Development and Evaluation of a University Campus–Based Food Safety Media Campaign for Young Adults

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MS 11-506: Received 15 November 2011/Accepted 12 January 2012

ABSTRACT

Food safety information campaigns are more likely to be most effective if the messages are tailored to the needs of a specific audience. Designing effective campaigns involves careful study of the target population and working with them using a community-based participatory research model. Thus, the development of the campaign materials for a university campus–based food safety media campaign for young adults followed intense efforts of working with the target audience to gather the baseline data needed to characterize this audience, to identify the most salient messages for college students, and to create materials and events that would resonate with them. This campaign was implemented and evaluated on eight university campuses in the United States. The results indicate that the campaign significantly increased self-ratings of food safety knowledge and skill, actual food safety knowledge, food safety self-efficacy, stage of change for safe food handling, and reported hand washing behaviors of a geographically and racially diverse group of college students. The positive study outcomes support the value of engaging in these research and development efforts and reflect the usefulness of the audience-specific materials and activities developed for the campaign. The findings also demonstrate the versatility and utility of the materials on different campuses. Developing health media campaigns specifically for unique populations is key to ensuring health messages reach the target audience and, even more importantly, appeal to them. The detailed overview of the development of a food safety media campaign aimed at young adults presented in this article illustrates how health professionals can work with their target population to develop a focused, effective health promotion campaign.

Young adults (ages 18 to 29 years), men, and individuals with education beyond high school are more likely to engage in risky food handling behaviors than others (7, 30, 37, 70, 75). Although these groups are not personally at increased risk unless pregnant or immunocompromised, their food handling behaviors are important because of their current and/or future roles as caregivers for household members at increased risk, such as infants, young children, and elderly parents, as well as their potential employment in the food service industry.

Although it is unknown why young adults tend to engage in risky food handling behaviors, researchers hypothesize it may be due to lack of food safety education, role models, and/or food handling experience (6). Changes in the educational system, which once taught food safety in home economics classes in every secondary school, have resulted in a reduction or even elimination of such courses over the past 2 decades (17, 69). Increasing numbers of working mothers and growing reliance on convenience foods have decreased opportunities for children to learn safe food handling via observation. As a result, a large proportion of young adults have limited food preparation experience and have never learned basic food safety principles and, thus, lack critical knowledge needed to proactively protect themselves and their families from foodborne disease (7, 10, 17, 38, 55, 68, 71, 75). Alternately, young adults may choose to ignore hazards associated with foodborne disease, perhaps because of social norms, impaired perceptions about their own and household members’ susceptibility to foodborne disease, an unwillingness to accept personal responsibility for food safety, misconceptions that they lack control over the risk of this health issue, or a belief that foodborne disease is a minor disease (30, 78). In addition, some consumers think they are handling and preparing food safely but in actuality are not doing so (58, 70).

Currently, there are few food safety education interventions that are specifically targeted to young adults with education beyond high school. One avenue to bring safe food handling and foodborne disease prevention education to this population is through media campaigns designed to influence voluntary behaviors with the goal of improving health and well-being (9). Information campaigns have been widely used in the health field, including food safety, to curb dangerous behaviors and promote healthy choices (12, 54, 66).

Food safety education is likely to be most effective if the messages are tailored to the needs of a specific audience...
Indeed, marketing experts tell us that educational programs and informational materials directed to “everyone” actually meet the needs of few (19, 25, 49, 53, 70, 73). Until recently, however, a lack of data precluded the development of food safety education materials and interventions specifically targeted to young adults with education beyond high school. These data were generated in the first phase of this three-stage project. In stage one, the food safety knowledge, psychosocial factors, and self-reported behaviors of young adults (n = 4,343) enrolled in colleges and universities across the United States were evaluated using an online survey (22, 24). The second stage involved assessing the actual food safety practices of a subsample (n = 154) (20, 21, 44). The final stage, reported here, was to use the data from phases one and two to develop, implement, and evaluate a campus-based media campaign to increase the safety of food handling in young adults.

MATERIALS AND METHODS

Campaign development. The campaign development occurred in three phases: focus groups with the target audience, directed discussions with food safety experts, and creation of campaign materials. The protocol for all stages of this study was approved by the Institutional Review Boards at the authors’ universities.

