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Evaluating Alternatives for Communicating About Food Risk

Abstract

This article describes the development and preliminary evaluation of model materials designed as one-step in helping consumers understand how scientists assess food risk, how that information is used in food safety policy decisions and what individuals can do to protect themselves from residual risks.

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This article describes the development and preliminary evaluation of model materials designed as one step in helping consumers understand how scientists assess food risks, how that information is used in food safety policy decisions, and what individuals can do to protect themselves from residual risks. Focus groups provided feedback on draft materials, and experts reviewed the simplified descriptions of specific food risks to assure consistency with current scientific knowledge. We used pilot tests to examine (1) whether initial factual questions would prompt more learning, and (2) the relative effectiveness of two formats: a paper version similar to typical government pamphlets and an interactive computer version. People learned about food safety from either version. There was little evidence that the "prompting" questions led to more learning, nor did subjects learn more from the computer version. Results suggest that the materials made respondents more comfortable about their own ability to choose and prepare safe food and increased their confidence in actions taken by government and industry.

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Introduction

Experts are increasingly concerned that ordinary consumers worry about the wrong risks (Science, 1990; Stevens, 1991). Food risks are an important example because of trade-offs among nutrition, taste, and safety. Consumer confidence has been shaken by incidents of actual illness (e.g., from *Listeria* in cheese, aldecarb in watermelons) and by reports of potential dangers (e.g., cyanide in grapes, Alar in apples). Citizens have a sense of anxiety about food safety policies and believe that their food choices have become more complicated (Zellner & Degner, 1989; Bord, 1991; Preston et al., 1991).

Experts often lament that if consumers merely understood how risks are estimated and how that information is used in policy decisions, they would have more confidence in the safety of our food supply (Scheuplein, no date). The food industry and government agencies have argued that food is safer than ever, and that the public should accept scientists' statements that minute residues of pesticides and additives are not harmful. This strategy has not worked, even though risk estimates generally support such statements.

It is difficult to communicate risks effectively, especially long-term risks such as those from some pesticides and food additives (Adler & Pittle, 1984; Tversky & Kahneman, 1974; Slovic, 1987; Krimsky & Plough, 1988; Bord et al., 1989). Most people find it difficult to understand small risks. They either tend to ignore some risks entirely (e.g., people who eat raw shellfish from contaminated waters) or to worry a great deal even when scientists' estimates show small risk (e.g., people who refuse to eat produce when pesticides were used in production) (Fisher, et al., 1989). Such evidence is consistent with experts' perceptions that consumers do not understand the size of a particular risk. Thus, one step in achieving convergence of views between experts and consumers is to make sure that they agree about the magnitude of risk estimates.

A second step toward achieving divergence is to help scientists understand the problem as the consumer defines it. Consumer judgments include risk characteristics (called risk qualities by the National Research Council, 1989) that go beyond scientific measures of the magnitude of the risk. For example, consumers tend to judge a risk that is involuntary and dreaded as more serious than the same size risk that is voluntary and not dreaded. Helping consumers understand the science behind the risk estimates, along with helping experts acknowledge and ameliorate risk characteristics, can lead to convergence in their risk judgments.

Our research concentrated on the first step—developing model materials to improve consumers' ability to understand the magnitude of food risks. The sections below describe the design, development, and preliminary evaluation of these materials.

Methods

Designing the materials

The goal was to design materials concentrating on what consumers *want to know* and what they *need to know* for two purposes: (1) Understanding how large risks are (for specific foods) and (2) Understanding how those risks can be reduced by actions in various stages of food production, food processing, and food preparation.

The general adult population might be viewed as the appropriate target audience for such information. However, our model materials were targeted to the subset of English-speaking adults who prepare food at home, especially those who might be reached by Cooperative Extension programs. We wanted to choose example-risks that reflected real-life concerns, while demonstrating how people react to alternative information-delivery methods. For instance, people often judge inorganic risks as more serious than natural risks (Sandman, 1986). This tendency suggested narrowing the range of example risks to naturally occurring toxins, contaminants, and microorganisms, rather than including both natural and inorganic risks.

The research design tests two delivery alternatives: (1) Information pamphlets and (2) An interactive computer program. Experts traditionally have used pamphlets to inform target audiences. The potential for kiosks at super markets, shopping malls, and public libraries made it worth testing whether a computer presentation might be more effective. The most reliable test would minimize the unique features of each delivery alternative, consequently, we made the format and information as similar as possible. Our computer version is incorporated in a program that automatically records responses and the time taken by each respondent (Sawtooth Software, 1989). This program is set up for IBM-compatible systems and can be used on personal computers. The model computer version has no color and only the simplest of graphics. If it turned out to be substantially more effective in pilot testing, we expected that more sophisticated materials could be developed, as well as being converted for use on Macintosh computers.

