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## Pilot Development of a Critical Food Safety Message Visual Communication Tool for Farmers' Market Vendors

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## **Pilot Development of a Critical Food Safety Message Visual Communication Tool for Farmers' Market Vendors**

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## **Pilot Development of a Critical Food Safety Message Visual Communication Tool for Farmers' Market Vendors**

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*Farmers' markets are popular sources of fresh and ready-to-eat foods for consumers in the United States. However, research indicates that food safety practices of vendors and their employees serve as a concern for customers. This pilot study focused on assessing a visual-based, minimal-text educational tool that was disseminated to farmers' market vendors and employees (n = 27) in Iowa. The tool was evaluated using a post-intervention survey of vendors' and employees' knowledge of food safety practices and their attitudes towards the educational tool. The results did not show a statistically significant increase in attitude and knowledge scores of farmers' market vendors and employees for participants that reported seeing the food safety tool versus those that did not. However, participants did respond favorably to the food safety tool's informative content and visual format; many indicated an interest in using the tool in their stalls in the future. The results suggest that farmers' markets vendors and employees feel favorably towards the use of visual tools in the communication and promotion of safe food handling practices.*

*Keywords:* food safety, foodborne illness, farmers' markets, educational tools, visual-based training

### **Introduction**

Over 40 percent of reported foodborne illnesses between 1998-2008 were from produce commodities such as fresh fruits, leafy greens, and nuts (Painter et al., 2013). Farmers' markets have become an increasingly popular source of food for consumers, with over 8,700 markets in the United States providing consumers access to fresh local produce and prepared foods (USDA Agricultural Marketing Service, 2015). Worsfold et al. (2004) found that temporary outdoor locations like farmers' markets have many food safety concerns, such as limited handwashing facilities, and can be challenging for controlling temperatures of perishable foods, increasing the potential of foodborne illness. Food safety knowledge gaps of farmers' market vendors surrounding temperature control and potentially hazardous foods have been established in the

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past (McIntyre et al., 2014; Worsfold et al., 2004), and consumers have expressed concerns about food safety at farmers' markets, at times limiting their food purchases (Gwin & Lev, 2011). Although ways to avoid these practices are typically described in fact sheets and operators' guides provided to farmers' markets' vendors, research shows there is a need for additional or more effective education materials on food safety best practices (Sirsat et al., 2015; Young et al., 2017).

### **Visual-Based Learning Tools for Food Safety Training**

Visual-based learning tools have been useful in supporting food safety training and education for foodservice professionals and in promoting positive food safety behaviors in foodservice employees. Research indicates visual-based learning tools are most effective when they:

- are programmed to be relevant and tailored to a specific, targeted audience (Kline et al., 2012),
- contain limited text, include graphic design, and incorporate narrative or story-telling aspects (Rajagopal, 2012),
- capitalize on the audience's preferred learning style, such as visual learning for food handlers, the predominant learning style of kitchen environments (Chapman et al., 2011), or
- provide consistent communication of food safety messaging (Ellis et al., 2010; Roberts et al., 2012).

### **Purpose**

The purpose of this study was to develop a visual-based minimal-text educational tool about safe food handling practices as detailed in the Food and Drug Administration (FDA)'s 2013 Food Code for farmers' market vendors in Iowa. Specifically, this study focused on communication regarding poor personal hygiene, cross-contamination, and time-temperature abuse, determined by the FDA to be the three leading improper food handling practices contributing to foodborne illnesses (United States Public Health Service FDA, 2013). The objectives of this study were to assess the knowledge and attitudes of farmers' market vendors and employees towards the developed visual-based minimal-text tool and to assess the tool's effect on food safety practices.

### **Methods**

The development, deployment, and assessment of the visual-based minimal-text poster was conducted with support from local food coordinators and farmers' market managers. The study was reviewed and approved by Iowa State University's Institutional Review Board for Human Subjects Research (IRB ID: 16-328).

