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Food safety and food quality perceptions of farmers' market consumers in the United States

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ABSTRACT

The number of farmers' markets in United States (U.S.) increased dramatically from 1775 markets in 1994 to 8476 markets in 2014. However, few studies have investigated consumers' food safety perceptions toward products in farmers' market or their impact on consumers' purchasing behaviors. The objectives of this study were to understand consumers' perception of food safety at farmers' markets and to explore the role of food safety perception on their purchasing fresh produce at a farmers' market. Analysis of covariance was used to investigate food safety perceptions at farmers' market among different demographic groups. In addition, multiple linear regression was used to explore factors including consumers' food safety perception and quality perception on their purchasing at a farmers' market. The results from the ANCOVA indicated that millennial generation consumers perceived better food safety conditions at farmers' markets. The linear regressions indicated quality perception and willingness to support local foods are primary reasons that consumers purchase products at farmers' markets, while food safety perception is not significantly related to purchasing fresh produce. The results imply that consumers generally hold a positive food safety perception that may be in contrast to actual microbial safety of produce obtained from farmers' markets. The results highlight an increasing need for consumer education specifically related to food safety awareness at farmers' markets.

1. Introduction

The farmers' market concept with a shorter food supply chain has achieved success worldwide (Åsebø, Jervell, Lieblein, Svennerud, & Francis, 2007; Lanfranchi & Giannetto, 2014; D'amico, Di Vita, Chinnici, Pappalardo, & Pecorino, 2014). The number of farmers' markets registered by the U.S. Department of Agriculture (USDA) has increased dramatically from 1775 markets in 1994 to 8669 markets in 2016 (USDA AMS, 2016) to meet consumer demand for products that are perceived as more wholesome than their retail supermarket counterparts (Feldmann & Hamm, 2015). Farmers' markets provide opportunities for growers to sell their products and provide consumers with alternative ways to access fresh, locally grown, and organic food (Gao, Swisher, & Zhao, 2012). In addition, these direct-to-consumer markets are an integral link between the rural and urban areas.

While a variety of locally grown and produced products are available at farmers' markets, fresh produce is the most common commodity (USDA LFD, 2016) and accounts for more than 82% of the total foods sold at these direct-to-consumer venues (Duarte, O'Neal, Liu, & O'shea, 2013). Moreover, because of the ready to eat (RTE) status of many fresh produce items (e.g., leafy greens, tomatoes, fresh herbs, fresh fruit/berries), if not handled and prepared properly, fresh produce can be a vehicle for transmission of foodborne illnesses—whether it is produced locally or internationally. Chapman, Eversley, Fillion, MacLaurin, and Powell (2010) reported that fresh produce accounted for more than 46% of the foodborne disease outbreaks in the U.S. from 1998 to 2008. Farmers' markets present unique challenges to the prevention and control of foodborne pathogen transmission. For instance, hand washing and toilet facilities may not be available because of the outdoor temporary locations of many farmers' markets (Worsfold, Worsfold, & Griffith, 2004). Moreover, the outdoor environment makes temperature control very difficult—a crucial and critical control point for farmers' market products such as fresh and fresh-cut produce (Worsfold et al., 2004; Smithers, Lamarche, & Joseph,

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2008; Norwood, 2015; Pollard Boyer, Chapman, di Stefano, Archibald, Ponder, & Rideout, 2016).

Only a few studies investigate consumers' perceptions about locally grown produce at farmers' markets. In a survey conducted by Onozaka, Nurse, and McFadden (2010), the authors reported that approximately 60% of the respondents felt that locally grown produce had superior food safety level than conventional produce. Smithers et al. (2008) revealed that consumers perceived locally grown produce as safer and carried less risk than produce grown elsewhere because the decrease in distance from "farm to fork". However, most studies associated with consumers' perceptions about farmers' market did not include food safety in their research scope (Byker, Shanks, Misyak, & Serrano, 2012; Wolf, 1997; Wolf, Spittler, & Ahern, 2005). Of the studies discussing consumers' food safety perceptions of farmers' markets, these surveys were conducted in only one to four farmers' markets—failing to represent the national farmers' market consumer. Also, no previous studies discussed the impact of food safety perceptions of farmer' market consumers on their purchasing decisions for fresh produce using the correlational method. Hence, the objectives of the current study were 1) to investigate consumers' food safety perceptions of the products in farmers' markets nationwide and 2) to identify the impact of demographic factors (age, gender, education level) and food safety perceptions on consumers' purchasing decisions of fresh produce at farmers' market.

