

Risk Perception, Attitudes, Knowledge and Safe Food Handling Behavior Among Those 65 Years and Older

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Abstract

Foodborne illness is a significant problem in the United States, especially for older adults who are at a greater risk of illness due to lowered nutritional status, weakened general health, and decreased immune system function. The present study investigated food safety in older adults by addressing several areas, including the degree to which older adults perform adaptive food handling behaviors; the perceived risk of contracting foodborne illness; personal knowledge of safe food handling, and multiple measures of efficacy. Results indicated that older adults are consistent in their behaviors, attitudes, knowledge, perceptions of risk, and food handling behaviors. Though the results indicate that those over 65 exhibit behaviors consistent with safe food handling practices, areas still exist that food safety advocates need to address when combating maladaptive food safety behaviors.

Consumption of food contaminated by bacteria, viruses, and parasites causes 76 million cases of foodborne illness, 325,000 hospitalizations, and 5,000 fatalities each year in the United States of America (Mead et al., 1999). Moreover, the proportion of U.S. residents over the age of 65 has steadily increased over recent decades and the number is expected to double from 35 million to 70 million by the year 2030 (United States Department of Health and Human Services, Administration on Aging, 2001). Because those over 65 generally have lowered nutritional status, weakened general health, decreased immune system function, and reduced stomach acid, they are at greater risk for foodborne illness (Smith, 1998; United States Department of Health and Human Services, Administration on Aging, 2001). *Salmonella* and *E. coli* infections cause death among the general population, but fatality rates among older adults are much higher (Bean, Goulding, Lao, & Angulo, 1996; Buzby, Roberts, Lin, & MacDonald, 1996). For instance, Gerba, a researcher from Arizona State University, reported that in nursing homes, the case-fatality rate for certain foodborne illnesses was anywhere from 10 to 100 times higher than for general populations (Buzby, 2002).

Foodborne illness is preventable provided that appropriate food-handling behaviors, such as hand washing, are adopted. In an effort to communicate effective food-handling practices to the population, several outreach programs have been developed. The success of these programs hinges on the willingness of the target population to adopt recommended behaviors. As a target public, those over 65 represent a group that is susceptible to an increased likelihood of contracting illness and an increased likelihood of more severe symptoms. Several variables have been implicated in one's willingness to comply with preventive health messages and engage in adaptive behaviors. While researchers have examined food handling behaviors of those over 65 (Hanson & Benedict, 2002), few have explored the determinants of adaptive behaviors. This research specifically examined perceived risk, attitudes, and knowledge as variables associated with safe food-handling in those 65 years and older.

The first variable is perceived risk. If individuals do not believe that they are likely to become ill from the food they eat, they are unlikely to adjust any maladaptive behaviors that they may regularly perform. Sandman (1987) argued that most people perceive the risk of becoming ill from microbial infections in food as being low and that foodborne illnesses contracted at home are perceived as controllable and nonfatal. High-risk behaviors (e.g., eating raw oysters) are voluntary, reinforcing the belief in a low risk of contracting a foodborne illness. Moreover, other more common behaviors, which may not overtly seem to pose such a high risk (e.g., failing to wash a knife used to cut raw meat before cutting vegetables), could lead to foodborne illness. Such underestimation of the risks associated with foodborne illness by the lay public may contribute to rejection of safe food-handling practices.

The second variable that may influence message effectiveness is the recipient's attitude toward the behavior advocated by the message. Social psychologists define an attitude as a "...psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor..." (Eagly & Chaiken, 1993, p.1). The prevailing belief is that people will behave in concert with their attitudes regarding that behavior (Manstead, 1996). The relationship between attitudes and behavior has been the topic of much psychological research with many early studies finding inconsistencies between the two (Darley & Batson, 1973; LaPiere, 1934). However, when situational factors are

taken into account and the attitude is specific to the behavior of interest, the relationship between attitudes and behavior is more robust (Ajzen & Fishbein, 1973).

