

Produce Food Safety in the Marketing Channel and the American Consumer

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Abstract

Publicity surrounding recent outbreaks of food-borne illness has raised concern among American consumers about the microbial safety of produce delivered through food marketing channels. In 2006 an E. coli outbreak was traced to spinach, resulting in millions of dollars in losses for the produce industry; in early 2008 a large salmonella scare linked to tomatoes also dampened industry profits. To investigate the effects of these concerns, a random survey of American consumers from the Gallup Panel was performed in September 2008 to investigate the extent to which consumers were concerned about the microbial safety of produce and how they coped with those concerns in the food marketing channel. In addition, the survey investigated consumer perceptions about the efforts of government agencies and produce marketing channel members to ensure food safety. Survey results showed about one-third of consumers had moderately high to high concerns about the microbial safety of produce, and that their concerns had increased over the previous year. Consumers who expressed higher concern used various coping mechanisms in the marketing channel more frequently than those with low concern, including keeping abreast of news reports, buying from farmers and farmers' markets, shopping at organic markets, avoiding packaged fruits and vegetables, shunning produce grown in certain places, and examining produce more carefully in stores. Surprisingly, the level of concern was unrelated to knowledge about how fruits and vegetables are handled and inspected in the produce marketing channel; equal numbers of high- and low-concern consumers erroneously believe various government agencies and channel members regularly inspect produce on a day-to-day basis to ensure microbial safety, although high-concern consumers had lower levels of trust in government agencies and marketing channel members. The results argue that the public is insufficiently educated about governmental and marketing channel efforts to ensure produce food safety.

Key words: Produce Food Safety, Consumer Panel, Panel Survey.

Introduction

The microbial safety of fruits and vegetables has increasingly become a concern for many Americans in recent years. In 2008, after recalls of tomatoes, jalapeño peppers, and cilantro, imported Serrano peppers were found to contain Salmonella (CDC 2008). Consumers in 2007 were warned about Salmonella in spinach (Burke 2007). In 2006, E. coli O157:H7 was found in lettuce (Bridges 2006) and in bagged spinach (CDC 2006). However, these were not isolated cases. From 1996 to 2006, Food and Drug Administration unpublished data reports there were at least 96 outbreaks, 10,253 illnesses, and 14 deaths from the

consumption of fresh produce (GAO 2008: 10). The U.S. Centers for Disease Control (CDC) believes these data greatly underestimate the number of food borne illnesses attributable to fresh produce. For example, in Salmonella cases, the CDC estimates a ratio of over 38 non-reported salmonella cases to each reported case (Voetsch, et al. 2004).

The first objective of our study was to investigate the extent to which consumers were concerned about the microbial safety of produce and how they coped with those concerns in the food marketing channel. The second objective was to investigate consumer perceptions about the efforts of government agencies and produce marketing channel members to ensure food safety.

The timing of the study coincided with a report released by the U.S. Government Accountability Office (GAO) calling for improvements in the oversight of fresh produce in September 2008 (GAO 2008) and the mandatory labeling of country of origin for fresh produce on Sept. 30, 2008 (Major, 2008).

Although studies have been conducted on how consumers react to pesticide residue on foods (Byrne et. al. 1994, Herrmann et. al. 1997, Huang 1993, Jussaume Jr. and Judson 1992, Sach et. al. 1987), little research has been conducted on how concerned consumers were about

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microbial safety and what coping strategies they employed. It was also unclear if consumers understood the inspection process and who was responsible for ensuring a safe produce food supply.

Consumers may underestimate the risk of food-borne pathogens (Hayes et. al. 1995). Byrne et. al. notes that “consumers expect produce to be safe without having to pay directly for that assurance” (1994: 491).

Ensuring the microbial safety of U.S. fruits and vegetables is the responsibility of several agencies. The CDC conducts surveillance of food borne illnesses, the United States Department of Agriculture (USDA) conducts food safety research, the Environmental Protection Agency (EPA) regulates pesticide residues, and the National Institutes of Health (NIH) researches ways to prevent food borne illnesses. The U.S. Food and Drug Administration (FDA) is the agency principally responsible for regulating the food supply including fruit and vegetables (FDA 2004). The bulk of the safety burden is placed on the fruit and vegetable industry and marketing channel members (Myers 2007).