Testing in the Development Phase

The first few versions of the research included three example foodborne risks: Salmonella in eggs, botulism, and aflatoxin. The materials were reviewed by federal government and university experts for their perspective on what consumers need to know and assurance that the information was consistent with current science.

Two sets of pretests revealed more about what consumers want to know. In the first pretest two focus groups reacted to preliminary pamphlets (Desvousges & Smith, 1988). A total of 23 undergraduate students in an agricultural economics course participated in the focus groups.

Input from the focus groups was used to revise the materials and develop the computer version. In the second pretest 48 Cooperative Extension specialists and agents worked through either the paper version or the computer version. Their responses showed that the materials were too long, so we cut the materials to one example risk: Salmonella in eggs.

Neither set of pretest participants was expected to be representative of the general adult population. However, they provided suggestive input rather than data for analysis.

Pilot Testing

After final revision data for analyzing the materials were collected from three groups (Table 1). The first pilot test group (Rose Society) was selected to be typical of adults whom nutrition educators, especially those in Cooperative Extension, try to reach.

Table 1: Pilot Test Groups

		# of Participants			
Group	Total	Male	Female	Paper Version	Computer Version
Rose Society	34	8	26	21	13
Lancaster	59	0	59	47	12
Personal	23	8	15	0	23
Totals	116	16	100	68	48

Most participants from the Rose Society group were women who had completed high school. More than half were middle-aged or older and lived in suburban neighborhoods. Many expressed conservative and traditional values.

The second group (Lancaster) included women professionals and paraprofessionals engaged in nutrition education and counseling. Most were at least 30 years old with some college education. We expected them to be more knowledgeable about food risks than the average consumer, so any difficulty they had with the model materials would be a signal that further revisions were needed.

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A third group (Personal) used the computer version with neighbors, colleagues, and friends. These one-on-one interviews provided an opportunity for more detailed follow-up than the first two pilot-test groups. Most participants in the Personal group did not prepare the majority of the meals, in contrast with those in the other groups.

Across the three pilot-test groups, 80 percent of the respondents reported hearing about foodborne illness in the last three months. Most got this information through TV coverage of local news or local newspapers. Thirty-eight percent recalled having had a foodborne illness, 44 percent thought they had not and 18 percent were not sure. Fifty percent recalled a member of the family or a friend having foodborne illness, and 21 percent were not sure. Participants with higher levels of education rated their knowledge (before reading the materials) lower than did less educated respondents.

Research Design

In order for the data to be analyzed for a prompting effect and to determine whether the computer version would be more effective, participants were distributed among four cells:

Cell 1: Paper version
Cell 2: Computer version
Cell 3: Paper with prompting (answer factual questions first, then read materials and answer all questions)
Cell 4: Computer with prompting (answer factual questions first, then work through materials and questions)

All participants were first asked to answer 13 questions, read (or work through the computer equivalent of) 5 pages of information about Salmonella, and answer 21 questions at the end of the test. Those in Cells 3 and 4 were also asked to answer 8 questions on a separate sheet before seeing the Salmonella materials. These questions were the same as those following the Salmonella information, and tested prior knowledge. "Cooking eggs until firm destroys any Salmonella bacteria in them" and "Washing and disinfecting the outer shell of eggs will eliminate all Salmonella bacteria" are examples of true-false questions in this section.

Responses to these "before-and-after" questions provided a baseline measure of knowledge and allowed us to test whether prompting increases learning. It took respondents about 20 minutes to read the materials and respond to the questions. Those in the Rose Society and Lancaster groups were divided across all four cells. Limits on the number of personal computers available for the Rose Society and Lancaster groups yielded small sample sizes in Cells 2 and 4. The Personal group was added to increase the data for Cell 2.

Evaluation

The literature provides little guidance on how to design an effective program for helping people understand the scientific and policy basis for risk management decisions to protect the food supply (Groth, 1990; Covello et al., 1989). For each version we evaluated how much and what respondents learned, whether they became more or less aware of, or concerned about, food risks, and whether they understood options for managing such risks.

The first task was to determine whether the three pilot-test groups could be combined for analysis. We used Chi-square tests for questions that called for a specific response and Analysis-of-variance for questions that elicited a degree (e.g., "less confident" to "more confident" on a sliding scale) (Mendenhall & Reinmuth, 1978). Most results showed the three groups differing significantly.