## Poster Development & Dissemination

Using safe food handling best practices from the FDA's 2013 Food Code (United States Public Health Service FDA, 2013), a visual-based minimal-text food safety poster was designed and developed focusing on four food safety topics (Table 1).

**Table 1. Food Safety Topics Used in Poster Development**

Food Safety Topic	Poster Presence
Good personal hygiene	<ul style="list-style-type: none"> <li>• Wash hands regularly.</li> <li>• Handle ready-to-eat foods with clean tongs or one-time-use disposable gloves.</li> <li>• Avoid bare hands when handling samples.</li> <li>• Do not smoke, drink, or eat in the stand or around food.</li> <li>• Venue should have restroom available for vendors.</li> <li>• Wash hands often with soap and water.</li> <li>• Wear clean clothing and restrain hair.</li> <li>• Do not work while sick.</li> </ul>
Time-temperature control	<ul style="list-style-type: none"> <li>• Keep hot food at temperature of 140°F or above.</li> <li>• Keep cold food at temperature of 41°F or below.</li> <li>• Use a calibrated food thermometer to maintain foods at safe temperatures.</li> </ul>
Cross-contamination	<ul style="list-style-type: none"> <li>• Handle ready-to-eat foods with clean tongs or one-time-use disposable gloves.</li> <li>• Label and store chemicals away from food.</li> <li>• Pack sold products in new packaging.</li> <li>• Keep food samples covered and protected.</li> <li>• Store food items and containers at least 6 inches off the ground.</li> <li>• Keep pets away from the stand.</li> </ul>
Cleaning and sanitizing	<ul style="list-style-type: none"> <li>• Use clean and sanitized equipment for food.</li> <li>• Keep display areas clean and sanitized.</li> </ul>

*Note.* Adapted from the United States Public Health Service FDA (2013) Food Code

The poster was reviewed and revised following feedback by a panel of food safety experts ( $n = 7$ ) for content and presentation. The finalized poster was entitled "Food Safety at the Farmers' Market" (Figure 1). The poster was provided to farmers' market managers at participating locations ( $n = 6$ ) in Iowa for dissemination at the start of the season in late spring/early summer 2017.

**Figure 1. Visual-based Minimal-text Poster Developed for Farmers' Market Vendors**



*Note.* From “Food Safety at the Farmers Market” by Shannon M. Coleman.

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## Post-Intervention Assessment and Evaluation

### Survey Development

A post-intervention questionnaire was developed to evaluate the effectiveness of a visual-based minimal-text poster in promoting safe food handling knowledge and attitudes towards food safety practices. Section one of the questionnaire assessed knowledge of food safety practices using ten true/false food safety statements. Section two evaluated participant attitudes to 14 food safety statements on a five-point Likert scale, ranging from 1 = *strongly agree* to 5 = *strongly disagree*. Section three included open-ended questions to collect participant feedback on the food safety poster. The final section comprised the demographic portion of the questionnaire and included questions regarding the type of food products sold, years of farmers' market experience, and previous food safety training, if any. To assess face validity, food safety scholars ( $n = 4$ ) were asked to evaluate the survey instrument, feedback provided was used to revise the questionnaire. The post-intervention questionnaire was administered in-person to a convenience sample of farmers' market vendors and employees at the participating farmers' markets.

### **Data Analysis**

Data collected from the questionnaires were cleaned and checked for accurate coding, with negatively worded items in the knowledge and attitude sections reverse coded before being entered SPSS 24.0 for analysis. Descriptive statistics were used to determine the means and ranges of data collected for each section and further subdivided into demographic categories for further analysis. To explore differences in knowledge and attitudes between participants who had and had not seen the posters and other demographic categories, *t*-tests were conducted. Significance levels were set to 0.05 for data analysis.

Data collected from the open-ended questions were cleaned, organized, and analyzed following the data procedures detailed by Creswell (2014) for coding data and developing themes; frequency of comments into each of the themes was also calculated.