In the sections that follow, we present a brief description of the Gallup Panel, the data source used for the Produce Food Safety survey. Next, we briefly describe the survey sample and the Web survey questionnaire. After noting the survey response rate, we present the findings from this survey in an effort to accomplish the objectives which we had set at the beginning of this article. Lastly, we discuss conclusions from this study and propose directions for future research.

Data and Methods

DATA SOURCE: GALLUP PANEL

The Gallup Panel recruits its members using an RDD sample of phone numbers of the general, non-institutionalized population in the U.S. In the first step of the recruitment process, the interviewer asks to speak to an adult member of the household. During this first telephone contact, respondents answer a short RDD survey about presidential approval and other current event topics and then are asked to participate in additional surveys as a member of the Gallup Panel. Those who agree are mailed a “welcome packet questionnaire,” which invites them and up to three additional members (age 13 and over) of the household to join the panel, and also ask each household member a short set of demographic questions. Upon receipt of this welcome packet information, the respondent (classified as the primary member in the household) and members of the household are officially enrolled in the panel.

Once enrolled, panel members are assigned to receive surveys via Web or mail (and sometimes over the phone conducted by an interviewer). The assignment of enrolled members into Web or mail survey mode is not random and is based on the responses to questions about household Internet access and Internet use in the welcome packet questionnaire. Respondents are assigned to Web survey mode if they have household Internet access and their reported use of the Internet is twice per week or more

(conditional on them providing a valid e-mail address). Respondents who use the Internet less than twice a week, or who did not provide an e-mail address, are assigned to receive panel surveys by mail. Lastly, there are no monetary incentives for participating on the Gallup Panel, though panel members receive several token thank-you gifts (e.g., birthday cards, wall calendars, etc.) and a copy of *Themes*, a quarterly member-exclusive magazine. For more information about the Gallup Panel, including panel recruitment response rate, refer to Rookey, Hanvey and Dillman (2008).

SAMPLE DESCRIPTION

Data for the present analysis come from a Web survey conducted by the Gallup Panel during September, 2008. The survey was entitled “Food Safety Survey” and was sent to a random sample of 6,002 active adult (aged 18 and older) Gallup Panel members assigned to receive Web surveys. To determine the extent of any demographic sampling bias, the sample demographics were compared with those of the adult U.S. population. The national data came from the March 2008 Current Population Survey (CPS) and is shown in Table 1. The sample data were found to be representative of gender ($\chi^2(1) = 1.1$, n.s.); however, the sample was skewed toward individuals who are older ($\chi^2(5) = 708.0$, $p < 0.001$), white ($\chi^2(1) = 188.6$, $p < 0.001$), married ($\chi^2(1) = 568.5$, $p < 0.001$), employed ($\chi^2(1) = 93.8$, $p < 0.001$), highly educated ($\chi^2(4) = 2426.1$, $p < 0.001$), and who reside in the South ($\chi^2(3) = 15.4$, $p < 0.01$). Considering the exploratory nature of our research, we consider the above-noted benchmark deviations as less of a concern. At the same time, it is important to note that the interpretation of the results from this study must consider the magnitude of these deviations which represent segments of the population that are over or under-represented in the sample.

WEB SURVEY QUESTIONNAIRE

The survey questionnaire was designed using principles from the Total Design Method for self-administered questionnaires (Dillman 2007). The Web survey questionnaire consisted of multiple pages in order to facilitate faster downloading of each page. A few operational aspects of this survey are summarized as follows. First, no advance letter or e-mail was sent to Web-assigned panel members. Second, an e-mail containing a link to the survey Web site was sent to these panel members. Third, the e-mail invitation, which contained a unique, randomly generated access code required to take the survey, ensured that access was provided to authorized e-mail recipients. Panel members were allowed to suspend the Web survey and return later to complete it at the point where they left off. While an explicit back button was not provided (only a submit button to move forward), respondents were able to move backward by clicking the browser’s back button. Fourth, non-responding panel members received a reminder e-mail sent seven days after

the survey launch. Lastly, the survey was designed to be completed in approximately 10-15 minutes.