The campaign was developed using guidance from the theory of reasoned action and the related theory of planned behavior (1, 52). According to these and many other cognitive-behavioral theories (13, 16, 26, 67) and stage-based theories (11), cognitions like knowledge, beliefs, locus of control, and self-efficacy have an important impact on whether individuals adopt recommended health behaviors and/or abstain from nonrecommended behaviors (2–5, 14, 31, 42, 65). These theories help explain why people behave as they do and are useful when it comes to designing strategies to influence behavior. The development of the campaign focused around one of the purposes of the theory of reasoned action, to identify how and where to target strategies for changing behavior.

(i) Focus groups with target audience. In the first phase, young adults, attending either a major northeastern or northwestern land-grant university, were recruited via official university student e-mail listservs and from introductory courses to participate in focus groups held on their campuses. The purpose of the focus groups was to gather information from the target audience that was used to guide campaign development. Focus groups (n = 53 participants from 15 groups), with 2 to 5 individuals in each group, were led by a trained moderator. The focus groups intentionally were kept smaller than usual to ensure that everyone in the group had ample opportunity to provide input. A focus group moderator guide, developed based on guidelines for conducting focus groups (48, 65), was used to conduct each focus group and gather pertinent information.

The moderator began each focus group with a brief presentation summarizing the key findings from stages one and two of this study. This presentation provided the participants with background on their peers’ food safety knowledge, attitudes, and self-efficacy (44), reported food handling behaviors (22), and observed food handling behaviors (20, 44), as well as current food safety research statistics (35, 50, 72). Next, the focus group participants were asked a series of questions designed to identify barriers to receiving and implementing safe food handling behaviors, describe how to best capture their interest in relation to the topic of food safety, and identify how they would prefer these messages be delivered, including format (e.g., newspaper articles, posters, radio, or television spots) and tone (e.g., positive or negative, threatening or nonthreatening, funny or sober).

A trained researcher attended each focus group to take comprehensive notes. Within 48 h of each focus group, the researcher transcribed the notes for review by the focus group moderator for clarity and thoroughness. Any discrepancies were discussed and resolutions made at this time. The focus group moderator then summarized all the focus groups’ data.

Focus group participants were 21.0 ± 1.7 (± standard deviation [SD]) years old (range, 18 to 26), predominately female (72%), white (57%), and juniors or seniors (57%). Few (n = 3) had a food safety certification. Less than 40 percent of the participants reported having ever experienced food poisoning; however, 55 percent reported they had changed their eating habits due to concerns about food poisoning. On average, the participants prepared one meal daily. They rated their own food safety knowledge as good (55%) but rated friends’ food safety knowledge as fair (76%). Most were interested (98%) in learning about food safety and felt that knowing about food safety was very important (57%). Two-thirds of the participants felt it was possible they would get food poisoning, and 81 percent thought it was unlikely their food preparation behaviors could give others food poisoning.

The most common responses from the focus groups are summarized in Table 1. In general, young adults felt the campaign should focus on only a few behaviors, be personalized to their population (e.g., use statistics from research on current food handling behaviors and food safety knowledge, appeal to college students’ sensibilities/interests), and provide concrete examples of how to improve behaviors. Young adults wanted the messages to be serious but presented in a light-hearted or comical tone using more graphics than text. Materials like refrigerator magnets with key information also were named as useful means of delivering the messages. Information overload, time constraints, and apathy were the major barriers to message delivery; however, young adults felt that keeping messages short and simple and personalized would help overcome these barriers.

(ii) Directed discussions with experts. The second phase involved gathering input from health and food safety education experts (e.g., U.S. Department of Agriculture Cooperative Extension food safety and nutrition specialists). Experts (n = 7) were recruited via direct e-mail request to participate in small groups (2 to 3 per group) in face-to-face directed discussions, lasting approximately 1 h, hosted by a trained researcher. Experts received a written summary of the key findings from stages one and two of study results via e-mail at least 2 weeks prior to their discussion group. During each discussion group, the focus group moderator began by reviewing key points from the study results. Next, the experts were asked to identify the key food safety objectives and messages they believed were the most salient to be highlighted in a food safety media marketing campaign for young adults.

