



Consumer Awareness of and Concerns about Food Safety at Three Arkansas Farmers' Markets

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ABSTRACT

An emerging national trend supports purchase of local, organic, all-natural and “slow” foods that allow consumers to feed their bodies without fear of potentially cancer-causing chemicals or bacteria and simultaneously feed their social conscience by not buying produce shipped from all over the world. Because of these demands, business at many farmers' markets is increasing. A total of 305 consumers at three Arkansas farmers' markets were surveyed to determine their concerns and beliefs about the safety of foods. Consumers surveyed were well educated (62% with a bachelors or higher degree), mature (41% over 56 years of age), female (63%), and Caucasian (88%). The largest category (36%) said their major reason for shopping at farmers' markets was that they wanted their food to be free of chemicals. Pesticides were the biggest safety concern of 45% of the respondents. Only 2–6% of respondents were concerned about harmful bacteria in their food, despite massive education projects and media attention related to “harmful bacteria.” An overwhelming majority of the respondents (76%) believed that organic foods are inherently safer than their conventional counterparts. This consumer research offers limited insight into the market drivers of safer foods and suggests a sales approach that depends on the markets' locations and gender of their customers.

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TABLE I. Survey instrument for consumers at farmers' market

1. How often do you purchase organic foods? (Circle one)
Never 1–2 times per week 1–2 times per month 1–2 times per year
2. How long have you been purchasing organic foods? (Circle one)
Started this year 2–3 years 3–4 years 5–6 years or 7 years or more
3. Which type of organic food do you purchase most often? (Circle one)
Meat Poultry Fruits and vegetables None
4. In general I feel organic food is as safe as or more safe than conventional foods. (Circle one)
As safe More safe
5. Where do you purchase most of your organic foods? (Circle one)
Health foods store Retail grocery store Farmers' market Other
6. I would purchase more organic foods if they were priced similar to convention foods? (Circle one)
Yes No Undecided
7. I believe “all natural” and organic foods are about the same. Yes No
8. Which statement best explains why you prefer to purchase organic foods? (Circle one)
 - a. Better taste
 - b. Fewer harmful bacteria
 - c. Free from chemicals
 - d. Better nutritional quality
 - e. Environmentally friendly
 - f. other _____
9. Which of the following concerns you the most about conventional foods? (Circle one)
 - a. Pesticides
 - b. Harmful bacteria
 - c. Negative environmental impact
 - d. Genetic Modification (GMO's)
 - e. Nutritional value
 - f. Other _____
10. I shop a Farmers' Market because I believe most strongly in the following: (Circle one)
 - a. Support local farmers
 - b. Better quality than retail stores
 - c. Fresher produce
 - d. Foods from Farmers' Market are safer
 - e. Support fair made / fair trade
 - f. other _____

To help our survey reflect a cross-section of the population, please answer the following:

11. Please circle your age group:
19 – 28 29 – 35 36 – 45 46 – 55 > 56
12. Please circle your gender: Male Female
13. Please circle the ethnic group you most identify with:
Hispanic White Black Asian Other _____
14. Please circle your highest education level:
 - a. Fewer than 12 years of schooling
 - b. High school graduate or GED
 - c. Associates or technical degree
 - d. Bachelor's degree
 - e. Master's degree
 - f. Professional or Ph.D degree

INTRODUCTION

In 2009, the Agricultural Marketing Service (AMS) reported that there were 5,274 farmers' markets across the United States, a 13% increase since 2008 (1). This growth provides support for the perception of an expanding national trend toward locally grown, organic, all natural and “slow” foods that allow increasingly

sophisticated consumers to feed their bodies without the fear of consuming perceived cancer-causing chemicals or hemorrhagic *E. coli* and at the same time feed their social conscience by not supporting the massive carbon footprint that comes from shipping imported foods from around the world (31). The number of farmers' markets in states such as Tennessee is exploding, having increased

by more than 15% over the past 5 years to 75 separate markets today, partly as a result of the more than \$500,000 in state grants that were recently made available (4). Tiemann (36) divided farmers' markets into two groups, “indigenous” and “experience.” Indigenous farmers' markets have only a small selection of goods available (“corn, ‘maters and ‘taters”), while experience farmers' markets have

a wider variety of produce and may also sell meats and perhaps craft items. Many farmers' market associations encourage a political subtext by admonishing customers to avoid the middleman and to benefit our environment by buying local (36).