Results

SURVEY RESPONSE RATE

A total of 6,002 e-mail invitations to participate were sent to panel members, in response to which 3,619 members (60.3%) logged on to the Web survey and 3,462 (57.6%) completed it. Thus a total of 157 (3,619-3,462) respondents started the survey but did not complete it, representing an overall break-off rate of 2.6% (157/6,002 x 100).

While the overall survey completion rate equals 57.6%, the overall response rate for the survey should take into account the various stages of panel recruitment and survey participation. As noted in Rookey, Hanvey and Dillman (2008), the Gallup Panel initial RDD recruitment has a response rate of 27% and approximately 55% of those who agree to participate ultimately are enrolled in the Gallup Panel. Therefore, the cumulative response rate for this particular study is 8.5% (27% x 55% x 57.6%).

CONSUMERS' CONCERN FOR PRODUCE FOOD SAFETY

Thirty-one percent of respondents identified themselves as having no to low levels of concern about the microbial safety of foods, while 35% reported having mid levels of concern, and 34% identified themselves as having high to very high levels of concern about microbial safety. To examine whether demographic characteristics played a role in the level of produce food safety concern, we compared the demographics of concerned respondents (see Table 2). As is evident from this table, respondents who are highly to very highly concerned about the microbial safety of their fruits and vegetables are more likely to be female, traditionalists (more than 61 years old), non-white, married, less educated (high school or less), and to live in the South.

The survey also asked whether respondents' level of concern about microbial safety has changed since last year. The response was measured on a 5 point Likert scale with the middle and end points of the scale referring to having about the same level of concern, less, and more concerned about microbial safety than respondents did a year ago. While a majority of respondents (60%) reported having about the same level of concern as last year, much fewer reported being less concerned (1%) and more concerned (11%) about microbial safety as they did a year ago.

In the last part of this segment of analysis, we analyzed the relationship between the level of concern about microbial safety and the amount of consumption of fruits and vegetables. The conventional wisdom in this case is that those who consume more fruits and vegetables are likely to be more concerned about their safety compared to their less concerned counterparts. Table 3 shows the results of this analysis. While higher consumption is significantly related to higher levels of concern for microbial safety of fruits and vegetables, these relationships, however, appear to be weak at best.

Table 2: Levels of Consumer Concern by Demographics

Demographic Characteristics	Levels of Food Safety Concern			
	(N)	No to Low level (%)	Medium level (%)	High to very high level (%)
Gender***				
Male	1,738	36.0	34.5	29.5
Female	1,881	26.5	35.6	37.9
Age groups***				
Gen Y (18-29)	246	51.2	32.6	16.2
Gen X (30-41)	844	36.3	36.5	27.2
Boomers (42-60)	1,691	26.5	35.5	38.1
Traditionalists (61+)	838	21.4	34.0	44.6
Race***				
White	3,235	32.0	35.9	32.1
Other	342	26.2	30.8	43.0
Marital Status**				
Married	2,558	28.8	36.1	35.0
Other	1,060	35.1	33.1	31.9
Education***				
High School or less	613	25.6	36.5	37.9
Some college or more	3,004	34.9	34.2	31.0
Census Regions***				
Northeast	686	30.0	34.9	35.1
Midwest	858	34.5	38.0	27.4
South	1,187	27.9	34.9	37.1
West	888	33.4	32.4	34.2
Total	3,619	31.0	35.1	33.9

Note: * p <.05; ** p <.01; *** p <.001; (two-tailed); Percentages are weighted; See appendix for weighting methodology.

