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Segmentation of US consumers based on food safety attitudes

Segmentation of
US consumers

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691

Abstract

Purpose – The purpose of this research paper is to segment US consumers based on their attitudes towards food safety and to demographically characterize each segment so that effective risk communication strategies and outreach programs may be developed to target vulnerable groups.

Design/methodology/approach – Factor analysis and hierarchical cluster analysis were applied to data on consumer food safety attitudes of a probability sample of US adults, collected by telephone questionnaires ($n = 1,014$).

Findings – The diversity of consumer attitudes was based on five factors; concern, trust, desire for a high level of regulation, acceptance for the number of people who are ill, hospitalized or die from foodborne illness, and preference for the right to purchase foods that are not guaranteed to be safe. The consumer segments identified on the bases of these factors can be classified as “confident,” “independent,” “trusting,” “cautious,” or “apprehensive” consumers. Socio-demographic characteristics; education, income, person with allergy in the household, and person under the age of six living in the household, varied significantly between each consumer segment.

Practical implications – This study can inform effective food safety intervention strategies and target consumers most in need of food safety education that may enhance overall food safety knowledge and/or lead to changes in their behavior.

Originality/value – This paper uses exploratory factor analysis to identify the factors that underlie consumers’ attitudes towards food safety. It is the first study to segment US consumers based on these factors and to demographically characterize each segment.

Keywords Food safety, Consumers, Market segmentation, Attitudes, Risk analysis, United States of America

Paper type Research paper

Introduction

Over the past several years foodborne outbreaks and other food safety issues have received extensive media coverage (Bruhn, 1997; Smith and Riethmuller, 2000). Subsequently, some studies report that consumers are more concerned than ever by food safety risks (World Health Organization, 2002). A US survey in 2004 found that 89 percent of consumers considered issues regarding food safety more important than issues regarding safe drinking water, crime prevention, health and nutrition, and the environment (Anon, 2004). Similarly, Bruhn (1997) reported that US consumers were

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more concerned about bacterial contamination of food than pesticide residues; mercury, aluminum, or lead contamination; or irradiated food. However, people can be influenced by both an optimistic bias and by an illusion of control (Frewer *et al.*, 1994) thus attitudes towards food safety appear to vary considerably across segments of the population. While these results may be a function of a great many things such as media coverage, it has been proposed that there is a segment of consumers who have become “hazard-weary” (Conley, 1998) toward food safety.

Regardless of whether consumers are concerned or “weary” about food safety issues there is little doubt that it is difficult for the general public to assess the safety of food (Lobb *et al.*, 2007). Understanding how individuals process and interpret the safety of food and how to assist them in the ranking risks presents major challenges to which researchers such as Slovic *et al.* (2004) have devoted substantial attention. Prevention of outbreaks of foodborne illness can be accomplished through a variety of policy and technological solutions, but behavior remains critical. Persuading people to engage in safe handling practices can reduce the incidence of foodborne disease.

It has been well documented that knowledge about food safety risks does not always predict safe food handling practice (Clayton *et al.*, 2002; Howes *et al.*, 1996) moreover, it is clear from the research on the relationship between behavior and individual-level psycho-social factors that variables other than knowledge, most notably attitudes, social norms, efficacy beliefs, and expectations about outcomes of enacting a behavior (Ajzen and Fishbein, 1980; Bandura, 1989), influence behavior. Attitudes, in particular, play a particularly important role in driving behaviors (Kim and Hunter, 1993); but the nature of attitudes related to food safety issues have not been specified. In order to plan effective strategies that ensure food safety these factors should be identified and developed (Foster and Kaferstein, 1985; Green *et al.*, 2005). This is the first study to use exploratory factor analysis to determine the factors that underlie consumers’ attitudes towards food safety and to segment US consumers based on these attitudes. Segmentation of audiences is a critical first step in the development of effective risk communication strategies (Atkin and Wallack, 1990) and education programs. By segmenting the audiences, convincing them to take risk-protective action can be better accomplished (Rimal and Real, 2003) as the food safety message can be tailored to their specific needs and/or desires. This study is also the first study to demographically characterize these types of consumer segments.