Anecdotal sources consider farmers' markets to be the preferred sales outlet for those who are just beginning to produce organic foods. The supportive farmers' market atmosphere may have provided the initial encouragement for many organic producers who have now expanded to supplying organic to food service and traditional retail food outlets (32). Hunt (20) found that many farmers, after interacting with their articulate customers at the farmers' markets, expressed a willingness to reduce the use of chemicals on their produce in order to meet their customers' demands.

The Organic Monitor (25) forecast that sales of organic foods would grow at a slower rate in 2009, predicting a slump for more expensive goods, including organic foods in the current economic recession. Before the downturn in the economy, growth in sales of organic foods, had been increasing at a sustained rate of 16 to 21% per year for the previous several years (28). With the completion of the OTA 2009 Organic Industry Survey, organic food sales in 2008 showed a 15.8% increase, reaching \$22.9 billion in sales. Predictions are that by 2025, 68% of all US food companies will offer organic foods as part of their product line, and the average consumer will buy some organic food on a regular basis (18). Recent reports from USDA's Economic Research Service (15) indicate that the organic food market has maintained its position as the single fastest growing sector in the U.S. food industry. Although the organic foods category is still small, amounting to only about 3% of total food sales, it has been growing at a rate 7 times that of the average food category. Today, more than 20,000 natural food stores and 73 percent of conventional grocery stores carry organic food products. In recent years organic and all-natural foods have become staples in the majority of mainstream retail grocery outlets.

This rapid growth in sales of organic foods is due in part to an increase in consumers' concerns about conventional food, combined with the evolution of newly available outlets for organic pro-

duction and marketing systems (10, 12). Hoefkens et al. (20) conducted consumer surveys and found that consumers perceived organic vegetables as containing fewer contaminants and more nutrients and thus as more healthful and safer than conventional vegetables, even in the absence of scientific evidence. According to a survey conducted among farmers' market vendors, almost 25% of vendors incorrectly rated the risk of their foods, and 84% believed that the foods they sold could not be a cause of foodborne illness. Consumers questioned at the same markets gave their main reasons for shopping there as freshness, traceability, taste, quality, and organic status. None of those surveyed raised any concerns about food hygiene or food safety. When prompted to consider this topic, most (86%) consumers expressed few or no concerns about the safety of the food on sale (35).

There is an understandable reluctance on the part of the traditional food industry to promote a portion of their line of foods as being "safer," because of the fear of a negative impact on their other lines. However, there is a real demand for foods that consumers perceive as being safer, as evidenced by the sustained growth in organic food sales (14). To date, there has been little research on the various segments of the consumer market that patronizes farmers' markets and their concerns and buying motivation related to the safety of the foods they purchase. The objectives of this study were to survey the opinions of consumers at three diverse farmers' markets in Northwest Arkansas about their reasons for purchasing organic foods and their food safety concerns related to conventional and organic foods. Demographic data was also collected.

MATERIALS AND METHODS

Survey procedures

A survey instrument (Table 1) was developed, patterned after that of Maciorowski et al. (24), Table 1. Questions were screened and approved by the Human Subjects Review Board of the University of Arkansas. The questions asking consumers' opinions about food safety issues were purposely placed toward the center of the ballot to gauge consumers' responses after they had become accustomed to answering this style of question. The ballot was also trans-

lated into Spanish for Hispanic shoppers. Data was collected from consumers shopping at 3 established farmers' markets in Fayetteville, Springdale and Eureka Springs, Arkansas, on separate Saturday mornings. The time frames used in this poll were selected to capture peak shopping demand times as suggested by the managers of the Arkansas Farmers Market Association (Personal Communication 2007). Self-reported demographic information on the respondents' age, gender and ethnicity was also collected at each location.

