop their instrument by garnering salient beliefs from the targeted demographic.

The researcher also suggests having messaging campaigns posted in dining facilities on campus. Research on one college campus showed that printed messaging campaigns consisting of simple, to-the-point prompt-type postings stimulated a 15% reduction in food waste (Whitehair et al., 2013). Perhaps partnering with the Razorback Food Recovery Program and Chartwells Dining Team on the University of Arkansas campus to communicate the effects of food waste could raise awareness and positively influence food waste-related behaviors. While this type of consumer education is context-specific, it could positively influence food waste-related behaviors and allow them to be mindful of their actions.

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Appendix

UNIVERSITY OF ARKANSAS

To:	Kacy R Wright
From:	Douglas J AdamsJustin R Chimka, Chair IRB Expedited Review
Date:	03/28/2022
Action:	**Exemption Granted**
Action Date:	03/28/2022
Protocol #:	2202384608
Study Title:	The Relationship Between Psychosocial Factors and Food Waste-Related Behaviors Among College Students

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Donna L Graham, Investigator

Psychosocial Factors and Food Waste-Related Behaviors

Informed Consent

This study is being conducted to determine if psychosocial factors (attitudes, subjective norms, perceived behavioral control) will explain students' food waste-related behaviors. There is no foreseeable risk as a result of participating in this study. Your participation in this study is completely voluntary, and declining to participate or discontinuing participation in this study at any time will not result in any penalty or loss of benefits to which you are otherwise entitled.

If you consent to participate in this survey:

1. Remove this page and keep it for your records.
2. Print your first and last name in the blanks at the top of the next page.
3. Complete the attached Psychosocial Factors and Food Waste-Related Behaviors Survey. If you have any questions concerning this study, please feel free to contact either of the individuals listed below:

Dr. Donna Graham, University Professor
Agricultural Education, Communication and Technology
AFLS E115
Phone: 479-575-6346
Email: dgraham@uark.edu

Ms. Iroshi (Ro) Windwalker, IRB Coordinator
Research Compliance
Office: 109 MLKG
Email: irb@uark.edu
Phone: 479-575-2208

This survey contains four sections. In the first section, we want to know your attitudes regarding food waste. Attitudes can be described as finding something favorable or unfavorable.

In the second section, we want to know how subjective norms influence your food waste-related behaviors. Subjective norms refer to external influences like family, friends, significant others, etc.

In the third section, we want to know how your perceived behavioral control influences your food waste-related behaviors. Perceived behavioral control refers to how confident you are that you can or cannot complete a task.

In the final section, we would like to know a little background information on you, like your age, academic classification, and major.

Please respond honestly – there are no right or wrong answers.

Please print your first and last name in the blank below and begin with Part I of the survey.

Name :_____(first and last)

Part I: Attitude Towards Food Waste

Please read each of these statements and rate your level of agreement with each statement by circling the appropriate number to the right of the statement.

1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
I feel guilty or bothered when I throw away edible food.	1	2	3	4
I believe that planning meals in advance reduces food waste.	1	2	3	4
I believe checking my pantry before shopping reduces food waste.	1	2	3	4
I feel that eating leftovers help reduce food waste.	1	2	3	4
I feel good when I make shopping lists	1	2	3	4
I believe wasting edible food contributes to food waste.	1	2	3	4
I believe household food waste is harmful to the environment.	1	2	3	4
I do not feel that food waste is a real concern	1	2	3	4

Throwing away uneaten food does not bother me	1	2	3	4
I do not worry about the amount of food I throw away	1	2	3	4

Part II: Subjective Norm Influence

Please read each statement and rate your level of agreement with each statement by circling the appropriate number to the right of the statement.

1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
Most people who are important to me approve of me reducing food waste	1	2	3	4
My friends think that I should reduce the amount of food I waste	1	2	3	4
My family thinks it would be a good idea for me not to waste edible food	1	2	3	4
Most people my age waste edible food	1	2	3	4
My professors want me to reduce food waste	1	2	3	4

My classmates do not think food waste is an important topic.	1	2	3	4
I feel socially pressured to reduce food waste	1	2	3	4
My peers do not expect me to reduce food waste	1	2	3	4
My parents encourage me to eat leftovers	1	2	3	4
Most people important to me disapprove of me preparing too much food.	1	2	3	4

Part III: Perceived Behavioral Control

Please read each statement and rate your level of agreement with each statement by circling the appropriate number to the right of the statement.

1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
Avoiding household food waste in my home is up to me	1	2	3	4
I am responsible for controlling household food waste in my home.	1	2	3	4

I am confident that I can put effort into reducing food waste.	1	2	3	4
I am capable of only buying the exact amount of food my household needs.	1	2	3	4
It is difficult for me to cook and prepare the exact amount of food my household will eat	1	2	3	4
Whether I reduce household food waste is not entirely up to me.	1	2	3	4
In my opinion, wasting food is unavoidable	1	2	3	4
Throwing away edible food would be difficult	1	2	3	4
It is possible for me only to buy food I will eat	1	2	3	4
I am completely capable of storing food properly so it does not go to waste	1	2	3	4

Part IV: Your Food Waste-Related Behaviors

Please read each statement and rate how often you engage in the behavior by circling the appropriate number to the right of the statement.

1 = Never
2 = Seldom
3 = Often
4 = Almost Always

Statement	Never	Seldom	Often	Almost Always
I use the date label on a food product to determine if I should discard it	1	2	3	4
After meals, I save leftovers that I can eat later.	1	2	3	4
I wind up throwing away leftovers I have saved in the fridge.	1	2	3	4
I do not plan meals before shopping	1	2	3	4
I only buy food items I know I will eat	1	2	3	4
I take more food than I can eat in buffet-style restaurants.	1	2	3	4
I take specific actions to prevent food waste	1	2	3	4
I discard uneaten food in dining halls and restaurants.	1	2	3	4
If given too much food, I discard any uneaten portion(s)	1	2	3	4
I ask for a "to go" box when I cannot eat all the food I order at a restaurant	1	2	3	4

Part V: Background Information

Please respond to the following questions in the manner indicated.

1. Are you 18 – 29 years old?
   □ Yes

□ No

2. Please select your current academic classification:

□ Freshman

□ Sophomore

□ Junior

□ Senior

□ Graduate

□ Law

□ Other

3. Are you currently majoring in an agricultural discipline?

□ Yes, I am a(n)_____

□ No

4. What is your gender?

_____ (fill in the blank)

Thank you for your participation!