### **Results**

In total, 34 responses were collected, of which 27 were useable. Respondents were predominately female (16 female, 8 male, 3 no response), over 50 years old ( $n = 14$ , 51.9%), and had completed a bachelor's degree ( $n = 11$ , 40.7%). Forty percent of respondents ( $n = 11$ , 40.7%) participated in only one farmers' market per season, and 37% had three to four years of farmers' market work experience. Of the respondents, more than half (51.9%,  $n = 14$ ) had completed some food safety training.

Twenty-one respondents (77.8%) recalled seeing the posters at the markets. Respondents that recalled seeing the visual tool at farmers' markets reported higher food safety attitude ( $M = 4.354$ ) and knowledge scores ( $M = 7.476$ ) than those that did not ( $M = 4.107$  and  $M = 6.500$ , respectively). The mean knowledge score resulted in a positive, though not statistically significant, difference of 0.976 (Table 2).

**Table 2. Food Safety Attitude and Knowledge Scores of Respondents with and without Poster Exposure**

Poster Exposure	Attitude <sup>a</sup>		Knowledge <sup>b</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Saw Poster	4.354	0.396	7.476	1.647
Did Not See Poster	4.107	0.380	6.500	2.291
Difference	0.247	0.016	0.976	-0.644

<sup>a</sup> Attitude scored 1 = *very negative*, 5 = *very positive*

<sup>b</sup> Maximum possible knowledge score was 10, scores were tabulated 1 = *correct*, 0 = *incorrect*

## Attitudes

Generally, attitudes towards food safety were positive, with a mean score of 4.330 overall, indicating most respondents reported they agreed to strongly agreed with most food safety attitudinal statements (Table 3). The statements with the greatest agreement focused on vendors' general food safety attitudes, such as "It is important to know how to provide safe foods to consumers" ( $M = 4.889$ ), "It is worthwhile to spend extra time to use food safety best practices" ( $M = 4.741$ ), and "I make sure to follow all food safety best practices" ( $M = 4.741$ ). Statements with the lowest attitudinal scores, averaging closer to 3 = *neither agree or disagree*, included, "My customers like seeing food safety reminders in my stand" ( $M = 3.593$ ) and "I like having food safety reminders in my stand" ( $M = 3.778$ ).

The total mean attitude scores for respondents who saw the poster and those who did not see the poster were  $M = 4.354$  and  $M = 4.107$ , respectively. Scores for three statements ("I do not think pets near my stand is a problem," "I make sure to follow food safety best practices," and "My customers like seeing food safety reminders in my stand") did not receive higher scores for those that saw the poster than for those that did not. Results of *t*-tests did not reveal a significant difference between the mean scores for the groups.

**Table 3. Food Safety Attitude Scores of Respondents with and without Poster Exposure**

Attitude Statements <sup>a</sup>	Combined Scores		Saw Poster		Did Not See Poster	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Total Score	4.330	0.393	4.354	0.396	4.107	0.380
It is important to know how to provide safe foods to consumers.	4.889	0.314	4.905	0.350	4.750	0.433
I am not concerned about foodborne illness with any of my products. <sup>b</sup>	4.037	1.216	4.048	1.214	3.500	1.500
I do not think pets near my stand is a problem. <sup>b</sup>	4.000	0.943	4.000	0.999	4.250	0.433
It is worthwhile to spend extra time to use food safety best practices.	4.741	0.516	4.810	0.426	4.750	0.433
I make sure to follow all food safety best practices.	4.741	0.438	4.714	0.452	4.750	0.433
Everyone working in stands at farmers' markets should be trained in food safety.	4.259	0.798	4.476	0.765	3.750	0.829
Food safety is not relevant to my products. <sup>b</sup>	4.037	1.201	4.190	0.881	3.750	0.829
I like having food safety reminders in my stand.	3.778	0.737	3.714	0.642	3.500	0.500
It is worthwhile to spend extra time to learn about food safety.	4.481	0.500	4.524	0.486	4.000	0.000
My customers like seeing food safety reminders in my stand.	3.593	0.782	3.429	0.732	3.750	0.829
I think that my customers are also responsible for keeping food safe.	4.333	0.720	4.381	0.710	3.750	0.433