The key food safety objectives and messages experts indicated the campaign should focus on were (i) correct hand washing technique and appropriate washing occasions (e.g., after using the restroom, before preparing or eating food); (ii) food thermometer use with cooked animal flesh and leftovers, with an emphasis on hamburger and poultry; (iii) safe refrigerator temperature range (i.e., 32 to 40°F); and (iv) safe handling of take-out foods, bag lunches, and leftovers (e.g., chill within 2 h, reheat to 165°F).
TABLE 1. Food safety campaign delivery preferences and advice provided by young adult focus group participants

<table>
<thead>
<tr>
<th>Focus group question</th>
<th>Common responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>How could we best capture your interest in food safety?</td>
<td>• Provide statistics (e.g., number of deaths, facts about young adults’ food handling practices)</td>
</tr>
<tr>
<td></td>
<td>• Personalize message to young adults (e.g., use information pertaining to them)</td>
</tr>
<tr>
<td></td>
<td>• Keep the message(s) simple and short</td>
</tr>
<tr>
<td></td>
<td>• Provide “how to’s” pertinent to a young adult’s lifestyle (e.g., the best way to wash your hands and check if meat is cooked to a safe temperature)</td>
</tr>
<tr>
<td>How would you prefer the message(s) be delivered?</td>
<td>• Focus on only a few behaviors</td>
</tr>
<tr>
<td></td>
<td>• Use more graphics and less text</td>
</tr>
<tr>
<td></td>
<td>• Use a comical, but serious tone to convey message(s)</td>
</tr>
<tr>
<td></td>
<td>• Keep wording simple and to the point</td>
</tr>
<tr>
<td></td>
<td>• Use events to “teach” about food safety (e.g., cooking show with emphasis on quick meals and safe food handling/preparation)</td>
</tr>
<tr>
<td>What are some educational items that may be appealing to you that also help deliver the message(s)?</td>
<td>• Present messages on posters/flyers posted in common areas (e.g., restrooms, bus stops, campus centers, dorms)</td>
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<tr>
<td></td>
<td>• Incorporate messages into freshman-level general education courses</td>
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<tr>
<td></td>
<td>• Work with established groups/events on campus to help deliver the message(s)</td>
</tr>
<tr>
<td></td>
<td>• Free food safety kits (e.g., refrigerator thermometer, sponge, hand sanitizer)</td>
</tr>
<tr>
<td></td>
<td>• Magnets with pertinent food safety reminder information</td>
</tr>
<tr>
<td></td>
<td>• Quick and easy meal cookbook with safe food handling instructions</td>
</tr>
<tr>
<td>What will be barriers to receiving this campaign and its message(s)?</td>
<td>• Young adults are on information overload</td>
</tr>
<tr>
<td></td>
<td>• Lack of time</td>
</tr>
<tr>
<td></td>
<td>• Feeling that it is “not my problem”</td>
</tr>
<tr>
<td>How can we overcome these barriers?</td>
<td>• Keep messages short and simple</td>
</tr>
<tr>
<td></td>
<td>• Personalize message</td>
</tr>
</tbody>
</table>

*There were 53 focus group participants.

(iii) Campaign plan. In the third phase, data from the young adult focus groups and discussions with experts were summarized and used to create an overall plan for the campaign. Trained researchers (n = 3) drafted campaign message content and slogans and developed a list of the desired materials to use in delivery of these messages.

The campaign key messages were as follows. CLEAN: Don’t get caught dirty handed! which encouraged young adults to always use soap and water, rub hands together for 20 s, and rinse and dry hands before eating and drinking. COOK: When the temp is right, take a bite! encouraged using food thermometers to check the doneness of ground beef and poultry. CHILL: Are you cool enough? promoted keeping refrigerators between 32 and 40° F. LEFTOVERS: Leftovers help keep you alive, but only if you reheat ’em to 165! encouraged safe handling of leftovers. Text for key messages and a list of the desired types of campaign materials (e.g., posters, magnets, table tents) was provided to a professional graphic designer who developed the layout and design of the campaign materials. (Note: The graphic designer selected for this project had extensive prior experience with young adults and with developing food and health education materials.)