The farmers' markets for this survey were selected partly because of their economic and population diversity. The markets at Eureka Springs and Springdale have 12 to 15 vendors on a typical Saturday morning market; their sales range from \$1,850 to \$2,500 from about 200 customers. The market in Fayetteville is located close to the University and has been in operation about 10 times longer than either of the other two markets; it typically has 3,000 patrons and sales of \$20,000 on a given Saturday morning.

After receiving permission from the manager of the individual farmers market for each location and survey date, a folding table was set up with copies of the survey instrument, pencils and thank-you gifts (University of Arkansas team mascot Razorback souvenir cups). The survey was administered by three students and a supervisor; the same team collected data at all three markets. A convenience sample was obtained by offering questionnaires to shoppers who appeared to be over the age of 18. Shoppers were asked if they would be willing to participate as part of a university research project. In an effort to get as wide a range of consumer responses as possible, student surveyors offered to read the surveys to consumers they determined to be somewhat reluctant to participate, and one team member who was fluent in Spanish offered the same service to Hispanic shoppers. Our goal was to obtain 100 completed surveys at each location on each sampling date; the final total was 279. Survey questions targeted two general consumer topics: (a) consumers' preferred quality attributes and their concerns about the safety of organic and conventional foods and (b) the type, frequency and price considerations of organic foods purchased at farmers' market. The survey was pretested with students and staff members in the Food Science Department of the University of Arkansas.

TABLE 2. Demographic profile of respondents shopping at three farmers' markets in NW Arkansas, summer 2007

	Location variable			Totals
	Eureka	Fayetteville	Springdale	
What age group do you represent?	N	N	N	N
19–28	1	13	14	28
29–35	3	20	7	30
36–45	12	16	15	43
46–55	28	22	17	67
>56	29	48	36	113
Total, all participants	73	119	89	281
What is your gender?				
Male	21	38	28	87
Female	50	77	55	182
All	71	115	83	269
What is your ethnicity?				
Hispanic	0	2	8	10
White	68	108	75	251
Black	0	1	0	1
Asian	1	6	1	8
Other	3	1	2	6
White, Hispanic	1	0	0	1
All	73	118	86	277
What is your highest level of education?				
Fewer than 12 years of schooling	3	0	7	10
High school graduate or GED	12	16	35	63
Associate or technical degree	7	12	14	33
Bachelor's degree	32	42	19	93
Master's degree	14	32	7	53
Professional or Ph.D. degree	5	16	6	27
All	73	118	88	279

Statistical analysis

Survey data was entered into separate Excel (Microsoft Corporation, Redmond, WA) spread sheets for each farmers' market location. Data was cross checked twice by separate teams for accuracy in transcription. Data was analyzed by JMP (release 8.0.1: SAS Institute, Inc., Cary, NC.) and SAS/STAT. Each respondent was given a corresponding number and his/her answers to each individual question were entered in JMP

with a specific code. Relationships between variables were then indentified, using a bivariate analysis of frequencies with the contingency analysis in JMP. To test the independence of cross-tabular data, a chi-square test was performed in JMP. In all statistical tests, a significance level of 0.05 was used to identify significant differences.

In addition, the chi-square test was used to estimate the predictive value of ordinal data (age, education, years and

frequency of purchasing, together with gender and farmers' market location) to correlate the respondents' answers to the food safety questions. The Somer's D test was used to identify the association between two variables. The calculated Somer's D values range from -1 to 1, with the values closer to the absolute value of 1 showing a stronger positive association. The P value $P = 0.05$ was used to reject the null hypothesis that there was no difference between (among)

the responses. Multiple Correspondence Analysis (MCA) was used to compare more than two variables, using XLSTAT (Addinsoft 2009, New York, NY), an add-in package for Microsoft Excel (Microsoft Corporation, Redmond, CA).

