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Survey of Consumers' Knowledge of Food Safety of Perishable Foods Purchased at Local Farmers' Markets

ABSTRACT

This study was conducted to determine the knowledge and practices of consumers who frequent local farmers' markets (FMs). A total of 270 consumers at six FMs in West Virginia, Pennsylvania, and Michigan were interviewed. Eleven questions were asked in face-to-face interviews or by self-reported questionnaire. Questions covered basic information, purchasing frequency, food handling practices, food safety concerns, and food safety responsibilities. Data from surveys were analyzed using chi-square tests for significant differences in responses ($P = 0.05$). Results revealed that 24.3 to 34.7% of participants purchased fresh vegetables and fruits once every week per season. Most participants (93.5 to 97.5%, $P < 0.05$) thought "availability," "freshness," and "flavor and taste" were "very" to "extremely important" in their decision regarding which perishable foods to purchase. More than 80% of participants reported that they always washed their hands and produce before preparing foods at home. Fewer than 50% of the participants reported refrigerating their purchased foods within 30 min. Most of the participants (>85%) never checked the thermometer of the vendor's booth. Over half of the participants (64.8%) believed that farmers and vendors should take the greatest responsibility for the microbial safety of products at FMs. These results emphasized the need for consumer education regarding safe food handling practices at FMs, especially temperature control of perishable foods.

INTRODUCTION

Food contaminated with foodborne pathogens is the leading cause of illness and mortality globally *(10)*. In the United States, foodborne diseases cause 48 million illness cases, 128,000 hospitalizations, and 3,000 deaths annually *(17)* and result in annual economic costs of US$17.6 billion *(20)*. The Centers for Disease Control and Prevention *(4)* estimated that in 2018 1,052 foodborne disease outbreaks were associated with fresh produce served in restaurants and schools and sold in stores.

Since 2000, demand for locally grown food has been increasing in the United States as indicated by the dramatic increase in the number of local farmers' markets (FMs)

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from 1,755 in 1994 to 8,268 in 2014 nationwide, with total local food sales reaching US$12 billion *(23)*. The surge in the demand for locally produced food has created jobs and opportunities for small agribusinesses throughout the United States, especially through local FMs. An FM is a public and recurring assembly of farmers selling their products directly to consumers. FMs are an important distribution channel for agricultural products in the United States. As of 2020, 220 known FMs were operating at >112 locations in West Virginia, generating >US$17 million in annual gross sales *(28)* and contributing significantly to the household income of farmers. Very small produce growers (with annual sales <US$10,000) make up 76.6% of produce growers in West Virginia *(23)*, and most of these growers sell their produce through FMs.

To improve microbial food safety, a series of guidelines and regulations have been established at the federal level, including good agricultural practices defined in the "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables" *(24)* and the new produce safety rules in the Food Safety Modernization Act (FSMA) of 2011 *(26)*. However, very small produce growers (with annual produce sales <US$25,000) are exempt from the FSMA produce safety rules as long as their products are not linked to foodborne illnesses. During recent microbial surveillance of FMs *(14)*, *Salmonella* was detected on 18.6% of spinach, 10.9% of tomatoes, 18.5% of peppers, and 56.3% of cantaloupes tested, and *Listeria* was confirmed on 3.78% of the samples. The high prevalence of microbial contamination suggests a critical need to improve the microbial safety of locally grown foods sold at FMs.

Consumers often consider fresh produce sold at FMs to be healthier and safer than products sold at conventional retail outlets *(5, 16, 18)*. Conner et al. *(5)* reported that food safety concerns were one of the most important reasons why consumers choose to shop at FMs. Only a few studies have been conducted to investigate consumers' perceptions of the safety of locally grown produce at FMs, including a recent survey of the consumers' food safety perceptions of fresh produce sold at Kentucky FMs *(12)*. This type of survey should be conducted in more states to better understand consumers' perceptions of food safety at FMs, the types of practices used in the consumer's home environment, and the existing knowledge gaps to ensure the safety of products obtained from local FMs *(21)*.

This study included an outreach survey of consumers who purchased food from local FMs at multiple locations within three states to determine consumer knowledge, attitudes, purchasing habits, and home food preparation practices regarding microbial safety of fresh perishable foods. The hypotheses are that knowledge gaps exist in microbial safety and home food preparation practices used by consumers who obtain food from FMs.