Methodology

The Food Safety Policy Center commissioned a survey of 1,014 US adult consumers. This survey was conducted from October 2005 through February 2006 via telephone interviews. Random digit dialing was used to generate a representative sample of adults to be interviewed. The respondents were questioned about their trust in the safety of food as well their attitudes about the federal government, the food industry, and their own role in regards to food safety practices. Some of the questions were deliberately similar to those in the Food Marketing Institute’s survey (Trends in the United States: Consumer Attitudes and the Supermarket, Food Marketing Institute, 1991-2000) to facilitate useful comparisons. The details of the responses to these questions have been previously presented and discussed (Food Safety Policy Center, 2006). Table I shows the socio-demographic characteristics of the respondents.

Using SPSS version 14.0 (Statistical Package for Social Science), the analysis was carried out in three stages:

| Socio-demographic variable | Survey response | % | Segmentation of US consumers |
|--|----------------------------|-------|---|
| Is anyone in your household allergic to any foods? | Yes | 24.83 | 693 |
| | No | 74.09 | |
| Are there any children under the age of six in your household? | Yes | 23.00 | |
| | No | 76.31 | |
| Is there anyone in your household age 65 or over? | Yes | 23.61 | |
| | No | 75.71 | |
| Dwelling location | Rural community | 27.22 | |
| | Small city or town | 36.86 | |
| | Suburb | 22.61 | |
| | Urban community | 12.38 | |
| Education | Less than high school | 6.32 | |
| | High school | 37.38 | |
| | Some college | 29.84 | |
| | University degree or more | 25.53 | |
| Marital status | Married | 55.23 | |
| | Divorced | 4.52 | |
| | Separated | 0.60 | |
| | Widowed | 7.84 | |
| | Member of unmarried couple | 0.66 | |
| | Single, never been married | 29.91 | |
| Income | Less than \$10,000 | 2.77 | |
| | \$10,000-\$19,999 | 9.15 | |
| | \$20,000-\$29,999 | 8.48 | |
| | \$30,000-\$39,999 | 11.08 | |
| | \$40,000-\$49,999 | 14.52 | |
| | \$50,000-\$59,999 | 8.03 | |
| | \$60,000-\$69,999 | 10.62 | |
| | \$70,000 + | 20.32 | |
| Gender | Male | 45.54 | |
| | Female | 54.46 | |
| Age category | 18-24 yrs | 15.21 | |
| | 25-29 yrs | 10.59 | |
| | 30-39 yrs | 14.99 | |
| | 40-49 yrs | 20.52 | |
| | 50-59 yrs | 16.34 | |
| | 60-64 yrs | 6.03 | |
| | 65 or older | 15.00 | |
| Census region | Northeast | 18.74 | |
| | Midwest | 21.55 | |
| | South | 36.68 | |
| | West | 23.03 | |
| Race/ethnicity | Caucasian/white | 72.44 | Table I. Socio-demographic characteristics of respondents |
| | African American/black | 11.30 | |
| | Hispanic | 11.81 | |
| | Other | 4.45 | |

- (1) Factor analysis (Kennedy *et al.*, 2005; Jang *et al.*, 2002; Kuo *et al.*, 2002) was used to determine the dimensions of consumer food safety attitudes.
- (2) Responses grouped in (1) were used to identify clusters of consumers using hierarchical cluster analysis (Jang *et al.*, 2002; Kennedy *et al.*, 2005).
- (3) Chi-square tests were used to determine whether or not the clusters identified in (2) were significantly different based on socio-demographic variables.

Varimax rotation and Kaiser normalization were used to identify patterns of factor loadings that were as diverse as possible so that they could be easily interpreted. In this study, factor loadings of 0.6 or higher were considered salient (Cooper and Bhattacharjee, 2001). As per standard practice (Stanek, 1993), the factor analysis was used with a predetermined cut-off Eigenvalue of one. Reliability coefficients (Cronbach's alpha) were computed to identify those factors, which displayed reasonable levels of internal consistency. In this study, a minimum alpha coefficient of 0.6 was used because it suggests, at least, moderately high reliability (Wright *et al.*, 2004). Finally, the Bartlett's Test and its associated probability were computed to determine if the correlation matrix comes from a population in which the variables are noncollinear.