Table 3: Levels of Consumer Concern by Consumption

Levels of Consumption	Levels of Food Safety Concern			
	(N)	No to Low level (%)	Medium level (%)	High to very high level (%)
Avg. fruit servings consumed***1				
None	151	44.2	27.5	28.3
1-2 servings per day	2,713	30.9	36.4	32.8
3+ servings per day	729	27.8	31.2	41.0
Avg. Vegetable servings consumed***2				
None	36	40.1	45.3	14.6
1-2 servings per day	2,417	32.1	34.6	33.3
3+ servings per day	1,154	27.8	35.6	36.5

Note: * p <.05; ** p <.01; *** p <.001; (two-tailed); Percentages are weighted; ¹Pearson's r = 0.07; ²Pearson's r = 0.05

CONSUMERS COPING MECHANISMS FOR FOOD SAFETY

Compared to those with no to low levels of concern about microbial safety, respondents with high to very high levels of concern were more likely to participate in activities to reduce the risk of bringing home fruits and

Table 4: Levels of Consumer Concern by Safety Coping Mechanisms

Coping Mechanisms	No to low level	Medium level	High to very high level
	(n=1,159) (%)	(n=1,239) (%)	(n=1,176) (%)
Keep track of news, stories on food safety	34.7	45.9	65.8
Examine fruits and vegetables in the store more carefully	28.5	44.0	54.9
Shop at major chain supermarkets and grocery stores	30.6	35.8	44.2
Avoid produce grown in certain places	10.3	17.7	38.7
Shop at farmers' market	16.7	22.5	34.5
Buy directly from farmers	8.5	11.0	20.8
Avoid packaged fruits and vegetables	6.9	10.8	18.8
Shop at natural food stores	7.5	9.7	17.4
Other	9.8	10.7	11.4
Do not do anything	32.1	17.0	5.0
Avoid non-packaged fruits and vegetables	0.2	1.3	3.9

Note: Respondents could choose more than one answer; Table is sorted in the descending order of 'High to very high' level concern.

vegetables with harmful microorganisms. In the survey, respondents were allowed to identify more than one activity and table 4 shows the results of this analysis.

In general, respondents with high to very high levels of concern have a higher adoption rate of all methods to reduce microbial risk. For these respondents, the top five popular risk alleviation activities were keeping track of news and stories on food safety (65.8%), examining fruits and vegetables in the store more carefully (54.9%), shopping at major food chains (44.2%), avoiding produce grown in certain places (38.7%), shopping at farmers markets (34.5%), and buying directly from farmers (20.8%). It is worthy to note that only 5% of high to very highly concerned participants report not doing anything to reduce microbial risk, compared to 17% and 32.1% for medium and no to low level concerned counterparts.

CONSUMER PERCEPTIONS ABOUT ENTITIES ENSURING PRODUCE FOOD SAFETY

In the survey, respondents were also asked about the role of government agencies and produce marketing channel members in ensuring the microbial safety of the nation's fruit and vegetable supply. While the responses to most of the entities that were asked indicated having a

Table 5: Levels of Consumer Concern by Consumers Perception of Entities Ensuring Food Safety

Routinely inspects fruits and vegetables for microbial safety to prevent unsafe fruits and vegetables from being sold	(N)	Levels of Food Safety Concern		
		No to low level of concern (%)	Medium level of concern (%)	High to very high level of concern (%)
Food and Drug Administration**				
Yes	1,274	28.7	36.1	35.1
No	848	30.9	32.3	36.9
Don't know/Does not apply	1,337	34.8	34.9	30.3
United States Department of Agriculture***				
Yes	1,927	29.5	35.4	35.1
No	406	31.6	30.2	38.3
Don't know/Does not apply	1,141	35.0	35.8	29.2
Your state department of health				
Yes	914	28.6	36.4	35.0
No	885	33.2	32.5	34.3
Don't know/Does not apply	1,658	32.7	35.0	32.4
Your state department of agriculture**				
Yes	1,352	29.0	34.7	36.3
No	612	30.8	34.4	34.8
Don't know/Does not apply	1,495	34.2	35.2	30.6
CDC (Centers for Disease Control and Prevention)**				
Yes	569	28.2	40.2	31.5
No	1,151	33.3	31.8	34.9
Don't know/Does not apply	1,724	32.1	34.6	33.3
Produce company (if there is a brand on the produce)**				
Yes	1,343	33.0	35.5	31.5
No	583	26.0	32.9	41.0
Don't know/Does not apply	1,537	32.0	35.1	32.9
The farmer**				
Yes	791	27.0	35.0	38.0
No	1,050	33.1	33.6	33.4
Don't know/Does not apply	1,614	33.1	35.6	31.3
Grocery store/chain				
Yes	926	29.7	35.1	35.2
No	1,017	31.6	32.3	36.1
Don't know/Does not apply	1,516	32.7	35.8	31.6