MATERIALS AND METHODS

Development of survey questionnaire

The survey questionnaire (see addendum) was initially developed by the authors from West Virginia University (WVU) and Western Kentucky University (WKU) and was pretested among consumers at a local FM in Bowling Green, KY to make sure the wording of questions was understood by the general public. A revised questionnaire was then sent to faculty members at Wayne State University (WSU) for finalizing. Before data collection began, WVU Institutional Review Board approval was obtained (2005997264). The survey questionnaire consisted of 11 questions with two to eight selective items per question covering basic information of participants' age, gender, and education; consumer awareness, attitudes, and concerns regarding the safety of fresh produce sold at local FMs; transportation and storage of produce after purchasing from the FMs; and handling of fresh produce at consumers' homes. The complete survey instrument is attached as a supplement to this article.

The consumer survey was conducted through face-to-face interviews or questionnaires from summer 2018 to fall 2019. Six FMs in three locations were included in the survey: Morgantown FM and WVU Health Science Center FM in West Virginia, Washington County FM and Canonsburg FM near Washington, PA, and two FMs in Detroit, MI. These six FMs are within 30 miles of either the WVU or the WSU campus. Almost all consumers who purchased food at the FMs during the study were approached to be interviewed or asked to fill out the questionnaire. The target sample size was 200 to 300 completed questionnaires. Participants were informed that the survey was voluntary and anonymous, and they were free to withdraw at any time. The participants who were unable to complete questionnaires on site could mail their answers to the study team or use a barcode at the top of the questionnaire to return their answers electronically. A total of 270 completed questionnaires were collected. The survey data from these questionnaires were first recorded in a WVU standard lab notebook log and then entered into an Excel spreadsheet (Microsoft, Redmond, WA) and transformed into percentages. Data were visualized using related figures. Data recorded by graduate students were rechecked by the corresponding author. The recorded data were then rechecked by a graduate student who was not involved in the survey process.

Data analysis

Data were analyzed with SPSS software (SPSS, IBM, Armonk, NY) to compare the difference in responses between locations. For most responses, no differences ($P > 0.05$) were found among the six locations in the three states; therefore, the 237 to 270 responses from the surveys were combined and analyzed without categorizing them by location. The prediction was that survey participants' frequency of answer choices for each question would be

different. Therefore, the chi-square tests of independence were first used to determine the significance of differences ($P = 0.05$) in the frequency of answers to each question and then used to test bivariate relationships between the education level, knowledge, and concerns regarding microbial safety of perishable foods in FMs ($P = 0.05$).

RESULTS AND DISCUSSION

Response rate and demographics

Of the 270 consumers who were given survey questionnaires at six FMs in three states, 270 survey responses were returned, for an overall response rate of 100%. The completion rate for each individual item was 90.5 to 100%.

Table 1 shows the demographic characteristics of the study participants. Most were female (76.4%; $P < 0.05$). More than 80% of the participants had obtained at least some higher education: 17.7% with an associate's degree, 31.6% with a bachelor's degree, and 31.2% with a graduate degree. This finding is likely related to the fact that four of the six FMs were located near a university or college. More than 50% of the participants were young, with 28.7% between 18 and 19 years old, and 26.6% were >60 years old. The distribution of demographic characteristics in this study was very similar to that for previous consumer surveys at FMs in New Jersey *(9)*, Arkansas *(6)*, and Kentucky *(12)*, in which 66 to 83% of the participants at local FMs were female and the largest age group was >60 years of age. As in the present study, Crandall et al. *(6)* and Khouryieh et al. *(12)* also reported that 65 to 66% of the participants held bachelor's or graduate degrees, suggesting that most consumers at FMs in college towns are highly educated.

Purchase of perishable foods at FMs

Regarding the frequency of purchasing perishable foods, including vegetables, fruits, dairy, and meats, at the six FMs, most of the participants (83.7%) indicated that they purchased perishable foods, and only 16.3% never did ($P < 0.05$) *(Table 2)*. Among the four major perishable foods listed in *Table 2*, vegetables and fruits were more likely to be purchased ($P < 0.05$) than were meat and dairy products; 34.7 and 24.3% of the participants purchased vegetables and fruits, respectively, once per week, but only 5.2 and 7.3% purchasing meat and dairy products, respectively, once per week, and 19.4 and 17.7% of the participants never purchased meat and dairy products, respectively *(Table 2)*. These results are similar to those obtained in a previous related consumer survey of FMs in Kentucky *(12)*, in which 29 to 42% of the surveyed consumers purchased produce (vegetables and fruits) once per week, whereas only 6.8 to 9.7% purchased meat and dairy products once per week, and 44 to 57% never shopped for meat and dairy products at local FMs.