Attitude Statements <sup>a</sup>	Combined Scores		Saw Poster		Did Not See Poster	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Learning best practices for food safety is important to me personally.	4.481	0.500	4.524	0.486	4.000	0.000
I believe I currently follow good food safety practices.	4.593	0.491	4.571	0.499	4.500	0.500
I think preventing incidences of foodborne illness is an important part of my job responsibilities.	4.667	0.471	4.667	0.495	4.500	0.500

<sup>a</sup> Attitude scored 1 = *very negative*, 5 = *very positive*

<sup>b</sup> Items were reverse coded for analyses.

## Knowledge

Overall, the mean knowledge of participants was 7.370 out of a possible 10 points (Table 4). All respondents correctly selected “true” in response to a statement surrounding the proper storage of chemical agents for cleaning and sanitizing separate from food ( $M = 1.000$  where 0 = *incorrect*, 1 = *correct*). Knowledge regarding correct food storage (storing raw and uncooked foods separately from ready-to-eat foods,  $M = 0.963$ ), time-temperature abuse (holding cold foods at or below 41°F,  $M = 0.926$ ), and avoiding cross-contamination (keeping pets away from the stand,  $M = 0.9263$ ) also saw a high number of correct responses. Knowledge statements regarding safe holding for ready-to-eat foods (“Ready-to-eat temperature controlled for safety foods must be labeled with a date if held longer than 48 hours” and “Hot foods should be held at or above 125°F”) received the lowest scores overall ( $M = 0.148$  and  $M = 0.444$ , respectively).

The total mean knowledge scores for respondents who saw the poster were not statistically significantly higher than those who did not see the poster ( $M = 7.476$  and  $M = 6.500$ , respectively). For individual knowledge statements, those that saw the poster scored higher for five statements, lower scores for four statements, and one unchanged score, but none of the differences were found to be statistically significant.

**Table 4. Food Safety Knowledge Scores of Respondents with and without Poster Exposure**

Knowledge Statement	Combined Scores		Saw Poster		Did Not See Poster	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Total Score	7.370	1.494	7.476	1.647	6.500	2.291
Foods on display must always be covered.	0.593	0.491	0.619	0.495	0.250	0.433
After handling money, I should wash my hands with soap and water.	0.852	0.355	0.857	0.393	0.750	0.433
Raw and uncooked foods (i.e., raw chicken) can be stored in the same coolers as ready-to-eat foods (i.e., fresh strawberries).	0.963	0.189	0.952	0.213	1.000	0.000
Cold foods should be held at 41°F or below 41°F.	0.926	0.262	0.952	0.213	0.750	0.433
Pets must be kept away from the stand.	0.926	0.262	1.000	0.294	0.500	0.500

Knowledge Statement	Combined Scores		Saw Poster		Did Not See Poster	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Ready-to-eat temperature controlled for safety foods must be labeled with a date if held longer than 48 hours.	0.148	0.355	0.143	0.35	0.250	0.433
Hot foods should be held at or above 125°F.	0.444	0.497	0.429	0.499	0.500	0.500
I can eat and drink in the farmers' market stall during my shift.	0.704	0.457	0.714	0.426	0.750	0.433
Chemical agents used for cleaning and sanitizing work surfaces can be stored around the food.	1.000	0.000	1.000	0.000	1.000	0.000
I can handle ready-to-eat foods with bare hands if they are clean.	0.815	0.388	0.810	0.393	0.750	0.433

*Note.* Maximum possible knowledge score was 10; scores for individual knowledge statements were tabulated 1 = *correct*, 0 = *incorrect*.

### Visual-Based Minimal Text Evaluation

Responses collected from the open-ended questions regarding the posters were generally very positive about the development and availability of the resource as a food safety reference—five respondents commented, “Love it!”, “It’s great!”, or “I like them,” and one respondent stated they will continue to keep the poster visible in their booth.