All key messages and draft materials created by the graphic designer were reviewed throughout the development process by the research team and the young adults (n = 20) who indicated during the focus groups in phase 1 that they would be willing to review campaign materials as they were developed. Copies of draft materials (e.g., campaign logos, posters, magnets, and videos) were e-mailed to the young adults for comment. Overall, the young adults responded very positively to the materials and had minor recommendations for improvement (e.g., change of color or font size). These comments were compiled and used by the researchers and graphic designer to refine the campaign materials into their final versions. The campaign materials (available at www.njaes.rutgers.edu/foodsafety) included colorful and informative refrigerator magnets, posters, and table tents, brief cartoon videos and recorded radio skits and scripts with attention-getting sound effects (e.g., toilet flushing), and advertisements for student newspapers.

Campaign implementation. Campaign materials were pilot tested over a 4-week period at a major northeastern university and subsequently implemented on a total of eight university campuses around the United States. Although campaign implementation varied somewhat across campuses due to unique campus characteristics, the implementation generally was as follows. Each week of the campaign focused on one of the food safety themes described above (i.e., Clean, Cook, Chill, and Leftovers). At the beginning of each week, campaign materials were distributed (i.e., table tents were placed on dining hall tables, cartoon videos on college television station and YouTube, and radio skits on campus radio stations, and posters were hung in campus buildings with high student traffic (~100 to 500 posters per week; numbers varied based on campus size)). Additionally, display advertisements appeared two days each week in the student newspaper, announcements were sent via official university student listservs, and a flyer was posted on Facebook. Each week, a campus-based event coordinated with the week’s food safety theme was held. The main purpose of each event was to draw attention to the importance of food safety, help convey each key food safety message in an entertaining and interactive way, provide message reinforcement by engaging students in a fun educational activity and giving participants a magnet bearing that week’s food safety message, and reach a significant number of students. Weekly events included hand washing activities outside dining halls using lotion containing simulated germs to show spots they missed when washing hands, grilling minihamburgers to teach students how to use a food thermometer to check the doneness of meat, “beach” parties to
focus on keeping refrigerators at a safe temperature (“cool enough”), and carnival, fishing, and other types of games to reinforce food safety messages.

**Campaign evaluation.** (i) Instruments. To assess student awareness and the effectiveness of the food safety media campaign, pre- and postcampaign survey data were collected. The pretest was conducted 2 to 4 weeks before the initiation of the campaign. The posttest was conducted the week immediately following the final week of the campaign. College students were recruited using Facebook flyers, advertisements in the student newspaper, and announcements on official student listservs and in classes. The pre- and posttest included these parts: demographics and food safety knowledge, stage of change, and self-efficacy. The posttest also assessed awareness of campaign materials and events.

Demographic data collected included gender, age, major, race, and marital status. In addition, items were included to assess prior exposure to food safety information, such as work experience related to food handling and completion of college-level courses in nutrition, microbiology, and food science. The respondents also were asked to judge their food safety (food poisoning prevention) knowledge and skills on a scale of 1 (poor) to 4 (excellent).

The eight-item food safety knowledge questionnaire was designed to evaluate knowledge related to the four key messages of the campaign. The items were drawn from those used in stage one of this research project. A detailed description of the development of these items is available elsewhere (23). In brief, the questionnaire included multiple-choice items that were scored by awarding 1 point for each correctly answered question. Thus, overall knowledge scores could range from 0 to 8. Subscores were computed from the knowledge questionnaire to assess knowledge specific to each key campaign message (i.e., recommended hand washing procedures, safe internal cooking temperatures for meat and poultry, safe temperatures for refrigerators, and safe handling of leftovers).