Hierarchical cluster analysis

The factors identified above were used to allocate respondents into homogenous clusters, using Ward's method (Girish and Stewart, 1983). This method was chosen to amalgamate the factors because it uses an analysis of variance to evaluate the distances between clusters and it is generally regarded as very efficient (StatSoft Inc., 2004). An agglomeration schedule enabled the identification of the optimum number of clusters (Hibbert *et al.*, 2004).

The mean scores for the factors were computed to characterize each cluster. The variance was analyzed using ANOVA. The effect size was measured with the Eta squared and the Bonferroni test identified and quantified the contribution that each factor made in differentiating the clusters as well as the significant difference between clusters. The Wilks lambda was used to test multivariate significance of the cluster solution, while the corresponding *F* tests showed whether the effect was significant (Kennedy *et al.*, 2005; Thanasoulas *et al.*, 2003).

Chi-square tests were used to determine whether the clusters were significantly different based on socio-demographic variables.

The socio-demographic variables from the original dataset (see Table I) were used in the chi-square analysis.

Results

1. Factor analysis

Table II presents the factor loading scores after Varimax rotation with Kaiser normalization. A total 21 variables were used in the initial factor analysis. Twenty of these variables had factor loadings greater than 0.6. These 20 variables grouped to form five factors, which accounted for 58 percent of the variance. The Cronbach alpha coefficients were all higher than 0.6, varying between 0.62 and 0.86. The Bartlett's test of sphericity is significant ($p < 0.001$). All the variables had an eigenvalue greater than one.

| Variables used to construct factors | Factor loading | Variance explained (%) | Cronbach alpha | Segmentation of US consumers |
|---|----------------|------------------------|----------------|--|
| <i>Factor 1. Concern</i> | | 22 | 0.82 | 695 |
| Are you concerned about the safety of the food that you eat? | 0.64 | | | |
| The last time you were shopping for food, did you think about whether the food you were buying was safe to eat? | 0.69 | | | |
| The last time you ate at a restaurant, did you think about whether the food you were buying was safe to eat? | 0.63 | | | |
| Are you concerned about causes of food-borne illnesses, such as <i>Salmonella</i> , <i>E. coli</i> or <i>Listeria</i> , in the foods you eat? | 0.72 | | | |
| Are you concerned about antibiotics or hormones in the foods you eat? | 0.76 | | | |
| Are you concerned about pesticides or chemical residues on the fruits and vegetables you eat? | 0.79 | | | |
| And are you concerned about additives or preservatives in the foods you eat? | 0.62 | | | |
| <i>Factor 2. Trust</i> | | 10 | 0.73 | |
| Trust: Federal Government to ensure food is safe | 0.65 | | | |
| Trust: processors and manufacturers to ensure food is safe | 0.73 | | | |
| Trust: farmers to ensure food is safe | 0.63 | | | |
| Trust: grocery stores to ensure food is safe | 0.74 | | | |
| Trust: restaurants to ensure food is safe | 0.63 | | | |
| Trust: average Americans to ensure food is safe | >0.6 | | | |
| <i>Factor 3. Desire for a high level of regulation</i> | | 10 | 0.74 | |
| The government should ban the sale of foods that are less safe even if they are more nutritious or healthy | 0.82 | | | |
| The government should ban the sale of foods that are less safe even if they are more tasty or flavorful | 0.86 | | | |
| The government should ban the sale of foods that are less safe even if they are more convenient to prepare and cook | 0.70 | | | |
| <i>Factor 4. Acceptance for the number of people who are ill, hospitalized or die from foodborne illnesses</i> | | 9 | 0.76 | |
| The CDC estimates that <1 percent of the US population is hospitalized because of foodborne disease in a given year | 0.73 | | | |
| The CDC estimates that of those who are hospitalized, 2 percent die because of foodborne diseases | 0.79 | | | |
| The CDC estimates that about 25 percent of the population will get sick because of consuming contaminated foods and beverages | 0.86 | | | |
| <i>Factor 5. Preference for the right to purchase safe or unsafe food</i> | | 6 | 0.67 | |
| Anyone should have the option of buying any foods I want regardless of how safe or unsafe they may be | 0.8 | | | |
| If labels contained safety information, would you strongly agree, agree, be undecided, disagree, or strongly disagree with the statement: anyone should have the option of buying any foods I want regardless of how safe or unsafe they may be | 0.62 | | | |
| <i>Total variance explained by the factors</i> | | 58 | | |
| Notes: * All have eigenvalues greater than 1; Bartlett's test of sphericity 4,799.67, df = 210, Sig. < 0.001 | | | | Table II. Factor loadings, variance explained and Cronbach alpha for the five identified food safety factors |

