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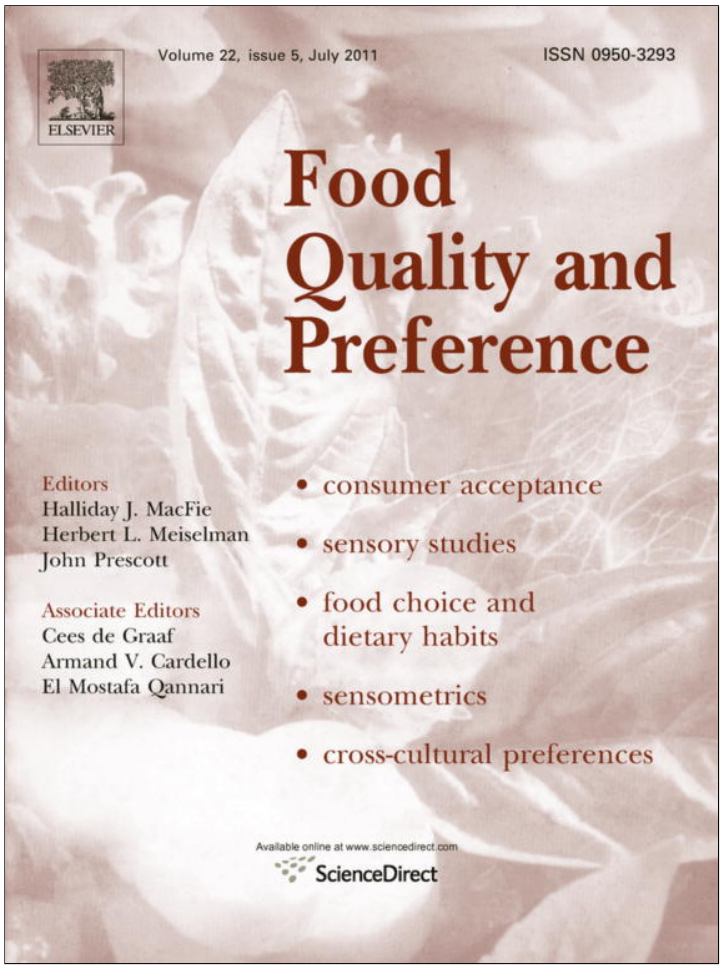

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Uncovering the mind-sets of consumers towards food safety messages

Aurora A. Saulo [a,*], Howard R. Moskowitz [b]

[a] University of Hawaii at Manoa, 3190 Maile Way, St. John 102, Honolulu, HI 96822, USA
[b] Moskowitz Jacobs, Inc., 1025 Westchester Avenue, White Plains, NY 10604, USA

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ABSTRACT

Knowing the specific characteristics which trigger a strong sense of safe versus unsafe allows risk communicators to reach consumers effectively with targeted messages. Using experimental design of ideas and conjoint measurement, we assessed consumer interest in and perceived safety of food characteristics that consumers think to be important when they make a purchase decision. The study identified the specific characteristics and the associated phrasing. The data generate a database by which we understand the perceptions of risk. In turn the database shows how these risk perceptions vary by conventional subgroups (age, gender, ethnicity), and by different mind-sets that exist in the population. The results combine insights about acceptance with insights about safety, answering questions that could not have been previously addressed in this efficient, quantitative way. The study is the first in a series designed to create a large-scale database of safety for food, beverage, and eating situation, based on the perceptions of consumers. The study opens up a new area for consumer understanding dealing with the perception of intangible topics including safety, compliance, and 'good-for-you'.

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1. Introduction

Although there is an abundance of information on food and nutrition, different ideologies are at play, and different criteria for scientific truth often conflict and coexist. As a result, the advice that emerges about food and nutrition all too often confuses the public, and discourages them from making important nutrition-related decisions (Painter, Prisecaru, & North, 2003). When the topic changes to food safety we find a similar wealth of messages but also effectively, paralysis. Despite the plethora of messages, the number of cases of foodborne illness in the United States as estimated by Mead et al. (1999) remains of public health concern.

We focus in this paper on one of the two aspects, food safety rather than good-for-you foods. Collins (1997) suggested that risks related to food safety can be traced to changes in demographic and consumer lifestyles. Examples of such changes include the increasing number of women in the workforce, the increasing number of households with single heads, and in the end, less time devoted to the proper handling and treatment of food. There are other factors besides the micro-effects of one's home. The issues can be 'macro' rather than 'micro'. Behrens et al. (2010) added that the global marketing of food, urbanization, and the presence of detrimental environmental factors both co-varied with an increase in food safety risks in both developing and developed countries.

The specific food safety needs, however, remain similar across populations. For example, researchers (e.g., Bednar, Kwon, Baker, & Kennon, 2003) determined that the food safety needs of low-income consumers who were at high-risk of foodborne illness in the United States were personal hygiene (hand washing), cross-contamination, and food preparation practices (handling of infant formula and leftover baby food). In addition to these factors, higher income groups in Sao Paolo, Brazil also considered convenience when purchasing foods. Because the principal food preparer in the home (i.e., the female head of household) generally worked outside the home and she had only limited time to prepare foods, there was some apprehension about the safety of available convenience foods. Although lower income consumers placed price on a higher priority than convenience when purchasing foods, they were similarly doubtful of their safety (Behrens et al., 2010). Overall, the common targets of food safety messages remained personal hygiene (hand washing), adequate cooking, and cross contamination. Proper storage and sources were also identified as key food safety messages but of lesser urgency (Medeiros, Hillers, Kendall, & Mason, 2001).

Knowledge of food safety alone, however, does not ensure compliance with food safety guidelines accepted by the scientific community (Medeiros et al., 2001). One must take into account the individual's history and mind-set. Behaviors deviate from the appropriate norms due to past experience, habit, along with the extra time and effort required to comply (Brennan, McCarthy, & Ritson, 2007). There is also evidence (Frewer, Shepherd, & Sparks, 1994; Parry, Miles, Tridente, Palmer, & South and East Wales

* Corresponding author. Address: University of Hawaii at Manoa, Department of Tropical Plant and Soil Sciences, 3190 Maile Way, St. John 102, Honolulu, Hawaii 96822, USA. Tel.: +1 808 956 6564; fax: +1 808 956 3894.
E-mail address: aurora@hawaii.edu (A.A. Saulo).

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Infectious Disease Group, 2004; Redmond & Griffith, 2003) that the resulting 'risky behavior' is associated with the phenomenon of optimistic bias (McKenna, 1993; Redmond & Griffith, 2004; Weinstein, 1980) or believing that one is likely to be less susceptible to foodborne illness in comparison to other people. For food safety messages to be effective, Medeiros et al. (2001) recommended increasing the awareness of risks and motivating behavioral changes by emphasizing appropriate and effective food safety messages that they identified.

Since it is behavior that has direct consequences for food safety and human health, it is critical that food safety messages be clear and that they drive behavioral changes. In this study, we explored the combination of food attributes that consumers consider to be interesting, including those product attributes that represent food safety to them. We further looked for different consumer mind sets regarding food safety messages. Knowledge of these segments and the effective methods for each segment allowed the creation of messages for these specific mind sets. This targeted information results in increased efficiency, greater precision of content delivery, and therefore, a higher level of effectiveness. This is because food is not only an agricultural product that affects public health, but also because food turns out to a political and emotional issue (Banati, 2003).

2. Rule developing experimentation (RDE)

In the language of experimental design, a product or service may be conceptualized as comprising component attributes (called categories or silos) and levels (called elements). RDE (Moskowitz & Gofman, 2007) is a systematized process that uses experimental design to discover specific interesting or appealing elements from different categories in the same topic area. The topic area may be a product or a service, or even a public policy or healthy policy initiative.