Finally, conventional wisdom indicates knowledge of the situation and of appropriate behaviors is likely to influence behavior. If people are ignorant of adaptive ways to prepare food, they are unlikely to handle their food appropriately and are thus more likely to contract foodborne illnesses. The belief that education is the key to safe food-handling practice is the crux of many outreach programs. Researchers have recommended that educational programs for food safety should emphasize changing behaviors that are most likely to result in foodborne illness, such as failing to wash one's hands before handling food (Medeiros, Hillers, Kendall, & Mason, 2001a). Medeiros et al. (2001) suggest that educational programs should be organized according to five categories: (1) personal hygiene, (2) adequate cooking, (3) avoiding cross-contamination, (4) cold storage/hot-holding, and (5) avoiding foods from unsafe sources. One program that has adopted a similar strategy is the Fight BAC! campaign which address four issues, (1) clean, (2) separate, (3) cook, and (4) chill (Food and Drug Administration & U.S. Department of Agriculture, Food Safety and Inspection Service, 2001).

This study addressed (1) perceived risk of contracting foodborne illness, (2) attitudes toward safe food-handling behaviors, and (3) knowledge of safe food-handling behavior. The degree to which these variables are associated with adaptive food-handling behaviors in U.S. residents over 65 is questioned.

Method

Participants

A national telephone survey was conducted including participants who were at least 65 years of age and prepared at least 5 meals per week. A priori power analysis indicated that a sample size of 250 was sufficient to achieve significant power. A random sample of residential telephone numbers and addresses of people 65 years and older was secured from a national company specializing in telephone survey research.

Materials

A multi-section survey was developed to examine food safety in seniors. Questions were often yes/no or Likert-scale. The first section collected general information from the participants (e.g., number living in household, type of residence, etc.). The second section consisted of questions related to participant's level of perceived risk. Parts of this section were taken from an unpublished U.S. Government Food Safety Survey and included questions such as, "How common do you think it is for people in the United States to become sick, that is, to get food poisoning, because of the way food is handled or prepared in their homes;" "Do you think contamination of food by micro-organisms, such as germs, is a very serious food safety problem, a serious food safety problem, somewhat of a problem, or not a food safety problem at all;" and "How likely do you think it is that raw chicken contains germs or other micro-organisms that could make you sick?"

The third section assessed participants' attitudes toward food safety. Most of the questions in this section were taken from a preexisting validated scale developed by Medeiros et. al (2001a). Questions in this section included: "Cooking and eating eggs that have firm yolks and whites is important to me for safety," "I am worried that I may get

sick if I eat hot dogs right out of the package,” and “It is not important to cover a cut or sore on my hand before I prepare food.”

The fourth section examined participants’ overall knowledge of food safety practices. The questions for this section were taken from another preexisting validated survey again developed by Medeiros et. al (2001b), *A Questionnaire to Assess Knowledge of Recommended Food Safety Behaviors*. Questions included items as: “It is safe to use raw eggs in recipes that will not be cooked,” and “When you can’t see any pink color inside a cooked hamburger patty, you know all of the harmful germs have been killed and the hamburger is safe to eat.

The final section explored participants’ behaviors regarding food safety practices. The questions for this section came from a survey developed and validated by Medeiros, Kendall, Hillers, and Mason (2001). In this section, participants responded on a 7-point Likert scale where 1 was “always” and 7 was “never”. For instance, in this section participants were asked: “Before preparing or handling food, I wash my hands with soap and warm running water,” “If I have a cut or sore on my hand, I cover it before preparing food,” and “I discard shellfish, such as mussels or clams, if the shellfish has not opened during cooking.” In addition, several yes/no questions were included regarding specific food handling behaviors. These questions included “Do you eat raw hamburger meat?” and “Do you wash your hands prior to preparing meals?”

Procedure

A randomized list of addresses was obtained through a company specializing in telephone survey research. Letters to potential participants were sent out 1 week in advance of calls and indicated that researchers would be calling to ask questions about food safety (Dillman, 2000). The letter also indicated that those who were at least 65 and the primary food preparer would receive a \$5.00 honorarium if they participated in the 20-minute survey.