Factors impacting purchase of perishable foods at FMs

In this survey questionnaire, participants were asked to select the importance of 10 major factors affecting their purchase of locally grown or processed perishable foods at FMs, with options of "not at all important," "slightly to

TABLE 1. Demographics of survey participants (n = 237)

	Frequency	%
Gender		
Male	56	23.6
Female	181	76.4
Age (yr)		
18–29	68	28.7
30–39	27	11.4
40–49	33	13.9
50–59	46	19.4
60+	63	26.6
Education		
No college degree	46	19.4
Associate degree	42	17.7
Bachelor's degree	75	31.6
Graduate degree	74	31.2

TABLE 2. Purchasing perishable foods at local farmers' markets

	Frequency	%
Have you purchased perishable foods such as dairy, meats, fruits, and vegetables at this farmers' market previously? ($n = 270$, $P < 0.05$, $\chi^2 = 122.68$)		
Yes	226	83.7
No	44	16.3
Frequency of purchasing vegetables, fruits, meats, and dairy once a week ($n = 236$, $P < 0.05$, $\chi^2 = 79.76$)		
Vegetables ($n = 236$)	82	34.7
Fruits ($n = 235$)	57	24.3
Meats ($n = 233$)	12	5.2
Dairy ($n = 234$)	17	7.3
Never purchasing meat and dairy products ($n = 88$, $P > 0.05$, $\chi^2 = 0.18$)		
Meat	46	19.4
Dairy	42	17.7

TABLE 3. Impact of factors considered before purchase of perishable foods at farmers' markets

	Not at all important (%)	Slightly to moderate important (%)	Very to extremely important (%)	Total participants (n)
Market atmosphere	2.6	34.2	63.2	234
Availability	0.9	9.9	93.5	232
Freshness	0.4	2.1	97.5	236
Flavor and taste	0.8	2.5	95.8	236
Better quality than retail stores	1.3	14.9	79.6	235
No added chemicals	2.1	22.1	75.7	235
Fewer microbial safety concerns	7.3	27.0	65.7	233
Environmental concerns	4.7	17.9	76.9	234
Convenience to your residence and workplace	3.0	30.5	68.2	236
Assist local farmers and agricultural economy	1.3	10.3	84.2	234
P	<0.05	<0.05	<0.05	N/A
χ^2	38.97	155.51	41.81	N/A

moderately important," and "very to extremely important" *(Table 3)*. Participants overwhelmingly responded ($P < 0.05$) that availability (93.5%), freshness (97.5%), and flavor and taste (95.8%) were "very to extremely" important factors for their purchase of perishable foods at local FMs, followed by assisting local farmers and the agricultural economy (84.2%) and better quality food than retail stores (79.6%). These results agree with those of previous consumer survey studies in Tennessee *(1)* and Kentucky *(12)*. In Tennessee, Albin *(1)* reported that 100% of the 27 survey participants chose product "freshness," "taste," and to "assist our local farmers and economy" as top reasons for purchasing food products

TABLE 4. Knowledge of time needed before perishable foods purchased from local farmers' markets must be refrigerated and for foodborne pathogenic bacteria to cause illness

	Frequency	%
How long does it take you to refrigerate perishable goods purchased at your local farmers' market? ($n = 260$, $P < 0.05$, $\chi^2 = 99.97$)		
>30 min	125	48.1
30–59 min	77	29.6
1–2 h	38	14.6
>2 h	20	7.70
How long does it take for pathogenic bacteria to cause foodborne illness in foods held between 40°F and 140°F? ($n = 262$, $P < 0.05$, $\chi^2 = 68.12$)		
>30 min	47	17.9
30–59 min	54	20.6
1–2 h	43	16.4
>2 h	18	6.9
Unsure or don't know	100	38.2

at local FMs. Similarly, in Kentucky Khouryieh et al. *(12)* found that 97% of the 230 surveyed participants from eight FMs thought freshness and taste of food products were very to extremely important factors for shopping at FMs, and nearly 90% of participants listed supporting local farmers and economic growth.