The cumulative odds and the odds ratios were calculated after the correspondence analysis, to quantify existing relationships between the variables, using the parameters obtained from an Ordinal Logistic Regression Model (OLR) and the Poisson Log-Linear Model (PL-LM). The OLR comparison was used, for example, to determine how the gender of the customers and the location of the farmers' markets predicted the answer to: "Are organic foods safer than conventional foods?" The PL-LM model was used with this survey on the basis of the assumption that the sample we surveyed was representative of shoppers who typically patronize these farmers' markets. The PL-LM model was performed using the levels of "frequency of purchasing", "years of purchasing", "education" and "age" as the independent variables, and only two-way interaction terms were considered in this model. Comparisons were made across (1) farmers' markets in individual cities, (2) age range, (3) educational levels (4) frequency of organic food purchases and (5) length of time purchasing organic foods.

RESULTS AND DISCUSSION

Farmers market locations and consumer demographics

Additional details on the farmers' markets, purchasing behavior and consumer demographics have been published (9), but it is important to give the reader a little background about the demographics of the survey respondents before examining in depth their responses regarding their motivation related to the question, "Are consumers willing to pay a premium for foods (organic as opposed to conventional) they perceive as being safer?" We felt that consumers at farmers' markets would be a good market super segment to test this premise (33). Of the total of 305 patrons from the pooled three farmers' markets, the two youngest age groups, 19 to 28 and 29 to 35, each accounted for less than 10% of the respondents. Customers 56 years and older made up over 41% of the surveyed

population (Table 1). As has been found with previous surveys of farmers' markets (7, 19) the majority (66%) of the patrons at these NW Arkansas farmers' markets were female, Caucasian (90%) and well educated. Combining the education levels for BS, MS and PhD accounted for 62% of these farmers' market patrons (Table 2).

Consumers' preferences and food safety concerns

Perhaps the most pivotal question to be answered was with regard to any consumers' prejudices before they answered additional food safety questions. The first food safety question targeted beliefs about the safety of organic foods as compared to conventional foods: "In general I feel organic food is as safe as or more safe than conventional food." An overwhelming majority (76%) of the respondents came to the market believing that organic foods were safer than conventional foods. The cross-tabular summaries are presented for each market location in Table 2. The support from this segment of the consumer market set up the hypothesis that they would have reasons for paying more for organic foods, which they perceived as safer than conventional. This question provided a framework for answering the food safety questions that followed, and these consumers' answers were consistent with self-reported marketing data from the organic foods industry, as reported by the Organic Trade Association (28).

Irrespective of demographics, 76% of the pooled consumers selected the option that organic foods were "more safe" (Table 3), indicating that all segments of the population equated organic foods with safer foods. In order to segment consumers who selected the "as safe" option, the chi-square independence test was conducted with the response variable as "safety" and the demographic information (gender, education level, age level and location) as predictors. The chi-square independence test and subsequent contingency analysis showed that only gender and location had significant predictive value for consumers' answer to the question about the relative safety of organic foods. Specifically, male consumers were significantly more likely to choose the "as safe" option than were

female consumers. We compared the odds ratio, which indicated that the odds for males versus females to select "as safe" rather than "more safe" were significant; male consumers were 2.37 times more likely than female consumers to select "as safe" versus "more safe." The odds for consumers in Eureka Springs versus Springdale to select "as safe" rather than "more safe" were also significant; a consumer in Springdale is 4.13 times more likely than a consumer in Eureka Springs to select "as safe" versus "more safe." Further, the odds for consumers in Fayetteville to select "as safe" versus "more safe" are 2.6 times the odds for consumers in Eureka Springs. It has been noted by other researchers that females and older persons are more concerned than men are about negative effects of foods (35).

With regard to the second significant predictor, results of the contingency analysis indicated that the greatest percentage of consumers who selected the "as safe" option were at Springdale rather than at other locations. When the three farmers' market locations were compared, more consumers in Eureka Springs chose the "more safe" option. The demographics of the respondents at all 3 locations were similar in that they were largely white and female, indicating that factors other than demographics influence beliefs about the safety of organic foods as compared to conventional foods. Other researchers have postulated that differences in concerns about food safety are based on personal values and have noted that those who are "pro nature" are more concerned with food safety (36). Food safety risk perceptions and attitudes are probably more related to experience with foodborne illness, local culture, and sources of information on food safety than to demographics (13, 22, 23, 24).