Seven items loaded together to form factor 1. This factor represented consumer concern for food safety and will be referred to as the “Concern” factor for ease of interpretation (see Table II). The responses to these questions were; 1 = yes or 2 = no. This factor accounted for 22 percent of the variance. The Cronbach alpha was 0.82.

Six items loaded together to form factor 2. This factor represented consumers trust in actors in food supply chain, known here after as “Trust.” Each “trust” variable was composed of three questions:

- (1) (Part a) How would you rate the performance of ... (each actor in the food supply chain)?
- (2) (Part b) How capable do you think ... (each actor in the food supply chain) is in making sure the foods you eat are safe?
- (3) (Part c) How committed do you think ... (each actor in the food supply chain) are to making sure that the foods you eat are safe?

The responses were coded as follows:

- 1 = very (part a) good job, (part b) capable and (part c) committed;
- 2 = somewhat (part a) good job, (part b) capable, and (part c) committed;
- 3 = neither (part a) good nor bad job, (part b) capable nor incapable, and neither (part c) committed or uncommitted;
- 4 = (part a) poor job, (part b) somewhat incapable (part c), and somewhat committed; and
- 5 = very (part a) poor, (part b) incapable (part c), and uncommitted.

The responses to these questions were summed (3 = high level of trust and 15 = low level of trust) (see Table II). This factor accounted for 10 percent of the variance. The Cronbach alpha was 0.7.

Four variables grouped together to form factor 3. This factor represented consumers’ preference for government bans on unsafe food (see Table II). The responses to these questions were; 1 = yes or 2 = no. This factor also accounted for 10 percent of the variance. The Cronbach alpha was 0.74.

Three variables concerned with respondents’ acceptance for the number of people who are ill, hospitalized, or die from foodborne illnesses were grouped together to form factor 4 (see Table II). Each item was measured as a Likert scale; respondents were asked whether the burden of foodborne illness described was very acceptable (1), somewhat acceptable (2), neither acceptable nor unacceptable (3), unacceptable (4), or very unacceptable (5). This factor also accounted for 9 percent of the variance. The Cronbach alpha was 0.76.

Two variables reflected consumers’ preference for the right to purchase safe or unsafe food. Again, each variable was measured as a Likert scale; strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4), or strongly disagree (5). This factor accounted for 6 percent of the variance. The Cronbach alpha was 0.67.

Hierarchical cluster analysis

The 1,014 respondents were sorted into five clusters on the basis of their responses (Table III). Cluster 1 was most likely to be composed of consumers who think that the government should not ban foods even if they are likely to be less safe. These