When asked whether microbial safety concerns affected their purchase of perishable foods at FMs, >65.7% of the total 233 respondents to this item indicated "very to extremely concerned" and only 7.3% thought these concerns were "not at all important" *(Table 3)*. Results clearly suggest a high level of concern regarding microbial food safety among consumers shopping at FMs. However, in contrast, in a survey of 50 FM traders in southeast Wales, Worsfold et al. *(29)* found that 86% of consumers had few or no concerns about food safety at FMs. U.S. consumers may be more aware of food safety and the risks associated with food regardless of where the foods are purchased and thus might be more concerned about the microbial safety of locally processed food products.

Knowledge of food safety at FMs

In this survey instrument, two questions shown in *Table 4* were included to evaluate the participant's knowledge of the amount of time that foods from FMs can be unrefrigerated and that foodborne pathogens require to grow in the temperature "danger zone." This danger zone is 40 to 140°F (4.4 to 60°C), which favors survival and rapid growth of foodborne pathogenic bacteria *(22)*. According to U.S. Department of Agriculture, Food Safety and Inspection Service guidelines *(22)*, consumers should not leave food out of refrigeration for >2 h. In the present survey, 38.2% of the respondents did not know the answer to the question related to the temperature danger zone, and 55% believed that pathogenic bacteria can cause foodborne illness in <2 h ($P < 0.05$, $\chi^2 = 99.97$); only 6.9% selected the correct answer of ">2 h" ($P < 0.05$, $\chi^2 = 68.12$). Among the 18 participants who answered correctly, 8 (44.4%) had obtained a bachelor's degree and 7 (38.9%) had obtained a graduate degree *(Table 7)*, a significantly higher number ($P < 0.05$, $\chi^2 = 8.22$) than the number of participants who answered correctly but did not have a college degree, suggesting that consumers with a higher level of education are more likely to hear about the temperature danger zone in microbiology or food safety–related college courses. However, >92% of the participants refrigerated perishable foods from FMs within 2 h after purchase; 48.1 and 29.6% of them refrigerated foods within 30 min or between 30 and 59 min, respectively ($P < 0.05$, $\chi^2 = 68.12$). These results are similar to those from a previous study by Khouryieh et al. *(12)*, who also reported that although only 7.3% of the respondents knew the correct answer of ">2 h," >96% of the respondents refrigerated perishable goods within 2 h from the time of purchase. These results might be due to the fact that most of the survey participants lived near the FMs where they shopped.

Consumer practices regarding purchase of perishable foods from FMs

Table 5 is a list of the self-reported practices that survey participants used when handling perishable foods purchased from local FMs. All the practices are related to food safety, including cold storage, temperature checks, washing

TABLE 5. Consumers' self-responded practices related to safety of perishable foods from local farmers' markets

Food safety practices	Never	Sometimes	Always	Total	*P*	χ^2
	Frequency	Frequency	Frequency	*N*		
	n (%)	*n* (%)	*n* (%)			
Prepare a cooling system (portable cooler, insulated bag or ice packs) when purchasing at farmers' markets	139 (52.9)	83 (31.6)	41 (15.6)	263	<0.05	55.15
Thermometer check at the booth of vendors	233 (88.6)	21 (8.0)	9 (3.4)	263	<0.05	362.22
Wash produce at home after purchasing	16 (6.1)	34 (12.9)	213 (81.0)	263	<0.05	270.62
Wash hands before preparing perishable foods	4 (1.5)	31 (11.8)	228 (86.7)	263	<0.05	341.12
Check or measure temperature of home refrigerator	112 (42.9)	89 (34.1)	60 (23.0)	261	<0.05	15.61