Final participants were asked questions from the survey which lasted anywhere from 15 to 25 minutes. The participants were told that all answers were confidential and their names would not to be associated with answers they gave. After the data was collected, participants were mailed the honorarium with a letter thanking them for their participation.

Results

The results are presented in five sections about food safety. The first section contains demographic information about the sample. The second section has results pertaining to perceived risk, while the third section describes attitudes about safe food-handling behaviors. The fourth section reports participant knowledge of food safety and the final section reports participant food-handling behaviors.

Section One: General Results

A total of 353 participants completed the telephone survey—245 (69.4%) were female and 108 (30.6%) were male. The mean age of the participants was 74.3 years old with 91% being White/Non-Hispanic. Participants prepared meals an average of 12 times per week. Ninety-nine percent of participants prepared meals for themselves and 72% prepared meals for others. Education level of the participants varied greatly, with

participants indicating completing high school or some college comprising the largest group (See Table 1).

Education Level	Σ
0-11 Years	37
12 Years (High school Graduate/GED)	110
1-3 Years of College (Some College)	94
College Graduate (Bachelor Degree or Equivalent)	66
Post Graduate, Masters Degree, Doctorate, Law Degree, Other Professional Degree	46

Table 1. Sum of participants for education level.

Section Two: Risk Perception

Older adults' risk perception of food safety was assessed by asking participants to respond to seven statements, using a 7-point Likert-scale, where 1 indicated "very likely" and 7 indicated "not very likely". Results showed that seniors indicated the greatest risk to food safety occurred in food processing plants (48%), followed by homes (20%), and by restaurants (16%). A follow up question however, indicated respondents were more concerned with food prepared at restaurants than with food prepared in their homes.

When asked if foods contaminated by micro-organisms was a "very serious," "serious," "somewhat" or "not at all" food safety problem, over 56% of participants indicated it was a "very serious" or "serious" problem. When probed with questions about the risk of certain food items being contaminated with micro-organisms, participants judged that raw chicken was most likely to make one sick, and raw fruit and vegetables were judged by participants as least likely to cause illness. Foods identified by experts as high risk foods, such as raw oysters, raw sprouts, and raw eggs, were judged in the middle of the scale by participants, indicating that risk perceptions of older adults associated with some foods were markedly different than risk assessments of experts (See Table 2).

Foods	Mean Response*
Raw Chicken	1.5
Raw Shellfish, Oysters	2.2
Raw Beef	2.3
Raw Eggs	2.5
Raw Sprouts, such as Alfalfa Sprouts	4.4
Raw Vegetables	5.2
Raw Fruits	5.4

*Scale: 1 (Very Likely) ---- 7 (Not At All Likely)

Table 2. Judgments of risk to certain foods containing micro-organisms.

When participants were presented with the statement, “If you happen to leave cooked food out of the refrigerator for more than 2 hours after it has finished cooking, how likely are you to get sick,” answers differed significantly in relation to education level [$F(4, 341) = 2.56, p < .05, \eta^2 = .03$]. Post hoc analysis indicated those participants who had completed post graduate work judged themselves at a lower risk of getting sick compared to those at other education levels.

Section Three: Attitudes

To assess attitudes, participants responded to 18 statements, taken from Medeiros et. al (2001a), on a 7-point Likert-scale, with 1 indicating “strongly agree” and 7 indicating “strongly disagree.” Overall attitudes towards safe food handling behaviors were positive with participants aware of food safety problems and having attitudes consistent with safe food-handling recommendations (See Table3).