Stage of change is a construct of the transtheoretical model that describes behavior change as a process in which an individual moves through a series of stages (i.e., precontemplation, contemplation, preparation, action, and maintenance), with the possibility of recycling through the stages (59, 60, 62). A single item asked respondents to identify which statement best described their stage of change for safe food handling: (1) I have no intention of changing the way I prepare food to make it safer to eat in the next 6 months (precontemplation); (2) I am aware that I may need to change the way I prepare food to make it safer to eat and am seriously thinking about changing my food preparation methods in the next 6 months (contemplation); (3) I am aware that I may need to change the way I prepare food to make it safer to eat and am seriously thinking about changing my food preparation methods in the next 30 days (preparation); (4) I have changed the way I prepare food to make it safer to eat, but I have been doing so for longer than the past 6 months (action); and (5) I have changed the way I prepare food to make it safer to eat and I have been doing so for more than the past 6 months (maintenance).

Self-efficacy is an individual’s confidence in his or her ability to perform a particular recommended health behavior or abstain from an unhealthy behavior (34). Self-efficacy is thought to influence which health behaviors will be initiated, the degree of effort expended, and the persistence of the behavior (13, 29, 33, 39, 40, 47, 64). The eight items on the food safety self-efficacy Likert-type scale were derived from the scale developed for stage one of this project (24). The items were scored 1 to 5 for the responses I am sure I could not do it, I could not do it, I don’t know if I could do it, I could do it, and I am sure I could do it, respectively. Self-efficacy score and subscores for each of the four key campaign messages were computed by summing the score of each item and dividing by the total number of items on the scale. Thus, scores and subscores could range from 1 to 5, with higher scores indicating greater self-efficacy.

As an indicator of behavior, the respondents were asked how frequently they washed their hands with soap before cooking and after going to the bathroom. The answer choices for these two items were all of the time, most of the time, some of the time, and rarely/never.

Awareness of campaign materials and events was assessed on the posttest. The respondents were shown a picture of each item of campaign material or given a description (e.g., e-mail listserv messages, campus events) and asked to indicate whether they had seen them on campus.

(ii) Study design. This study included two groups: a pretest-posttest group and a posttest-only group. The purpose of the pretest-posttest group was to determine the impact of the campaign on food safety self-efficacy, knowledge, and stage of change. The purpose of the posttest-only group was to ascertain whether the pretest affected posttest scores (i.e., learning from the pretest rather than the campaign).

(iii) Data analysis. Analyses of central tendency and dispersion (e.g., means and standard deviations, frequencies) were conducted to describe the survey respondents and mean scores for each pretest and posttest measure. Paired t tests were used to compare changes in study measures between the pretest and posttest. To determine whether pretesting affected performance on the knowledge posttest (i.e., learning from the test versus the campaign), the knowledge scores of those in the posttest-only group were compared with those in the pretest-posttest group using unpaired t tests. The significance level was set at a P value of <0.05.

**RESULTS**

Five geographically diverse land-grant universities (one Northeastern, one mid-Atlantic, two mid-Western, and one Northwestern U.S. universities) provided data with respondent identifiers that permitted the pretest and posttest to be matched. A total of 1,159 pretests were completed at these universities; approximately half (n = 552) were lost to follow-up (58% of those lost were due to unforeseen changes in circumstances at one university that were unrelated to the campaign). Unpaired t tests revealed that those lost to follow-up did not differ significantly in terms of stage of change for safe food handling or self-efficacy subscales; however, compared with those completing both the pretest and posttest, the pretest scores of respondents lost to follow-up were significantly lower on the knowledge test (score was ~7% lower). A comparison of the posttest knowledge scores of the 650 individuals in the posttest-only group with those in the pretest-posttest group revealed that posttest-only respondents achieved significantly higher posttest knowledge scores (i.e., 4.39 ± 3.54 versus 4.17 ± 3.38), thereby indicating that completing the pretest did not offer an advantage to posttest performance.

The 607 individuals with matched pretest and posttest data had a mean age ± SD of 19.86 ± 1.52 years (range, 17 to 26). The majority were female (70%), white (53%),...
and single (98%). Most were first- or second-year students (59%) who had never taken a nutrition, food science, or microbiology course (>82%), had never worked as a food server (65%) or food preparer (83%), and did not have any food safety certifications (92%). The respondents were from a wide array of majors.