RDE provides a depth of granularity and specificity that dramatically expands the insight from mail surveys and focus groups, changing the information from discussion or survey research to experiment-within-a-survey. The statistical basis for RDE is conjoint analysis, a class of research procedures based in experimental design. RDE tests combinations of the elements, obtains the reaction of respondents to these combinations, and then through regression analysis estimates the part-worth contribution of each element. The elements appear independently of each other.

RDE and conjoint analysis attempt to better simulate the reality of a person's experience, by presenting different elements in many different combinations. (Gofman & Moskowitz, 2010). The numerical value of a part-worth contribution indicates how much is added or how much of the respondent population is interested when the element is inserted into the concept (Moskowitz, Porretta, & Silcher, 2005). Experimental design measures the response to components, but the test stimuli present more natural combinations of elements of the type a person might encounter in an advertisement, or in other aspects of daily life. Furthermore, it becomes very difficult with such combinations, perhaps impossible, to adopt a politically correct stance when assigning the ratings, because too many elements of different types appear in each test stimulus. The respondent is forced to answer at an intuitive level, rather than at considered, intellectualized level with the attendant biases emerging from a desire to *say the right thing* or *please the interviewer*.

Internet-based research was chosen because of the speed by which it reaches a large number of people at a relatively low cost. Unlike mail surveys, the survey remains under the complete control of the consumer researcher and unlike focus groups, this survey costs relatively little to conduct. IdeaMap®.Net technology (Mahanna, Moskowitz, & Lee, 2009) using conjoint analysis was used because it deals with the complexities in nature but removes some of the inherent limitations of conjoint measurement providing a less bias-prone method. IdeaMap®.Net has been used before to understand various brand values and to analyze brand names in concepts (Moskowitz, German, & Saguy, 2005; Moskowitz, Porretta, & Silcher, 2005) the value of sensory experiences (Shofu, Bevolo, Moskowitz, & Moskowitz, 2009), and attitudes and behavior of teens to food and beverages (Foley, Beckley, Ashman, & Moskowitz, 2009). Although RDE has been applied traditionally to products and services, RDE has not been previously used to something abstract or intangible such as food safety. This paper represents the first such application in food policy, which we will call Food Safety RDE.

3. Materials and methods – Food Safety RDE

3.1. Recruiting respondents

Luth Research (San Diego, CA), a recruiting house and field service specializing in online data collection and panel selection, sent an email invitation to approximately 2000 of its panelists who are members of its Survey Savvy Panel. Individuals in Luth's Survey Savvy Panel were members of an opt-in email group that had expressed interest in participating in surveys. The composition was to comprise approximately equal numbers of males and females, and of four ethnic groups (White, Black/African American, Asian, and Hispanic). The email invitation listed the project objectives. Interested panel members who decided to continue with the study needed only to click on the embedded link to go to the actual study. The precise number of survey invitations was not disclosed, because percent completed interviews as a function of invitations sent is considered a trade secret in the consumer research industry.

3.2. Structure of Food Safety RDE

The experimental design utilized in this study comprised six categories or silos which represented different aspects of food safety. The test elements were expressed as short telegraphic statements about food safety messages. The elements were derived from literature search, training sessions, brainstorming, and basic knowledge of food safety. Included with these food safety messages were sound bites or part of the sound bites resulting from the intense efforts since 1997 of the food industry, government, and academia both in the United States and other countries to bring food safety as a focus of the consumer (PFSE, 2010; US Department of Agriculture FSIS, 1997). These sound bites were: "When in doubt, throw it out," "...keep clean...," "Wash hands...," "Refrigerate foods after 2 h at room temperature," "Do not cross contaminate," "Keep hot foods hot and cold foods cold," "Sanitize...," and "Reheat to >165F...".

Listing the six categories or silos and six messages or elements for each silo is the most important up-front part of the exercise, and often takes a while especially among novices to the approach. Several iterations were performed until the silos and the elements per silo were logical and made sense, as shown in Table 1.

3.3. Food safety stimuli using RDE

Food safety is an abstract concept, unlike a service or a food product that is tangible. People can readily characterize food products and even relate to them by memory. By contrast, people do not usually think of food safety unless it is featured in the news or one has a direct experience with foodborne illness. Optimistic bias often leads people to think that foodborne illness only happens to others.

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Table 1
Food Safety RDE matrix showing the categories and elements that represent interesting food safety messages.

Silos and elements	
Category1: Personal beliefs	
A1	You can be confident in the safety of the US food supply…
A2	US has the safest foods in the world…
A3	Safe foods mean… no risk to public safety or public health…
A4	Prevent foodborne illness to stay well…
A5	Kill those harmful bugs…
A6	No food additives or chemicals mean safe food…
Category2: Components of safe food	
B1	Reducing use of pesticides is healthy…
B2	Do not eat foods with food additives…
B3	Safe foods mean no hormones or antibiotics used on animals…
B4	Foods prepared outside the home are not as safe as the foods you prepare yourself…
B5	Minimal and recyclable packaging is used only for safe foods…
B6	Bottled water means safe water…
Category3: Characteristics of safe food	
C1	Foods prepared using sustainable methods are safer…
C2	Locally sourced foods are safer than those from locations further away
C3	Fresh means safe
C4	Green means safe
C5	Safe foods are responsibly produced
C6	Ethical practices are used to produce safe foods
Category4: Food safety issues	
D1	Organic or natural foods are safer to eat
D2	People are scared of biotech foods or GMO…
D3	People stay away from irradiated foods…
D4	Canned foods are safe
D5	There are many ethnic foods and their safety is questionable…
D6	Imported foods are not as safe as our foods prepared in the US…
Category5: Practices to achieve safe food	
E1	Wash hands often
E2	Sanitize kitchen utensils
E3	Always keep clean and the microbes won't win
E4	When in doubt, throw it out
E5	You should use ways to track foods that make you sick…
E6	You need harmonized (same) food regulations around the world…
Category6: Requirements of safe food	
F1	Food handlers with basic sanitation training will prepare safer foods…
F2	When inspected by food inspectors, our foods are safe…
F3	Use the 2-h (not the 5-s) rule…Refrigerate foods after 2 h at room temperature…
F4	Do not cross contaminate–separate raw foods from cooked foods…
F5	Keep hot foods hot (>140 °F) and cold foods cold (<40 °F)…
F6	Reheat to >165 °F before eating foods to be safe…

Instead of asking direct questions, e.g., self-explicated attitudes, RDE prescribes stimulus response (S–R), a different approach derived from experimental psychology. The strategy presents the respondent with statements about situations that might be encountered, and get a numerical scale about the intensity of reaction the situation.

The basic stimuli for an RDE study comprise test concepts or vignettes. These vignettes are created according to experimental design that prescribes the different combinations. Every respondent evaluated 48 different combinations constructed from the 36 elements. Each test vignette comprised one or no element from each of the six silos. No vignette comprised more than four elements so that by design there were always silos absent from the test vignette. This design stratagem eliminates the possibility of multi-collinearity, and allows the elements to appear independently of each other in a statistical sense. This stratagem ensures that it is statistically straightforward to create an equation for each respondent because the elements remain independent of each other (Moskowitz, German, et al., 2005; Moskowitz, Porretta, et al., 2005).

RDE works with a permutation scheme that reduces the bias due to the possibly incorrect selection of combinations at the start of the experiment. The basic experimental design is permuted again for each respondent. Consequently, each respondent evaluates a unique set of 48 combinations. The elements, however, remain the same 36 that were selected at the start of the study for the purposes of investigation.

Respondents rated each vignette on two scales. The first vignette instructed the respondent to evaluate the entire vignette in terms of overall safety, using a 9-point scale.

How safe do you feel the food in this vignette will be?

1 = Not safe at all … 9 = Extremely safe.

The second vignette required the respondent to choose a relative dollar value versus the price one would typically pay. This second rating scale presented the respondents with seven different relative prices, and instructed the respondent to choose one of the prices.

How much would you pay to buy the food described here compared to what you would ordinarily pay?

1 = About 40% less.
2 = About 20% less.
3 = About the same.
4 = About 20% more.
5 = About 40% more.
6 = About 60% more.
7 = About 80% more.

Respondents who agreed to continue with the online study were guided to the Welcome or Orientation Page, marking the beginning of the survey proper. The Orientation Page provided an overview of the study, presented the two rating questions, and informed the respondent that the survey would end with a series of demographic questions and self-profiling questions. Respondents were told that the interview would take approximately 12–15 min.

A sample test vignette for the Food Safety RDE asking the first attribute question is shown on Fig. 1.

After orientation and the evaluation of 48 test vignettes, the third part of the RDE survey was introduced and dealt with the demographics of the respondents, including gender, age group, ethnic background, geographical area of their home, level of education, income before taxes, number of children living at home, marital status, and employment status. These geo-demographic questions were then followed by eleven self-profiling questions that were used to divide respondents into similar groups based on self-explicated attitudes and behaviors. Respondents described themselves on a 3-point scale for these eleven questions:

Does not describe me.
May describe me.
Absolutely describes me.

Table 2 shows the self-profiling questions.

3.4. Data analysis

The 9-point ratings were transformed from the 1–9 rating scale to a binary scale. The recoding from a multi-point category scale to a binary scale follows the convention used by consumer researchers who focus on membership in a group rather than intensity of feeling.

Ratings 1–6 were recoded as 0 for the "*no – not safe group*" denoting low or no perceived level of food safety assigned to the particular vignette that was being rated. Ratings 7–9 were recoded as 100 for the "*yes – is safe group*" denoting moderate or high perceived level of food safety assigned to the particular vignette.

After recoding, and adding a small random number to the rating of each respondent for each vignette (for statistical purposes, to

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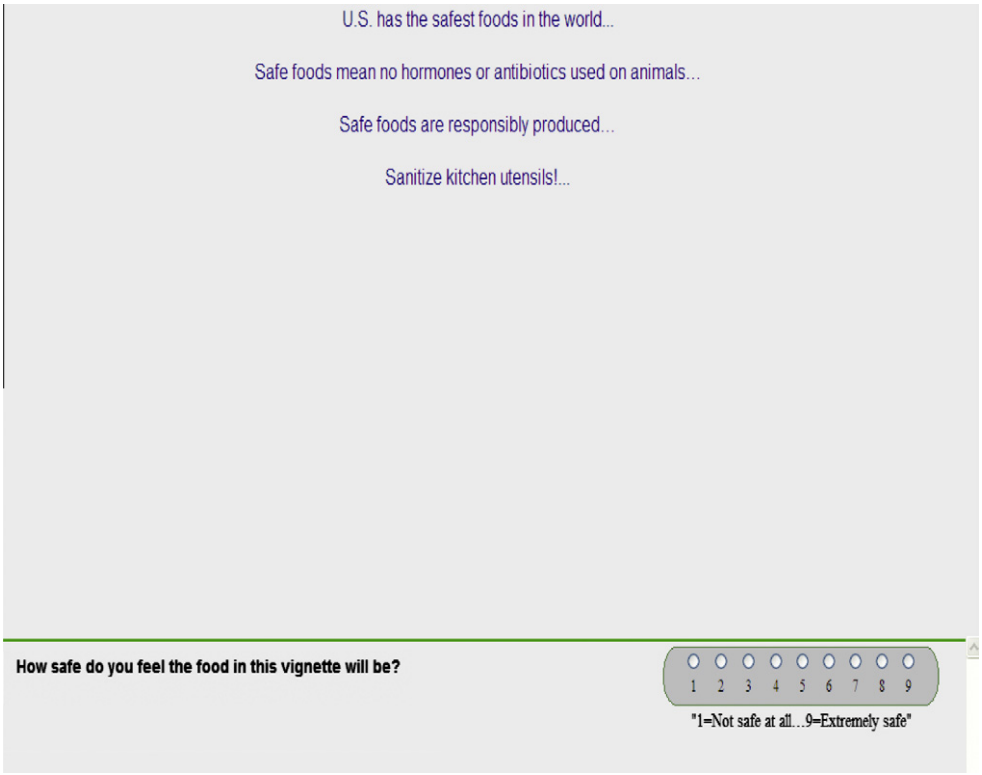

Fig. 1. A test vignette for the Food Safety RDE. The same message combinations will appear next, ending with the second attribute question on economic evaluation.

Table 2
The 11 self-profiling questions asked in the classification portion of the RDE interview.

I'm usually among the first to hear/read about a food safety issue, the most updated among my family/friends/colleagues...
I usually notify/bring up-to-date my family/friends/colleagues on current food safety issues...
I always obey the rules of good food safety practices...The foods I prepare don't make people sick
I try to eat out less often...Foods I don't prepare are likely to make me sick
I have not experienced any food safety-related issues. I don't get sick, so why bother ...
Food safety messages are just not interesting to me...I'm not at all influenced by food safety messages
Food safety messages definitely concern me...I like to stay healthy!
My mom taught me everything I should know about food safety...I don't get sick
Food safety messages don't concern me any longer...I carry and use sanitizing lotion all the time now
There are food safety problems because of chemicals people use on our foods
I wish food safety experts would deliver the same food safety messages...I find conflicting messages confusing and don't know which ones to follow

prevent crashing), the ratings for each respondent were subjected to ordinary least squares regression (OLS) that created a standard equation. Each equation comprised an additive constant and 36 coefficients, with one coefficient for each of the 36 elements.

OLS generated two equations for the ratings of each respondent. For the Persuasion Model (used for segmentation), the coefficients showed the number of rating points that would be traced to the particular element. The additive constant corresponded to the estimated number of rating points that a vignette would achieve without any elements.

For the Interest Model (run on the ratings transformed to the binary 0/100), the coefficients showed the conditional probability of a vignette being rated 7–9 (yes-is-safe) when the element was incorporated into the vignette. The additive constant for the Interest Model was the conditional probability of a vignette being rated 7–9 in the absence of any elements, and was a purely estimated parameter that can be used as a baseline value.

The selection of relative dollar value generated a third dependent variable, relative dollar value. Relative dollar values were assigned to the answers to the second attribute question about economic evaluation of the safety of the food. The rating "1 = About 40% less" became 60, i.e., 100–40; "3 = About the same" became 100; "5 = About 40% more" was recoded as 140, and so on. The recoded 140 meant that the respondent was willing to pay 40% more than she/he ordinarily would for a food. The relative dollar model was generated for the full data from each key subgroup, rather than being generated on a respondent by respondent basis, although it could have been generated that way.

4. Results and discussion

4.1. The panel

The total panel comprised of 239 respondents with 122 males and 117 females. We defined three different age groups in our total panel:<39 years, 39–52 years, and >52 years, respectively. The panel consisted of 62 Whites, 62 Black/African-Americans, 58 Asians, and 56 Hispanics.

4.2. Interest model

OLS was used to relate the presence/absence of the elements to the ratings. The average of the additive constants across all the respondents was 36 for the total panel; i.e., 36% of the respondents would be estimated to rate the vignette as 'safe' (i.e., rating of 7–9) without any of the elements introduced.

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Table 3
Impact, i.e., utility or coefficient values for perceived safety (Interest Model) and for relative price that one would pay (n = 239). The elements are sorted by the model for interest (total panel).

		Total panel interest model (safe)	Total panel relative price model (% vs regular)
	Additive constant (intercept of the model, baseline)	36	112
E2	Sanitize kitchen utensils…	**9**	3
F4	Do not cross contaminate–separate raw foods from cooked foods…	**8**	2
C2	Locally sourced foods are safer than those from locations further away…	7	1
C5	Safe foods are responsibly produced…	5	1
F6	Reheat to > 165F before eating foods to be safe…	5	1
D1	Organic or natural foods are safer to eat…	4	3
E6	You need harmonized (same) food regulations around the world…	4	1
E4	When in doubt, throw it out…	4	2
E3	Always keep clean and the microbes won't win…	4	2
F5	Keep hot foods hot (>140 °F) and cold foods cold (<40 °F)…	3	2
F2	When inspected by food inspectors, our foods are safe…	3	0
E5	You should use ways to track foods that make you sick…	3	1
C3	Fresh means safe…	2	1
A3	Safe foods mean… no risk to public safety or public health…	2	2
E1	Wash hands often…	2	3
A2	U.S. has the safest foods in the world…	2	1
C1	Foods prepared using sustainable methods are safer…	2	0
B1	Reducing use of pesticides is healthy…	2	2
C4	Green means safe…	1	0
B3	Safe foods mean no hormones or antibiotics used on animals…	1	1
A4	Prevent foodborne illness to stay well…	1	0
B2	Don't eat foods with food additives…	1	−1
F3	Use the 2-h (not the 5-s) rule…Refrigerate foods after 2 h at room temperature…	0	−2
A6	No food additives or chemicals mean safe food…	0	2
A5	Kill those harmful bugs…	−1	−2
F1	Food handlers with basic sanitation training will prepare safer foods…	−1	0
B4	Foods prepared outside the home are not as safe as the foods you prepare yourself…	−1	0
A1	You can be confident in the safety of the US food supply…	−2	1
C6	Ethical practices are used to produce safe foods…	−2	0
D6	Imported foods are not as safe as our foods prepared in the US…	−2	−2
B6	Bottled water means safe water…	−2	0
D3	People stay away from irradiated foods…	−2	0
B5	Minimal and recyclable packaging is used only for safe foods…	−3	0
D4	Canned foods are safe…	−3	−2
D2	People are scared of biotech foods or GMO…	−3	−3
D5	There are many ethnic foods and their safety is questionable…	−10	−5

We arranged the elements with impact values in decreasing order, i.e., the strongest performers were at the top (Table 3). The category numbers (i.e., A1–A6, B1–B6,…, F1–F6) were retained to aid the reader in tracking the elements in the discussion. Most of the elements introduced in the vignette generated positive impact values, meaning that the respondents perceived the element to add perceived safety to the vignette when the element was introduced. Realistically, only those elements with impact values of 8 and higher may be considered as influencing the respondent's perception of food safety. The cutoff of 8 was made based upon the mean square error of the analysis of variance, suggesting that the differences of 8 or more would be statistically significant at the 95% confidence level.

Elements with high coefficients in the Interest Model drive perceived food safety beyond the percent estimated by the additive constant (baseline). Thus, the addition of the element "Sanitize kitchen utensils!" (E2) was perceived by 45% (36 + 9) of the respondents as safe.

A few elements generated negative impact values; i.e., these elements reduced the probability that a vignette about food would receive a rating of 7–9 when evaluated on expected safety. These were elements dealing with GMO (D2) and irradiated foods (D3). Irradiated foods marginally decreased the number of respondents perceiving those as safe to 34% (36–2) whereas GMO foods further decreased the population size to 33%. The reduction in perceived safety may be due to the negative connotations of both irradiation and GMO. However the effect was very small.

The utility values from the conjoint analysis show the additive percent of respondents who would rate the element communicating 'safe.' The data suggest that reheating foods to a level dictated by science-based recommendation (F6) is perceived to generate foods just as safe as responsibly produced foods (C5). Fresh foods (C3) and foods prepared using sustainable methods (C1) were perceived to be just as safe as when food handlers washed their hands (E1) during food preparation.

When it comes to the nature of food, organic or natural foods (D1) were perceived to be safe when hygienic procedures (E3) were followed in food preparation. The perceived safety of a food increased when associated with the rising social food trends of organic foods, natural foods, fresh foods, and sustainability (ElAmin, 2006).

Respondents were generally not confident regarding the safety of the US food supply (A1), nor did they agree that ethical practices (C3) were used in producing safe foods. As noted above, respondents questioned the safety of irradiated foods. Respondents further questioned the safety of bottled water (B6). These latter results reflected prevailing consumer attitudes that the safety concerns related to the use of plastic packaging for bottled water included the leaching of chemicals to the water and harmful impact on the environment from leaching (American Chemistry Council, 2010).

Finally, respondents also considered canned (D4), biotech (D2), and GMO foods (D2) as offering the same level of safety, but still generally felt that organic and natural foods (D1) were safer to

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eat. Respondents overwhelmingly disagreed with the proposition that ethnic foods (D5, D6) entail more food safety concerns than did other foods. This finding suggests that consumers have accepted the global nature of foods today.

4.3. The relative price that food safety might command

Consumers know the difference between what they want and what they are willing to pay (Behrens et al., 2010; Moskowitz & Gofman, 2007). Just because a food is perceived as safe will not mean that the consumer will be willing to pay more. The economics of a product versus its health and safety is not necessarily considered by consumers to be identical. It is a matter of experimentation to determine how these two factors are separately driven by the elements in a vignette.

The right-most data column of Table 3 shows the relative price that the respondents would pay for foods presented in the vignette. The additive constant was obtained by regression analysis. Since the relative price was anchored at '100' for 'the same price,' the additive constant of 112 meant that on the average the respondents would pay an additional 12% premium when the product was positioned as 'safe.' This additive constant stemmed from some of the expectations respondents had going into the evaluation, as well as what they felt was the case from the orientation page.

Beyond the additive constant is the additional incremental or decremental contribution of each of the 36 elements. The highest additional price was 3%, such that overall the highest additional price would be the sum of the additive constant and this element (sanitize kitchen utensils; impact = +3%, total = 112 + 3 = 115). The lowest additional price was -5% (There are many ethnic foods and their safety is questionable), making the sum 107, i.e., 112–5%. It is clear from the table that the price range for food safety is fairly narrow. A lot of the incremental pricing (112% in contrast to the normal 100%) was done by the general positioning of a safe food. There was very little else of a particular nature that any element really contributed.

Respondents regarded organic or natural foods (D1) as generally safer than other foods. In terms of their willingness to pay, respondents would pay 15% more (112 + 3) for organic or natural foods, just as they would pay for foods prepared with sanitized kitchen utensils (E2) or washed hands (E1). Again, the additive constant did all the work; the actual contribution of the element itself was minor, namely an additional 3% over the 112% baseline.

Reduced use of pesticides (B1) on food was perceived as healthful, and of no risk to public safety or health. Thus, respondents would pay 14% more for such foods just as they would pay for foods prepared under science-based procedures and recommendations. Examples of such procedures and recommendations are no cross-contamination (F4), holding foods outside the danger zone (F5, F6), and practicing hygienic procedures (E1, E2, E3). Respondents would further pay 10% more for canned foods (D4) just as they would pay for foods stored safely at room temperature (F3) and foods without pathogenic microorganisms (A5, D4 which include commercially sterile canned foods).

Respondents said that they would pay 10% more for imported foods (D6) and 7% more for ethnic foods (D5). It is important to keep in mind that these estimated amounts emerged from responses to compound mixtures, so that respondents could not consciously 'game the system' in terms of amount paid. Such impossibility of being consistent at a conscious level made another finding more compelling. That is, that although respondents have earlier indicated their reluctance to use biotech or GMO foods (D2), they surprisingly would pay 9% more for these foods.

4.4. Differences between genders

Genders clearly differed in their predisposition to call a food safe, as shown in Table 4. The additive constant for women was 50; i.e., one out of two women perceived a food as safe even without any elements presented. On the other hand, the additive constant for males was 22 indicating that in the absence of element; only approximately one of every five men would consider a food safe.

The strong performing elements differed across genders. Females found it important to take control of the safety of their foods as soon as they handled the food, that is, during purchase. Nothing else seemed to be more or even just as important to the females as personal control of food safety achieved by avoiding cross-contamination. Almost 60% (50 + 9) of the female respondents considered foods that "Do not cross contaminate…" (F4) as safer than those prepared with "Sanitize(d) kitchen utensils…" (E2) or those from "Locally sourced foods…" (C2, 56%).

Males distributed their modest levels of trust (as indicated by low impact values) among various elements (experts, messages, social trends, popular press, the Internet, and personal actions). For men, the elements driving food safety were the food safety messages or sound bites featured in the popular press and those that would be most likely repeated to them by family and friends. These messages included temperature–time abuse (E3, E4, F4, F5: the danger zone, proper reheating, correct storage and sources), personal hygiene (E2, E3: cleaning, sanitizing), and cross contamination (F4). Food inspection (F2) and harmonized food regulations (E6) also increased their perception of food safety. Males tended to depend on the expertise of others, such as the food producer, food inspectors, or food handlers, to control the safety of their food.

Table 4
Impact values of elements that drive food safety among males and females.

		Total	Male	Female
	Base Size	239	122	117
	Additive constant (intercept of the model, baseline)	36	22	50
Men consider safe				
E2	Sanitize kitchen utensils…	**9**	**11**	6
F2	When inspected by food inspectors, our foods are safe…	3	**10**	−5
C2	Locally sourced foods are safer than those from locations further away…	7	**9**	6
E4	When in doubt, throw it out…	4	**9**	−2
F5	Keep hot foods hot (>140F) and cold foods cold (<40F)…	3	**9**	−3
F4	Do not cross contaminate–separate raw foods from cooked foods…	**8**	8	**9**
F6	Reheat to >165 °F before eating foods to be safe…	5	**8**	1
E3	Always keep clean and the microbes won't win…	4	8	0
E6	You need harmonized (same) food regulations around the world…	4	**8**	0
Women consider safe				
F4	Do not cross contaminate – separate raw foods from cooked foods…	**8**	8	**9**

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Only about one-third (22 + 11) of the male respondents considered food with the element "Sanitize kitchen utensils..." (E2) as safe, although it is a science-based recommendation used to control food safety. This was probably because sanitizing action would be executed by them and not by the experts on whom they typically relied.

Men and women thus differed dramatically in what they considered to be food safety. Female respondents recognized their personal responsibility in the safety of the food they ate. They trusted the US system to deliver safe foods, would purchase foods that they considered safe, and would handle the foods safely. On the other hand, although male respondents relied on various sources for the safety of their food, they remained cynical about those sources to deliver safe foods.

4.5. Differences among age groups

We defined three different age groups in our total panel of 239 respondents:<39 years, 39–52 years, and >52 years, respectively. These three ranges produce sufficient respondents in each group to generate stable estimates of impact values. Based on their answers in the self-profiling questionnaire, most respondents had children living at home. Table 5 lists the high scoring elements with impacts of 8 or higher, i.e., elements that drive the perception of safe food.

When dealing with issues of food safety, the youngest group is fact-oriented and communication-sensitive. Since the additive constant is low (22), the elements had to do the convincing and the work of communicating food safety. This low predilection to food safety differed from that of the other two age groups. These younger respondents regarded social trends in foods as significant contributors to safe foods; i.e., organic foods or natural foods (D1; constant + element impact = 33%), socially responsible producers (C5; 32%), and green methods that protect the environment (C4; 31%). These respondents were aware of the need for a global harmonization of food regulations (E6; 35%) as important to safe foods. They responded positively to well-publicized and long-running food safety sound bites (E2, E3, E4, F4) of the US federal agencies (USDA, 1997), including "Always keep clean...," "Do not cross contaminate...," "When in doubt, throw it out...," and "Sanitize kitchen utensils..." Their perception of food safety was a product of what the popular press discriminated for them as important. This supports current knowledge that most consumers obtain their information regarding foods and nutrition including food safety, from newspapers, consumer magazines, radio, television, the Internet, and families and friends (Lang, O'Neill, & Hallman, 2003). Similar to males who had low predilection to food safety, this younger group of respondents relied on various elements, such as social trends, policy makers and regulators, popular press, and food sound bites, to enhance their perception of food safety.

For the middle group with ages 39–52, self-reliance was critical. Almost one-half (47%) of the respondents with ages 39–52 years felt the foods described by the vignette to be safe, even without elements. This predisposition from the high additive constant of 47 was more than twice the magnitude found for the younger respondents above. The elements actually did not do very much at all. The only element to really make an impression was "Sanitize kitchen utensils..." (E2). It was important for this middle group to rely on themselves to execute an action, i.e., sanitizing, to ensure the safety of their foods. This element convinced an additional 11% of the respondents to rate the vignette as describing a safe food.

For the older respondents beyond 52 years old, about 40% considered foods as safe without any elements introduced. This older group was intermediate in their basic predilection to call a food safe without any information; the youngest group showed an additive constant of 22 and the middle group an additive constant of 47. The issue for this older group revolved around self-reliance and the reliance on one's immediate community for the safety of their foods. This group felt that locally sourced food (C2) is safer. Compared to the younger respondents, these "localvores" or "locavores" or "locatarians" (Bennett, 2007) probably have had more worldly experience through travel and might also have experienced more cases of foodborne illness while away from home, making them more discriminating about the source of their food. Currently, local foods do not only mean foods grown and sold within 100 miles from one's home but also foods supportive of one's community, free roaming poultry, grass-fed cattle, and animals that are locally slaughtered "with dignity and respect" (Nutritalk, 2009). The only other element that was important to this older group was the message "Do not cross contaminate..." (F4) which 49% of those >52 years perceived as contributing to food safety. This older group of respondents would purchase locally grown foods that they also probably inferred to mean as being less contaminated than foods grown elsewhere. This may reflect of their awareness that the immune system becomes increasingly compromised with increasing age.

4.6. Differences among ethnic groups

Table 6 shows the high scoring elements with impact values of 8 or higher for the four ethnic groups of approximately 25% of the respondents in each group. When arranged in order of increasing values, the additive constants (predilection to call a food safe)

Table 5
Impact values of elements that drive food safety among respondents of different ages.

		Total	Age < 39 years	Age 39–52 years	Age > 52 years
	Base Size	239	87	75	79
	Additive constant	36	22	47	40
Age under 39 consider safe					
E6	You need harmonized (same) food regulations around the world...	4	**13**	−1	1
E3	Always keep clean and the microbes won't win...	4	**11**	0	0
D1	Organic or natural foods are safer to eat...	4	**11**	1	1
C5	Safe foods are responsibly produced...	5	**10**	−1	4
F4	Do not cross contaminate–separate raw foods from cooked foods...	**8**	**10**	6	**9**
C4	Green means safe...	1	**9**	-8	2
E4	When in doubt, throw it out...	4	**9**	6	-3
E2	Sanitize kitchen utensils...	**9**	**9**	**11**	6
Age 39–52 consider safe					
E2	Sanitize kitchen utensils...	**9**	**9**	**11**	6
Age 53 + consider safe					
C2	Locally sourced foods are safer than those from locations further away...	7	6	4	**12**
F4	Do not cross contaminate–separate raw foods from cooked foods...	**8**	**10**	6	**9**

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Table 6
Impact values of elements that drive food safety for four ethnic groups.

		Total	White	Black/African American	Asian	Hispanic
	Base Size	239	62	62	58	56
	Additive constant	36	21	30	35	56
Most safe – according to Whites						
E2	Sanitize kitchen utensils…	**9**	**13**	8	5	**9**
F6	Reheat to >165 °F before eating foods to be safe…	5	**12**	-2	6	3
D1	Organic or natural foods are safer to eat…	4	**11**	**9**	5	-9
C1	Foods prepared using sustainable methods are safer…	2	**11**	2	−4	−2
E4	When in doubt, throw it out…	4	**11**	5	−2	0
F4	Do not cross contaminate–separate raw foods from cooked foods…	**8**	**10**	**12**	8	4
C2	Locally sourced foods are safer than those from locations further away…	7	**9**	7	**11**	3
E6	You need harmonized (same) food regulations around the world…	4	**9**	5	−3	6
B1	Reducing use of pesticides is healthy…	2	**9**	4	0	−7
B5	Minimal and recyclable packaging is used only for safe foods…	−3	**9**	-2	0	−17
Most safe – according to Black/African American						
A3	Safe foods mean… no risk to public safety or public health…	2	3	**13**	−1	−7
F4	Do not cross contaminate–separate raw foods from cooked foods…	**8**	**10**	**12**	8	4
F2	When inspected by food inspectors, our foods are safe…	3	0	**12**	-1	1
C5	Safe foods are responsibly produced…	5	4	**10**	6	−2
D1	Organic or natural foods are safer to eat…	4	**11**	**9**	5	−9
E1	Wash hands often…	2	1	**9**	1	−2
Most safe – according to Asians						
C2	Locally sourced foods are safer than those from locations further away…	7	**9**	7	**11**	3
Most safe – according to Hispanics						
E2	Sanitize kitchen utensils…	**9**	**13**	8	5	**9**

showed dramatic differences. Whites generated the lowest additive constant (21), followed by the Black/African-American (30), Asian (35), and finally Hispanic (56). This order suggested that in the absence of qualifying information Whites believed the least and Hispanics believed the most, that their food was safe.

Just as in the case of males and the younger respondents <39 years, Whites were influenced by many elements, such as science-based food safety sound bites (F6, E4, F4, E3: "Reheat to >1650F…," "When in doubt, throw it out…," "Do not cross contaminate…," and "Sanitize kitchen utensils…"). Whites also felt that the social trends of organic and natural foods (D1), sustainability (C1), local foods (C2), harmonization (E6), reduced pesticides (B1), and recycling (B5) were able to drive food safety.

The Black/African American group considered proper hygiene to drive food safety. They were the only ethnic group who considered hand washing (E1) to be important for food safety. Furthermore, they were the only ethnic group that considered an authority or implied authority or public figure to define good food handling practices that would drive food safety (A3, F4, F2, C5, D1: "Safe foods…no risk to public safety or public health…," "Do not cross contaminate…," "When inspected by food inspectors…," "…responsibly produced…," and "Organic or natural foods…").

In terms of food safety, the Asians were "localvores," believing that local foods (C5) delivered safe foods. Although this may be a rising social trend in the US, many Asians still obtain their foods from markets within the communities where they reside. Many Asians have merchants as their personal shoppers. They have patronized some of these merchants for many years, sometime lifetimes, and in turn these personal shoppers remember the personal preferences of their clients and set aside those choices for the days when they shopped. The ensuing strong bond with their merchants reinforces their trust that the foods they purchase are safe. Thus the '"localvore" nature of food safety among Asians should not be surprising, and now seems consistent with what we know of Asian food habits.

The Hispanic group felt that the most important driver of food safety was to ensure that the cooking and eating implements they used were sanitized (E2). Hispanics were more particular than the Black/African American group in their choice of proper hygienic practices that would ensure the safety of their foods.

4.7. The additive constant reveals predilection to believe in food safety

We used ordinary least squares regression to generate the additive constants for each individual, and then averaged these constants across groups. These groups varied on specific, self-profiling criteria: gender, age, ethnicity, residence area, education level, household income, number of children in the home, marital status, employment status, and the 11 self-profiling classifications. We then eliminated groups of respondents comprising fewer than 20 respondents, since their averages were deemed to be unstable. The remaining groups generated additive constants that told us their likelihood to feel that a food is 'safe' without any qualifying information. This means that the additive constant for the group gives us a sense of their predilection to call a food safe, i.e., it becomes a baseline likelihood. The standard error is 13 for the additive constant.

The tabulated additive constants are shown in Table 7. The panel of 239 respondents generated an additive constant of 36. We operationally defined 36 ± 13 as the limits to define 'typical,' based on previous (unpublished) analyses of additive constants in a variety of different RDE studies. A group whose constant was above 49 (36 + 13) was defined to be more likely to accept a food as safe without information ('accepting'). A group whose constant was below 23 (36–13) was defined to be less likely to accept a food without information ('suspicious'). We signaled with **** in the appropriate columns those additive constants that were low and high.

Table 7 shows a number of groups who were suspicious of the safety of their foods, at least on the average. These suspicious respondents, with low predilections to call a food safe, were typically male, younger (<38 years), White, not living on the West coast, have completed graduate/post graduate studies, with a household income of $125,000 or more, separated or divorced, working full-time, not interested in current food safety issues,

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Table 7
Predilection to Food safety: The additive constants for the perceived food safety of different groups.

		Additive constant	Base size	Low constant	High constant
	Total Sample	36	239		
Gender	Male	22	122	*****	
Gender	Female	50	117		*****
Age	18–29	23	57	*****	
Age	30–38	21	28	*****	
Age	39–44	53	35		*****
Ethnic	White/Caucasian	21	62	*****	
Ethnic	Hispanic/Latino	56	56		*****
Market	Pacific States (WA, OR, CA, AK, HI)	68	64		*****
Education	Completed high school	50	29		*****
Education	Some college less than 2 years	58	59		*****
Education	Completed graduate/post graduate	4	37	*****	
Income	$40,000–49,999	72	23		*****
Income	$75,000–99,999	53	36		*****
Income	$125,000 and over	21	27	*****	
Marital	Separated/divorced	10	27	*****	
Work	Working full-time	21	112	*****	
Work	Retired	58	37		*****
	It absolutely describes me	55	50		*****
I usually notify/bring up-to-date my family/friends/colleagues on current food safety issues …	Does not describe me…	10	45	*****	
	It absolutely describes me…	56	77		*****
	It absolutely describes me…	38	152		
I try to eat out less often…Foods I don't prepare are likely to make me sick	Does not describe me…	22	96	*****	
	It absolutely describes me…	52	50		*****
Food safety messages don't concern me any longer…I carry and use sanitizing lotion all the time now	Does not describe me…	32	138		
	It may describe me…	35	79		
	It absolutely describes me…	59	22		*****
There are food safety problems because of chemicals people use on our foods	Does not describe me…	9	31	*****	
	It may describe me…	33	143		
	It absolutely describes me…	55	65		*****

*****designates an additive constant that is low (i.e., low predilection to food safety) or high (i.e., high predilection to food safety) in the absence of elements.

did not restrict eating out, and did not believe that chemicals made foods unsafe.

By contrast, several groups were accepting, i.e., they had a basic predilection to call a food safe even without any of the elements helping the food in the test vignette. These groups comprised females, 39–44 years old, Hispanics, living on the West coast, have completed high school and perhaps attended up to two years of college, with a household income of $40,000–49,999 or $75,000–99,999, and in some cases, retired.

The accepting group reported certain patterns of attitudes. They generally liked food safety sound bites and believed them, practiced proper food handling procedures like a Sanitarian, were current food events junkie being the first to know about food safety issues, usually notified others on current food safety issues, and were generally not concerned because they carried a hand sanitizer. Those who were more likely to call a food safe were those who have accepted their personal responsibility in selecting such foods by consciously making choices during purchasing, storing, and consumption.

4.8. Mind-set segmentation regarding safety

Moving beyond conventional subgroups, one can identify different segments in the respondents by clustering respondents on the basis of elements that drive perceived food safety. This segmentation works at the granular level of actual responses to vignettes dealing with food safety, rather than dividing people by more general variables such as self-explicated attitudes towards food.

The individual-level Persuasion Model relating the presence/absence of the 36 elements to the 9-point ratings provides the necessary information to divide the respondents by the pattern of their impact values. All 36 impact values were used for segmentation, based upon hierarchical clustering (Systat, 2007). The clustering algorithm generated solutions comprising two segments, then three segments, then four segments, respectively. The 2-segment solution did not yield clear descriptions of the segmented mind-sets and was difficult to interpret. The 3-segment solution made more sense, and was chosen in the interests of both interpretability (i.e., the segments 'made sense') and parsimony (i.e., there were as few segments as possible, but the individual segments were still interpretable).

Those elements generating impact values greater than +8, or less than −8, were treated as the key elements. The commonality among the high performing elements (impact >+ 8) suggested the name of the segment. Table 8 shows these three consumer segments.

Segment 1 comprised 104 respondents, with an additive constant of 45. This additive constant (45) meant that about half of the respondents in Segment 1 would call a food safe without any specific elements. Respondents in Segment 1 reacted positively to the well-publicized sound bites on food safety from the private–public partnership of organizations (E2, E4, E3: "Sanitize

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Table 8
The three different consumer mind-sets for food safety.

		Total	Seg1	Seg2	Seg3
	Base size	239	104	102	33
	Additive constant	36	45	24	44
Segment 1 of 3 – Sound Bites R Us					
E2	Sanitize kitchen utensils…	**9**	**18**	−2	**13**
E6	You need harmonized (same) food regulations around the world…	4	**11**	−1	−1
E4	When in doubt, throw it out…	4	**11**	−1	−3
E5	You should use ways to track foods that make you sick…	3	**10**	−4	−1
E3	Always keep clean and the microbes won't win…	4	**10**	−2	3
C2	Locally sourced foods are safer than those from locations further away…	7	**8**	7	5
E1	Wash hands often…	2	6	−1	−2
F3	*Use the 2-h (not the 5-s) rule…Refrigerate foods after 2 h at room temperature…*	*0*	*−11*	***12***	*1*
F1	*Food handlers with basic sanitation training will prepare safer foods…*	*−1*	*−17*	***15***	*2*
Segment 2 of 3 – The Techno-lover					
F4	Do not cross contaminate–separate raw foods from cooked foods…	**8**	3	**16**	2
F1	Food handlers with basic sanitation training will prepare safer foods…	−1	−17	**15**	2
F6	Reheat to > 165F before eating foods to be safe…	5	−8	**14**	**13**
F5	Keep hot foods hot (>140F) and cold foods cold (<40F)…	3	−7	**14**	3
C3	Fresh means safe…	2	−3	**12**	−14
F2	When inspected by food inspectors, our foods are safe…	3	−7	**12**	6
F3	Use the 2-h (not the 5-s) rule…Refrigerate foods after 2 h at room temperature…	0	−11	**12**	1
C4	Green means safe…	1	−3	**9**	−6
C5	Safe foods are responsibly produced…	5	5	**8**	−6
D2	*People are scared of biotech foods or GMO…*	*−3*	*1*	*−12*	***9***
D5	*There are many ethnic foods and their safety is questionable…*	*−10*	*−9*	*−16*	***9***
Segment 3 of 3 – The Socially Influenced Cynic					
E2	Sanitize kitchen utensils…	**9**	**18**	−2	**13**
F6	Reheat to > 165F before eating foods to be safe…	5	−8	**14**	**13**
D3	People stay away from irradiated foods…	−2	−8	−2	**13**
D1	Organic or natural foods are safer to eat…	4	4	3	**10**
B2	Don't eat foods with food additives…	1	−7	5	**9**
D5	There are many ethnic foods and their safety is questionable.	−10	−9	−16	**9**
D2	People are scared of biotech foods or GMO…	−3	1	−12	**9**
D4	Canned foods are safe…	−3	−4	−5	**9**
A6	*No food additives or chemicals mean safe food…*	*0*	*−5*	*7*	*−10*
B1	*Reducing use of pesticides is healthy…*	*2*	*4*	*4*	*−11*
C6	*Ethical practices are used to produce safe foods…*	*−2*	*−6*	*5*	*−12*
A2	*US has the safest foods in the world…*	*2*	*6*	*2*	*−12*
C3	*Fresh means safe…*	*2*	*−3*	***12***	*−14*
A1	*You can be confident in the safety of the US food supply…*	*−2*	*−5*	*5*	*−14*

kitchen utensils…," When in doubt, throw it out…," and "Always keep clean…"). Because of their affinity for these sound bites, we named Segment 1 "Sound Bites R Us."

Segment 2 comprised 102 respondents, with an additive constant of 22. The additive constant (22) meant that about one-fourth of these individuals perceived foods as safe without any elements introduced into the vignette. They were not as likely to label a food safe until they heard the appropriate information. Segment 2 was influenced only slightly by the social trend of "Green means safe." In addition to being predisposed to similar sound bites as Segment 1 was, Segment 2 preferred sound bites with technical information such as 165 °F, 140 °F, and 2 h at room temperature. Segment 2 may be named "The Techno-lover."

Segment 3 comprised 33 respondents with an additive constant of 44. This additive constant meant that without elements, 44% of them would perceive foods as safe. They were more aware of the social trends in food safety than were respondents in Segment 2. Segment 3 respondents believed that organic, natural, (D1) and canned foods (D4) were safe to eat. They also stayed away from irradiated (D3), biotech, and GMO (D2) foods. They possessed some technical knowledge to know that that absence of food additives or chemicals, freshness, and the reduction of pesticide use did not necessarily produce safe foods. But they remained not confident in the safety of the US food supply and disagreed that the US has the safest foods in the world. Segment 3 tended to be more suspicious of their foods. We named Segment 3 "The Socially Influenced Cynic."

5. Conclusions

We began this study analyzing the role of food safety messages and how consumers responded to them. The objective was to improve the effectiveness of food safety messages when these messages are communicated to consumers. We used IdeaMap®.Net as the web-based conjoint tool to investigate 36 messages about food safety. The messages were divided into six groups or silos, each with six elements. The division is purely for bookkeeping purposes so that mutually contradictory messages do not appear together.

About 36% of the respondents perceived a food as safe even without any element introduced. There were no food safety messages, however, that may be considered to be strong drivers of the perception of food safety. Surprisingly, "Wash hands often…" did not consistently increase respondents' perception of food safety. This was probably due to hand sanitizers that many of them carried and made them feel safe when they used them before handling foods. In terms of price, the respondents would pay a premium of 12% for safe foods. However, and as before, there were no food safety messages that may be considered as truly able to drive the price that one would pay.

On an applied level, results of the study indicated that the USDA, the US FDA, and The Partnership for Food Safety Education appear to have been successful, and their time, effort, and resources were well-spent in food safety communication through well-publicized sound bites. Consumers remembered and believed them. Consumers declared that they followed those messages. Some even retained

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additional technical information. They knew the temperatures and times needed to achieve safe food. Approximately 15% of the population, however, remained suspicious of irradiated foods, GMO, biotech foods, food additives and chemicals, and pesticides. This suspicion reveals itself in the lowered impact values.

To improve consumer's trust and the credibility of the messages in food safety communication, it is recommended that those elements that received very low impact values not be used, either alone or even in combination with other food safety messages. These weak performing elements are:

- The US has the safest foods in the world.
- There are many ethnic foods and their safety is questionable.
- Imported foods are not as safe as our foods prepared in the US.

There were noticeable group differences in the knowledge and belief of the respondents regarding food safety. These differences emerged for various elements when the impact values for elements were compared for groups varying in gender, age, and ethnicity. The strongest differences emerged after mind-set segments were generated. Segmentation generated three distinct mind-set segments, differing from each other in the way they feel about food safety. We named these segments Sound Bites R Us, The Technolover, and The Socially Influenced Cynic. Sound Bites R Us formed the largest mind-set at 104 respondents who believe the long-running and well-publicized food safety sound bites started in 1997 by a partnership of private, government, and academic units, including "Sanitize...," "Clean...," and "Do not cross-contaminate." The Techno-lovers comprised 102 respondents but, in addition to having an affinity to the same food safety sound bites, they preferred those with technical information such as safe food temperatures and times. The smallest mind-set was The Socially Influenced Cynic consisting only of 33 respondents. This group kept up with the social trends and remained suspicious of their foods.

The identification of mind-set segments suggests an emerging opportunity to create messages targeted specifically to the individual mind-set. With that identification made, it then becomes possible to present the respondent with a message of heightened impact because the respondent is in the specific mind-set that reacts strongly to the specific element (i.e., the specific message). Food safety communication may then be effective. Additional studies are necessary to develop specific food safety messages targeted to specific mind-set segments and measure the effectiveness of the delivered food safety messages. It is further recommended to apply the same methodologies employed in this study to various other intangible topics such as misbranding, hunger, food misperceptions, and fear of foods and identify the specific elements that would target the specific mind-set segments effectively.

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References

American Chemistry Council. (2010) Rumor Registry. *PlasticsMythBuster.org*, http://plasticmythbuster.org/Main-Menu/Plastics-Rumor-Registry.aspx (Accessed June 24, 2010).

Banati, D. (2003). The EU and candidate countries: How to cope with food safety policies? *Food Control, 14*, 89–93.

Bednar, C., Kwon, J., Baker, M., & Kennon, L. (2003). Survey of food safety education needs for low-income consumers. *Journal of the American Dietetic Association, 103*(9), 111–112.

Behrens, J. H., Barcellos, M. N., Frewer, L. J., Nunes, T. P., Franco, B. D. G. M., Destro, M. T., et al. (2010). Consumer purchase habits and views on food safety: A Brazilian study. *Food Control, 21*(7), 963–969.

Bennett, D. (July 22, 2007) The localvore's dilemma. *The Boston Globe*, http://www.boston.com/news/globe/ideas/articles/2007/07/22/the_localvores_dilemma/ (Accessed June 24, 2010).

Brennan, M., McCarthy, M., & Ritson, C. (2007). Why do consumers deviate from best microbiological food safety advice? An examination of 'high-risk' consumers on the island of Ireland. *Appetite, 49*(2), 405–418.

Collins, J. E. (1997). Impact of changing consumer lifestyles on the emergence/reemergence of foodborne pathogens. *Emerging Infectious Diseases, 3*(4), 471–479.

ElAmin, A. (January 10, 2006) Roundup: Food packaging innovation driven by social trends. *FOODproductiondaily.com*, http://www.foodproductiondaily.com/Packaging/Roundup-Food-packaging-innovation-driven-by-social-trends (Accessed June 24, 2010).

Foley, M., Beckley, J., Ashman, H., & Moskowitz, H. R. (2009). The mind-set of teens towards food communications revealed by conjoint measurement and multi-food databases. *Appetite, 52*(3), 554–560.

Frewer, L. J., Shepherd, R., & Sparks, P. (1994). The interrelationship between perceived knowledge, control and risk associated with a range of food related hazards targeted at the individual, other people and society. *Journal of Food Safety, 14*, 19–40.

Gofman, A., & Moskowitz, H. R. (2010). Application of isomorphic permuted experimental designs in conjoint analysis. *Journal of Sensory Studies, 25*(1), 127–145 (19).

Lang, J.T., O'Neill, K.M., Hallman, W.K. (2003). Expertise, trust, and communication about food biotechnoloby. *AgbioForum*, 6(4),185–190. http://www.agbioforum.org/v6n4/v6n4a06-lang.htm (Accessed June 25, 2010).

Mahanna, K., Moskowitz, H. R., & Lee, S.-Y. (2009). Assessing consumer expectations for food bars by conjoint analysis. *Journal of Sensory Studies, 24*(6), 851–870.

McKenna, F. P. (1993). It won't happen to me: Unrealistic optimism or illusion of control. *British Journal of Psychology, 84*(1), 39–50.

Mead, P. S., Slutsker, L., Dietz, Vc., Macaig, L. D., Bresee, J. S., & Shapiro, C. (1999). Food-related illness and death in the United States. *Emerging Infectious Diseases, 5*, 607–625.

Medeiros, L. C., Hillers, V. N., Kendall, P. A., & Mason, A. (2001). Food safety education: What should we be teaching to consumers? *Journal of Nutrition Education, 33*(2), 108–113.

Moskowitz, H. R., German, B., & Saguy, I. S. (2005). Unveiling health attitudes and creating good-for-you foods: The genomics metaphor and consumer innovative web-based technologies. *CRC Critical Reviews in Nutrition and Food Science, 45*(3), 191–265.

Moskowitz, H. R., & Gofman, A. (2007). *Selling Blue Elephants: How to make great products that people want BEFORE they even know they want them*. New Jersey: Wharton School of Publishing.

Moskowitz, H.R., Porretta, S., Silcher, M. (2005). *Concept Research in Food Product Design and Development*. Iowa: Blackwell Publishing. http://www3.interscience.wiley.com/cgi-bin/bookhome/117886177?CRETRY=1&SRETRY=0 (Accessed June 22, 2010).

Nutritalk, Inc. (January 27, 2009) Top nine nutrition trends for 2009. *Free Press Release*. http://www.free-press-release.com/news/200901/1233083339.html (Accessed June 24, 2010).

Painter, J.E., Prisecaru, V.I., North, J. (2003) The Starting Point for a Healthy Diet: Where the Popular Diets and Governmental Authorities Agree. *Journal of the American Dietetic Association*, 103(9), A-55

Parry, S. M., Miles, S., Tridente, A., & Palmer, S. R., & South and East Wales Infectious Disease Group. (2004). Differences in perceptions of risk between people who have and have not experienced salmonella food poisoning. *Risk Analysis, 24*(1), 289–299.

The Partnership for Food Safety Education, (PFSE) (2010) Fight BAC™, web page for the partnership. http://www.fightbac.org/component/content/article/2/162-about-us (Accessed January 5, 2011).

Redmond, E. C., & Griffith, C. J. (2003). Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection, 66*(1), 130–161.

Redmond, E. C., & Griffith, C. J. (2004). Consumer perceptions of food safety risk, control and responsibility. *Appetite, 43*(3), 309–313.

Shofu, R., Bevolo, M., Moskowitz, D., Moskowitz, H. (June 2009) *Between Design and Science: Value-measurement of the sensory experience in hotels, and beyond.* Paper presented at the 2009 ESOMAR Fragrance Conference, Cannes, France.

Systat. (2007) *Systat, the system for statistics.* User manual, Version 12. Evanston, IL.

US Department of Agriculture Food Safety and Inspection Service. (1997) Fight BAC™, *The Food Safety Educator*, 2(4), 1.

Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology, 39*(5), 806–820.