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RESEARCH ARTICLE

How Do Preference and Perception of Risks Affect Willingness-To-Pay for Food Safety?

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Abstract
Foodborne illnesses are costly to society and have been associated with local produce. The affordable "3-step wash" cleaning procedure was designed to reduce pathogens on produce. We estimate consumer willingness to pay (WTP) for food safety (i.e. 3-step washed), prepackage, and sales location attributes in locally grown produce (e.g., lettuce). On average, consumers are willing to pay $1.46 more for 3-step washed and $0.30 more for prepackaged lettuce. Additionally, consumers are willing to pay $0.16 more for fresh produce sold in natural stores and farmers markets compared to supermarkets, but $0.22 less for produce sold in other direct-to-consumer locations such as roadside stands. Higher WTP for the food safety attribute is associated with consumers who have greater risk aversion, less knowledge of foodborne illness, and stricter food safety cleaning and handling practices. Consumers highly concerned about foodborne risks also show higher WTP for both food safety and prepackage attributes. These findings can guide local farmers in making decisions about adopting pathogen-reduction cleaning procedures, selecting sales locations, and developing effective marketing strategies.

Keywords: Food safety; fresh produce; local food; risk perception; risk preference; willingness-to-pay

JEL classifications: D1; M3; Q13; Q18

1. Introduction

Food represents a major daily expense for people worldwide. In 2022, consumers in the United States spent an average of 11.3% of their disposable income on food, rising to nearly one-third among low-income households, while total food-at-home spending surpassed $1 trillion for the first time amid surging inflation (USDA ERS, 2024). Beyond food availability and affordability, ensuring the safety of food supply is also critical. Inadequate food safety not only affects individual health but can also lead to foodborne disease outbreaks, contributing to a range of social issues and heightened social costs (e.g., Antle, 1999; Traill and Koenig, 2010; World Health Organization, 2022). The USDA Economic Research Service (ERS) estimated that the total cost of foodborne illnesses associated with the 15 leading foodborne pathogens, which led to 8.9 million cases, was about $17.6 billion in 2018 (USDA ERS, 2023), a $2 billion increase from 2013 (Hoffmann and Ahn, 2021).

This paper aims to evaluate consumer willingness to pay (WTP) for food safety attributes associated with locally grown fresh produce, focusing in particular on how behavioral factors

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(e.g., risk preferences, level of concern regarding foodborne risks, knowledge of foodborne pathogens, and food safety behavior indicator) influence their WTP. Significant research efforts have been made on new methods to enhance food safety, but the willingness to adopt these new practices among small-scale producers remains moderate due to high upfront costs (Jarman et al., 2023; Pivarnik et al., 2018). A recent study by Becot et al. (2021) found that nearly two-thirds of small- and medium-scale producers would invest in food safety practices only if they were affordable. As such, producers need the appropriate monetary incentives to invest in food safety measures. Absent of policy supports, the monetary incentive would need to come from consumer demand. This gives rise to two critical questions: Do consumers truly value locally grown produce with enhanced food safety measures? Are they willing to pay a premium for this added benefit that would enable producers to recoup their investment in these measures?

Over the years, governments and the food industry have made significant endeavors to uphold food safety across the supply chain. For instance, the Preventive Controls Rule covers facilities that process commodities into different products, and the Produce Safety Rule applies to farms that grow fruits and vegetables and may also carry out post-harvest activities (e.g., soring, washing, or packing) (Yeh and Astill, 2022). Nevertheless, policies vary by state and market type and enforcing them can be costly (Horeh et al., 2023). For locally grown produce sold through unconventional channels, certain food safety inspections may be exempted or enforced less rigorously. For instance, most small- and medium-scale farms in the United States are exempted from the 2011 Food Safety Modernization Act's Produce Safety Rule, which sets minimum safety standards for fresh fruit and vegetable production (Becot et al., 2021; Gerdes et al., 2022). This could be one explanation for why fresh produce sold in farmers markets is often found to contain more pathogenic bacteria than that from conventional outlets in the United States (Kim et al., 2021; Li et al., 2017; Roth et al., 2018).

Several foodborne outbreaks linked to fresh produce from farmers markets were reported across the United States over the past decades. Examples include the 2009–2010 raw pea contamination in Alaska (Gardner et al., 2011), the 2011 strawberry contamination in Oregon (Laidler et al., 2013), and more recently the pea contamination in Wisconsin in 2022 (Marler, 2022). Furthermore, Bellemare and Nguyen (2018) showed the prevalence of farmers markets has increased the number of reported foodborne illness outbreaks. Research from the USDA ERS highlights that post-harvest activities vary in their risk of introducing microbial contamination, potentially causing foodborne illnesses such as Salmonella or Listeria (Yeh and Astill, 2022). These contaminations, causing illness, hospitalization, and even death, might have been mitigated if proper post-harvest sanitizing procedures were taken to process the produce.

Consumer WTP for a specific attribute of a food product (e.g., enhanced food safety, organic, non-GMO, high quality, etc.) is commonly quantified using choice experiments (e.g., Castillo and Carpio, 2019; Grant et al., 2019; Sarasty and Amin, 2023). Onozaka and McFadden (2011) show that U.S. consumers are willing to pay a premium for locally grown products, and locally grown is the highest valued label among other labels they studied. Region-specific studies further estimate consumer WTP for locally produced food (Hu et al., 2012; James et al., 2009). For instance, Ohio and Kentucky consumers are willing to pay more for locally produced jam (Hu et al., 2012), and Pennsylvania consumers are willing to pay a premium for locally produced applesauce (James et al., 2009). Outside the United States, Spanish consumers also exhibit a higher WTP for locally sourced eggs compared to imported alternatives (Gracia et al., 2014).

Studies on consumer WTP for improved food safety cover a broad range of food products (e.g., Cicia et al., 2016; Mørkbak et al., 2011; Sckokai et al., 2014; Wang, 2018; Yu et al., 2018). These studies have found that consumers in the U.S. are willing to pay 31% more for grapefruit with 50% food safety risk reduction (Buzby et al., 1995), 65% more for cabbage certified as safe (Amfo et al., 2019), and $1 premium for fresh-cut produce with 50% lower foodborne risk (Yu et al., 2018). Consumers are also willing to pay extra for potato products with increased food safety but WTP varies based on how the information is framed (McFadden and Huffman, 2017).

Further, two-thirds of surveyed consumers in a Midwestern city are willing to pay a premium for beef products with pre-slaughter food safety interventions (Britwum and Yiannaka, 2019).

Previous studies on consumer WTP for food safety have primarily focused on demographics, purchase frequencies, and consumption habits (Gedikoğlu and Gedikoğlu, 2021; Sckokai et al., 2014). Some studies explored opinions about the government's role in animal vaccines (Britwum and Yiannaka, 2019), attitudes toward the use of agrochemicals, trust in certification agencies (Amfo et al., 2019), and consumer preference heterogeneities (Seong et al., 2024). However, limited research has examined how individuals' risk and food safety-related behavioral factors affect their WTP for food safety. As noted in previous studies, these behavioral factors significantly affect their demand for risky products (House et al., 2004; Lobb et al., 2007; Lusk and Coble, 2005). For instance, consumers who are more risk-averse and perceive a higher risk associated with consumption are generally less likely to choose those products. We argue that these same factors likely play a crucial role in shaping consumer WTP for enhanced food safety features. Understanding these factors can help producers develop targeted marketing strategies based on consumer segments with diverse risk tolerance and food safety concerns.

Moreover, limited research has explored the potential shift in consumer WTP for food safety attributes following the COVID-19 pandemic. Huang et al. (2021) showed that the pandemic affected consumer food purchasing behavior, especially in terms of location (e.g., grocery stores and farmers markets). We argue that consumer WTP for food safety features, especially those associated with minimally processed or locally sourced foods, may have evolved. Reexamining these factors using data collected during the pandemic enables us to understand whether consumers' decision-making factors and willingness have changed.

The following topics will be assessed in the present paper: (1) consumer WTP for food safety attributes, (2) WTP based on sales locations (e.g., supermarkets, supercenters, natural stores, farmers markets, and other direct-to-consumer (DTC) channels) and packaging options (prepackage vs. non-prepackage), and (3) the impact of behavioral factors on consumers' WTP for locally grown fresh produce. A national survey was conducted in August 2020 through Qualtrics to address these questions. The choice experiment in the survey considers a food safety attribute, represented by the "3-step wash," which is an easy-to-implement and low-cost postharvest processing procedure that has been shown to significantly reduce the prevalence of pathogens on fresh produce (Li et al., 2021).

Additionally, we consider sales location and packaging options in the choice experiment to assess how consumer WTP varies with these two attributes. Previous studies show that WTP and preferences for the same product or attribute can vary significantly based on sales locations (Printezis et al., 2019). For instance, Darby et al. (2008) found that consumers were willing to pay \$0.54 for a "freshness guarantee" feature on strawberries in grocery stores compared to \$0.73 through DTC channels. Marques et al. (2021) noted that while consumers generally prefer large chain stores for buying fresh fruits due to their convenience and pricing, their choice of where to buy local fruits is mainly influenced by the atmosphere of the sales location. Since consumers may associate sales locations with varying levels of food safety, understanding factors influencing WTP for the location attribute can reveal how these perceptions shape preferences regarding food safety. Moreover, consumer WTP for agricultural products may be affected by whether the product is packaged or non-packaged (Van Asselt et al., 2022). Farmers and food retailers have adopted various marketing strategies such as prepackaged fresh products to differentiate themselves from competitors, improve consumer experiences, and increase market share (Brunori et al., 2016; Marques et al., 2021). By combining insights from food safety, location, and prepackaging attributes, local farmers can better make informed decisions on what product attributes to include, where to sell the produce, and how to market their produce, considering the costs and constraints facing them.

Our results show that consumer WTP for the food safety attribute (3-step wash) for lettuce is \$1.46 per head, and their WTP for prepackage is \$0.30. Multivariate regression results further show that all behavioral factors we investigate, including general risk preferences, knowledge of foodborne pathogens, concern about foodborne risks, and the food safety behavioral indicator, significantly impact consumer WTP for food safety and prepackage attributes. Additionally, consumers are willing to pay \$0.16 more for fresh produce sold in natural stores and farmers markets compared to supermarkets, but \$0.22 less for produce sold in other direct-to-consumer locations such as roadside stands.