The paired t test results shown in Table 2 indicated that posttest self-ratings of food safety knowledge and skills were significantly higher than at pretest, with the mean score indicating that these self-ratings moved from the study midpoint (indicating ratings of fair and good) to closer to good. (Independent sample [unpaired] t tests also were run for all pretest participants and all posttest participants; the results [data not shown] were similar to those reported for paired tests in Table 2.) Food safety knowledge, except that related to hand washing, increased significantly between the pretest and posttest. The overall gain in knowledge was 11%, with 10 to 16% increases in all the individual subscale scores except hand washing. Similarly, stage of change for safe food handling progressed significantly (~4% increase), moving closer to the preparation stage. Food safety self-efficacy scores also increased at the posttest for all behaviors except those related to safe handling of leftovers. Although significant, the gain of total self-efficacy was only about 1%, perhaps because respondents started out with self-efficacy scores near the upper end of the range. The respondents also indicated that they washed their hands with soap before cooking and after going to the bathroom significantly more often at the posttest, moving from “some of the time” to nearer “most of the time.” The changes in these two self-reported behaviors from pretest to posttest were 12 and 16%, respectively.

All were aware of the campaign, and the vast majority recalled (90%) having seen or heard campaign-specific campaign materials (e.g., posters, table tents, events, and videos). Most (65%) indicated they had encountered materials related to all of the key campaign messages. Approximately 8% for each reported encountering materials related to one, two, or three of the key messages.

**DISCUSSION**

This article describes the development and evaluation of a university campus–based food safety media campaign for young adults. Few food safety media campaigns exist (54), and none targeted to young adults could be located. The findings indicate that the campaign increased self-ratings of food safety knowledge and skill, actual food safety knowledge, food safety self-efficacy, stage of change for safe food handling, and reported hand washing behaviors of a geographically and racially diverse group of college students. The ultimate goal of health campaigns like this one is to change behaviors. Although it was not

### TABLE 2. Comparison of pretest and posttest group respondents' food safety self-efficacy, stage of change, and knowledge

<table>
<thead>
<tr>
<th>Measure</th>
<th>Possible score range</th>
<th>Pretest score (mean ± SD)</th>
<th>Posttest score (mean ± SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-rating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food safety knowledge</td>
<td>1–4</td>
<td>2.47 ± 0.71</td>
<td>2.71 ± 0.63</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Food safety skills</td>
<td>1–4</td>
<td>2.50 ± 0.74</td>
<td>2.71 ± 0.66</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Food safety knowledge’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>0–8</td>
<td>3.29 ± 1.61</td>
<td>4.17 ± 1.84</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Recommended hand washing procedures</td>
<td>0–1</td>
<td>0.63 ± 0.48</td>
<td>0.62 ± 0.49</td>
<td>0.6356</td>
</tr>
<tr>
<td>Safe internal cooking temperatures</td>
<td>0–3</td>
<td>1.34 ± 0.87</td>
<td>1.81 ± 0.93</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Safe temperatures for refrigerators</td>
<td>0–1</td>
<td>0.38 ± 0.49</td>
<td>0.53 ± 0.50</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Safe handling of leftovers</td>
<td>0–3</td>
<td>0.93 ± 0.94</td>
<td>1.22 ± 1.01</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Stage of change for safe food handling</td>
<td>1–5</td>
<td>2.58 ± 1.11</td>
<td>2.77 ± 1.21</td>
<td>0.0002</td>
</tr>
<tr>
<td>Food safety self-efficacy’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>1–5</td>
<td>4.23 ± 0.54</td>
<td>4.30 ± 0.54</td>
<td>0.0003</td>
</tr>
<tr>
<td>Recommended hand washing procedures</td>
<td>1–5</td>
<td>4.42 ± 0.68</td>
<td>4.49 ± 0.66</td>
<td>0.0076</td>
</tr>
<tr>
<td>Safe internal cooking temperatures</td>
<td>1–5</td>
<td>4.05 ± 0.69</td>
<td>4.16 ± 0.68</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Safe temperatures for refrigerators</td>
<td>1–5</td>
<td>3.99 ± 0.86</td>
<td>4.09 ± 0.82</td>
<td>0.0081</td>
</tr>
<tr>
<td>Safe handling of leftovers</td>
<td>1–5</td>
<td>4.43 ± 0.64</td>
<td>4.43 ± 0.62</td>
<td>0.8816</td>
</tr>
<tr>
<td>Self-report behavior indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washed hands with soap before cooking</td>
<td>1–4</td>
<td>1.95 ± 1.05</td>
<td>2.41 ± 1.14</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Washed hands with soap after bathroom use</td>
<td>1–4</td>
<td>2.01 ± 1.15</td>
<td>2.66 ± 1.28</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

