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Research Paper

Exploring Consumer Willingness to Pay for Food Safety in Produce: A Focus on Small vs. Large Farms

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ABSTRACT

Multiple studies have investigated consumers' willingness to pay premium prices for produce grown under conditions that are more regulated and safer than those of conventionally grown crops. However, little is known about whether the presence of food safety labels and farm size affects consumer willingness to pay for produce at premium prices. The purpose of this study was to identify consumer willingness to pay for produce with a food safety label from various farm sizes to determine consumer food safety preferences. An online survey was conducted with consumers (n = 914), which included a willingness to pay section with four scenarios to purchase produce. Each scenario included farm size, label, and inspection status. A significant majority of consumers expressed a willingness to pay premium price for produce with a food safety label from both small-sized farms (72%; $p < 0.001$) and large-sized farms (69%; $p < 0.001$). However, 36% said they were willing to pay a premium of no more than 10% for produce from small-sized farms. The findings of this study indicate an increased price to consumers may not be suitable motivation for farmers to adopt on-farm food safety practices, suggesting other on-farm food safety techniques should be investigated.

Produce food safety remains a continuing concern in the United States, as outbreaks occur year after year (Centers for Disease Control and Prevention, 2024). The U.S. Centers for Disease Control and Prevention (CDC) identified 40 Shiga toxin–producing *Escherichia coli* (STEC) outbreaks linked to leafy greens, causing illness in 1,212 people and the deaths of eight others, between the span of 2009 and 2018 in the United States and Canada (Marshall et al., 2020). In addition to leafy greens, the U.S. Food and Drug Administration (FDA) has identified fresh hot peppers as a produce commodity at risk for microbial contamination (FDA, 2018a). In 2016, an outbreak of *Salmonella* associated with fresh hot peppers sickened 32 individuals (Hassan et al., 2017). In response to recurring produce safety issues in the United States, the U.S. Food and Drug Administration (FDA) implemented the Produce Safety Rule (PSR) in January 2016 under the Food Safety Modernization Act (FSMA), which was signed into law in 2011. PSR compliance was phased in based on farm size and average produce sales. Large farms (over $500,000 in average annual sales) were required to meet post-harvest water requirements beginning in 2022, while small farms ($250,000–$500,000) and very small farms ($25,000–$250,000) began compliance in 2023 and 2024, respectively (FDA, 2024b). The rule does not apply to produce rarely consumed raw or intended for personal or on-farm consumption (FDA, 2018b). Additionally, produce that undergoes a validated "kill step" to significantly reduce pathogens may also be exempt.

A farm's eligibility under the PSR is determined by its average annual produce sales, adjusted for inflation (FDA, 2024a). Farms with a three-year average of $25,000 or less are exempt from the PSR and not subject to FDA or state inspections (The Federal Register, 2015). Farms with an average annual produce sales of less than $500,000 over the past three years, and that primarily to "qualified end users", defined as consumers, restaurants or retail food establishment located in the same state or within 275 miles, may qualify for a modified exemption. These farms must maintain specific records but are not subject to the full scope of the rule. Farms with over $500,000 in produce sales over a three-year average, or those selling primarily wholesale with more than $25,000 in sales, are fully covered under the PSR (FDA 2024b). Despite the broad impact of these exemptions, little research has been done to investigate consumers' perception of these exemptions from the PSR standards based on farm size.

Willingness to pay is a tool used to determine the maximum price a consumer is willing to pay for an item. Previous studies have used consumers' willingness to pay premium prices for commodities with food

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safety labels to determine consumers' preference for food safety. A study with consumers in Indonesia elicited willingness to pay for cabbage using a variety of government and private labels declaring "safety" in general terms, with no requirements behind the label. The study identified a higher willingness to pay for cabbage with a food safety label from sources with which they were familiar, such as government agencies or identifiable organizations, when compared to generic labels (Wongprawmas & Canavari, 2017). Similarly, a study with consumers in Taiwan highlighted a higher willingness to pay for rice with a food safety label when compared to no label. Those findings indicate that consumers base their food safety perception on certification labels (Ting et al., 2021). In the United States, Loureiro & Umberger (2007) conducted a study with consumers that demonstrated a higher willingness to pay for beef with a certified USDA food safety inspection label in comparison to beef with no label. Additionally, the study showed a higher willingness to pay for food bearing a safety label when compared to other label types such as those with country-of-origin, traceability, and tenderness information. These studies indicate consumer willingness to pay a premium for food safety labels for certain food items.