2. Material and methods

2.1. Participants and data collection

A survey instrument was designed to investigate consumers' perceptions about food safety issues and purchasing behaviors at farmers' markets. Questions were screened and approved by the University of Houston's Human Subjects Review Board. Fifty participants pilot tested the questionnaire to assess items and clarified and identified whether response options were clear. The questionnaire was revised based on the results of pilot tests. The survey instrument was distributed to participants nationwide through an online panel (www.Qualtrics.com). The participants included 1050 respondents (55.5% female and 44.5% male). The survey was equally distributed to ten regions of the U.S. based on regions assigned by the U.S. Environmental Protection Agency (Table 1; EPA, 2016) with 105 respondents (10.1%) per region. This was done to ensure that the responses reflected a national representation of consumer perception of food safety at farmers' markets. In addition, to participate in the survey, respondents had to self-report visiting a farmers' market at least once a month during a regular market season. Three filter questions were included in the survey to examine the quality of responses. After the data cleaning procedure, 917 valid responses remained for further data analysis.

Table 1
U.S. Environmental protection agency (EPA) region distribution.

Region	States
Region 1	CT, MA, ME, NH, RI, VT
Region 2	NY, NJ, PR, VI
Region 3	DC, DE, MD, PA, WV, VA
Region 4	AL, FL, GA, KY, MS, NC, SC, TN
Region 5	IL, IN, MN, OH, MI, WI
Region 6	AR, OK, NM, LA, TX
Region 7	IA, KS, MO, NE
Region 8	CO, MT, ND, SD, MT, UT
Region 9	AZ, CA, HI, NV
Region 10	AK, ID, OR, WA

2.2. Measures

The questionnaire was divided into five sections. Section One included questions about participants' gender, age, education level, and household income. In Section Two, food safety perceptions and food safety practices of the participants were assessed. A panel of food safety experts developed the questions based on previously published studies (Milton & Mullan, 2010; Yarrow, 2006). General food safety perception was measured by four items using a five-point Likert scale ranging from strongly disagree to strongly agree. For example, one of the items is as follows: "I think unsafe food can make people really sick". Similarly, four items were used to measure food safety practices. An example of a food safety practice item is: "Proper food safety practices reduce the risk of food poisoning".

The questions included in Section Three were designed to ask respondents about purchasing behaviors at a farmers' market. Respondents were required to answer whether they purchase produce, meat and poultry, non-food items, and plants at a farmers' market. All the questions in Section Three were rated on a five-point Likert scale. An example is "I purchase most of my vegetables and fruits at a farmers' market".

The questions in Section Four were designed to measure participants' food safety and food quality perceptions towards items available in farmers' markets as well as other reasons that motivate them to visit a farmers' market (e.g., to support local foods or because of health concerns/awareness). Since limited literature was found to measure farmers' market consumers' food safety and quality perceptions using multi-item methods, items were developed by the authors of the present study. The survey instrument is demonstrated in Table 2.

2.3. Statistical analysis

The data were analyzed in three steps. The first step was scale validation, which was used to ensure self-generated items were able to measure respondents' perceptions accurately. For this validation, IBM SPSS Statistics 22.0 for Windows (IBM Corporation, Armonk, NY) and AMOS 4.0 for Windows (IBM Corporation) were used. SPSS 22.0 software was used for data screening, reliability analysis, and exploratory factor analysis (EFA). Confirmatory factor analysis (CFA) was conducted using AMOS 4.0 to present the construct validity of self-generated items. In the second step, descriptive analysis and analysis of covariance (ANCOVA) using SPSS 22.0 were conducted. This step demonstrated how different groups of participants (based on gender, generation, and level of food safety training) perceived the food safety and quality of products available at farmers' markets. Linear regression for the investigation of factors influencing purchasing behavior at farmers' markets was conducted using SPSS 22.0.

3. Results

3.1. Preliminary scale validation

The construct validity of data was examined by CFA (Table 2). The results of the CFA demonstrated a reasonable model fit (χ^2 = 123.11, df = 51, $p < 0.001$, χ^2/df = 2.41, CFI = 0.987, RMSEA = 0.037) where χ^2 is chi-square test, df is degrees of freedom, CFI is comparative fit index, and RMSEA is root mean square error of approximation. Factor loadings of each item varied from 0.65 to 0.92, indicating a good model. Convergence validity was assessed by using average variance extracted (AVE) score. All AVE scores were over 0.50 (varied from 0.51 to 0.64), indicating convergence (Hair, Black, Babin, & Anderson, 2010). Second,