*There were 607 respondents.
*b Possible score range is lowest to highest possible score.
*c Cronbach alpha coefficient of internal consistency = 0.83.
*d Livingston’s coefficient (18, 27, 41) for reliability for criterion-referenced tests using a passing score of 63% (i.e., 5 of 8 items) = 0.83.
feasible to observe changes in actual food safety practices, other research indicates that food safety training increases compliance with safe food handling practices (28, 36, 43). In addition, numerous studies have reported a positive association between self-efficacy and the practice of health-protective behaviors (15, 46) and a positive correlation between self-reported stage of change and actual behavior (61, 63). In light of previous research, the knowledge, self-efficacy, and stage of change increases noted in this study, along with self-reported changes in hand washing with soap, appear to indicate that improvements in safe food handling are a likely outcome of this campaign.

According to the elaboration likelihood model, messages that are centrally processed (i.e., close attention and scrutiny are given to the information and its relation to preexisting cognitions stored in memory that are related to the information) are more likely to be remembered and predict future behavior than those peripherally processed (e.g., when cognitive “short cuts” are used to deal with information, such as focusing on whether related materials were attractive) (56). Persuading the target audience to engage in central processing is important in health campaigns like the one described here where the goal is to improve and sustain changes in cognition and behavior (76). Studies indicate that central processing is more likely to occur when the message is personally meaningful and relevant (56, 76). The ability to understand the message and not be distracted (e.g., too much text, incongruent accompanying artwork) also are critical for central processing (56, 57). The significant and relatively large gains in food safety knowledge and self-reported frequency of hand washing with soap suggest that the campaign’s messages had the elements needed to result in central processing by the target audience.

The development of the campaign materials followed intense efforts of working with the target audience to gather the baseline data needed to characterize this audience, to identify the most salient messages for college students, and to create materials and events that would resonate with them (20–24, 44, 45). The positive study outcomes support the value of engaging in these research and development efforts and reflect the usefulness of the audience-specific materials and activities developed for the campaign. The findings also demonstrate the versatility of the materials in that general implementation procedures were provided to all campuses but, by necessity, the campaign’s implementation had to vary somewhat due to unique characteristics of the different campuses.

The value of research findings must be balanced with limitations. A limitation of the behavior indicator data is that they are self-reports. A common concern with self-report data like these is that they tend to overestimate actual behaviors. However, these data are comparable to observational studies of hand washing in public places (8), perhaps because the online administration of the survey made it confidential for young adults to more accurately answer questions that have a strong social desirability component (77). At a minimum, these self-report data indicate that respondents are more aware of the need to use soap during hand washing. Another limitation is a lack of long-term follow-up to determine the extent to which the changes in knowledge, self-efficacy, and stage of change were sustained. The inability of some universities to record participant identifiers due to restrictions imposed by their institutional review boards and the high rate of those lost to follow-up at one university due to circumstances unrelated to the campaign are limitations but also realities of conducting human research at multiple institutions. Despite the study’s limitations, the campaign materials and activities did improve key cognitions (i.e., food safety knowledge and self-efficacy) that promote adoption of healthy behaviors (11).

Developing health media campaigns specifically for unique populations is key to ensuring that health messages reach their target audience and, even more importantly, appeal to them (11). Designing effective campaigns involves careful study of the target population and working with them using a community-based participatory research model (32) to seek their input and guidance. This article presents a detailed overview of the development of a food safety media campaign aimed at young adults. The process described above and the materials and messages developed (see www.njaes.rutgers.edu/foodsafety) illustrate how health professionals can work with their target population to develop a focused, effective health promotion campaign.

ACKNOWLEDGMENTS

This research was funded by the U.S. Department of Agriculture, National Integrated Food Safety Initiative, grant no. 2003-51110-01736. We thank the many students, staff, and faculty who participated in this study.

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