Consumers' preferences for organic foods

The second food safety question was the first of two questions designed to answer why consumers would be willing to pay more for safer foods, by uncovering what product attributes consumers desire in the organic foods they purchase. Cross-tabular results of this question are presented in Table 3. This segment of consumers preferred their organic foods to be free from chemicals, 37%; of better

TABLE 3. Consumers' beliefs and concerns about organic and conventional foods while shopping at three farmers' markets in NW Arkansas

Organic compared to conventional foods are...	Location variable			Total
	Eureka	Fayetteville	Springdale	
As safe	9	29	27	65
More safe	63	88	58	209
All	72	117	85	274
I purchase organic foods because ...				
Fewer harmful bacteria	3	1	1	5
Free from chemicals	29	36	35	100
Better nutritional quality	10	17	16	43
Environmentally friendly	4	24	4	32
Other	0	6	4	10
More than one	25	10	9	44
Better taste	2	21	15	38
All	73	115	84	272
I am concerned about ... in my foods				
Harmful bacteria	3	6	7	16
Negative environmental impact	9	17	4	30
Genetic modification	6	13	7	26
Nutritional value	3	12	7	22
Other	1	6	3	10
More than one	24	13	7	44
Pesticides	27	49	49	125
All	73	116	84	273
I purchase foods at farmers' markets because ...				
Better quality than retail stores	9	13	7	29
Fresh produce	13	29	24	66
Foods from farmers' market are safer	2	4	7	13
Support fair made/fair trade	2	2	0	4
Other	2	1	1	4
More than one	16	14	13	43
Support local farmers	28	53	37	118
All	72	116	89	277

nutritional quality, 16%; better tasting, 14%; environmentally friendly, 12%; other, 4%; and, lastly, fewer harmful bacteria, 2%. The results point out that almost 4 out of 10 of these consumers purchase foods to avoid what they perceive to be “harmful chemicals” in their foods. This market driver seems to be firmly in control, despite media reports

of microbial foodborne pathogenic outbreaks and recalls of vegetables due to bacterial contamination. Interestingly, 16% of the shoppers chose to circle all of the answers as being reasons why they purchased organic foods, despite explicit direction at the end of this question directing them to only “circle one” answer.

To glean additional information from the consumers' responses to this question, we first ran a check for proportionality, testing the null hypothesis that each of the 5 responses to this question were equally likely to be selected. The “no effect” H_0 was rejected, and the chi square test showed that only location contributed significantly, at the 1% level; age, gender and education level did not

TABLE 4. Contingency Analysis Table comparing location of farmers' market to reasons they preferred organic foods

	Fewer harmful bacteria	Free from chemicals	Better nutritional quality	Environmentally friendly	Better taste
Eureka					
Count	3	29	10	4	2
Total %	1.4	13.3	4.6	1.8	0.9
Col %	60	29	23.3	12.5	5.3
Row %	6.3	60.4	20.8	8.3	4.2
Fayetteville					
Count	1	36	17	24	21
Total %	0.5	16.5	7.8	11	9.6
Col %	20	36	39.5	75	55.3
Row %	1	36.4	17.2	24.2	21.2
Springdale					
Count	1	35	16	4	15
Total %	0.5	16.1	7.3	1.8	6.9
Col %	20	35	37.2	12.5	39.5
Row %	1.1	49.3	22.5	5.6	21.1

significantly affect the differences in responses. Next, a Contingency Analysis was conducted between the significant predictor variable of location, compared to each of the responses as to why consumers preferred to purchase organic foods (Table 4). Consumers in Fayetteville preferred organic because they felt organic foods were “free from chemicals”. Fayetteville was the only location to have a significantly greater percentage than the other two locations (21%) of consumers who believed organic foods were more environmentally friendly. A similar number of consumers from Fayetteville, 18%, purchased organic foods because they felt that organic foods had a superior taste. Similarly, Springdale consumers most often selected freedom from chemicals as a response, and were almost evenly divided on their next highest preference between better nutritional quality and better taste. Consumers in Eureka Springs agreed with consumers from the other two locations on their top choice (freedom from chemicals), but more than 1/3 of the consumers from Eureka Springs selected more than one answer as their single most important reason for choosing organic foods. A 2004 survey also found that lifestyle, rather than demographics, is a driver of organic purchases, with increased access to

organic products in mainstream markets, concerns about health, and an increase in information being key factors (34).