There are also some other studies highlight the importance of food safety information in the purchasing decision-making process for produce (Feng et al, 2016; Gedikoğlu & Gedikoğlu, 2021; Osmani et al., 2021; Yu et al., 2018). Recent studies showed that have a food safety label affixed, the source of the label matters; studies have shown that consumers care about the certification process and seek labels that they can trust (Van Loo et al., 2011; Wang et al., 2020; Wongprawmas & Canavari, 2017).

However, few studies have explored consumers' preferences for food safety labels on produce from small versus large farms, or the relationship between purchasing organic produce and willingness to pay for food safety labels. This study aims to fill these gaps through a consumer survey to better understand perceptions and preferences regarding food safety labels and farm size.

Materials and methods

Before the survey was administered, the research protocol was approved by the Institutional Review Board at Purdue University (IRB#2020-1493). The survey format and question design was adapted from previous studies. A pilot study was conducted with 10 consumers for face validity. Pilot study participation requirements included (1) primary meal preparer of the household; (2) purchased fresh bell peppers, spinach, or kale in the past month. Feedback was collected from the pilot test participants, and revisions were made to the survey. The revision included rewording questions for clarity, deleting questions, and adding questions based on suggestions. Then a soft launch was conducted with 50 consumers. Further revisions were made to the survey based on their responses. The researchers purchased a pool of participants through Qualtrics XM (Provo, UT), a third-party survey software application, between October 8 and November 3, 2021. Qualtrics maintains a panel of approximately 90 million individuals who have consented to be contacted for survey participation. Qualtrics provided participants with an incentive upon completing the survey. The survey had eight sections, with 89 questions. The survey questions were adapted from previous consumer surveys (Allan et al., 2018; Giampietri et al., 2018; Khouryieh et al., 2019; Low et al., 2022; Swinehart and Feng, 2023; Yu et al., 2017). The full set of survey questions can be found in Supplemental Information.

A quota-control was used during recruitment to ensure results reflected the U.S. population for state of residence, gender, race and ethnicity, education level, and income. Inclusion criteria included U. S. citizen and/or resident, primary grocery shopper in the household, and purchaser of produce on which the study focused. At the discretion of the researchers and Qualtrics, participants who completed the survey in less than 293 s (4.89 min) were eliminated from the data analysis because the median time from a soft launch ($n = 50$) was 585 s (9.75 min). The researchers used time for completing surveys as an elimination tool to ensure thoughtful answers from participants. Out of the 1,009 survey responses, 914 were considered for analysis due to qualifying survey response time and 100% completion of survey.

A payment card approach was used, which includes showing participants a card listing potential payment amounts for a specific item and asking them to choose the amount they are willing to pay (Hu et al., 2011; Yang et al., 2013; Yu et al., 2014). The consumers were first shown a picture of three bell peppers and a generic food safety label with the words "food safety guarantee." Participants were told that the label indicated that the bell peppers were subject to FDA inspection. Participants were then presented with four scenarios and asked to select the maximum price range they would pay for bell peppers under each of the scenarios. The bell pepper scenarios were: (1) sourced from a small-sized farm with unknown FDA inspection status and no food safety label (abbreviated as SNL); (2) sourced from a small-sized farm with known FDA inspection and a food safety label (SL), (3) sourced from a large-sized farm with known FDA inspection but no food safety label (LNL), (4) sourced from a large-sized farm with known FDA inspection and a food safety label (LL). Under the payment card approach, participants were given the option to pay the standard price or several increments of higher prices for the product. The method is designed to elicit the maximum price consumers will pay for a certain product.

To better understand consumers perception of organically grown produce, survey participants were shown four different attributes assigned to organically grown produce: (1) chemical free; (2) more sustainable; (3) safer to eat; (4) reduced risk of food poisoning; and asked to evaluate how much they agreed with the statement. The evaluation was a 5-point Likert style scale which ranged from "strongly disagree" to "strongly agree".