The Chi-square and Analysis-of-variance tests tell whether groups differ but not how they differ. We used Duncan's multiple-range test to examine how the groups differ. For all tests, a significance level of .05 was used (i.e., there is a 5 percent chance of rejecting the null hypothesis of no difference when it actually is true). The groups were combined only when the analysis failed to show significant differences in their responses.

Results and Discussion

Hypothesis Testing

Results from the five hypotheses tested are listed below (H1-H5).

H1: Subjects learn from the materials.

Supported. The "after" scores (Table 2) are significantly higher than the "before" scores, which demonstrates learning.

Table 2: Share of Factual Answers Correct

	With Prompting	Without Prompting
PAPER		
Before	73% (32)	--
After	88% (32)	87% (36)
COMPUTER		
Before	64% (9)	--
After	100% (9)	91% (16)

Note: Figures in parenthesis indicate number of respondents, so we have more confidence in the results for the paper version. This table excludes the Personal group because prompting was not used with the respondents.

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H2: Prompting (a short quiz before delivering information) increases learning.

Rejected. For the paper version Table 2 shows similar "after" levels of performance for those who were prompted (88 percent correct) and those who were not (87 percent correct).

H3: Subjects learn more from the computer version.

Table 3: On a Scale of 1 (much more confident) to 7 (much less confident), how has this information affected your confidence...

Q26	that you can <u>choose or prepare safe food?</u>	1.90 - 2.4*
Q27	about <u>actions taken by the government</u> to keep foods safe?	2.34 - 3.34
Q28	about <u>actions taken by the food industry</u> to keep foods safe?	2.75 - 3.42

*The range for each questions shows the span of mean values for the Rose Society, Lancaster, and Personal groups.

Rejected. Table 2 shows little evidence that respondents learn more about food safety facts from the computer version than from the paper version. The (very small) computer group with prompting appears to have a larger increase in scores than the paper group with prompting, but there is little difference for groups that did not see the prompting questions.

H4: The materials increase consumers' confidence about food safety.

Table 4: How would you like to see food safety information presented?

	Percent (%)
computer	9
pamphlet	81
TV	80
newspaper	69
videotape	16
phone call to expert	27

*Sample size = 108:
% indicates first, second, or third choice for that medium.

Supported. The materials led to more confidence in food safety actions taken by industry and government (Table 3). Respondents especially felt more comfortable about their own ability to choose or prepare safe food.

H5: Subjects prefer electronic media for receiving information.

Rejected. Pamphlets and TV were ranked about equally as the preferred medium of delivery. Computers ranked last among the six choices (Table 4).

Discussion

All pilot test groups found some new information in the model materials and found the materials easy to understand. Many wanted *more information*, yet wanted it *to be brief and exclude calculations*. Most participants wanted a short definition of the foodborne illness, its likelihood, and an explanation about what to do if it occurs.

Many wanted information they could use at their leisure, in a form they could quit at any point and resume later. This helps explain why they preferred a pamphlet to a computer version. Respondents said that incentives, such as coupons, would encourage them to pick up the pamphlet. Many wanted pamphlets at the checkout counter or attached to the food products, especially just before the holidays for reference when baking and preparing large meals.

Participants' preferences for pamphlets over computers does not reveal how much learning would take place in an uncontrolled setting. Some respondents indicated that the computer version might result in more learning (in uncontrolled settings) because it pushes the participant to focus and continue through the materials as well as provides positive reinforcement for correct responses. These respondents felt that it would be easier to discard or merely skim a pamphlet version.

Participants thought computer materials would be beneficial in an educational setting. They liked the computer version's positive reinforcement features and suggested adding pleasing pictures. Yet graphics probably cannot be used to their full potential if the primary group using the materials is to be Cooperative Extension; older computer hardware in their field offices often cannot use graphics.

Limitations

Several shortcomings limit what can be concluded from this research. For example, there was no statistical difference in responses between the cells that had prompting questions and those

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that did not, nor between responses for the cells using the pamphlet version and the cells using the computer version. These results may have been caused by relatively small cell sizes and the fact that the pilot test groups are not representative of the target audience.

A potential explanation for the lack of prompting effect is the intensive media coverage of New York and New Jersey legislation about raw eggs at the time of the pilot tests. The high initial level of knowledge might reflect such media coverage. (The Lancaster respondents would be expected to know more about Salmonella risk because of their job responsibilities.)