Concerns about conventional foods

The next question asked what the respondents' concerns were about conventional foods. Frequency responses in order of level of concern about conventional foods were: pesticides, 46%; negative environmental impact, 11%; genetic modification (GMOs), 8%; nutritional value, 6%; harmful bacteria, 4%. Pathogenic bacteria continue to be a minor concern, despite massive efforts to educate the public on their responsibilities in keeping their own food safe from the outgrowth of harmful microorganisms during storage and preparation. Avoiding GMOs, certainly a hot button issue in the EU, was not a major concern with this group of mid-American, middle aged, affluent, well-educated female shoppers, as has been previously noted (16). About 16% of the respondents circled more than 1 answer despite directions to the contrary.

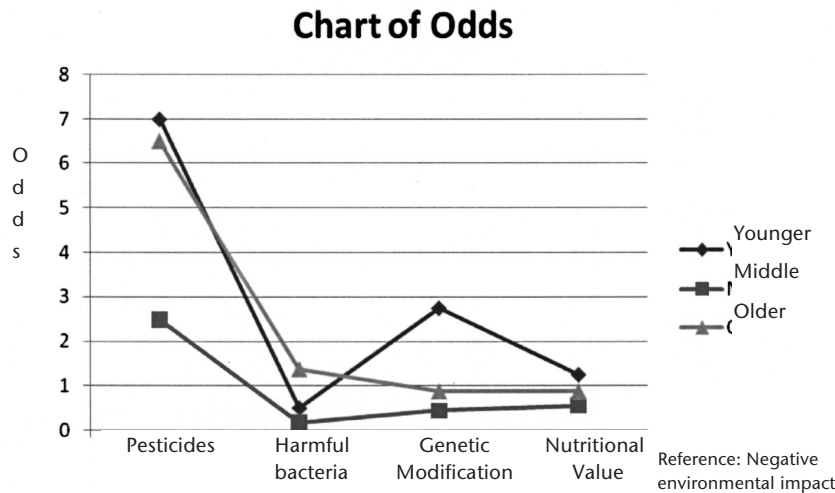
The results from this survey point out that people who purchase organic foods do so to avoid what they perceive to be “harmful chemicals.” This mar-

ket driver seems to be firmly in control despite massive media attention on pathogenic foodborne illness outbreaks. Avoiding harmful bacteria was the least important reason cited for purchasing organic foods. This correlates well with the response to the first food safety question, which showed that 72% of the shoppers believed that organic foods were safer than conventional, probably because of having fewer chemicals.

Comparison between concerns and age

The whole Nominal Logistic Regression Model was significant at the 5% level, using the “concerns” as response and predictor as “age level” with the reference category as “negative environmental impact.” The odds calculated for the significant parameter estimates are shown in Fig. 1. The odds for the younger consumers to select “pesticides” compared to “negative environmental impact” were about 7. The odds categories other than for the pooled group of younger consumers were not significant. This implies that the younger consumers were more concerned about “pesticides” than about any other aspect of conventional products, when the reference category is “negative environmental impact.” This may pro-

FIGURE I. Calculated Odds Ratio comparing pooled ages of consumers at the three farmers' market locations versus respondents' concerns for buying conventional food, using "negative environmental impact" as the reference category.



vide insight into future marketing opportunities as these youngest consumers begin establishing homes, starting families and increasing the amount of food they purchase. The middle aged consumers were more concerned about the "negative environmental impact" than about "genetic modification." The odds for the older consumers to choose "pesticides" and "harmful bacteria" compared to "negative environmental impact" are 6.5 and 1.4. This indicates that "pesticides" and "harmful bacteria" are their concerns about the conventional products when "negative environmental impact" is the reference category.