Question	Mean Response*
I am not concerned if I thaw perishable food on the kitchen counter	5.5
Cooking and eating eggs that have firm yolks and whites is important to me for safety	2.3
Drinking pasteurized apple juice or cider is important to me for safety	2.6
After cutting raw meat or chicken, I like to wash the cutting board, knife, and counter top with hot soapy water before continuing cooking	1.5
I am not interested in using a meat thermometer	4.3
I don't worry that I may get sick if I eat alfalfa and other raw sprouts	3.8
I am worried that I may get sick if I eat hot dogs right out of the package	3.7
Using cheese and yogurt made only from pasteurized milk is important to me	2.2
I am concerned that I may get sick if I eat raw oysters	2.8
I don't worry about keeping the refrigerator at or below 40 degrees Fahrenheit	5.0
I don't worry about washing my hands after playing with my pets	5.9
It is not important to cover a cut or sore on my hand before I prepare food	5.9
Refrigerating food such as rice and beans overnight before serving them the following day is not important to me	5.6
There is no need to store eggs in a refrigerator, room temperature is just fine	6.7

*Scale: 1 (Strongly Agree) ---- 7 (Strongly Disagree)

Table 3. Attitudes towards safe food handling.

Participants' level of education was often associated with maladaptive food handling attitudes. When presented with the statement, "I am not concerned if I thaw perishable food on the kitchen counter," a significant difference existed among the different levels of education of the participants [$F(4, 345) = 3.67, p < .01, \eta^2 = .04$]. Post hoc test indicated those with a college level education differed from the rest. Specifically, those with college educations were more likely to report that thawing perishable foods on the counter was not a concern to them.

Also, when asked to respond to the statement, "It is not important to cover a cut or sore on my hand before I prepare food," another significant difference existed between those with college education and others [$F(4, 344) = 2.12, p = .07, \eta^2 = .025$]. Post hoc analysis indicated that covering a cut or sore on their hands was not as important to those with college educations as it was to non-college educated participants.

Section Four: Knowledge

Knowledge was assessed by having participants respond to 8 yes/no statements as well as answers to 4 questions about foods that are safe or not safe to eat taken from the validated survey by Medeiros et. al (2001b). Overall, participants answered knowledge questions about safe food-handling behaviors correctly. People generally knew they should wash their hands before cooking, should use a new dish cloth to wipe down counters after raw meat, and should use a different cutting board (or wash it with hot soapy water) for vegetables after cutting raw meat or chicken. Still, participants consistently answered questions incorrectly in two areas—cooking temperatures and the storage of cooked foods.

First, participants consistently answered questions incorrectly about cooking hamburger meat. When asked the proper cooking temperature of a hamburger patty, over 57% of the participants indicated they did not know. Also, 63% of participants reported hamburger patties are free of harmful germs when cooked until no pink shows, which is contradictory to research data indicating that hamburger may lose pink color before reaching safe temperatures.

Second, participants were unsure about whether cooked food that had been sitting on the counter for two hours after preparation was safe to eat. Forty-seven percent of participants indicated it was safe to eat rice left out of the refrigerator and 60% indicated it was safe to eat a baked potato left out of the refrigerator for two hours. Moreover, 24% reported cooked meat was safe to eat after not being refrigerated for two hours.

Section Five: Behaviors

Participants were asked to report their behaviors by responding to 11 statements on a 7-point Likert-scale, with 1 indicating "always" and 7 indicating "never" and 23 yes/no questions (Medeiros, Kendall, Hillers and Mason, 2001). Participants reported behaviors that tended to be consistent with safe food handling practices (See Table 4). However, there were two areas in which participants self-reported behaviors were questionable—risky foods and thermometer usage.

The first area dealt with participants' consumption of high risk foods. When asked if they ate eggs with runny yolks, 37% of participants indicated "yes", which is a maladaptive food safety practice. Participants responded "yes" 26% of the time when asked if they ate homemade cookie dough, which is also a maladaptive behavior because

it contains raw eggs. Finally, 26% of participants indicated that they eat raw alfalfa or other raw sprouts. The USDA recommends people over 65 years of age avoid all of those foods.