Note: * p <.05; ** p <.01; * p <.001; (two-tailed); Percentages are weighted**

significant relationship with concern for food safety (see Table 5), they also indicated the lack of awareness on the part of the consumer on this issue. For instance, 3 out of 10 (35.1%) respondents who selected FDA, have high to very high level of concern for food safety. Although the FDA is in charge of inspecting fruit and vegetable imports according to the U.S. Government Accountability Office, inspection is not on a regular basis and less than one percent of the 7.6 million fresh produce lines imported

between 2002 and 2007 were inspected (GAO 2008). This indicates that respondents' beliefs in who is routinely inspecting fruits and vegetables for microbial safety is misguided and misapplied. Furthermore, the substantial proportion of "Don't know/Does not apply" responses for each of the entities could indicate either respondents' lack of awareness about that entity (hence they provided a "don't know" response) or respondents' awareness about that entity (hence they provided a "does not apply" response). There's no way to know for sure which one is the case because these two response types were not asked separately in the survey.

Respondents also rated how they trusted several government agencies. There was a weak, significant negative relationship between the participant's level of concern and trust in the FDA, USDA (United States Department of Agriculture), State Department of Agriculture, CDC (Center for Disease Control), importers of foreign produce, and grocery store chains. In other words, consumers who showed higher levels of concern about microbial safety were less likely to trust government and private entities. Table 4 shows the correlations between consumer level of trust and concern over microbial safety of fruit and vegetables.

Discussion

Consumers seem to be confused regarding who is inspecting their food supply for harmful microbial pathogens. Equal numbers of high- and low-concerned consumers erroneously believed various government agencies and channel members regularly inspect produce on a day-to-day basis to ensure microbial safety. The agency most cited by panel participants in routinely inspecting produce on a daily basis was the FDA. The study also showed that American consumers trust the FDA.

However, any great trust in government agencies and channel members may be misplaced. To take the FDA as an example, in 2005, the Secretary of the Department of Health and Human Services, Tommy Thompson, "expressed concern about the ability of the Food and Drug Administration (FDA) to protect the safety of the food supply in the United States" (Hampton 2005). The Government Accounting Office also has serious questions on the FDA's oversight of safety of produce (GAO 2008, Kuehn 2008). Government agencies are often under-resourced and marketing channel members are often driven by cost concerns.

The issue of food safety is not only a concern for American consumers. According to Dr. David Satcher, former Surgeon General of the United States, "food safety has emerged as a significant global issue with public health and international trade implications" (Satcher 2000:1817).

Although sixty-nine percent of participants identified themselves as showing medium to very high levels of concern about microbial safety, they falsely believed their fruit and vegetables were being inspected on a routine basis. The results argue that the public is insufficiently educated about governmental and marketing channel efforts to ensure food safety.

Appendix

GALLUP PANEL WEIGHTING METHODOLOGY

The Gallup Panel data is weighted for two reasons: First, to correct for disproportionalities in selection probabilities at the sampling stage; second, to compensate for nonrandom nonresponse and noncoverage across major demographic categories (age, gender, education, race, ethnicity, and region). The initial step is to correct for disproportionate geo-graphic sampling based on telephone exchanges. Different strata exist based on ethnic density (high/low), racial density (high/low), median income (high/medium/low), and state (i.e., oversamples have been added to the panel in Iowa and Nebraska to allow for specific research projects in those states). The strata are non-overlapping and are defined by survey sampling's exchange level demographics (as defined by Census tracts that are then mapped back using telephone listings for listed telephone number to telephone exchanges). The initial base weight proportionalizes the interviewed sample to match the relative size of each stratum. This initial base weight is then divided by the number of phone lines (landline telephones) to account for the difference in probability of selection between households with a single phone and those with more than one telephone. Post-stratification weights are then computed using iterative proportional fitting (raking) to account for differences between the interviewed population and U.S. adult population targets provided by the Current Population Survey conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. The weighting categories include race (white only, black only, and all other races, including multiple races), Census region (Northeast, Midwest, South, and West), gender (male/female), age (18-24, 25-34, 35-44, 45-54, 55+), education (high school or less, some college, bachelors degree or more), and ethnicity. Where data were missing (e.g. no race given by respondent) the modal category was imputed for purposes of weighting. Each variable is corrected and the process automated to repeat iteratively until the weights converge and all targets are matched. Finally, the weights are trimmed to limit the variation introduced by weighting. A maximum weight of 6 was permitted for any individual. The weights are then normalized so that the sum of the weights is equivalent to the actual number of cases.