This study used the interval regression approach to account for the pricing increments from which the participant chose, which is a common analysis for willingness to pay elicited by payment card approach (Yang et al., 2013; Yang et al., 2014; Yu et al., 2014). The interval regression was conducted using Python, with the Tobit Package (v.1.0, Jensen 2016). Independent variables were screened to remove highly correlated variables and variables of near-zero variance. IBM SPSS Statistics (Version 29) was used for descriptive statistics and to assess consumers' willingness to pay a premium. To make that assessment, we organized their responses into two classifications: "not willing to pay a premium = 0" and "willingness to pay a premium = 1" thus dichotomizing the results. A paired samples proportions test was run in SPSS to elicit both statistics, and we used a McNemar test for the means comparison.

Results and discussion

Of the 1,009 consumers who attempted to complete the survey, 914 (91%) met all the inclusion criteria and completed the survey. Just over half (54%) were female, 49% reported living in suburban locations, a majority (40%) reported living in the Southern region of the United States, and with a median income ranging from $50,000 to $74,999 (Table 1). The socio-demographic results closely represented the 2020 U.S. census (U.S. Census Bureau, n.d.).

A significant majority of consumers professed willingness to pay a premium for produce with a food safety label from both small-sized farms (72%; $p < 0.001$) and large-sized farms (69%; $p < 0.001$); however, as Table 2 shows, slightly more consumers expressed willingness to pay a premium for produce from small-sized farms in contrast to large-sized farms ($p = 0.007$). Similar studies with consumers also have shown a higher willingness to pay for produce with increased

Table 1
Sociodemographic characteristics of survey participants (n = 914)

Characteristics	Response n (%)
Gender	
Male	419 (46%)
Female	495 (54%)
Age range	
18–24	129 (14%)
25–34	179 (20%)
35–44	169 (18.5%)
45–54	152 (17%)
55–64	121 (13%)
65 and above	164 (18%)
Household's Income	
Less than $25,000	180 (20%)
$25,000–$49,999	219 (24%)
$50,000–$74,999	188 (20%)
$75,000–$99,999	96 (11%)
$100,000–$149,999	111 (12%)
$150,000–$199,999	60 (6%)
$200,000 an above	60 (6%)
Living area description	
Urban	270 (30%)
Suburban	448 (49%)
Rural	196 (21%)
Ethnicity	
African American	127 (14%)
Asian or Pacific Islander	28 (3%)
Hispanic or Latino	223 (24%)
Native American	10 (1%)
White non-Hispanic	588 (64%)
Other	4 (1%)
Region of residence	
South	371 (40%)
West	198 (22%)
Midwest	174 (19%)
Northeast	170 (19%)

Table 2
Participants' willingness to pay a premium versus no willingness to pay a premium

Variable	Response n (%)
Small-size farm no label[a]	
I will not pay any more	434 (47)
Willingness to pay a premium	480 (53)
Small-size farm with label[b]	
I will not pay any more	253 (28)*
Willingness to pay a premium	661 (72)*
Large-size farm no label[c]	
I will not pay any more.	404 (44)*
Willingness to pay a premium	510 (56)*
Lare-size farm with label[d]	
I will not pay any more.	283 (31)*
Willingness to pay a premium	631(69)*

* $p < 0.01$ (test value 0.5).
[a] Sourced from a small-sized farm with unknown FDA inspection status and no food safety label.
[b] Sourced from a small-sized farm with known FDA inspection and a food safety label.
[c] Sourced from a large-sized farm with known FDA inspection but no food safety label.
[d] Sourced from a large-sized farm with known FDA inspection and a food safety label.

food safety standards (Wongprawmas & Canavari, 2017; Yu et al., 2018). Consumers' preference for produce from small-sized farms can be explained by past studies that found consumers prefer purchasing from small-sized farms in comparison to large-sized farms (Berlin et al., 2009; Hashem et al., 2018). A study by Hashem et al. (2018) indicated consumer preference favoring small-sized farms may be driven by ethical considerations; consumers believe that purchasing from small-sized farms is more sustainable and supports small- size farmers. Furthermore, Carrigan & Attalla (2001) highlighted consumers' ethical beliefs as an influence factor in the purchasing decision-making process. However, while consumers tend to value produce from small-sized farms for ethical and sustainability reasons, they do not necessarily perceive it as safer than produce from large-scale farms (Archila-Godínez et al., 2025).