TABLE 6. Concern and responsibility for food safety at farmers' markets

	Frequency	%
How concerned are you about the safety of perishable foods at farmers' market ($n = 262, P < 0.05, \chi^2 = 28.65$)?		
Not at all concerned	80	30.5
Slightly concerned	61	23.3
Moderately concerned	52	19.8
Very concerned	38	14.5
Extremely concerned	31	11.8
Who do you believe is most responsible for the safety of farmers' market products ($n = 315, P < 0.05, \chi^2 = 46.21$)?		
You, the consumer	82	26.0
Farmers	108	34.3
Vendors	96	30.5
Government (food safety inspectors and health inspectors)	29	9.2

produce, and washing hands. When the participants were asked about portable cooling systems for the temporary storage of products from FMs, including portable coolers, insulated bags, or ice packs, 52.9% responded "never," 31.6% responded "sometimes," and only 15.6% responded "always" preparing a cooling system ($P < 0.05, \chi^2 = 55.15$). These results agree with those of Jevšnik et al. *(11)* and Khouryieh et al. *(12)*, who reported that 51.7 to 54% of the respondents never used a cooling bag, only 15.5 to 16% always brought a cooling or freezing bag for perishable foods, and 33% thought a cooling bag was not necessary or never considered using one. Keeping perishable foods in a cooler to avoid the temperature danger zone of 40 to 140°F (4.4 to 60°C) is important for microbial food safety because the generation (doubling) time of some foodborne pathogens such as *Escherichia coli* O157:H7 is only 16 to 20 min. These results indicated that the majority of consumers shopping at local FMs in multiple states never bring a small cooling

TABLE 7. Relationship between education level, knowledge, and concerns of microbial safety of perishable foods in farmers' markets

	High school or less	Associate Degree	Bachelor's Degree	Graduate Degree	Total	*P*	χ^2
	n (%)	*n* (%)	*n* (%)	*n* (%)	*N*		
How long does it take you to refrigerate perishable goods purchased at your local farmers' market?							
<30 min	26 (22.4)	22 (19.0)	37 (31.9)	31 (26.7)	116	>0.05	4.34
30–59							
30–59 min	10 (15.2)	10 (15.2)	21 (31.8)	25 (37.9)	66	<0.05	10.73
1–2 h	5 (17.2)	6 (20.7)	11 (37.9)	7 (24.1)	29	>0.05	2.86
>2 h	2 (9.1)	2 (9.1)	8 (36.4)	10 (45.5)	22	<0.05	9.27
How long does it take for pathogenic bacteria to cause foodborne illness in foods held between 40°F and 140°F?							
<30 min	10 (22.7)	10 (22.7)	13 (29.5)	11 (25.0)	44	>0.05	0.55
30–59 min	7 (15.6)	9 (20.0)	17 (37.8)	12 (26.7)	45	>0.05	5.04
1–2 h	7 (18.9)	4 (10.8)	12 (32.4)	14 (37.8)	37	>0.05	6.78
>2 h	1 (5.6)	2 (11.1)	8 (44.4)	7 (38.9)	18	<0.05	8.22
Don't know	18 (20.2)	15 (16.9)	27 (30.3)	29 (32.6)	89	>0.05	6.24
How concerned are you about the safety of perishable foods at farmers' market?							
Not too slightly	24 (19.5)	21 (17.1)	38 (30.9)	40 (32.5)	123	<0.05	9.07
Moderately	8 (15.7)	5 (9.8)	21 (41.2)	17 (33.3)	51	<0.05	13.24
Very	5 (15.2)	6 (18.2)	12 (36.4)	10 (30.3)	33	>0.05	3.97
Extremely	6 (23.1)	8 (30.8)	6 (23.1)	6 (23.1)	26	>0.05	0.46

appliance when purchasing perishable foods, although the Texas Farmers' Market Website lists shopping tips (https://texasfarmersmarket.org/shopping-tips/) that include "have coolers with ice packs in your car."

Temperature control is crucial for the microbial safety of perishable foods. The outdoor environment of most FMs, especially the variance between shaded areas and those exposed to the sun, makes temperature control extremely difficult *(18, 29)*. When asked about checking thermometers at vendor booths, the vast majority (88.6%) of the participants never checked and only 9 and 21% sometimes and always checked the vendor's thermometer, respectively ($P < 0.05$, $\chi^2 = 326.22$) *(Table 5)*. Similar results were reported by Jevšnik et al. *(11)* and Khouryieh *(12)*, who found that 67.8 to 89% of the survey respondents stated that they never checked the temperature in a retail booth setting. As a follow-up question in the present study, the participants were asked whether they checked the refrigerator temperature at home; 42.9% responding that they never checked or measured the temperature of their home refrigerators, and only 23% always checked the refrigerator temperature ($P < 0.05$, $\chi^2 = 15.61$) *(Table 5)*. Marklinder et al. *(15)* and Badrie et al. *(3)* reported that 65.3 and 76% of survey respondents were unaware of or never checked the temperature of their home refrigerators, respectively. Jevšnik et al. *(11)* and Khouryieh et al. *(12)* both found that 44% of the FM vendors did not know the temperature of their refrigerators, and the only respondents who measured the temperature were those who were most concerned about the microbial safety of perishable foods sold at FMs *(11)*.