These findings offer valuable insights for small- and medium-scale producers in the United States who, although exempted from certain food safety standards, may seek to enhance their food safety practices. In particular, results help quantify how much producers can invest in enhanced food cleaning procedures or equipment—such as adding cleaning steps to mitigate foodborne pathogens—while remaining economically viable. If the price premium consumers are willing to pay is insufficient, determining the disparity between the price premium and additional costs could help policymakers decide whether to offer subsidies to encourage the adoption of such cleaning procedures by small- and medium-sized farms.

This study contributes to the literature in three key ways. First, it investigates how behavior factors affect consumer WTP for increased food safety on locally grown produce, for which consumer WTP for food safety attributes is relatively under-researched. Second, our findings are derived from a survey conducted in August 2020, following the onset of the COVID-19 pandemic. This is critical because consumers' food purchasing behavioral patterns have undergone significant changes since then (e.g., Ellison et al., 2021; Lai et al., 2020; Melo, 2020). Previous meta-analyses highlight that consumer WTP for local food can differ greatly depending on the specific context (Enthoven and Van den Broeck, 2021; Feldmann and Hamm, 2015; Printezis et al., 2019; Stein and Santini, 2022). To our knowledge, this is the first study on WTP for food safety in locally grown fresh produce in the United States since the pandemic. Furthermore, the food safety attribute is based on an existing emerging postharvest cleaning procedure. This focus on real-world applicability provides concrete information for extension personnel to guide small and medium-sized producers in implementing improved food safety practices. The one study closest to ours is Yu et al. (2018), which examined consumer perceptions of food safety risks and their impact on WTP for pre-cut produce with reduced foodborne risks. However, apart from assessing food safety risk perception and sociodemographic factors, they did not investigate risk preferences or other behavioral indicators.

2. Survey design and data

A nationwide survey study was carried out in August 2020 through Qualtrics to: (1) conduct a choice experiment to assess consumers' preferences for increased food safety on locally grown fresh produce, as represented by the 3-step wash attribute; (2) elicit consumers' general risk preferences and foodborne-related perceptional and behavioral factors; and (3) collect sociodemographic characteristics and geographic location related information. All questions and procedures were approved by the West Virginia University Institutional Review Board before the survey was distributed.

Prior to survey participation, all potential participants received a cover letter explaining the research project and emphasizing their voluntary participation. The letter also explained complete data anonymization and participants' right to withdraw from the survey at any time. To gather the most reliable information, we focused only on household primary grocery shoppers who had first-hand knowledge of the food budget and the best understanding of the food expenditures. A screening question, asked at the beginning of the survey, identified if the respondents were the primary grocery shoppers of their households.

Our sample quotas and distribution mirror the five-year average income, education, and age distributions presented in the US Census Bureau 2018 American Community Survey (see Appendix I for the detailed quotas). Various censoring questions were included throughout the survey to ensure the quality of responses. After dropping 381 invalid responses, a total of 514 valid responses from the primary grocery shopper of the household were recorded. This number is greater than the minimum sample size suggested by Qualtrics – based on the 2015–2019 average number of US households, 120,756,048, the minimum survey sample size for a 95% confidence level, 0.5 standard deviation, and 5% margin of error is 385.[1]

2.1. Choice experiment design

Choice experiments are a well-established tool to elicit consumer WTP and identify key factors influencing their choices for products with varying attributes (e.g. Grant et al., 2019; Joya et al., 2022; Wang, 2018). We selected fresh lettuce for the experiment because of its widespread availability and popularity as a local item. This eliminates the need to consider preferences for products not readily available from local producers.

Four attributes are examined in the experiment: cleaning procedure, prepackage, purchase location, and price. Figure 1 shows the detailed explanation of the four attributes presented to survey participants. We use "3-step wash" under the cleaning procedure attribute to deliver an explicit message of enhanced food safety. As Gil et al. (2009) pointed out, deficiency in postharvest sanitization practices is a key contributor to compromised fresh produce safety. Currently, the most common postharvest on-farm cleaning process used in the fresh produce industry is rinsing with water or sanitizing using chlorine solutions (Shen et al., 2013).

The 3-step wash procedure, which involves cleaning produce through two water dips and one antimicrobial dip with commercial antimicrobial solutions (Li et al., 2021), has been shown to significantly reduce pathogens on fresh produce compared to conventional practices (Li et al., 2020a; Li et al., 2021). Additionally, it offers a practical and cost-effective solution for small-scale farmers, costing $500–$2000 to clean 1000–5000 squashes (Li et al. 2020b). Significant extension efforts have been made over the past few years to encourage local producers to adopt the 3-step wash procedure due to its effectiveness, simplicity, and low investment. However, the cost remains a burden for producers, making it hard for them to adopt the procedure unless they can recoup it by selling at higher market prices. We visually and verbally (in writing) explain the difference between the 3-step wash and the usual postharvest on-farm cleaning procedure and the effectiveness of the 3-step wash method in improving food safety prior to the choice experiment.

While prepackage does not always indicate a cleaner or safer product, some consumers perceive it as such. This perception likely stems from the consumers' understanding that (1) packaging facilitates safe transportation, potentially maintaining freshness and wholesomeness until consumption (Marsh and Bugusu, 2007), (2) certain packaging technologies, such as modified atmosphere packaging and antimicrobial packaging, can effectively inhibit microflora growth (Caleb et al., 2013; Han, 2005), and (3) proper packaging prevents cross-contamination (Carrasco et al., 2012). Both non-prepackage and prepackage options are visually and verbally (in writing) presented to participants prior to the experiment.

For the third attribute, we are interested in how purchase locations affect consumer WTP for locally grown fresh produce. Supermarkets are the main purchasing location for fresh produce for many consumers. Although they may have more stringent food safety requirements than nonconventional channels, consumers may still value additional safety measures for produce sold there. Including supermarkets in the analysis can inform farmers selling through this channel on adopting practices that align with consumer preferences, as well as inform retailers and policymakers about the value consumers place on enhanced safety practices.

[1]See "How to determine sample size" from Qualtrics: https://www.qualtrics.com/experience-management/research/determine-sample-size/. Accessed on 1/15/2024 (Webster, 2020).

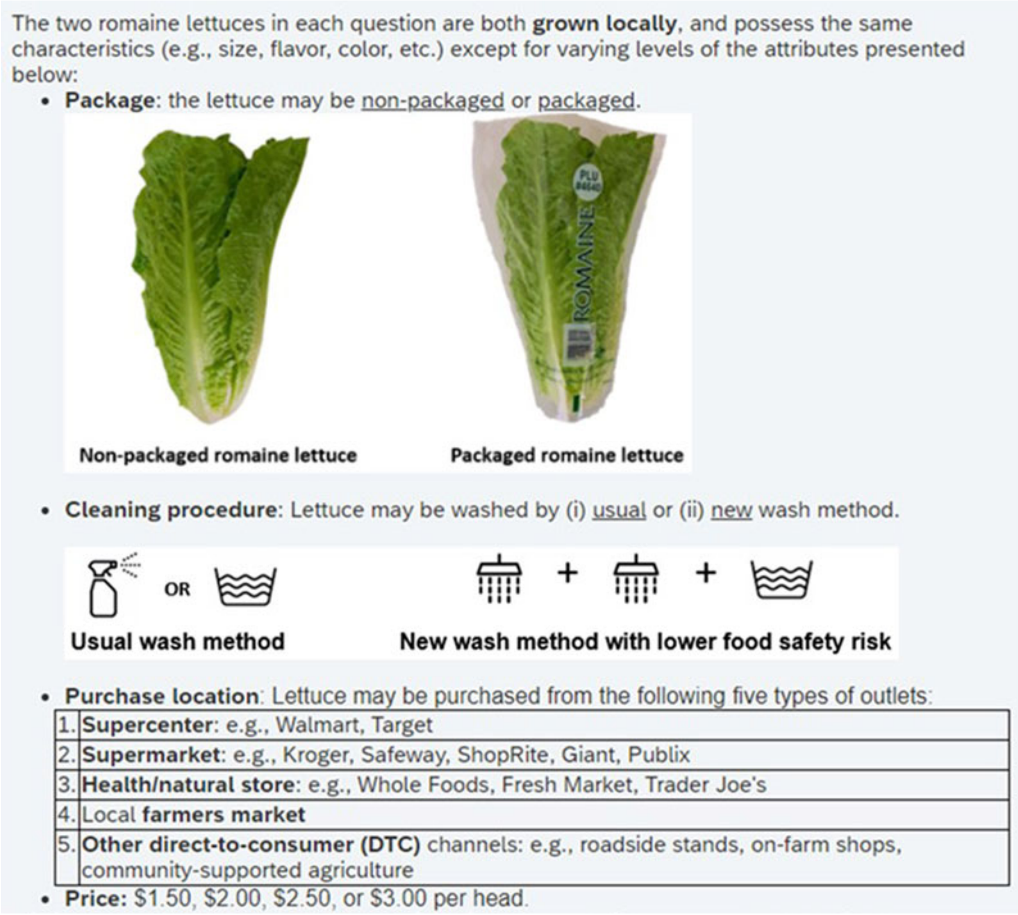
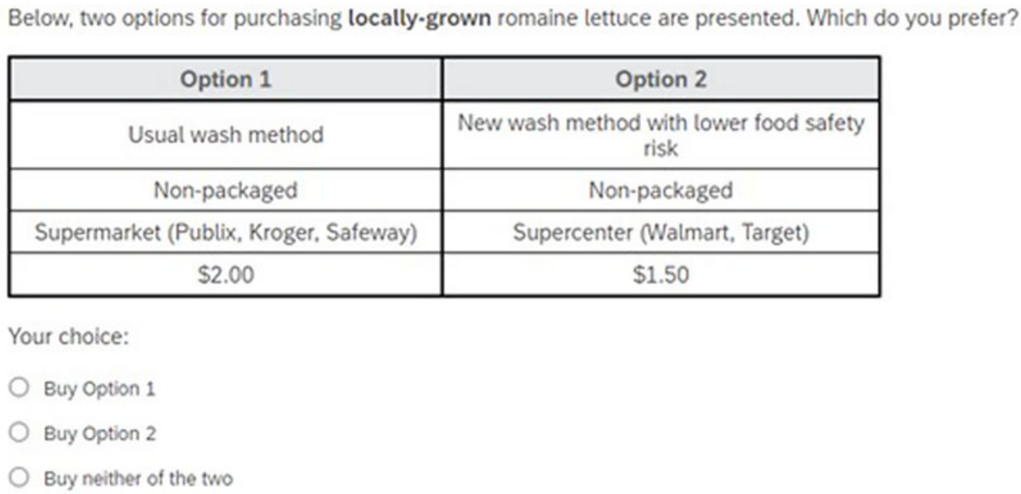


Figure 1. Explanations of product attributes.