Although consumers self-reported a higher willingness to pay for produce with a food safety label, 36% said they were willing to pay a premium of no more than 10% for produce from small- and mid-sized farms, and 32% expressed willingness to pay a 10% premium for safety-labeled produce from large-sized farms (Table 3). Additionally, the current study found that over half of consumers (60%) ranked price as very- extremely important when purchasing fresh produce. These findings are supported by Gedikoğlu and Gedikoğlu (2021), who identified consumers' willingness to pay a premium of only 10% for Hazard Analysis and Critical Control Points (HACCP)-certified lettuce. Additionally, previous studies have shown that labeled items for which consumers are willing to pay a premium have price premiums not much higher than the original price for unlabeled produce (Carrigan & Attalla, 2001, Gedikoğlu & Gedikoğlu, 2021).

Studies have shown small-sized farmers face a higher financial burden when complying with the PSR when compared to large- sized farms (Bovay et al., 2018; Adalja & Lichtenberg, 2018). Despite this, consumers believe small-sized farms should be held to the same food safety standards as large- sized farms, expecting the produce they purchase to be safe (Archila-Godínez et al., 2025; Ellison et al. 2016). Thus, explaining consumer reluctance to pay a premium for food safety because they view it as a basic requirement and not an added value.

Therefore, charging the consumer more for produce may not be an appropriate approach to motivate farmers to adopt food safety practices. One approach may be to educate farmers about the consequences of on-farm food safety failures, for example the negative impact that might occur to the farms' finances and/or reputation. Food recalls have been shown to place financial burden throughout the food supply chain, including the farmer through loss of sales and destroyed product (Moon and Tonsor, 2020; Pozo and Schroeder, 2016). Additionally, a review conducted by Bovay (2023) discusses a farm's reputation as a major motivator for farmers to maintain food safety

Table 3
Participants willingness to pay for package of three bell peppers

Variable	Response n (%)
Small-sized no label	
I will not pay any more	434 (47)
(<10%) $3.38–$3.70	239 (26)
(10% to <20%) $3.71–$4.03	125 (14)
(20% to <30%) $4.04–$4.37	83 (9)
(≥30%) $4.38 or more	33 (4)
Small-sized with label	
I will not pay any more	253 (28)
(<10%) $3.38–$3.70	325 (36)
(10% to <20%) $3.71–$4.03	195 (21)
(20% to <30%) $4.04–$4.37	96 (10)
(≥30%) $4.38 or more	45 (5)
Large-sized no label	
I will not pay any more	404 (44)
(<10%) $3.38–$3.70	264 (29)
(10% to <20%) $3.71–$4.03	134 (15)
(20% to <30%) $4.04–$4.37	72 (8)
(≥30%) $4.38 or more	40 (4)
Large-sized with label	
I will not pay any more	283 (31)
(<10%) $3.38–$3.70	294 (32)
(10% to <20%) $3.71–$4.03	199 (22)
(20% to <30%) around $4.04–$4.37	90 (10)
(≥30%) $4.38 or more	48 (5)

standards. The review indicates internal standards to protect the farm's public image as one of the most effective motivators for on-farm food safety outcomes. However, more research needs to be conducted to assess the economic and reputation impact of food recalls on small-sized farms (Fig. 1).

Table 4 presents the regression results examining the relationship between consumer attributes and their willingness to pay for produce, both with and without a food safety label, from small and large-sized farms.

As Table 4 indicates, the variable of importance, *free from bacterial contamination*, was negatively associated with the decision to purchase produce without a food safety label. That correlates with the finding that consumers who value produce safety will not pay a premium for produce without a food safety label, regardless of the farm size. The findings from the current study found that consumers that prefer produce free from bacterial contaminations, do not express willingness to pay a premium for produce without additional food safety standards. These findings can be supported by past studies that documented the importance of produce safety to consumers (Berlin et al., 2009; Tobin et al., 2012; Wang et al., 2020). Additionally, the findings from a consumer survey by Naanwaab et al. (2014) showed an increased willingness to pay for produce grown and processed with increased safety measures. Recent studies have also found that consumers who valued food safety were more likely to pay a premium for produce with increased food safety precautions. One study found that consumers who value food safety had higher willingness to pay for produce from a nonexempt farm (PSR covered) when compared to exempt farms (Neill & Holcomb, 2019), and another found higher willingness to pay preferences for apples with enhanced food safety precautions (Yin et al., 2019).

Figure 1. Image of bell peppers used for willingness to pay scenarios.

The age of consumers significantly influenced their willingness to pay premium prices for produce, no matter the food safety label status or farm size. The findings from the current study found that older consumers do not express a willingness to pay for food safety (Table 4). A study by Neill & Holcomb (2019) supports these findings by reporting that younger adult "millennial" consumers spent more on food at home when compared to older consumers. Additionally, one study found that millennial consumers had a higher risk perception when purchasing fresh produce, when compared to their older counterparts (Yu et al., 2018). Older consumers were more concerned about price and expressed willingness to pay a premium only for certain items that they perceived held high value and quality (Carrigan et al., 2004). This may indicate that food safety is not a high-value attribute for older consumers. In contrast, studies have identified that food safety is important to the older consumer (Larson, 2023; Taylor et al., 2012). One study emphasized food safety as a minimum quality standard for consumers when purchasing produce (Archila-Godínez et al., 2025). Thus, older consumers may not express a willingness to a premium for food safety because they consider food safety to be the minimum standard and therefore shouldn't have to pay a premium for it.

Inconsistencies in responses to food safety labeling emerged among consumers who favor purchasing organic foods. As Table 4 indicates, consumers who favored purchasing organic produce were more likely to purchase foods from small-sized farms with no food safety label and large-sized farmers with food safety labels. Additional results from the study showed that among consumers who purchase organically grown produce (67%, $n = 612$), most of them (74%) agree or strongly agree that organically grown produce is chemical free, more sustainable (70%), safer to eat (70%), and can reduce the risk of food poisoning (65%) in contrast to non-organically grown produce (Fig. 2).

The findings from the current study found that consumers assign food safety attributes, among others, to organically grown produce that may impact their willingness to pay a premium for produce. These findings are supported by several prvious studies. Bruhn and Feng (2021) reported that consumers rated "organic" labeling as more important than food safety related labeling, like "pasturized." Hughner et al. (2007), who found that consumers who purchased organically grown foods perceive that such produce is safer to eat than conventionally grown foods. Similarly, a study of farmers market consumers identified 40.7% consider organically grown produce as less likely to be contaminated with illness-causing bacteria (Henley & Fu, 2019). Additionally, consumers' motivation to purchase organically grown food has been associated with concerns for the environment and animal welfare, and support of local economies and small- size businesses (Meas et al., 2015; Padel & Foster, 2005). Thus, consumers

Table 4
Interval regression: Consumer's characteristics and willingness to pay

Variable	Small-sized no label	Small-sized with label	Large-sized no label	Large-sized with label
The belief that SMF produce fresh foods, while large farms do not produce fresh foods	0.116	0.582*	0.389*	0.140
Importance of being free from bacterial contamination when assessing food safety risk of produce	−0.566*	0.063	−0.491*	0.005
Normally buys produce from specialized markets	0.627	0.767*	0.999*	0.771*
Normally buys produce from online grocery delivery	0.771*	0.860*	0.925*	0.636*
Normally buys produce from Online Websites	0.421	0.589	0.702*	0.810*
Importance of produce being from SMF when assessing food safety risk of produce	0.934*	0.290	1.070*	0.339
Importance of price when purchasing produce	−0.540*	−0.442*	−0.351	−0.668*
Participants are from the Midwest of the US	0.453	0.636	0.458	0.857*
Blames meal preparer for foodborne illness outbreaks	0.234	0.480	0.055	0.602*
Importance of organic when buying produce	0.626*	0.727	0.445	1.047*
Belief that small farmers should be exempt from food safety regulations after exposure to educational information	1.681*	0.934*	1.032*	0.666
Participant identifies as African American	0.672*	0.345	0.382	0.035
Age Range	−0.813*	−1.000*	−1.143*	−1.385*

* $p < 0.05$.

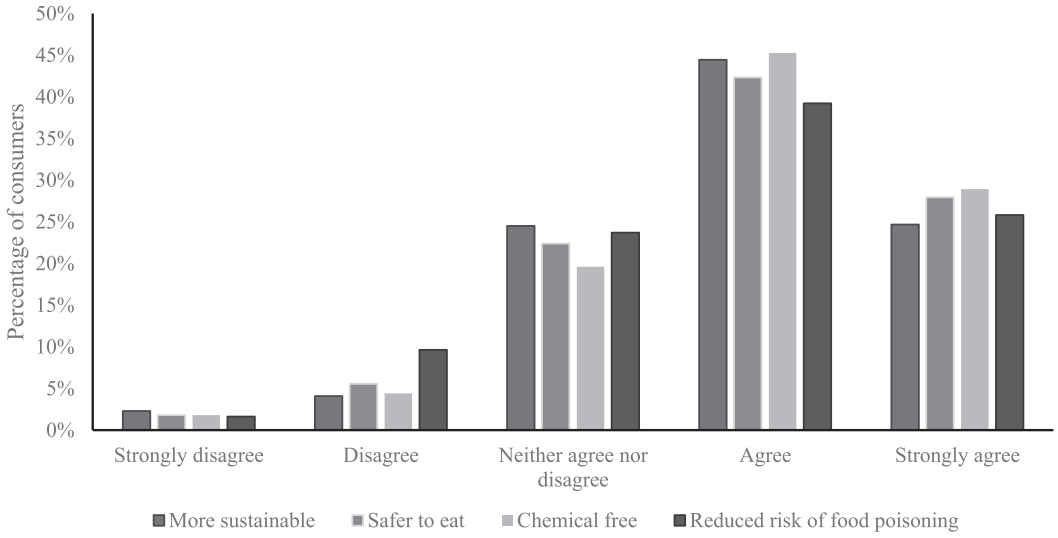

Figure 2. Consumers' perception of organically grown foods.

perceive organically grown foods to be healthier, safer, and more socially responsible than purchasing non-organic foods. These findings suggest that consumers who purchase organic foods consider organic labels more compelling than generic food safety labels.

Due to the nature of hypothetical scenarios, the consumers' responses should be interpreted as hypothetical. Thus, we recommend conducting a real-life study to assess consumers' perceptions and preferences regarding food safety of produce grown at small-sized farms in contrast to large-sized farms. Additionally, the results reflect consumers' willingness to pay for bell peppers and may not be reflective of other fresh produce. More studies are recommended to investigate consumers' willingness to pay for other commodities. Due to the lack of statistically significant results from the interval regression analysis, future studies are recommended to better understand how consumer characteristics affect their willingness to pay for produce with a food safety label from small-sized farms in contrast to labeled produce from large-sized farms. Furthermore, the results may have been skewed by "food safety guarantee" labeling, a misleading claim that cannot be validated. We recommend the use of labels with more general language for future studies, for example "subject to FDA inspection." However, it's important to consider consumers' health literacy and perception of regulatory oversight. Future research also should explore the dynamics of these preferences in more depth, particularly the nuanced perceptions of food safety and organic labels across broader demographics and changing market conditions. Additionally, investigating the long-term trends in consumers' willingness to pay premiums for certified produce could provide further strategic insights for the agricultural sector, particularly by exploring the influences of perceived peer pressure and label fatigue overtime. Finally, farmers' willingness to adopt new labeling practices should be explored, particularly to assess whether a modest increase in consumers' willingness to pay would influence farmers' decision to adopt new labels.

Conclusion

The study demonstrates consumers' discernible preference for produce with food safety labels, however reflecting a willingness to pay only a small premium for such products (Table 3). Thus, an increased price to consumers may not be an appropriate incentive in motivating farmers to adopt food safety practices and other methods to motivate farmers should be investigated. Additionally, the current study underscores the significance of "bacterial contamination-free" produce in influencing purchasing decisions and highlights one demographic trend: older consumers are less likely than younger consumers to pay a premium for food safety claims. The nuanced consumer attitudes toward organic produce, reflecting a preference for organic labels over generic food safety labels, suggest a complex interplay between health, environmental concerns, affordability, and ethical considerations in consumer choices. These insights are crucial for small-sized farm operations in understanding market dynamics and consumer expectations, and in advocating for a strategic focus on food safety certifications and organic labeling to cater to consumer preferences effectively. Additionally, the study illustrated consumers' misconceptions of what organically grown produce entails. Consumer food safety education efforts should focus on providing clarity to the consumer to address these misconceptions. Thus, to provide consumers with the autonomy to make educated risk decisions when purchasing food.

Consent for publication

All the authors read and agreed to publish this article.

Data availability

Data will be made available on request.

Financial interest

All authors declare that they have no financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

CRediT authorship contribution statement

Autumn Stoll: Writing – original draft, Formal analysis. **Maria I. Marshall:** Writing – review & editing, Project administration, Funding acquisition. **Renee Wiatt:** Writing – review & editing, Project administration. **Yaohua Feng:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

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