| Factors | Cluster | | | | | Population <i>n</i> = 757 | Between-subjects One-way ANOVA <i>F</i> | Effects <i>F</i> significance | Measure of Association Eta squared |
|---|----------------------|---------------------|----------------------|-----------------------|-----------------------|------------------------------|---|-------------------------------------|--|
| | 1 <i>n</i> = 196 | 2 <i>n</i> = 133 | 3 <i>n</i> = 122 | 4 <i>n</i> = 59 | 5 <i>n</i> = 247 | | | | |
| Concern | 0.02 ^a | -0.24 ^b | 0.36 ^{abcd} | -0.12 ^c | -0.31 ^d | 0 | 6.27 | 0.000 | 0.03 |
| Trust | -0.3 ^a | -0.24 ^b | -0.44 ^{abc} | 2.2 ^{abcd} | -0.15 ^{cd} | 0 | 132.04 | 0.000 | 0.43 |
| Desire for a high level of regulation | 0.99 ^{abcd} | -0.76 ^b | -0.75 ^c | -0.76 ^d | 0.17 ^{abcd} | 0 | 173.54 | 0.000 | 0.51 |
| Acceptance for the number of people who are ill, hospitalized or die from foodborne illnesses | 0.66 ^a | 0.68 ^b | 0.54 ^c | -0.77 ^{abcd} | -1.14 ^{abcd} | 0 | 362.00 | 0.000 | 0.67 |
| Preference for the right to purchase safe or unsafe food | -0.19 ^a | -0.71 ^{ab} | 0.94 ^{eb} | 0.06 ^b | 0.06 ^a | 0 | 53.47 | 0.000 | 0.24 |

Notes: Significant differences (using Bonferroni tests) between clusters are indicated by the same superscript at 0.05 level. Wilks' lambda test 0.06, f - ratio = 150.09, $p < 0.001$

Table III.
Differences from the population mean values using the five identified food safety factors

consumers were also more likely than those in clusters 3, 4 and 5 to agree that consumers should have the option of purchasing food regardless of how safe or unsafe that it is. These consumers had the characteristics of confident consumers.

Cluster 2 was most likely to want a high level of food regulation; believing that the government should ban foods that are likely to be unsafe. However, respondents in the same cluster were likely to agree that consumers should have the option of assessing food purchases themselves regardless of the safety of the food (if it contains safety information on the label). These consumers are not inclined to worry about the number of people who are ill, hospitalized, or die from foodborne illness. These consumers have the characteristics of independent consumers.

Cluster 3 respondents were least likely to be concerned about food safety (when shopping or at restaurants), pathogens, hormones, pesticides or additives in their food. They were most inclined to trust the various players in the food supply chain. They were also least likely to agree that consumers should have the option of assessing food purchases themselves regardless of the safety of the food (if it contains safety information on the label). They had the characteristics of trusting consumers.

Cluster 4 respondents were least likely to trust the various players in the food supply chain and they were most likely to think that unsafe food should be banned. They had the characteristics of cautious consumers. Finally, cluster 5 is most likely to be concerned about food safety (when shopping or at restaurants), pathogens, hormones, pesticides or additives in their food and they are most likely to worry about the number of people who are ill, hospitalized or die from foodborne illness. They had the characteristics of apprehensive consumers (see Table III).

Chi-square tests were used to determine whether the clusters were significantly different based on socio-demographic variables.

The chi-square statistic was used to test for significant differences between the clusters for the 11 socio-demographic variables (see Table IV). Four out of the 11 variables were significantly different, education ($\chi = 30.89$: $df = 12$, $p \leq 0.01$), person with allergy in the household ($\chi = 12.65$: $df = 4$, $p \leq 0.05$), person under the age of six living in the household ($\chi = 10.08$: $df = 4$, $p \leq 0.05$) and range of income ($\chi = 54.94$: $df = 54$, $p \leq 0.01$).

Confident consumers are most likely to be composed of respondents who have a child under the age of six living in the household. Independent consumers were most likely to have a lower than average level of education. Trusting consumers reported the highest level of income and the highest level of education and they were least likely to have reported that a child under the age of six was living in their household. Cautious consumers were most likely to have a lower than average income. Apprehensive consumers were least likely to have a person with an allergy in their households.