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Table 1: Demographic Characteristics of Gallup Panel Food Safety Survey Sample Compared Against CPS

		Food Safety Survey Sample (September 2008 Gallup Panel)	Adult U.S. Population (March 2008 CPS)
		(%)	(%)
Gender			
	Male	47.7	48.4
	Female	52.3	51.6
Age***			
	18-24	3.5	12.6
	25-34	14.7	17.9
	35-44	24.8	18.8
	45-54	25.2	19.6
	55-64	18.1	14.8
	65+	13.6	16.3
Race***			
	White only	87.1	81.3
	Black only	6.2	11.9
Marital status***			
	Married	70.3	55.0
	Not-married	29.7	45.0
Employment Status***			
	In the labor force	73.1	67.3
	Not in the labor force	26.8	32.7
Education***			
	Less than High School Diploma	2.6	14.3
	High School Diploma or Equivalent	14.3	30.9
	Some College	25.5	19.7
	Associate Degree	7.3	8.3
	Bachelor's Degree or Beyond	50.1	26.9
Census region**			
	Northeast	18.2	18.5
	Midwest	23.2	21.9
	South	34.3	36.5
	West	24.1	23.1

Note: Gallup Panel Food Safety Survey Sample (N) = 6,002; Significance is based on a one-sample chi-square tests comparing the population proportion to the un-weighted sample proportions on the following demographics: gender, age, race, marital status, employment status, education, and census regions; * p <.05; ** p <.01; *** p <.001; (two-tailed).

Table 6: Correlations between Consumer Level of Concern about Microbial Safety and Trust in Government Organizations and Private Entities

		How concerned are you about the microbial safety of fruit and vegetables?	Trust FDA	Trust USDA	Trust private certifying organizations	Trust your state dept of health	Trust your state dept of agriculture	Trust CDC	Trust foreign imports	Trust brand of produce	Trust Grocery Store	Trust Farmer
How concerned are you about the microbial safety of fruit and vegetables?	Pearson Correlation	1.000										
Trust FDA	Pearson Correlation Sig.	-.077** .000	1.000									
Trust the USDA	Pearson Correlation Sig.	-.095** .000	.812** .000	1.000								
Trust private certifying organizations	Pearson Correlation Sig.	-.019 .000	.317** .000	.342** .000	1.000							
Trust your state department of health	Pearson Correlation Sig.	-.069 .000	.713 .000	.716** .000	.388** .000	1.000						
Trust your state dept of agriculture	Pearson Correlation Sig.	-.063** .001	.700** .000	.758** .000	.406** .000	.801** .000	1.000					
Trust CDC	Pearson Correlation Sig.	-.024 .205	.700** .000	.679** .000	.362** .000	.712** .000	.662** .000	1.000				
Trust foreign imports	Pearson Correlation Sig.	-.135** .000	.411** .000	.372** .000	.273** .000	.419** .000	.390** .000	.365** .000	1.000			
Trust brand of produce	Pearson Correlation Sig.	-.088** .000	.478** .000	.507** .000	.454** .000	.539** .000	.545** .000	.463** .000	.386** .000	1.000		
Trust grocery store chain	Pearson Correlation Sig.	-.074** .000	.443** .000	.464** .000	.411** .000	.513** .000	.499** .000	.453** .000	.351** .000	.564** .000	1.000	
Trust farmer	Pearson Correlation Sig.	.005 .783	.190** .000	.220** .000	.526** .000	.302** .000	.284** .000	.263** .000	.208** .000	.359** .000	.440** .000	1.000

** Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed).