Research and Professional Briefs

Risky Eating Behaviors of Young Adults—Implications for Food Safety Education

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ABSTRACT

Young adults engage in risky eating behaviors like eating raw/undercooked foods of animal origin that put them at increased risk for foodborne disease. This cross-sectional survey assessed the self-reported risky eating behaviors of young adults enrolled in higher education as a part of a large-scale survey administered over 10 months. Participants (N=4,343) completed a risky eating questionnaire by indicating which of the foods listed they consumed (the list included a random sequence of foods that are considered safe or risky to eat). Each risky food consumed earned one point, with the risky eating score calculated by summing points earned (range 0 to 27). Higher scores indicated more risky eating behaviors. Food safety knowledge and self-efficacy and stage of change for safe food handling were also assessed. Mean risky eating score (5.1±3.6) indicated that young adults consumed risky foods. Male respondents and whites consumed more risky foods compared with female respondents and nonwhites, respectively. As stage of change (movement to higher stages) and self-efficacy increased, risky eating score decreased; those who believed food poisoning was a personal threat tended to eat fewer risky foods. Regression models indicated that the strongest predictor of risky eating was self-efficacy score followed by stage of change. These variables, together with sex and race, explained about 10% of the variance in risky eating score. Although food safety knowledge correlated weakly with risky eating score, it did not significantly predict it. Efforts to improve current food-handling behaviors and self-efficacy through education are important to reduce prevalence of risky eating behaviors within this population.

J Am Diet Assoc. 2008;108:549-552.

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0002-8223/08/10803-0012$34.00/0

doi: 10.1016/j.jada.2007.12.013

Consumers have become more food safety–conscious during the past decade (1). Despite this, Americans continue to frequently engage in risky eating behaviors, such as eating raw or undercooked foods of animal origin (2-4). In 2006 almost 40% of Americans reported consuming raw eggs, whereas close to 20% reported consuming pink hamburger and raw fish (2).

The 1998-2006 Food and Drug Administration/Food Safety Inspection Service's Consumer Food Safety Survey (2,5) as well as the Behavioral Risk Factor Surveillance System (6-8) indicate that food safety problems, including risky eating behaviors, are more acute in some consumer groups than in others. Specifically, young adults (aged 18 to 29 years) and individuals with education beyond high school (2,6,9-11) are more likely to engage in risky eating behaviors than others. At first glance the eating behaviors of this consumer group do not appear particularly worrisome because, with the exception of pregnant and lactating women, young adults typically are not considered to be at risk for foodborne disease. However, the true occurrence of foodborne disease in this population is likely underreported because symptoms of foodborne disease are often thought to be caused by flu (12). Furthermore, the importance of young adult food-handling behaviors becomes clear as their current and/or future roles as caregivers for household members at increased risk, such as young children and aging parents, is realized.

To gain a deeper understanding of the specific risky eating behaviors of young adults, this construct was included as a part of a large scale cross-sectional survey of young adults enrolled in higher education (13,14). It was hypothesized that number of nutrition, microbiology, and/or food science courses completed in college; previous foodservice experience and food safety certification; previous food poisoning; being a man; and lower food safety knowledge, stage of change, and self-efficacy all would be associated with greater risky eating behaviors. This study was approved by the authors' respective Institutional Review Boards.

METHODS

For this cross-sectional online food safety survey, college and university instructors from across the United States were invited via e-mail to recruit students in their introductory courses to complete an online food safety survey

(13,14). Invitations to participate were sent to department chairs at all colleges and universities in the United States with a program approved by the American Psychological Association or American Dietetic Association; deans at all universities with a college or school of human ecology; and professors who subscribed to a psychology, biology, or nutrition electronic mailing list. Recipients were encouraged to share the invitation with faculty colleagues. Interested professors were asked to recruit students in their general education courses (ie, introductory psychology, biology, or nutrition). All students enrolled in a participating course were able to complete the survey; however, data were only used from students who met the a priori age criteria (aged 17 to 26 years). Recruiting from introductory courses helped limit completion of the survey by ineligible students (ie, aged >26 years). A total of 4,548 students completed the survey between January and October 2005.

As part of the survey, participants completed a risky eating questionnaire that asked them to indicate which of 26 foods listed they consumed. The list included a randomly ordered sequence of foods that would generally be considered safe to eat (n=6; eg, rice in a box without a US Department of Agriculture inspection stamp) and foods that are generally thought to be risky (n=20; eg, raw oysters or rare hamburgers). This questionnaire was modified from earlier studies that only asked about consumption of unsafe food items (7,9). Both high- and low-risk foods were included to prevent a response set and reduce the risk of over- or underestimating a participant's risky eating behavior. The seven other items assessed how completely cooked (ie, raw to well done) participants chose to eat animal proteins. Each risky eating behavior (ie, eating a risky food from the list; eating animal protein that was cooked less than well done) was awarded one point. Foods in the list considered safe to eat were not included in score calculations. Final score was calculated by summing points earned; thus, scores could range from 0 to 27, with higher scores indicating greater consumption of risky foods and, thus, more risky eating behavior.