Most of the existing studies do not differentiate between farmers markets and other direct-to-consumer (DTC) channels (Marques et al. (2021). While farmers markets continue to be the most prevalent venue for local produce, alternative DTC channels (such as on-farm shops and roadside stands) have become increasingly popular. Here, we treat farmers markets and other DTC sales channels as two different locations. A total of five purchase locations are examined, including supercenter, supermarket, health/natural store, farmers market, and other DTC channels. Examples for each purchase location are provided to participants. The final attribute, price, ranging from $1.50 to $3.00 per head of lettuce, allows us to calculate consumer WTP for each aforementioned attribute, and investigate their interrelationships.

The collective design, following Louviere et al. (2000), is $(L^A)^M$ factorial with M being options in a choice set, A being attributes for each option, and L for levels. Hence, the collective factorial is $(2^2 * 4^1 * 5^1)^2$ or 6,400. The opt-out option has no attributes and thus is constant. To reduce the number of combinations within the full factorial design, a fractional factorial design allowing for main effects and some interaction effects is created. The fractional factorial design allows for interactions between the prepackage and cleaning procedure and between the cleaning procedure and purchase location. 80 profiles are chosen using SAS PROC OPTEX achieving a D-efficiency score of 95.5%. Profiles are combined into 10 blocks, each with 8 scenarios. Each survey taker is asked to complete a total of eight choices where each choice consists of two options


Below, two options for purchasing **locally-grown** romaine lettuce are presented. Which do you prefer?

Option 1	Option 2
Usual wash method	New wash method with lower food safety risk
Non-packaged	Non-packaged
Supermarket (Publix, Kroger, Safeway)	Supercenter (Walmart, Target)
$2.00	$1.50

Your choice:

- Buy Option 1
- Buy Option 2
- Buy neither of the two

Figure 2. Choice experiment exercise example.

(Option 1 and 2) and a "buy neither of the two" option. For Options 1 and 2, the information for each of the four attributes (cleaning procedure, prepackage, sales location, and price) is provided, as shown in Figure 2. Experimentally designed choice alternatives were randomly ordered to avoid the potential ordering effect.

2.2. Behavioral factors

A key focus of the paper is to understand how behavioral factors affect consumer WTP for food safety attributes. We focus on four key factors: general risk preferences, perception of foodborne risks, knowledge of foodborne pathogens, and a food safety behavioral indicator. Risk-averse consumers, who are less comfortable with uncertainty, are expected to have a higher WTP for food safety attributes. Since the 3-step wash and prepackage represent ways to reduce the risk of foodborne illness, they hold greater value for those who prioritize mitigating risks. Meanwhile, individuals who are more concerned about foodborne illness may be willing to pay more to reduce the perceived risk by purchasing products with enhanced food safety features.

The impacts of knowledge levels of foodborne pathogens and food safety behavioral indicators are less straightforward. While greater knowledge might increase WTP for enhanced safety measures, it could also lead to confidence in self-cleaning, reducing their WTP. Similarly, frequent safe handling practices (food safety behavioral indicators) might indicate a higher WTP for safety attributes, but also a belief that these practices are sufficient, lowering their WTP.

2.2.1. General risk preferences

Consumer risk preferences are elicited following the approach of Holt and Laury (2002) and subsequently used by Dorner et al. (2019) and Lusk and Coble, 2005). Respondents are asked to make ten consecutive choices between two lotteries: Option A (safer lottery) and Option B (riskier lottery). Table 1 details the ten lottery choice questions. Figure 3 shows one of the choices, in which Option A comes with an 80% chance to win $8 and a 20% chance to win $10, while Option B comes with an 80% chance to win $1 and a 20% chance to win $19.

To ensure respondents fully understand the exercise, at the beginning of the section, they participated in a practice round that explained in detail the question design. To encourage realistic decision-making, respondents are notified that "1 in every 100 participants is randomly drawn to

Table 1. Ten paired lottery-choice decisions and the expected payout

Option A	Option B	Expected payoff difference[2]
10% chance of $10, 90% chance of $8	10% chance of $19, 90% chance of $1	$ 5.4
20% chance of $10, 80% chance of $8	20% chance of $19, 80% chance of $1	$ 3.8
30% chance of $10, 70% chance of $8	30% chance of $19, 70% chance of $1	$ 2.2
40% chance of $10, 60% chance of $8	40% chance of $19, 60% chance of $1	$ 0.6
50% chance of $10, 50% chance of $8	50% chance of $19, 50% chance of $1	$ −1
60% chance of $10, 40% chance of $8	60% chance of $19, 40% chance of $1	$ −2.6
70% chance of $10, 30% chance of $8	70% chance of $19, 30% chance of $1	$ −4.2
80% chance of $10, 20% chance of $8	80% chance of $19, 20% chance of $1	$ −5.8
90% chance of $10, 10% chance of $8	90% chance of $19, 10% chance of $1	$ −7.4
100% chance of $10, 0% chance of $8	100% chance of $19, 0% chance of $1	$ −9

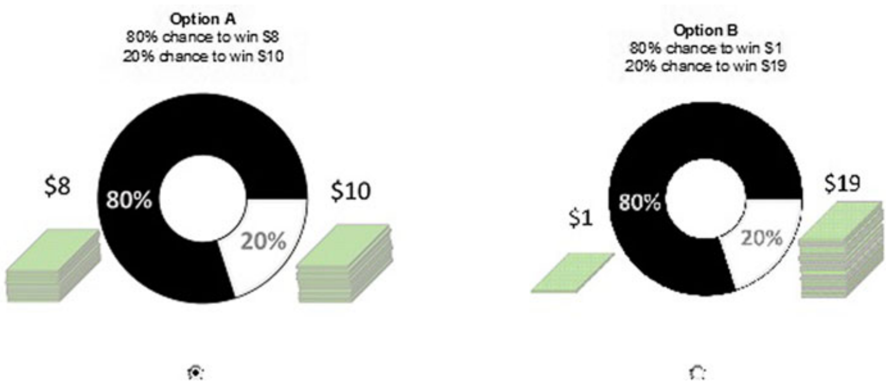


Figure 3. Risk preference lottery exercise example.

play 1 of their 10 choices for BONUS payment."[3] Additionally, the tenth (last) question serves as one of the censoring questions. Here, the only rational choice is Option B, offering a guaranteed $19 compared to $10 in Option A. Failing to select Option B suggests inattentiveness or a lack of understanding of the task, and hence is excluded from the analysis.

The risk preference of each respondent is represented by the number of times they chose Option B, the riskier option. Respondents are considered to be absolutely risk neutral if they pick Option A exactly five times because the expected payoff for picking Option A changes from positive to negative starting at the fifth round (Holt and Laury, 2002). Individuals are considered to be risk-averse if they pick Option A more than five times, and risk-seeking otherwise. Figure 4

[2]Expected payoff difference is calculated by expected payoff of lottery 1 minus expect payoff of lottery B = [(r) * Lottery A high payoff + (1-r) * Option A low payoff] − [(1-r) * Option B high payoff + (r) * Option B low payoff].

[3]The RANDBETWEEN function in Excel was used to randomly (1) select five bonus payment winners, (2) select one lottery question (from questions 1–10) for each of the five winners, and (3) simulate the lottery outcome based on the option they chose (option A or B) for the selected question. For instance, if individual 10 was selected as a winner, we would use RANDBETWEEN to randomly select one of their 10 answered questions. If question 6 was chosen and they selected Option A (60% chance of $10, 40% chance of $8), RANDBETWEEN would again determine the payout based on these probabilities. Although the random selection process was executed successfully and with full intent to reward the winners, a miscommunication with Qualtrics prevented us from distributing the extra payment.

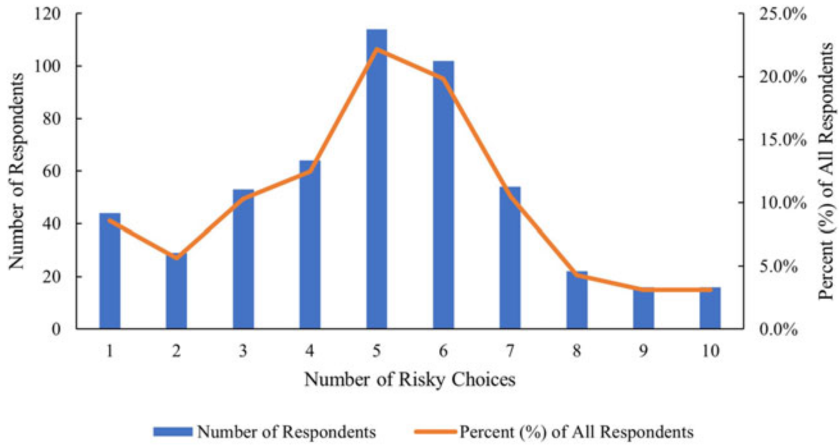


Figure 4. Number of risky choices made by respondents.

illustrates the distribution of respondents' risk preferences. The average number of risky picks (Option B) is 4.97 (out of 10), with a median of 5. About 37% of respondents choose Option B no more than four times (risk-averse), 22% pick Option B exactly five times (absolute risk neutral), and 41% select Option B six times or more (risk-seeking).

2.2.2. Foodborne risk perceptions and knowledge level

To determine respondents' risk perceptions of foodborne illness, we followed Yu et al. (2018) and asked the respondents to rate their perceptions of the three most common pathogens on fresh produce that cause foodborne illness, *Salmonella, E. coli*, and *Listeria*. Salmonella is included despite its traditional association with uncooked animal products. Raw fruits and vegetables can also become contaminated with *Salmonella*, as evidenced by several recent outbreaks linked to fresh produce in the United States (Astill et al., 2019; Hanning et al., 2009).

Specifically, respondents used a five-point Likert scale (1 = very safe, 5 = very risky) to answer the following question for each pathogen: "How risky fresh produce contaminated by [pathogen name] is to your health?". The sum of these three Likert scores (ranging from 3 to 15) represents each respondent's level of concern regarding foodborne risks used in empirical estimation. The average (median) level of concern was 13.16 (13) among respondents, falling between "somewhat risky" and "very risky." This suggests that the majority of respondents perceive these pathogens as posing a significant health risk.

In addition, we survey consumers' knowledge of foodborne pathogens. House et al. (2004) show that knowledge significantly affects consumers' willingness to accept new product attributes (e.g., GM foods), and Jin and Han (2014) find that consumers with more food safety-related knowledge are less likely to panic and overreact to food safety issues. Here, we follow Jin and Han (2014) to assess consumer knowledge of foodborne pathogens using a five-point Likert scale (1 = Very low, and 5 = Very high). We adapted their questions to our research focus (i.e. fresh produce foodborne pathogens). Respondents answered the question: "How would you rate your knowledge of *Salmonella, E. coli*, and *Listeria?*" The individual-level Likert scale (ranging from 1 to 5) was used in running the regression models. Among our respondents, the average score was 3.33 (between Medium and High), with a median of 3 (Medium).

2.2.3. Food safety behavioral indicator

For the food safety behavioral indicator, respondents are asked about how often they practice each of the five suggested safe food cleaning and handling practices suggested by the Dietary Guidelines for Americans (USDA and U.S. Department of Health & Human Services 2015). These five practices are (1) wash hands with soap and running water before handling food, (2) sanitize kitchen surfaces and cutting boards, (3) use one cutting board for fresh produce and a separate one for raw meat, (4) rinse fresh produce under running water just before cutting, eating, or cooking, and (5) refrigerate or freeze perishables (e.g., berries, lettuce, eggs, seafood, etc.) within 2 hours of purchase.

Respondents used a Likert scale (0 = Never/Almost never, 3 = Always/Almost always) to answer these questions. The sum of Likert scores of these five questions, ranging from 0 to 15, represent respondents' food safety behavioral indicators. Among our respondents, the mean (median) of their food safety behavioral indicator is 12.27 (13), ranging between Often and Always/Almost always. This indicates that, on average, respondents follow the majority of the five suggested safe food cleaning and handling practices.

2.3. Sociodemographic and geographical information

The sample distribution of the study closely resembles the five-year average income, education, and age distributions reported in the US Census Bureau 2018 American Community Survey (see Appendix I for detailed quotas). Table 2 presents summary statistics of relevant variables.

Household income is segmented into four categories: less than \$50,000, \$50,000 to \$99,999, \$100,000 to \$149,999, and \$150,000 or more. Individuals in each income bracket, from the lowest to the highest, represent 41.25%, 30.93%, 14.98%, and 12.84% of the sample, respectively. The average household comprises 3.14 members. Furthermore, 42.22% and 29.96% of households in the sample include at least one member under 18 and at least one member over 64, respectively. It is worth noting that approximately two-thirds of the respondents are female, aligning with the fact that 65% of primary food shoppers in US households were female in 2018 (Statista, 2020). 47.3% of respondents are employed either full-time, part-time, or self-employed, while the remainder are either unemployed, student, retired, homemaker, or unable to work.

Respondents are categorized as either metropolitan or non-metropolitan residents based on their zip code information. According to the USDA classification, areas with a Rural-Urban code less than or equal to 3 are considered metropolitan. 85% of respondents reside in metropolitan areas. By cross-referencing a respondent's zip code with the USDA Food Access Research Atlas dataset, we derive the density of farmers markets selling fresh produce per 10,000 people in 2018 and the density of supercenters and grocery stores per 10,000 people in 2016, at the zip code level. On average, there are 0.18 farmers markets selling fresh produce and 2.34 supercenters and grocery stores per 10,000 people.

Two measures are used to account for COVID-19 and other health risks affecting each respondent. First, we gauge the severity of COVID-19 by calculating the accumulated number of COVID-19 cases per 100 people on August 12, 2020 (day 1 of the survey) at the county level, utilizing data from USA Facts.[4] This information is matched to the respondents' zip codes. On average, there are 1.53 cases per 100 people. Second, respondents are asked to rate their own health status on a 1–5 scale, with 1 being extremely unhealthy and 5 extremely healthy. Generally, individuals in poor health are more susceptible to severe illness from foodborne diseases. In our sample, the average self-reported health status is 3.76, indicating conditions ranging between fair and good.

3. Model specification and estimation procedures

3.1. Mixed logit model in WTP space

The analytic model adopted in this study is based on the random utility theory. Specifically, respondents are assumed to choose the products with attributes that maximize their utility when

[4]Available at https://usafacts.org/visualizations/coronavirus-covid-19-spread-map. Accessed on 1/15/2024.

Table 2. Demographic information of the survey respondents and variable descriptions

Variable definitions	Obs.	%	Variable definitions	Obs.	%
Household income			*Age of primary food shopper*		
< \$50,000	212	41.25%	18 to 24 = 1	51	9.92%
\$50,000-\$99,999	159	30.93%	25 to 34 = 2	106	20.62%
\$100,000-\$149,999	77	14.98%	35 to 44 = 3	122	23.74%
\$150,000 or more	66	12.84%	45 to 54 = 4	47	9.14%
Education of primary shopper			55 to 64 = 5	97	18.87%
Less than high school	60	11.67%	65 or above = 6	91	17.70%
High school	144	28.02%	Employed (full/part time)	218	42.41%
Some college (no degree)	115	22.37%	With at least one kid<18 and/or at least one elder member>64	340	66.15%
Associate's degree	48	9.34%			
Bachelor's degree	95	18.48%	Metropolitan area = 1	437	85.02%
Graduate/prof. degree	52	10.12%	Male = 1	166	32.30%

Variable definitions	Mean	Std.
# of grocery stores & supercenters per 10,000 population, min = 0.7; max = 9.4	2.34	1.47
# of FM selling fresh produce per 10,000 population, min = 0; max = 4.8	0.18	0.3
COVID-19 cases per 100 population, min = 0.05; max = 5.13	1.53	0.82
Self-report health condition, min (extremely bad) = 1; max = 5	3.76	0.88
Food safety behavioral indicator, min (not following any suggested practice) = 0; max = 15	12.27	3.05
Level of ***concern*** on foodborne risks, min (least concern) = 3; max = 15	13.16	3.17
Level of ***knowledge*** on foodborne pathogens, min (expecting least) = 1; max = 5	3.33	1.01
Level of ***general risk preference***, min (most risk-averse) = 1; max = 10	4.97	2.17
Number of observations: 514		

faced with different choice scenarios. The respondent i's utility function from choosing product j when facing choice scenario s is specified as a function of the product's price ($P_{i,j,s}$) and other non-price attributes ($X_{i,j,s}$) (Hole and Kolstad, 2012):

$$U_{i,j,s} = \alpha_i P_{i,j,s} + \beta_i' X_{i,j,s} + e_{i,j,s}, \tag{1}$$

where $i = 1, \ldots, I; j = 1, \ldots, J; s = 1, \ldots, S$. α_i and β_i are individual-specific coefficients for the price and non-price attributes, respectively. $e_{i,j,s}$ represents an unobserved random term that has an *i.i.d.* extreme value type I distribution with variance given by $\mu_i^2(\pi^2/6)$, where μ_i is an individual-specific scale parameter.

We divide Equation (1) by a scale parameter. While this does not affect behavior, it results in a new error term that is i.i.d. extreme value distributed with the same variance of $\pi^2/6$ for all decision makers (Train and Weeks, 2005):

$$U_{i,j,s} = -\lambda_i P_{i,j,s} + C_i^{\prime X_{i,j,s}} + \varepsilon_{i,j,s}, \tag{2}$$

where $\lambda_i = \alpha_i/\mu_i$ and $C_i = \beta_i/\mu_i$. Equation (2) is defined in preference space (Hole and Kolstad, 2012; Train and Weeks, 2005). Since the WTP for a non-price attribute is given by $\rho_i = C_i/\lambda_i$, Equation (2) can be re-written as:

$$U_{i,j,s} = -\lambda_i(P_{i,j,s} + \rho_i' X_{i,j,s}) + \varepsilon_{i,j,s}, \tag{3}$$

and this specification is defined as the model in WTP space (Train and Weeks, 2005). The coefficients in the WTP space models can be estimated by using the maximum simulated likelihood method as suggested by Hole and Kolstad (2012) and Scarpa et al. (2008).[5] 1000 Halton Draws were used for the simulation.

3.2. Estimating impacts of factors on WTP

To quantify the impacts of sociodemographic and behavioral factors on consumer WTP for non-price attributes (cleaning procedure, prepackage, and sales location), we use a two-step approach following previous studies (e.g., Castillo and Carpio, 2019; Sarasty and Amin, 2023). In the first step, we estimate each individual's WTP coefficients for each non-price attribute from the WTP space model (Equation 3) using the maximum simulated likelihood method. The density of each β_i is conditional on the respondent's sequence of choices and the population parameters (Castillo and Carpio, 2019; Sarasty and Amin, 2023):

$$D(\beta_i|\theta) = \frac{S_i(\beta_i)f(\beta_i|\theta)}{P_i(\theta)}. \tag{4}$$

So the expected value of β_i is $E(\beta_i|\theta) = \int \beta_i D(\beta_i|\theta)$. The simulated approach (based on 1,000 Halton draws) to the individual vector of values for the attributes is used (Castillo and Carpio, 2019; Sarasty and Amin, 2023):

$$\hat{E}(\beta_i|\theta) = \frac{\sum_j \beta^r S_i(\beta^r)}{\sum_j S_i(\beta^r)}, \tag{5}$$

where θ^r corresponds to the r-th draw from the population density $f(\beta_i|\theta)$, and $S_i(\beta^r)$ is the probability of respondent i's sequence of choices.

In the second step, the estimated individual-level WTP for all attributes is merged with the respective respondents' characteristics into a cross-sectional dataset. Following previous studies (e.g., Doris and Rongchang, 2018; Hidalgo and Goodman, 2013; Kavosi et al., 2018), we estimate the impact of various factors on consumer WTP:

$$WTP_i^a = c^a + z_i' b^a + e_i^a \tag{6}$$

where $WTP_i{}^a$ is respondent i's WTP for non-price attribute a, c^a is the attribute-specific constant intercept, z_i is a vector of respondents' characteristics, b^a is the associated coefficients, and e_i^a is the idiosyncratic error term. z_i includes sociodemographic characteristics, risk preferences, foodborne risk perceptions, knowledge about foodborne pathogens, and the food safety behavioral indicator discussed in Sections 2.2 and 2.3. Equation (6) allows us to estimate the marginal effects of various factors on the WTP for the non-price attributes.

4. Results

4.1. Mixed logit results and mean WTP

Table 3 reports the results from the mixed logit model in WTP space. The mean WTP coefficients represent the average monetary amounts respondents are willing to pay for the attributes, relative to the base options (no 3-step wash, non-prepackage, sold in a supermarket). Results are presented

[5]*Stata* 18 command *Mixlogitwtp* written by Hole & Kolstad (2012) is used to calculate the average WTP for each non-price attribute. Normal distribution was imposed for WTP estimates of non-price attributes in the model. Log-normal distribution was imposed for price.

Table 3. Mixed logit model in willingness to pay (WTP) space result

	Mean WTP	Standard deviation
3-step wash	1.4640 *** (0.1090)	1.2799 *** (0.0921)
Prepackage	0.3044 *** (0.0668)	0.5023 *** (0.0858)
Sales location (Bbse: supermarket)		
Supercenter	0.1661 (0.1163)	1.0538 *** (0.1387)
Natural store	0.1570 * (0.0931)	0.3177 ** (0.1622)
Farmers market	0.1549 * (0.0897)	0.3719 (0.2275)
Other DTC (Direct-to-Consumers) sales	−0.2160 ** (0.0885)	0.2848 * (0.1659)
ASC	−4.6794 *** (0.4564)	4.4376 *** (0.3615)
Price (Log)	0.1714 ** (0.0776)	0.7133 *** (0.0818)
Observations	12,336	

Notes: *ASC* = Alternative Specific Constant, i.e., "Buy neither of the two" option in this study. For *Price (Log),* when running the Mixed logit model in WTP space (i.e., *mixlogitwtp* command), the price coefficient is log-normally distributed. Following Hole (2007), the mean of the price coefficient is: $-e^{(0.1714+0.5*0.7133^2)} = -1.5308$, indicating a negative preference for higher prices. The standard deviation of the price coefficient is: $e^{(0.1714+0.5*0.7133^2)} * \sqrt{e(0.7133^2)-1} = 1.2467$.
Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

in terms of WTP instead of preference to allow for direct interpretation as dollar values. A significant standard deviation for an attribute suggests substantial preference heterogeneity among respondents (Hensher et al., 2015; Hole and Kolstad, 2012).

The significant positive mean coefficient of WTP for the 3-step wash attribute indicates that, on average, consumers are willing to pay $1.46 more for locally grown lettuce washed using the 3-step wash procedure than for those cleaned with the conventional procedure. The significant standard deviation further suggests considerable heterogeneity in preferences for this attribute (Hole and Kolstad, 2012).

Compared to non-prepackaged fresh produce, some consumers might perceive prepackaged fresh products as more high-end. This attribute may also be sending a mixed signal of food safety and quality. Testing and estimating consumer WTP for the prepackage attribute allows us to verify how this perception affects consumer decisions in practice. The significant positive mean coefficient of WTP for prepackage indicates that, on average, consumers are willing to pay $0.30 more for having prepackaged locally grown lettuce than non-prepackaged ones. Similar to the 3-step wash attribute, a significant estimated standard deviation for the prepackage attribute indicates considerable preference heterogeneity among respondents.

For the sales location, supermarkets serve as the base case. The WTP estimates indicate how much more or less consumers are willing to pay for locally grown lettuce compared to buying it at a supermarket. No significant difference is found in WTP between supermarkets and supercenters. However, consumers are willing to pay, on average, $0.16 more for locally grown lettuce from natural stores and farmers markets compared to supermarkets. This aligns with the perception of natural stores as offering higher-end products, where shoppers may expect to pay a premium (Ngigi et al., 2010). Similarly, previous studies found that prices for conventional (i.e. non-organic) fruits and vegetables at farmers markets are often higher than at grocery stores (Hewawitharana et al., 2022; Salisbury et al., 2018). This price difference may reflect consumer WTP a premium to support local economies and community developments while also enjoying the opportunity to interact directly with farmers (Curtis and Cowee, 2011; Torres, 2020).

In contrast, the coefficient for the "Other DTC" attribute is significantly negative, indicating that consumers are willing to pay $0.22 less for locally grown lettuce from these channels compared to supermarkets. This finding is consistent with Valpiani et al. (2016) which found that on average, the price per cup of vegetables was highest at farmers markets ($0.60), followed by supermarkets ($0.55), and lowest at roadside stands ($0.46) in North Carolina.

Our findings indicate that consumers may be expecting lower prices when buying directly from producers in "Other DTC" channels compared to farmers markets. One explanation could be that with the elimination of middlemen and distributor costs, consumers may expect these cost savings to be shared between farms and themselves. Another reason could be that consumer preference for the variety and convenience offered by farmers markets, where multiple vendors are available in one location, over the limited options available when purchasing directly from a single producer from other DTC channels. Indeed, Archambault et al. (2020) found that farmers markets can increase sales by attracting vendors with a diverse range of products. The differences in WTP between farmers markets and other DTC channels highlight the importance for producers to treat these two sales locations separately when deciding where to place their products. It also underscores the necessity for us to define farmers markets and other DTC channels as two different sales locations in our study.

Five out of six attributes (3-step wash, prepackage, supercenter, natural store, and other DTC) analyzed yield significant estimated standard deviations, suggesting the presence of preference heterogeneity among respondents. This further suggests that variations at the individual-level among consumers could affect their WTP for these attributes, and these factors can be identified through regression models.

4.2. Factors affecting WTP for food-safety attributes

Table 4 shows the multivariate regression results examining how selected sociodemographic characteristics and behavioral factors affect consumer WTP. Shaded colors represent coefficients that are statistically significant. For brevity, basic sociodemographic variables are omitted from the table; full regression results are available in Appendix II. Appendix V presents the results of misspecification tests for models in Table 4, including Ramsey regression specification test Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, and multicollinearity test. Nearly all models pass all three tests. Accordingly, conventional standard errors are reported. Results of OLS with robust standard errors and analyses less sensitive to influential outliers[6] are provided in Appendies III and IV, respectively, for interested readers.

For robustness, we added 10 interaction terms for all possible combinations of sociodemographic factors. Adding these terms caused a few previously non-significant sociodemographic variables in the main regression results (Appendix II) to become significant, such as *male* for 3-step washed and farmers market attributes, and *employed* for 3-step washed and prepackaged attributes (Appendix VI). Importantly, the inclusion of interaction terms did not change the significance levels or signs of the coefficients associated with behavioral factors across all models.

[6]Robust regression (Stata command: *rreg*) is a weighted least square method designed to reduce sensitivity to outliers while maintaining a linear relationship between dependent and independent variables. It is an alternative to OLS when data may contain outliers not caused by entry errors.

Table 4. Multivariate regression results

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers Market (5)	Other DTC (6)
Self-report health condition	−0.032	−0.0004	−0.0139	−0.0007	0.0070^	−0.0059**
	(0.0518)	(0.0100)	(0.0274)	(0.0036)	(0.0044)	(0.0028)
# of grocery stores & supercenters per 10k pop.	−0.0384	−0.0397	−0.055	−0.0124	0.019	0.0341**
	(0.2978)	(0.0577)	(0.1576)	(0.0208)	(0.0254)	(0.0162)
# of FM selling fresh produce per 10k pop.	−0.9669	0.2615	−1.1237	0.0602	−0.0222	0.2034**
	(1.4822)	(0.2871)	(0.7846)	(0.1037)	(0.1264)	(0.0805)
Covid-19 cases per 100 pop.	0.0793^	−0.0044	0.012	0.0009	−0.0072^	0.0007
	(0.0549)	(0.0106)	(0.0290)	(0.0038)	(0.0047)	(0.0030)
Level of general risk preference	−0.0332*	0.0019	0.0006	−0.0003	0.0013	0.0001
	(0.0193)	(0.0037)	(0.0102)	(0.0013)	(0.0016)	(0.0010)
Level of concern on foodborne risks	0.0348**	0.0051*	−0.0117^	−0.0003	0.0007	0.0006
	(0.0148)	(0.0029)	(0.0078)	(0.0010)	(0.0013)	(0.0008)
Level of knowledge on foodborne pathogens	−0.0920**	0.0089	−0.03	0.0016	0.004	−0.0004
	(0.0434)	(0.0084)	(0.0230)	(0.0030)	(0.0037)	(0.0024)
Food safety behavioral indicator	0.0266*	−0.0011	−0.0026	0.0014	0.0002	0.0004
	(0.0144)	(0.0028)	(0.0076)	(0.0010)	(0.0012)	(0.0008)
Constant	1.0625*** (0.3783)	0.2392*** (0.0733)	0.6268*** (0.2002)	0.1364*** (0.0265)	0.1233*** (0.0323)	−0.2177*** (0.0205)
Sociodemographic variables included	YES	YES	YES	YES	YES	YES
R-squared	0.0559	0.0188	0.0287	0.0208	0.0272	0.0441
Observations	514	514	514	514	514	514

Notes: Standard errors in parentheses. *** or [dark shading] for $p < 0.01$, ** or [shading] for $p < 0.05$, * or [shading] for $p < 0.1$, ^ or [light shading] for $p < 0.15$.

This suggests that our main results, which exclude interaction terms, remain robust and provide appropriate and interpretable findings for this section.

The focus of the first model in Table 4 is on the "3-step wash" attribute. All sociodemographic variables are non-significant, suggesting a limited impact of general characteristics on consumer WTP for food safety attributes in locally grown lettuce. This result differs from Joya et al. (2022) which found that Malaysian consumers' income and education levels significantly impact their WTP for food safety attributes of tomatoes. The positive coefficient (though not significant at a 10% significance level) for the COVID-19 severity level is consistent with the findings from Meixner and Katt (2020), which indicated that consumer WTP for food safety attributes on beef products increased significantly after COVID-19.

Regarding consumers' perceptional and behavioral factors, a significant negative coefficient is observed for risk preference (-0.0332), indicating a decrease in WTP for the 3-step wash attribute with increasing preferences for general risks (i.e. risk-taking attitude). This aligns with expectations, as risk-averse individuals typically invest more in mitigating various risks, including foodborne risks. Conversely, a positive and statistically significant coefficient is observed for the level of concern regarding foodborne risks (0.0348), indicating a higher WTP among individuals perceiving foodborne diseases as posing greater health risks. Moreover, a positive and statistically significant coefficient is observed for the food safety behavioral indicator (0.0266), suggesting a higher WTP among consumers adhering more closely to suggested safe food cleaning and handling practices. These findings underscore the significance of perception and behavior in consumer decision-making regarding food safety, potentially outweighing the influence of sociodemographic characteristics.

The second model focuses on the prepackage attribute. Similar to Model 1, sociodemographic characteristics have no significant impact on consumer WTP for the prepackage attribute on locally grown lettuce. The only significant coefficient is the one associated with the level of concern regarding foodborne risks (0.0051), indicating a higher WTP among respondents concerned with foodborne risks for the prepackage attribute.

4.3. Factors affecting WTP for sales location attributes

Models 3–6 in Table 4 examine the impacts of consumer characteristics on their WTP for locally grown lettuce at various sales locations other than supermarkets. In Model 3, a weakly negative coefficient (-0.0117, $p < 0.15$) is observed for the level of concern regarding foodborne risks, suggesting that consumers more concerned about foodborne risks have a lower WTP for locally grown lettuce from supercenters compared to supermarkets. For natural stores (Model 4), behavioral factors do not significantly affect WTP for this sales channel.

For farmers market (Model 5), a weakly significant coefficient (0.0070, $p < 0.15$) is observed for self-reported health conditions, suggesting that healthier individuals exhibit a higher WTP for locally grown lettuce sold in farmers markets compared to those sold in supermarkets. This could be due to their tendency to frequent farmers markets or their favorable perceptions of fresh produce sold therein. Additionally, a weakly significant negative coefficient (-0.0072, $p < 0.15$) for COVID-19 cases per 100 population is identified, indicating a decreased WTP among consumers residing in areas with higher COVID-19 severity levels for purchasing locally grown lettuce from farmers markets, possibly due to concerns about crowded marketplaces during the pandemic.

Lastly, for the other DTC attribute (Model 6), a significant negative coefficient of health condition (-0.0059) suggests that consumers with poorer health conditions exhibit a higher WTP for purchasing locally grown lettuce from DTC channels, possibly preferring delivery services over in-person grocery shopping, especially during the COVID-19 period. Additionally, significant positive coefficients for the densities of grocery stores (0.0341) and farmers markets (0.2034) are observed. This may be attributed to consumers in areas with higher grocery store densities (fewer people sharing one grocery store) opting for DTC channels for delivery services to avoid traveling longer distances to the nearest grocery store. On the other hand, when a farmers market is less crowded (higher farmers market densities), closer consumer-vendor relationships may be built more easily. This may lead to an increased WTP for the other DTC attribute among consumers in such areas because a large number of vendors also sell products via DTC channels other than farmers markets.

5. Conclusions and implications

Ensuring food safety is vital, given its implications for public health and social welfare. Despite significant efforts to maintain food safety across the supply chain, small-scale local farms continue to face substantial challenges. For governments, enforcement is costly. On the producer side, especially small-scale producers, the willingness to voluntarily adopt technologies and practices to enhance food safety depends on the appropriate monetary incentives to justify such investments. Our findings indicate that there is a demand for food safety and farmers could potentially charge a premium for employing a simple and affordable produce cleaning method.

In this national-level study, we assess consumer WTP for food safety, pre-packaging, and sales location attributes in locally grown fresh lettuce. We find that consumers are willing to pay an average of $1.46 more for lettuce washed using the 3-step wash procedure, the food safety attribute that reduces food safety risks, and $0.30 more for prepackaged lettuce. Compared to supermarkets, consumers are willing to pay about $0.16 more at natural stores or farmers markets, but $0.22 less when purchasing directly from producers. The significant standard deviations among attributes indicate high heterogeneity in individual preferences, suggesting variations among consumers affect their WTP for these attributes.

We subsequently analyze how various consumer characteristics impact their WTP. While most sociodemographic factors are non-significant, behavioral factors emerged as crucial determinants.[7] Consumers displaying heightened concern about foodborne risks demonstrated a greater WTP for both food safety and prepackage attributes. Those who exhibited higher levels of risk aversion and adhered more strictly to safe food cleaning and handling practices tend to place a higher value on the food safety attribute. Interestingly, consumers with less knowledge about foodborne pathogens also tend to pay more for the food safety attribute. For sales location, in areas where the numbers of farmers markets and grocery stores are higher per 10,000 inhabitants, there is a greater WTP for making fresh produce purchases from other DTCs, compared to supermarkets. Consumers with poorer health conditions also have a higher WTP for purchasing fresh produce from other DTCs. This can be due to a preference for buying directly from the producer and reduced costs related to the middleman, better knowledge of produce origin, or other intrinsic factors of DTC.

These findings suggest that producers stand to gain higher returns by adopting food safety methods such as the 3-step wash procedure. While specific data on the cost of cleaning lettuce using this method is currently unavailable, assuming it is comparable to cleaning squashes (estimated at $0.40 to $0.50 per squash in Li et al., 2020b), producers could potentially earn an extra $1 per head ($0.96 to $1.06) from selling lettuce cleaned through the 3-step procedure. However, these gains rely on producers effectively communicating this enhanced food safety treatment to consumers. This insight can assist extension educators in advocating for food safety practices among small and medium-scale producers, as well as helping producers make informed decisions regarding food safety procedures.

[7]We believe that the effects from sociodemographic factors may have been captured within the behavioral factors. We also estimate a model with the interactions of social demographic factors and find that they become important at certain levels of education, age, and income. Results are presented in Appendix VI.

Although this study specifically examines the 3-step wash procedure, our findings have broader implications for new food processing or production technologies. Evaluating consumer perceptions and WTP is critical to ensure these technologies yield sufficient returns to justify investment by producers. Extension programs could integrate findings from this consumer WTP research as parameters in interactive web-based tools, allowing producers to simulate financial outcomes based on their specific business details (e.g., farm scale, expected yield, cost of production) and expected sales prices.

Our results also highlight the importance of behavioral factors in consumer WTP for food safety in local food, an aspect often overlooked in previous research and current marketing efforts. We show that producers and retailers may need to account for these behavioral dimensions when tailoring their marketing messages. For instance, emphasizing product safety and the effectiveness of cleaning procedures may resonate more strongly with risk-averse consumers or those with heightened food safety concerns. Additionally, applying behavioral economic principles, such as framing information to align with an individual's objective and subjective knowledge or using point-of-sale nudges (e.g. placing items at eye level), could further encourage purchases of safer, higher-priced products.[8] For instance, farmers or vendors selling fresh produce cleaned with the 3-step procedure or similar effective cleaning procedures need to clearly indicate this food safety attribute in an easy-to-understand way on the product packaging (if individually prepackaged) or display a sign near their produce to communicate this information effectively to consumers. Furthermore, when consumers express heightened concerns about food safety, the vendors can take this opportunity to further explain their cleaning procedures and their effectiveness in ensuring product safety.

Policymakers and extension services could further support these efforts by investing in educational efforts focused on food safety risks and practices. Examples include hosting workshops or distributing educational materials on the benefits of effective cleaning procedures. Furthermore, video or in person demonstrations at points of sale (e.g. supermarket or farmers market) could demonstrate food safety to consumers, educating them on the different cleaning methods. Addressing misconceptions about local food safety (Yu et al., 2017) through these educational interventions could raise the premium that the general public is willing to pay for local produce with enhanced food safety. Ultimately, this will lead to a significant reduction in the societal costs associated with foodborne illnesses and outbreaks.

A limitation of our work is that participants in this study were fully aware of which option represented the product that was cleaned using an effective wash procedure in the choice experiment and were well-informed about the procedure. In contrast, most real-life consumers are unlikely to possess such knowledge. While strategies such as special labeling, packaging, or advertising in stores and media could potentially raise public awareness, it is uncertain whether these methods would effectively increase consumer awareness of the effective cleaning procedures (3-step wash and other similar procedures) and the ability to identify such products. Future studies may wish to explore the effectiveness of various methods to better signal or enhance consumer awareness of this specific information and other important food attributes. Moreover, interdisciplinary research teams may collaborate with extension personnel to conduct crop- and region-specific cost-benefit analyses of effective fresh produce cleaning procedures and other food safety practices.

Data availability statement. The data supporting the findings of this study are not publicly available to protect the privacy of the research participants. The data that support the findings of this study are available (with respondents' personal information removed) from the authors, upon reasonable request.

[8]Differences between what a consumer actually knows (objective knowledge) and what they think they know (subjective knowledge) can affect information retention and consequently product choice (House et al., 2004). Thaler and Sunstein (2009) argue that when we know how individuals think we can elaborate environments that facilitate their decision towards the "better" option.