Ten respondents reported the posters’ content was “very informative” while still “easy to understand” and served as a “helpful reminder” of food safety at farmers’ markets. Feedback also included comments on the posters’ visual appeal, believing the poster was “colorful and attractive” and “easy to read.” One comment suggested a smaller format be available in the future.

### Discussion

This study developed a visual-based minimal-text poster about safe food handling practices for farmers’ market vendors in Iowa based on the FDA’s 2013 Food Code (United States Public Health Service FDA, 2013), focusing on poor personal hygiene, cross-contamination, and time-temperature abuse. Previous research had reported an additional need for a greater variety of food safety education materials (Sirsat et al., 2015).

Although mean attitude and knowledge scores of farmers’ market vendors and employees who did and did not report seeing the food safety tool were not statistically significantly different, feedback and interest from farmers’ market vendors regarding the tool were positive. The feedback regarding its use and availability was largely encouraging, particularly its informative nature and visual design. Previous literature has reported that positive attitudes can improve practice, acting as a mediator between knowledge and practice (Ko, 2013; Zanin et al., 2015), suggesting that providing a tool that positively encourages safe food handling attitudes may also

help to encourage improved handling practices. Past research has also found that visual-based learning tools can be useful in food safety training for food handlers by providing consistent food safety messaging in a learning style found to be most comfortable for food handlers (Chapman et al., 2011; Ellis et al., 2010; Roberts et al., 2012).

Multiple respondents indicated an interest in continuing to use the posters in their stalls at future farmers' markets. The positive attitude towards the food safety tool and farmers' market managers', vendors', and employees' interest in using the tool in the future may result in improved food safety practices, as previous research has found passively delivered food safety education interventions have been successful in improving knowledge among food handlers (Chapman et al., 2011; Dworkin et al., 2012). Previous research regarding farmers' market food safety has suggested that consumers have, at times, limited their purchases due to food safety concerns and that food safety knowledge gaps exist for vendors; therefore, providing freely available resources that promote safe food handling practices is critical both for consumer safety and the financial health of small farmers' market retailers (Abel et al., 1999; Gwin & Lev, 2011; Scheinberg et al., 2013).

Notably, without adequate food safety knowledge, positive attitudes are insufficient for improving food safety practices (Tokuç et al., 2009). While the tool was positively received by participants, further development of a visual-based minimal-text poster to include opportunities for improving knowledge and attitudes is needed.

### **Limitations and Future Research**

Given the small sample size and limited geographical range, the value of these findings is primarily in the potential value of alternative forms of food safety communication at farmers' markets. Future research may wish to evaluate the tool with an expanded sample size to better detect differences in knowledge and attitudes. A larger sample and broadening the geographical area could improve the generalizability of the findings. A potential approach would be looking specifically at the number of farmers' markets in an area and building a representative sample size from the population. Additionally, surveying vendors and employees at farmers' markets who did not have access to the poster at all (control group) would be beneficial. Each of these changes could improve the ability to draw definitive conclusions on the value of the tool.

### **Implications for Extension Educators**

Overall, respondents that recalled seeing the "Food Safety at the Farmers' Market" posters responded with positive poster feedback and felt encouraged by the availability of a new food safety resource for their stalls. The results suggest that farmers' market vendors are interested in expanded resources in the education and promotion of safe food handling practices.

The findings of this study contribute to the body of knowledge regarding the dissemination of food safety messaging for food handlers across the various sectors of the foodservice industry and may be helpful for industry leaders, regulators, and educators in understanding and potentially implementing a variety of formats for communicating food safety knowledge and training information. The tool can provide industry practitioners an additional potentially useful means for communicating and consistently reminding food safety handlers in an appealing way. This may support efforts at improving food safety awareness and improve food handlers' practices in farmers' markets, thus reducing the food safety hazards found at farmers' markets for the public.

The visual tool developed for this study is available, free of charge, on the Iowa State University Extension website (<https://store.extension.iastate.edu/product/15446>).

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