Safe food-handling self-efficacy was assessed using a scale containing 24 5-point Likert type items that assessed participants' confidence in their ability to perform specific recommended safe food handling behaviors (Cronbach α=.91). Scale scores were calculated by summing the score of each item and dividing by the total number of items on the scale. Higher scores reflect greater self-efficacy. Belief that food poisoning is a personal threat was assessed by a food poisoning belief scale comprised of six 5-point (strongly agree to strongly disagree) Likert type items (Cronbach α=.87). Belief scores were calculated in the same manner as the self-efficacy scale. The development of the self-efficacy and belief scales is described in detail elsewhere (13).

The Transtheoretical Model, which describes behavior change as a process in which an individual moves through a series of stages (15), was adapted in the development of the food safety stage of change. Specifically, participants identified the statement that best described them: I have no intention of changing the way I prepare food to make it safer to eat in the next 6 months; 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; 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; I have changed the way I prepare food to make it safer to eat, but I have been doing so for less than the past 6 months; and 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 (15). This construct was included to assess where on the continuum of behavior change young adults placed themselves for their food safety behavior.

Food safety knowledge was assessed by an 89-item knowledge questionnaire that included objective items (eg, multiple choice and true/false) that were scored by awarding one point for each correctly answered question (possible score range zero to 89). A detailed description of the development of the questionnaire is available elsewhere (14).

Participants also completed items that established their basic demographic characteristics; prior exposure to food safety information, including foodservice work experience; number of meals prepared weekly; prior illness related to food poisoning; and completion of food safety certification courses and college-level courses in nutrition, microbiology, and/or food science.

Data Analysis

Statistical analyses were completed using the Statistical Program for the Social Sciences (version 14.0, 2006, SPSS Inc, Chicago, IL). Measures of central tendency and dispersion were conducted to describe the study participants and mean risky eating score. Spearman's ρ for nonparametric correlations was calculated to determine relationships among risky eating score, self-efficacy, and stage of change because these measures were not normally distributed. Stage of change scores were limited to integer values between one and five, thus analysis of variance was used to test for a linear trend with risky eating score scores. Backward stepwise regression with exclusion criterion set at $F<25$ was used to identify demographic characteristics and scores that were associated with risky eating behavior. This high F value was chosen because of the large size of the survey sample and to focus on the strongest predictors of risky eating score. Independent variables evaluated were sex; race/ethnicity (white, nonwhite); number of meals cooked weekly (0, 1 to 10, >10); number of nutrition, microbiology, and/or food science courses completed in college; previous experience as a food server or preparer; food safety certification; previous food poisoning episode; and stage of change, belief, knowledge, and self-efficacy scores.

RESULTS AND DISCUSSION

Young adults (N=4,343, mean age 19.92±1.67 years) enrolled at 21 colleges and universities located in 17 states across the nation completed the survey. The sample was from a wide array of college majors with no major predominating. The majority (84%) were preparing at least one meal weekly, were women (65%), white (70%), and freshman or sophomores (79%). Most perceived themselves in excellent or good health (88%) and did not believe they or a household member had food poisoning in the past year

Table. Self-reported food safety study measure means of young adults enrolled in college, by sex and race

Measure	Total group (N=4,343)	Sex		Race	
		Male (n=1,502)	Female (n=2,841)	White (n=3,059)	Nonwhite (n=1,284)
	← mean±standard deviation →				
Risky food consumption[a]	5.1±3.6	5.9±4.3	4.7±3.1***	5.3±3.6	4.8±3.6***
Food safety self-efficacy[b]	4.1±0.6	3.9±0.6	4.2±0.5***	4.2±0.5	4.1±0.6***
Stage of change[c]	2.7±1.2	2.4±1.2	2.8±1.2***	2.7±1.2	2.6±0.5
Food poisoning is a personal threat[d]	3.1±0.8	2.9±0.8	3.2±0.8***	3.0±0.8	3.4±0.8***
Food safety knowledge[e]	53.7±10.5	51.3±11.3	55.0±9.7***	55.6±9.9	49.1±10.4***

[a]Possible range of scores is 0 to 27, low scores indicate less-risky eating.
[b]Scores could range from 1 (most negative) to 5 (most positive).
[c]Scores could range from 1 (precontemplation) to 5 (maintenance).
[d]Scores could range from 1 (strongly disagree) to 5 (strongly agree).
[e]Scores could range from 0 to 89, high scores indicate greater knowledge.
***$P<0.001$ for differences within categories (eg, sex, race) based on independent t tests.