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Appendix I: Quota used in the survey

	US 5-year average[a] (Quota)	Full sample ($n = 514$)	Opt-outs dropped ($n = 381$)
Household income			
< $50,000	42%	41.25%	40.42%
$50,000 to $99,999	30%	30.93%	31.50%
$100,000 to $149,999	15%	14.98%	16.01%
$150,000 or more	13%	12.84%	12.08%
Education level			
Less than high school	12%	11.67%	9.71%
High school	28%	28.02%	28.61%
Some college or Associate's degree	31%	31.71%	31.76%
Bachelor's degree	18%	18.48%	19.42%
Graduate or professional degree	11%	10.12%	10.50%
Age			
18 to 34	30%	30.54%	30.97%
35 to 54	34%	32.88%	37.01%
55 or above	36%	36.57%	32.02%

Notes: [a]American Community Survey 2014–2018 5-Year Average Estimate.
Source: U.S. Census Bureau (2019).

Appendix II. Multivariate regression results

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers market (5)	Other DTC (6)
Male	0.0324	0.0198	0.0081	−0.0083	0.0002	−0.0026
	(0.0979)	(0.0190)	(0.0518)	(0.0068)	(0.0083)	(0.0053)
Age	0.0191	−0.0062	−0.0093	−0.0021	−0.0003	−0.0012
	(0.0298)	(0.0058)	(0.0158)	(0.0021)	(0.0025)	(0.0016)
Employed	−0.0633	0.0064	−0.0668	0.0059	0.0099	−0.0001
	(0.0990)	(0.0192)	(0.0524)	(0.0069)	(0.0084)	(0.0054)
Education	−0.0077	−0.0003	−0.0164	0.0014	−0.0036	0.0034
	(0.0412)	(0.0080)	(0.0218)	(0.0029)	(0.0035)	(0.0022)
Income	0.0737	−0.0042	−0.0077	0.0032	−0.0024	−0.001
	(0.0608)	(0.0118)	(0.0322)	(0.0042)	(0.0052)	(0.0033)
Self-report health condition	−0.032	−0.0004	−0.0139	−0.0007	0.0070	−0.0059**
	(0.0518)	(0.0100)	(0.0274)	(0.0036)	(0.0044)	(0.0028)
Kid and/or elder in the household	−0.0608	−0.0138	−0.0208	0.0066	0.0066	0.0028
	(0.0898)	(0.0174)	(0.0475)	(0.0063)	(0.0077)	(0.0049)
Metro	0.0255	0.0248	0.0234	−0.0044	−0.0101	−0.006
	(0.1257)	(0.0244)	(0.0665)	(0.0088)	(0.0107)	(0.0068)
# of grocery stores & supercenters per 10k pop.	−0.0384	−0.0397	−0.055	−0.0124	0.019	0.0341**
	(0.2978)	(0.0577)	(0.1576)	(0.0208)	(0.0254)	(0.0162)
# of FM selling fresh produce per 10k pop.	−0.9669	0.2615	−1.1237	0.0602	−0.0222	0.2034**
	(1.4822)	(0.2871)	(0.7846)	(0.1037)	(0.1264)	(0.0805)
Covid-19 cases per 100 pop.	0.0793	−0.0044	0.012	0.0009	−0.0072	0.0007
	(0.0549)	(0.0106)	(0.0290)	(0.0038)	(0.0047)	(0.0030)
Level of general risk preference	−0.0332*	0.0019	0.0006	−0.0003	0.0013	0.0001
	(0.0193)	(0.0037)	(0.0102)	(0.0013)	(0.0016)	(0.0010)
Level of concern on foodborne risks	0.0348**	0.0051*	−0.0117	−0.0003	0.0007	0.0006
	(0.0148)	(0.0029)	(0.0078)	(0.0010)	(0.0013)	(0.0008)
Level of knowledge on foodborne pathogens	−0.0920**	0.0089	−0.03	0.0016	0.004	−0.0004
	(0.0434)	(0.0084)	(0.0230)	(0.0030)	(0.0037)	(0.0024)
Food safety behavioral indicator	0.0266*	−0.0011	−0.0026	0.0014	0.0002	0.0004
	(0.0144)	(0.0028)	(0.0076)	(0.0010)	(0.0012)	(0.0008)
Constant	1.0625***	0.2392***	0.6268***	0.1364***	0.1233***	−0.2177***
	(0.3783)	(0.0733)	(0.2002)	(0.0265)	(0.0323)	(0.0205)
R-squared	0.0559	0.0188	0.0287	0.0208	0.0272	0.0441
Observations	514	514	514	514	514	514

Notes: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Appendix III. OLS with robust standard errors

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers Market (5)	Other DTC (6)
Male	0.0324	0.0198	0.0081	−0.0083	0.0002	−0.0026
	(0.0960)	(0.0182)	(0.0482)	(0.0063)	(0.0081)	(0.0053)
Age	0.0191	−0.0062	−0.0093	−0.0021	−0.0003	−0.0012
	(0.0279)	(0.0057)	(0.0161)	(0.0022)	(0.0025)	(0.0016)
Employed	−0.0633	0.0064	−0.0668	0.0059	0.0099	−0.0001
	(0.1021)	(0.0175)	(0.0513)	(0.0065)	(0.0080)	(0.0054)
Education	−0.0077	−0.0003	−0.0164	0.0014	−0.0036	0.0034
	(0.0386)	(0.0087)	(0.0268)	(0.0030)	(0.0038)	(0.0024)
Income	0.0737	−0.0042	−0.0077	0.0032	−0.0024	−0.0010
	(0.0561)	(0.0124)	(0.0356)	(0.0044)	(0.0051)	(0.0037)
Self-report health condition	−0.0320	−0.0004	−0.0139	−0.0007	0.0070*	−0.0059**
	(0.0499)	(0.0101)	(0.0233)	(0.0039)	(0.0040)	(0.0029)
Kid and/or elder in the household	−0.0608	−0.0138	−0.0208	0.0066	0.0066	0.0028
	(0.0907)	(0.0181)	(0.0471)	(0.0064)	(0.0076)	(0.0050)
Metro	0.0255	0.0248	0.0234	−0.0044	−0.0101	−0.0060
	(0.1320)	(0.0278)	(0.0753)	(0.0087)	(0.0111)	(0.0072)
# of grocery stores & supercenters per 10k pop.	−0.0384	−0.0397	−0.0550	−0.0124	0.0190	0.0341**
	(0.3362)	(0.0475)	(0.1293)	(0.0188)	(0.0243)	(0.0137)
# of FM selling fresh produce per 10k pop.	−0.9669	0.2615	−1.1237*	0.0602	−0.0222	0.2034**
	(1.1756)	(0.2415)	(0.6106)	(0.1102)	(0.1007)	(0.0848)
COVID-19 cases per 100 pop.	0.0793	−0.0044	0.0120	0.0009	−0.0072	0.0007
	(0.0512)	(0.0112)	(0.0291)	(0.0039)	(0.0044)	(0.0029)
Level of general risk preference	−0.0332	0.0019	0.0006	−0.0003	0.0013	0.0001
	(0.0201)	(0.0037)	(0.0103)	(0.0013)	(0.0016)	(0.0010)
Level of concern on foodborne risks	0.0348**	0.0051*	−0.0117	−0.0003	0.0007	0.0006
	(0.0148)	(0.0029)	(0.0083)	(0.0011)	(0.0013)	(0.0008)
Level of knowledge on foodborne pathogens	−0.0920**	0.0089	−0.0300	0.0016	0.0040	−0.0004
	(0.0439)	(0.0083)	(0.0214)	(0.0028)	(0.0037)	(0.0024)
Food safety behavioral indicator	0.0266*	−0.0011	−0.0026	0.0014	0.0002	0.0004
	(0.0160)	(0.0026)	(0.0075)	(0.0009)	(0.0012)	(0.0007)
Constant	1.0625***	0.2392***	0.6268***	0.1364***	0.1233***	−0.2177***
	(0.3608)	(0.0699)	(0.1861)	(0.0243)	(0.0328)	(0.0207)
R-squared	0.0559	0.0188	0.0287	0.0208	0.0272	0.0441
Observations	514	514	514	514	514	514

Notes: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Appendix IV. Robust regression results

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers market (5)	Other DTC (6)
Male	0.0183	0.0201	0.0259	−0.0061	−0.0027	0.0030
	(0.1036)	(0.0184)	(0.0383)	(0.0061)	(0.0082)	(0.0051)
Age	0.0191	−0.0078	−0.0026	−0.0008	−0.0014	−0.0016
	(0.0315)	(0.0056)	(0.0117)	(0.0019)	(0.0025)	(0.0016)
Employed	−0.0448	0.0103	0.0194	0.0026	0.0118	−0.0034
	(0.1047)	(0.0186)	(0.0387)	(0.0062)	(0.0083)	(0.0052)
Education	−0.0098	−0.0019	−0.0394**	0.0048*	−0.0059*	0.0054**
	(0.0436)	(0.0077)	(0.0161)	(0.0026)	(0.0035)	(0.0022)
Income	0.0741	−0.0052	0.0268	0.0016	0.0022	−0.0053*
	(0.0643)	(0.0114)	(0.0238)	(0.0038)	(0.0051)	(0.0032)
Self-report health condition	−0.0406	−0.0118	0.0014	−0.0050	0.0090**	−0.0043
	(0.0548)	(0.0097)	(0.0203)	(0.0032)	(0.0044)	(0.0027)
Kid and/or elder in the household	−0.0557	−0.0103	−0.0171	0.0075	0.0082	0.0043
	(0.0950)	(0.0168)	(0.0352)	(0.0056)	(0.0076)	(0.0047)
Metro	0.0060	0.0236	−0.0251	0.0040	−0.0136	−0.0112*
	(0.1330)	(0.0236)	(0.0492)	(0.0078)	(0.0106)	(0.0066)
# of grocery stores & supercenters per 10k pop.	−0.0316	−0.0382	−0.0759	−0.0155	0.0269	0.0348**
	(0.3151)	(0.0558)	(0.1166)	(0.0186)	(0.0250)	(0.0156)
# of FM selling fresh produce per 10k pop.	−0.4874	0.2280	−0.9336	0.1407	−0.0226	0.1431*
	(1.5685)	(0.2779)	(0.5803)	(0.0925)	(0.1247)	(0.0779)
COVID-19 cases per 100 pop.	0.0795	−0.0040	0.0045	0.0012	−0.0064	0.0002
	(0.0581)	(0.0103)	(0.0215)	(0.0034)	(0.0046)	(0.0029)
Level of general risk preference	−0.0379*	0.0019	0.0086	−0.0002	0.0008	0.0002
	(0.0204)	(0.0036)	(0.0075)	(0.0012)	(0.0016)	(0.0010)
Level of concern on foodborne risks	0.0368**	0.0053*	−0.0071	−0.0015	0.0004	0.0009
	(0.0156)	(0.0028)	(0.0058)	(0.0009)	(0.0012)	(0.0008)
Level of knowledge on foodborne pathogens	−0.0912**	0.0039	0.0011	−0.0001	0.0036	−0.0011
	(0.0460)	(0.0081)	(0.0170)	(0.0027)	(0.0037)	(0.0023)
Food safety behavioral indicator	0.0277*	−0.0019	−0.0021	0.0010	0.0007	0.0009
	(0.0153)	(0.0027)	(0.0056)	(0.0009)	(0.0012)	(0.0008)
Constant	1.0933***	0.3039***	0.3384**	0.1571***	0.1155***	−0.2250***
	(0.4003)	(0.0709)	(0.1481)	(0.0236)	(0.0318)	(0.0199)
R-squared	0.0520	0.0270	0.0286	0.0359	0.0394	0.0510
Observations	514	514	514	514	514	514