Discussion

In this study, the factors that were found to be important in distinguishing the clusters of consumers were:

- concern (concern when shopping or at restaurants, or concern about pathogens, hormones, pesticides or additives about various food safety risks);
- trust (in the federal government, processors/manufacturers, farmers, grocery stores, restaurants and average Americans to ensure safe food);
- desire for a high level of regulation;

| | Confident | Independent | Clusters Trusting | Cautious | Apprehensive | Chi-square significance |
|---|------------|-------------|-------------------|------------|--------------|-------------------------|
| Education (1 = lowest level of education) | 5.54 (2.2) | 5.02 (2.0) | 5.68 (1.8) | 4.91 (2.3) | 5.33 (2.2) | ≤ 0.01 |
| Person with an allergy in the household (0 = nobody in household with an allergy) | 2.96 (0.9) | 2.63 (0.8) | 2.97 (0.9) | 2.88 (0.9) | 2.79 (0.9) | ≤ 0.05 |
| Person under the age of six years in the household (0 = nobody in household under the age of six) | 3.40 (1.9) | 4.24 (1.6) | 4.54 (1.3) | 4.21 (1.6) | 3.71 (1.9) | ≤ 0.05 |
| Range of income (1 = lowest range of income) | 3.50 (1.9) | 3.99 (1.7) | 4.09 (1.7) | 3.93 (1.8) | 4.50 (1.3) | ≤ 0.01 |

Table IV.
Mean and (standard deviation) of socio-demographic variables in the five identified clusters of consumers

- acceptance for the number of people who are ill, hospitalized or die from foodborne illnesses; and
- preference for the right to purchase safe or unsafe food.

The five segments identified based on these factors had the characteristics of confident, independent, trusting, cautious and apprehensive consumers.

Confident consumers were most likely to think that the government should not ban foods even if they are likely to be less safe. These consumers were also likely to agree that consumers should have the option of purchasing food regardless of its safety (if it contains safety information on the label). These consumers are likely to have a child under the age of six living in the household. Although this finding is not directly comparable to findings in other studies an Economic Research Service study reported that consumers with no children were less likely than those with children to rate product safety as “very important” and these consumers may require higher exposure to food safety messages to change attitudes and behaviours than respondents with children (2003).

Independent consumers are more likely to want the government to ban foods that may be unsafe. However, they are also more likely to agree that consumers should have the option of assessing food purchases for themselves regardless of the safety of the food (if it contains safety information on the label). They are not inclined to worry about the number of people who are ill, hospitalized, or die from foodborne illness. These consumers are likely to have a person with an allergy living in their household. There is no published literature relating attitudes towards food safety and a person with an allergy living in the household. However, it is likely that consumers who have food allergies also habitually assess the foods they purchase and do not require that food, which is unsafe for their consumption, to be banned.

Trusting consumers are least likely to be concerned about food safety (when shopping or at restaurants), pathogens, hormones, pesticides or additives in their food, and they are most inclined to trust the various players in the food supply chain. The link between consumers’ perceived risks from food and trust in the food chain actors in relation to consumer behavior has been previously reported by Lobb (2005). The Trusting consumers were least likely to agree that consumers should have the option of assessing food purchases themselves regardless of the safety of the food (if it contains safety information on the label). Previous reports suggest that it is the government’s responsibility to protect consumers (Opinion Research Corporation, 1995) and according to Kennedy (1988) since consumers cannot directly measure food safety risks for themselves, food safety issues are a matter of trust. Consumers’ attitudes towards the safety of foods are strongly associated with how much they trust not only the food industry but also government agencies that are responsible for ensuring food safety (Wilcock *et al.*, 2004). In essence, Trusting consumers rely on producers, retailers and regulators to ensure potential health impacts are minimized. These consumers were most likely to have a higher than average level of education. Although work by Johnson *et al.* (1995) and Slovic *et al.* (2004) have shown an inverse relationship between education and some types of public health risks this study has shown a positive relationship between consumer education and trust. This may be because consumers with a higher level of education are more inclined to favor scientific and technological solutions (and they assume that the government will use science and technology to solve food safety problems). The respondents in this cluster were least

likely to have either a person under the age of six or a person with an allergy in their household studies. This finding is comparable to other studies (Smith and Riethmuller, 2000; Polacheck and Polacheck, 1989; Jussaume and Judson, 1992), which have reported that the absence of children in a household can be correlated with more trust in the food safety system.