Reasons to shop at farmers' markets

The final question asked consumers their reasons for shopping at farmers' markets. The choices for response were: support local farmers, the foods at farmers' market are safer, the quality of foods are better at farmers' market than at retail stores, provide support for fair made /fair trade or simply purchase fresher produce and other. The major market driver was these consumers' desire to support local farmers, with 51% of the respondents agreeing with this was their single best reason. However, there seems to be a sig-

nificant disconnect between consumers' concerns about conventional foods and the tiny percentage (6%) of respondents who chose "foods from farmers market are safer."

DISCUSSION

Results from this survey may provide some degree of insight into why consumers are willing to pay a premium for foods they perceive as being chemically safer. Two basic assumptions were made in this study: first, that consumers at farmers' markets tended to represent a narrow but growing segment of U.S. consumers (buy local) in general, and second, that because organic foods typically cost more, consumers need to satisfy themselves that there is sufficient reason for spending more for foods they perceive as being safer chemically. Food processors have difficulty directly labeling food safety attributes of their products because of scientific uncertainty about a cause-and-effect relationship between processing parameters and safety attributes (30). Even if safety can be proven, it may involve expensive testing, and many processors elect instead to differentiate their products by attributes such as organic, GMO-free or antibiotic free (30). The results of the survey

reported here indicate that consumers in these markets perceive the label "organic" to be the equivalent of chemically safer food.

We asked consumers whether they perceived organic foods to be safer than conventional foods, in an effort to confirm what has been widely reported as a consumer perception among purchasers of organic foods. Alex Avery (2) reports that, to date, there have been almost no peer-reviewed studies demonstrating that organic foods are safer or better for promoting health. In fact, many recently published reports show quite the opposite (2). Despite evidence to the contrary, the higher safety of organic foods was a widely held perception among the respondents to our survey.

A majority (76%) of the respondents felt that organic foods were safer than conventional, but the main reason reported as to why these consumers shopped at farmers' markets was to support local farmers. Brown (7) reported that women patronized farmers' markets for three main reasons: (1) quality of the offerings (2) good variety and good prices and (3) convenient atmosphere. Govindasamy and others (18) found a majority (87%) of the shoppers at the farmers' market rated the quality of the products for sale as "very good or excellent." Nearly 90% of their respondents said their main reasons for shopping at a farmers' market were freshness of the products, direct contact with the grower-farmer, and the consumers' belief that they were supporting local agriculture (19). Almost every farmers' market consumer (98.5%) expected higher quality produce at farmers' markets, compared to other retail outlets.

Consumers' concerns about hazardous chemicals in their foods may be fueled by media coverage. BenKinney (3) noted that media reports covering potential food safety risks from chemicals are increasing. Reports on heavy metals such as methyl mercury in fish, pesticides and antibiotic residues in foods, and contaminated pet food imported into the U.S. have received for major media coverage (3). A number of studies have indicated that consumers' fear of chemicals and novel food processes generally outweigh concerns about microbiological food contamination (5, 17). In a 1990 survey, only 30% of Michigan consumers found that food freshness or spoilage was their

primary food safety concern; however, nearly as many (27%) were concerned about pesticides (6). Brewer and Rojas (6) surveyed consumers on food safety chemical issues and microbiological issues. The category “chemical issues” included food additives and artificial colors, pesticide residues in food, hormones in meat and poultry, preservatives, irradiation and nitrites. Within the chemical issues category, consumers were mostly concerned with pesticide residues, hormones in poultry and meat, and preservatives. Within the category of microbiological issues, consumers were more concerned about restaurant sanitation (56%) and meat being thoroughly cooked (54%) than about microbiological contamination or mad cow disease (45% each).

The results from this limited survey point out that the outreach and education efforts of food safety educators to inform consumers of the relatively greater risks from pathogenic bacteria than from chemical residues, especially on foods eaten raw or with minimal preparation, have not succeeded. The respondents in this survey were highly educated consumers who could be presumed to be well read and fit into the “preventative life-style” super segment of the consumer market (33). Consumers report that they do not believe that pathogenic bacteria pose a greater threat than chemicals, despite the massive media coverage given to the outbreak of hemorrhagic *E. coli* infection caused by contaminated bagged spinach shortly before this survey (8).

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