(80%). The majority had limited exposure to food safety education: had never held a job serving (60%) or preparing (76%) food; did not hold a food safety certification (94%); and had never completed a college course in nutrition (77%), food science (88%), or microbiology (84%).

Young adults in this study had strong feelings of self-efficacy, were between the contemplation and preparation stage, were somewhat positive that food poisoning was a personal threat, and had modest knowledge levels (see the Table). Although young adults did report consuming risky foods, overall they did not report very high consumption rates. However, 53% consumed raw homemade cookie dough; 33% consumed fried eggs with runny or soft yolks; 29% consumed sushi; 29% raw sprouts; 11% raw oysters, clams, or mussels; and 7% consumed rare hamburger. This study supports previous analyses in similar populations, which also found that young adults consume risky foods and fail to cook risky foods sufficiently (16-18). When the US population as a whole (aged 15 years and older) was assessed, reported consumption levels for raw eggs (approximately 40%) or pink hamburger (approximately 20%) are higher than those reported by young adults in this study (2). These differences likely are due to methodological dissimilarities (eg, pink vs rare hamburger or raw vs runny eggs).

A comparison of mean risky eating scores by sex using unpaired t tests revealed that men ate significantly more risky foods than women ($P<0.0001$), supporting previous findings (18). White participants engaged in significantly more risky eating behaviors than nonwhite participants. In addition, as self-efficacy scores increased, risky eating declined (Spearman's $\rho=-0.29$; $P<0.001$); likewise, those in the lower stages of change consumed significantly more risky foods than those in higher stages of change (Spearman's $\rho=-0.16$; $P<0.001$). Moreover, those who believed that food poisoning was a personal threat tended to eat fewer risky foods (Spearman's $\rho=-0.10$; $P<0.001$). The findings related to self-efficacy, stage of change, and personal threat are congruent with health behavior change (19-26). That is, perceptions of one's ability to adopt recommended behaviors and perceptions of risk are known to affect a wide array of health behaviors (23,27-33).

The correlation between food safety knowledge and risky eating score was statistically significant ($P=0.03$), but very weak (Spearman's $\rho=-0.031$). A comparison of students who had completed a college-level nutrition, microbiology, and/or food science course, which may have addressed food safety, with those who had not completed such a course revealed no significant differences in risky eating between these two groups. Similarly, Unklesbay and colleagues' (16) survey of college students, 33% of whom had completed a food safety course, found rates of risky food consumption very similar to those reported in this study. This finding, together with our study's findings, suggests that current food safety education efforts may not provide the information and/or motivation needed to compel individuals to change their consumption levels of risky foods. Indeed, McArthur and colleagues (17), who reported recently that college students majoring in a health-related area were no more knowledgeable about food safety than nonhealth majors, and others (34) suggest that food safety is inadequately addressed in college-level health-related curricula.

When regression models were evaluated, the strongest predictor of risky eating score was self-efficacy score followed by stage of change. These variables, together with sex and race, explained about 10% of the variance in risky eating score. Despite a significant correlation between the personal threat belief and risky eating score, belief was excluded from the backward regression model. Neither food safety knowledge nor enrollment in a college-level nutrition, food safety, and/or microbiology course significantly predicted risky eating behaviors.

A limitation of this study is that the sample was restricted to young adults enrolled in a small sampling of colleges in the United States and cannot be generalized to all young adults. However, these students were distributed across the nation, attended colleges and universities of varying sizes with widely varying admission requirements, and had a similar age and demographic breakdown compared to recent postsecondary education enrollment statistics (35). In addition, no information is available regarding nonparticipants.

CONCLUSIONS

This study provides insights into the risky eating behaviors of young adults enrolled in college. Despite the importance of food safety, young adults, particularly white men, engage in risky eating behaviors. Current safe food-handling practices, food safety self-efficacy, and stage of change all help explain risk for engaging in risky eating practices. The high self-efficacy and belief that food poisoning is a personal risk reported by this population suggests that they are willing to take the issue of food safety seriously; however, being between the contemplation and preparation stage of change and having modest food safety knowledge highlights a need to provide not only general food safety education, but encouragement and skill development to translate this education into behavior.

The baseline data regarding the risky eating behaviors of young adults presented here need to be expanded with future research that both continues to evaluate this population and examines at stage of change for specific identified problem behaviors (eg, I am aware that I may need to change the way I cook hamburger to ensure it is safe to eat . . .) and explore education methods to reduce risky behaviors. Compelling young adults to change eating behaviors will be the challenge. Health professionals should focus creative efforts on developing safe food consumption behaviors in this group and thereby help safeguard the health of this population and enable them to fulfill the role of protecting the health of their future families (18).

This research was funded by the US Department of Agriculture, National Food Safety Initiative, Grant No. 2003-51110-01736.

The authors thank Ellen Cussler, MS, University of Arizona Department of Physiology, for her invaluable assistance with data analysis and interpretation.

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