Although postharvest washing seems to be more effective for preventing cross-contamination than for reducing pathogens *(8)*, the U.S. Food and Drug Administration (FDA) *(25)* encourages consumers to wash produce in their home kitchen when preparing foods, including gently rubbing soft produce (e.g., plums and tomatoes) under running tap water and scrubbing firm surfaces of tougher foods (e.g., melons and cucumbers) with a vegetable brush under running water. In the present study, when participants were asked whether they washed produce at home after

purchasing it from FMs, 81% answered "always" and only 6% answered "never" ($P < 0.05$, $\chi^2 = 270.62$) *(Table 5)*. Khouryieh et al. *(12)* also found that >85% of the consumers at Kentucky FMs washed produce at home. An early consumer survey conducted for the FDA in 2006 revealed that the frequencies of washing bagged lettuce, cantaloupes, tomatoes, and strawberries were 54, 57, 97, and 98%, respectively *(27)*.

Hand washing is considered an effective approach for preventing cross-contamination and reducing foodborne pathogens, especially in consumers' home kitchens *(2, 7, 13)*. In the present study, 86.7% of the participants always washed their hands before preparing perishable foods in their home, results similar to those of a previous study by Khouryieh et al. *(12)*, who reported that almost 90% of the consumers always washed their hands before food preparation. Washing hands before preparing foods has been adopted by a large share of consumers. However, questions about the use of soap and the duration of hand washing were not included in this questionnaire but should be considered in future studies.

Concerns and responsibility for food safety at FMs

Survey participants were also asked about their concerns related to the safety of perishable foods at FMs; 26.3% of the participants were either extremely or very concerned, and 53.8% of the participants were only slightly or not at all concerned ($P < 0.05$, $\chi^2 = 28.65$) *(Table 6)*. Our analysis based on education level *(Table 7)* indicated that consumer concerns about the safety of perishable foods at FMs might be associated with consumer education level. For example, among the 123 respondents who were not or only slightly concerned about food safety at FMs, 63.4% (78 respondents) had a bachelor's or graduate degree, a significantly higher percentage ($P < 0.05$, $\chi^2 = 9.07$) *(Table 7)* than the 36.6% (45 respondents) who did not have a 4-year college degree. Differences with regard to the education of participants also were found among those who were very to extremely concerned about food safety at FMs *(Table 7)*. Khouryieh et al. *(12)* also found that consumers without a college degree were more concerned about the safety of perishable items at FMs than were respondents with a college degree.

When the survey participants were given options for who should be most responsible for food safety risks at FMs (consumers, farmers, vendors, or government), 34% of them believed that farmers should take most of the responsibility for the safety of their foods sold at FMs, 30.5% thought vendors should take this responsibility, and 26% believed that consumers themselves should be responsible for food safety *(Table 6)*. Only 9.2% ($P < 0.05$, $\chi^2 = 46.21$) thought that the government, including food safety inspectors and health inspectors, should take major responsibility for food safety issues at the local level. These results are consistent with those obtained by Khouryieh et al. *(12)*, who reported that 43.0% of the consumers at Kentucky FMs considered themselves to be the major responsible parties for the safety of food at FMs. In contrast, the consumers that Jevšnik et al. *(11)* interviewed believed that farmers should take major responsibility for food safety at FMs instead of themselves. The participants in the present study realized that food safety is the responsibility of all parties, including farmers, vendors, and the consumers, especially at the local level because some federal food safety regulations, such as the FSMA regulations *(26)*, offer some degree of flexibility for small local communities. Because communication among small produce growers, state regulatory agencies, and FM consumers about the safety of locally grown foods will not likely occur on its own, the cooperative extension programs from land-grant universities such as WVU should assist in developing and disseminating information on the food safety concerns of various stakeholders, including consumers. Formal and informal education opportunities related to food safety at local FMs should also be provided *(19)*.