Cautious consumers are least likely to trust the various players in the food supply chain and they were most likely to think that unsafe food should be banned. They were most likely to have a lower than average education. This finding is comparable with a recent Eurobarometer study, which found that people with lower education were more concerned about illnesses caused by food (European Research, 2006). This finding contrasts with the report by Wandel (1994) which states that people with lower education were less interested than others on the general question that food could be harmful to health.

Apprehensive consumers are likely to be concerned about food safety (when shopping or at restaurants), pathogens, hormones, pesticides or additives in their food and they are most likely to worry about the number of people who get sick/are hospitalized or die from foodborne illness. They were most likely to have above average income. The findings are in contrast to previous findings (Economic Research Service, 2003; Smith and Riethmuller, 2000) insofar as high-income consumers were shown to be less apprehensive than lower income consumers. The study by Kinnear *et al.* (1974), in agreement with this study, suggested that higher income groups were more concerned with food safety than lower income groups. Yet, previous reports have also found that higher income consumers are more inclined to take food safety risks for palatability reasons (Economic Research Service, 2002a; Wilcock *et al.*, 2004).

Based on published literature, the most common socio-demographic characteristics affecting consumer food safety behaviour, knowledge and risk perceptions include education (Economic Research Service, 2002b; Streiner and Norman, 2001; Yang *et al.*, 1998; Altekruise *et al.*, 1995; Huang, 1993; Williamson *et al.*, 1992; Kiecolt, 1988; Klontz *et al.*, 1995), income (Economic Research Service, 2002b; DeVault, 1991), marital status (Economic Research Service, 2002b), ethnicity (Economic Research Service, 2002b; Huang, 1993), gender (Economic Research Service, 2002b; Williamson *et al.*, 1992; Huang, 1993; Hibbert *et al.*, 2004; Huang, 1993), size of household (Hibbert *et al.*, 2004), and age (Williamson *et al.*, 1992; Huang, 1993; Hibbert *et al.*, 2004; Gettings and Kiernen, 2001; Miles *et al.*, 2004). In this study, the socio-demographic elements found to be important in distinguishing the consumer food safety segments were; education, income, person with allergy in the household, and person under the age of six living in the household. These elements will play a part in determining consumer food purchase, preparation and consumption decisions and thus should be incorporated in the context of food safety education initiatives.

Conclusion

Food safety attitudes, which are important in distinguishing consumers have been identified. It is interesting that the consumers who are most inclined to worry about food safety are also the consumers who are most inclined to be concerned about the number of people who are ill, hospitalized, or die from foodborne illnesses. These consumers have been termed Apprehensive consumers. Reaching out to this segment of consumers about may alleviate “probability neglect” (Sunstein, 2003) and misconceptions about the frequency and severity of foodborne illnesses which can

be detrimental to the food industry. The information aimed at this segment of consumers should include:

- the Centers for Disease Control and Prevention estimation of number of people who are affected by foodborne illnesses (are sick, hospitalized and die) in the USA annually;
- the most frequently-responsible etiological agents in outbreaks and cases of foodborne illness; and
- how to recognize the symptoms of foodborne illness.

Consumers who are most likely to be unconcerned about food safety were also those who were most likely to trust actors in the food chain. A study of consumers in Germany, The Netherlands, and the United States during the BSE scares indicated that there was a strong relationship between trust in the government and how concerned consumers were with eating beef. In the countries where people trusted information from the government such as the USA and The Netherlands, people were less concerned about eating beef. However in Germany, where people did not trust the information from the government consumers were very concerned about beef consumption and sales figures reflected this concern. This concern was not related to the actual risk of contracting the disease because this risk was seen as constant in all three countries (Wansink, 2004).

Putting the risk of food poisoning into perspective and increasing consumer trust in food chain actors appear to be two particularly important factors in changing consumer attitudes towards food safety. Communication and education strategies should include information about the structure of the food safety system and what the government can and cannot do to ensure safe food supply. As previously addressed in this paper attitudes do not necessarily imply behavioral change however once a positive attitude has been formed in consumers minds it may influence the further formation of other attitude dimensions – cognitive, affective and/or behavioral.

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