The computer and pamphlet versions of the model materials were designed to be very similar. (The major difference is that the computer version gives immediate feedback about the correctness of answers to the factual questions.) This similarity would tend to minimize differences in responses. However, it might be possible to capitalize on the unique aspects of each approach, leading to quite distinct computer and paper materials so that one is more effective for at least some of the hypotheses listed above or with some target groups (i.e. children). Our set of model materials clearly does not utilize the full strength of either pamphlets or computers.

Limited resources meant we could not get access to many suitable pilot test groups. This limitation also meant that we could not test model materials for more food risks or food risks in general. The relatively small sample and the differences in demographic characteristics across pilot test groups make it difficult to generalize from our results. Participants might have responded differently to materials about another food risk, or about several food risks, especially if materials were available in short segments spread across several time blocks. Tests with larger, more representative samples and alternative materials would better determine how much adults learn from traditional pamphlets and interactive computer program.

Conclusions

Many materials have been developed to help people understand foodborne risks, but few have been evaluated to determine whether they achieve their objectives. The Chemical Education for Public Understanding Program (CEPUP, 1992) module is an important exception, but it is designed for middle-school children rather than adult consumers. Despite the limitations discussed in the previous section, our research demonstrates that such evaluation can guide both the design of materials and the choice for medium of delivery.

In our evaluation participants learned from either version of the model materials. They preferred the convenience of a pamphlet that they could keep, compared with a computer program that might be accessible only infrequently and in a group setting. Overall, the materials made them more confident about their own food choice and preparation, and about actions taken by government and industry to protect food safety.

These materials can serve as a model for developing materials on other food risks *and* for evaluating whether they help consumers understand the risks. Only through such evaluation will nutrition educators know whether consumers can make more informed decisions about food choice, food preparation, and input into food safety policy decisions.

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The Institutional Review Board of Pennsylvania State University approved the use of human subjects for this research April 8, 1991.

A poster version of interim results was displayed at the December 1992 annual meeting of the Society for Risk Analysis, San Diego, CA. Summary results were presented at the June, 1993 Environment, Culture, and Food Diversity Conference, University Park, PA.

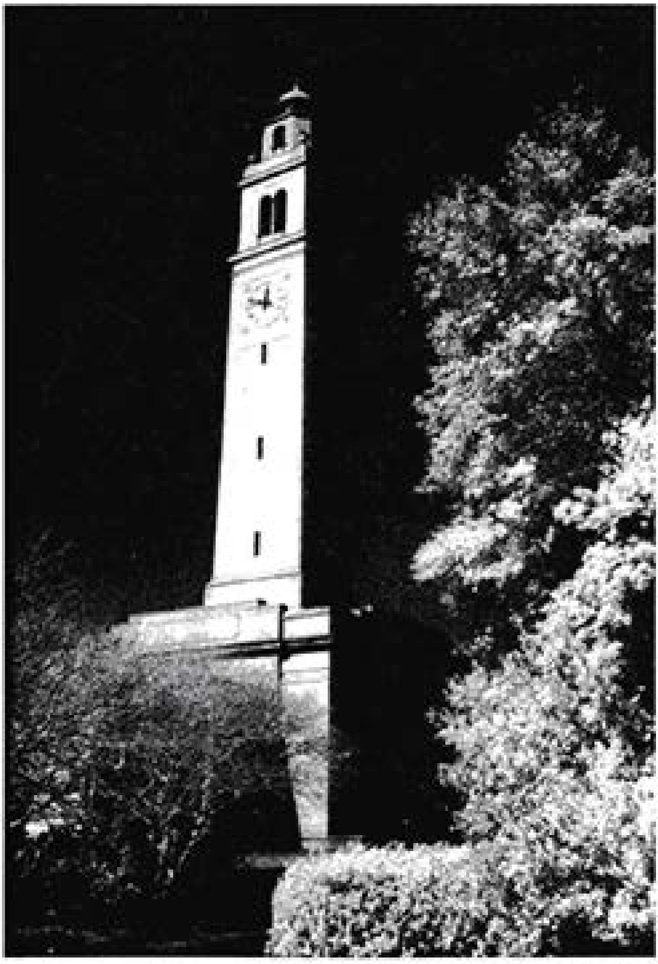

Photo by John Wozniak

Winner of the Class 24, Black and White Photo Series Gold Award in the Agricultural Communicators in Education Critique & Awards Program, this photo by **John Wozniak** was shot using a Leica M 4-2 with a f/2 Summicron lens and a Leica IR filter. The photograph was taken for Louisiana State University's *LSU Today* newspaper.

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