CONCLUSIONS

The results of this survey study suggest that consumer participants purchasing perishable foods at local FMs appeared to have some understanding of practices regarding microbial food safety, such as washing hands and produce when preparing foods at home. Although survey participants may have had little knowledge of the particulars involving temperature control, they did know that temperature control is related to microbial food safety. The results of this study will be of interest to university cooperative extension specialists and agents in states such as West Virginia, Pennsylvania, and Michigan and can be used to develop local food safety education programs, such as general food safety short courses on foodborne pathogens, home refrigerator temperature measurement and control, and preparation of perishable foods in home kitchens, and course-related fact sheets could be distributed to consumers at FMs. Because the survey sample in this study mainly comprised individuals with a college degree, future studies are needed to include more participants without college degrees, especially those in rural and mountain areas referred to as hard-to-reach communities.

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ADDENDUM

Hello:

We are conducting a short, 10-minute survey on consumer perceptions of food safety of locally grown foods sold at WV, PA, and KY farmers' markets. We would greatly appreciate your time and efforts completing our short survey. Completing this questionnaire is completely voluntary, and you may withdraw your participation at any time without penalty. To protect your anonymity, please do not write your name on the survey instrument. By completing this survey instrument, you are providing your informed consent to participate in this research and you also are affirming that you are at least 18 years of age. If you have any questions, please do not hesitate to let us know. Thank you again for your assistance.

Question #1: Have you purchased perishable foods such as dairy, meats, fruits and vegetables at this farmers' market previously? (please check)

[ ] Yes (If you answered "yes" – please proceed with the next question of the survey.)
[ ] No (If you answered "no" – please do not complete any of the questions on the remainder of the survey instrument and return this packet to a member of the research team. Thank you for your participation.)

Question #2: How often do you purchase each of the following perishable foods at this local farmers' market? Please place a "check" mark in each box to indicate the frequency for each item.

	Never	First time	1–3 times a season	4–6 times a season	Once a month	Twice a month	Weekly	2+ times a week
Dairy								
Meats								
Fruits								
Vegetables								
Other (please specify: _____)								

Question #3: How important are each of the following when considering purchasing perishable good(s) such as dairy, meats, fruits, and vegetables at your local farmers' market? Please place a "check" mark in each box to indicate the level of importance for each item.

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Welcoming atmosphere					
Product availability					
Product freshness					
Product taste					
Better quality than retail stores					
Free from chemicals					
Fewer microbial safety concerns					
Eating local for environmental concerns					
Convenience to your residence & workplace					
Eating local to assist our local farmers and economy					

Question #4: How long does it typically take you to refrigerate perishable goods purchased at your local farmers' market?

- ❑ Less than 30 minutes
- ❑ 30–59 minutes
- ❑ 1–2 hours
- ❑ More than 2 hours

Question #5: How long does it take for pathogenic bacteria to cause foodborne illness in foods held between 40°F and 140°F?

- ❑ Less than 30 minutes
- ❑ 30–59 minutes
- ❑ 1–2 hours
- ❑ More than 2 hours
- ❑ Unsure/Don't know

Question #6: How concerned are you about the safety of perishable farmers' market purchases?

- ❑ Not at all concerned
- ❑ Slightly concerned
- ❑ Moderately concerned
- ❑ Very concerned
- ❑ Extremely concerned

Question #7: How often do you do the following? Please place "check" mark in the appropriate box for each row.

	Never	Sometimes	Always
Pack a cooler, insulated bag, ice chest, or ice packs when you plan to purchase a perishable food at a farmers' market?			
Check for a thermometer at farmers' market vendor booths?			
Wash produce purchased at a farmers' market?			
Wash your hands before preparing your produce?			
Measure your home refrigerator temperature?			

Question #8: Who do you believe is most responsible for the safety of farmers' market products?

- ❑ You, the consumer
- ❑ Farmers
- ❑ Vendors
- ❑ Government, including Food Safety Inspectors and Health Inspectors

Question #9: What is your gender?

- ❑ Male
- ❑ Female

Question #10: What is your age?

- ❑ 18–29
- ❑ 30–39
- ❑ 40–49
- ❑ 50–59
- ❑ 60+

Question #11: What is your highest degree or level of education that you have completed?

- ❑ Fewer than 12 years of schooling
- ❑ High school graduate or GED
- ❑ Associate's or technical degree
- ❑ Bachelor's degree
- ❑ Graduate degree (Master's, professional, or Ph.D.)