Notes: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Appendix V. Specification, heteroskedasticity, and multicollinearity test results

3-step wash WTP				
		Test statistic	*P*-value	Result
Specification	Ramsey regression specification-error test	0.65	0.5849	Fail to reject null, support for lack of omitted variables
Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 1.50$	0.2200	Fail to reject null, support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable
Prepackage WTP				
		Test statistic	*P-value*	*Result*
Specification	Ramsey regression specification-error test	1.07	0.3623	Fail to reject null, support for lack of omitted variables
Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 0.73$	0.3916	Fail to reject null, support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable
Supercenter WTP				
		Test statistic	*P-value*	*Result*
Specification	Ramsey regression specification-error test	0.63	0.5960	Fail to reject null, support for lack of omitted variables
Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 0.19$	0.6442	Fail to reject null, support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable
Natural store WTP				
		Test statistic	*P*-value	Result
Specification	Ramsey regression specification-error test	1.69	0.1672	Fail to reject null, support for lack of omitted variables
Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 3.43$	0.0640	Reject null at 0.1 significance level, fail to support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable
Farmers market WTP				
		Test statistic	*P-value*	*Result*
Specification	Ramsey regression specification-error test	0.21	0.8923	Fail to reject null, support for lack of omitted variables

(*Continued*)

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Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 0.03$	0.8601	Fail to reject null, support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable
Direct-to-Consumer WTP				
		Test statistic	*P-value*	*Result*
Specification	Ramsey regression specification-error test	1.18	0.3181	Fail to reject null, support for lack of omitted variables
Heteroskedasticity	Breusch-Pagan and Cook-Weisberg test	$\chi^2 = 0.04$	0.8273	Fail to reject null, support for constant variance
Multicollinearity	Mean Variance Inflation Factor (VIF)	*1.36*	–	VIF is between 1 and 5 which is acceptable

Appendix VI. Multivariate regression with interaction terms results

We estimate the impact of various factors and their interaction effects on consumer WTP:

$$WTP_i^a = c^a + z_i^{'} b^a + \rho_i^{'} \beta^a + e_i^a$$

where WTP_i^a is the respondent i's WTP for non-price attribute a, c^a is the attribute-specific constant intercept, z_i is a vector of respondents' characteristics, b^a is the associated coefficients, ρ_i is a vector of respondents' sociodemographic interaction terms, β^a is the coefficients associated with interaction terms, and e_i^a is the idiosyncratic error term. Below are the full regression results.

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers Market (5)	Other DTC (6)
Male	0.5925*	0.0009	−0.2806	−0.0337	0.0670**	0.0100
	(0.3326)	(0.0646)	(0.1764)	(0.0233)	(0.0284)	(0.0181)
Age	−0.0164	0.01	−0.0375	0.002	0.0062	−0.005
	(0.0725)	(0.0141)	(0.0384)	(0.0051)	(0.0062)	(0.0040)
Employed	−0.5674**	0.1096**	−0.0441	0.0087	0.0212	−0.0007
	(0.2700)	(0.0525)	(0.1432)	(0.0189)	(0.0231)	(0.0147)
Education	−0.1137	0.018	−0.1435*	−0.0019	−0.0021	0.0148*
	(0.1461)	(0.0284)	(0.0775)	(0.0102)	(0.0125)	(0.0080)
Income	0.1508	0.0409	0.1611	0.0257*	−0.0082	−0.0220*
	(0.2124)	(0.0413)	(0.1126)	(0.0149)	(0.0182)	(0.0116)
Male*Age	−0.1431**	0.0042	0.0562	−0.0011	−0.0119**	−0.0025
	(0.0704)	(0.0137)	(0.0373)	(0.0049)	(0.0060)	(0.0038)
Male*Employed	−0.4281*	0.0239	0.045	−0.018	−0.0085	−0.008

(*Continued*)

(*Continued*)

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers Market (5)	Other DTC (6)
	(0.2249)	(0.0437)	(0.1192)	(0.0158)	(0.0192)	(0.0123)
Male*Education	0.0517	−0.0079	0.0518	0.0073	−0.0055	0.0014
	(0.0918)	(0.0178)	(0.0487)	(0.0064)	(0.0079)	(0.0050)
Male*Income	0.018	0.0092	−0.0554	0.007	0.0004	−0.0022
	(0.1375)	(0.0267)	(0.0729)	(0.0096)	(0.0118)	(0.0075)
Age*Employed	0.0515	−0.0141	0.0067	0.0018	0.0029	0.0002
	(0.0677)	(0.0131)	(0.0359)	(0.0047)	(0.0058)	(0.0037)
Age*Education	0.0132	0.0006	0.0208	0.0013	−0.0009	−0.0018
	(0.0276)	(0.0054)	(0.0146)	(0.0019)	(0.0024)	(0.0015)
Age*Income	0.0073	−0.0084	−0.0268	−0.0047*	−0.0013	0.0052**
	(0.0391)	(0.0076)	(0.0208)	(0.0027)	(0.0033)	(0.0021)
Employed*Education	0.1611	−0.0168	0.0602	−0.0005	−0.0059	−0.0065
	(0.0981)	(0.0191)	(0.0520)	(0.0069)	(0.0084)	(0.0054)
Employed*Income	−0.0316	−0.0078	−0.1221*	−0.0022	−0.0018	0.0125*
	(0.1357)	(0.0264)	(0.0720)	(0.0095)	(0.0116)	(0.0074)
Education*Income	−0.0233	−0.0036	0.0015	−0.0018	0.0034	−0.0009
	(0.0356)	(0.0069)	(0.0189)	(0.0025)	(0.0030)	(0.0019)
Self-report health condition	−0.0233	−0.0041	−0.015	−0.0004	0.0061	−0.0057**
	(0.0528)	(0.0102)	(0.0280)	(0.0037)	(0.0045)	(0.0029)
Kid and/or elder in the household	−0.0487	−0.0162	−0.0159	0.0059	0.007	0.0019
	(0.0908)	(0.0176)	(0.0481)	(0.0064)	(0.0078)	(0.0050)
Metro	0.016	0.0239	0.0161	−0.0057	−0.0084	−0.0063
	(0.1266)	(0.0246)	(0.0672)	(0.0089)	(0.0108)	(0.0069)
# of grocery stores & supercenters per 10k pop.	−0.0605	−0.0216	−0.0255	−0.0108	0.0149	0.0326**
	(0.3042)	(0.0591)	(0.1613)	(0.0213)	(0.0260)	(0.0166)
# of FM selling fresh produce per 10k pop.	−1.1345	0.2848	−1.0794	0.0605	−0.0506	0.2033**
	(1.4933)	(0.2902)	(0.7919)	(0.1047)	(0.1277)	(0.0815)
COVID-19 cases per 100 pop.	0.0845	−0.0046	0.0111	0.0009	−0.0064	0.0007
	(0.0551)	(0.0107)	(0.0292)	(0.0039)	(0.0047)	(0.0030)
Level of general risk preference	−0.0321*	0.0014	0.0013	−0.0003	0.0014	0.0001
	(0.0194)	(0.0038)	(0.0103)	(0.0014)	(0.0017)	(0.0011)
Level of concern on foodborne risks	0.0428***	0.0041	−0.0158*	−0.0002	0.0009	0.0007
	(0.0155)	(0.0030)	(0.0082)	(0.0011)	(0.0013)	(0.0008)
Level of knowledge on foodborne pathogens	−0.0844*	0.0076	−0.0282	0.0021	0.0037	−0.0004
	(0.0436)	(0.0085)	(0.0231)	(0.0031)	(0.0037)	(0.0024)

(*Continued*)

(*Continued*)

Dependent variable: WTP for	3-step wash (1)	Prepackage (2)	Supercenter (3)	Natural store (4)	Farmers Market (5)	Other DTC (6)
Food safety behavioral indicator	0.0259*	−0.0009	−0.0022	0.0014	0.0003	0.0004
	(0.0145)	(0.0028)	(0.0077)	(0.0010)	(0.0012)	(0.0008)
Constant	1.0894**	0.1549*	0.7783***	0.1172***	0.1033**	−0.2111***
	(0.4687)	(0.0911)	(0.2486)	(0.0329)	(0.0401)	(0.0256)
R-squared	0.0786	0.0368	0.0486	0.0394	0.0456	0.0587
Observations	514	514	514	514	514	514

Notes: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

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