Question	Mean Response*
Before preparing or handling food, I wash my hands with soap and warm running water	1.5
After playing with a pet and before getting a snack, I wash my hands with soap and warm running water	1.5
If I have a cut or sore on my hand, I cover it before preparing food	1.5
I discard shellfish, such as mussels or clams, if the shellfish has not opened during cooking	1.5
I wash the plate used to hold raw meat, poultry, or seafood with hot, soapy water before returning cooked food to the plate OR I use a clean plate	1.3
I wash my hands with soap and warm running water after working with raw meat, poultry, or seafood and before I continue cooking	1.3
I clean countertops with hot soapy water after preparing food	1.7
I leave cooked foods, such as rice or beans, on the stovetop overnight to be used the next day	6.4
I put frozen meat and poultry on the counter in the morning so it will be thawed and ready to cook in the evening	5.5
I store my eggs at room temperature	6.7
I never eat raw vegetables if they have come in contact with raw meat or chicken	3.3

*Scale: 1 (Always) ---- 7 (Never)

Table 4. Participants responses to food handling behaviors.

The second area dealt with food preparation. The main problem area was the lack of thermometer use. Less than half (49.4%) of the participants indicated they used a thermometer to check the temperature of their refrigerator. Only 9% used a meat thermometer to check if hamburger meat was cooked to the proper temperature. Over 90% indicated they used the “no pink” method of determining safety of hamburger meat.

In some instances, education level was associated with maladaptive food handling behaviors. Those with a higher education, particularly those with post graduate work, reported not covering a cut or sore on their hands before preparing meals [$F(4, 348) = 3.98, p < .05, \eta^2 = .04$]. Responses based on education level differed significantly when participants were asked, “If before preparing or handling food, do you wash your hands with soap and warm running water?” [$F(4, 346) = 2.58, p < .05, \eta^2 = .03$]. Those with post graduate work again differed from the rest, indicating that they tended not to wash their hands in this manner.

Discussion

Unlike previous research which has shown that people do not engage in safe practices (United States Department of Health and Human Services, Administration on Aging, 2001; Mead et al., 1999), results from the present study indicated that overall, older adults report prescribing to safe food-handling practices. Though food safety is statistically a national problem, the results indicated that older adults are consistent in their perceptions of risk, attitudes, knowledge, and behaviors when it comes to avoiding maladaptive food handling. The overall results are positive, but there are three specific problem areas: (1) level of education, (2) specific foods, and (3) food preparation.

Level of Education

Overall, results indicated that those who were educated, i.e., with a college degree or post graduate work, were less concerned with food safety. For example, people in this education level had attitudes that were contradictory to safe food-handling practices. They were not concerned with such practices as thawing perishable foods on counter tops and covering a cut or sore on their hands before cooking. Also, those in this education bracket perceived less risk in getting sick from foods that sat out of the refrigerator for more than 2 hours after preparation. Finally, people with this education level were more likely to engage in negative food safety practices. Specifically, they were less likely to cover a cut or sore on their hand or wash their hands with soap and water before cooking.

Two plausible yet simplistic reasons can explain this result. (1) Generally, those who fall within this education level make more money than those who fall below this education level, i.e., they are wealthier. Thus, they can afford better healthcare than others. This may lead to a lower level of perceived risk due to foodborne illness because they can afford healthcare to combat any sickness they come across. This would be similar to the studies that show that a glass of wine a day will lower heart disease. This may be true, but what is more likely is that those who can afford a glass of wine have better healthcare and combat heart disease in other ways as compared to those with inferior healthcare. (2) Since those who fall in this education level do make more money, they may be more careless with their resources (e.g., food) because they can afford more of them, whereas those who make less do not have the luxury of wasting and therefore are conscious of potential hazards. Either way, people with education have negative attitudes, perceive less risk, and engage in behaviors contrary to proper food safety.

Specific Foods

Over the past several years, the U.S. government has carried out public awareness campaigns on the dangers of eating raw and undercooked chicken. Based on the results, it appears to be working. Participants perceived a large level of risk from eating raw chicken. However, the results of this study indicated two foods in which public awareness needs to be increased.

First, participants indicated there was a low level of risk associated with eating of raw eggs. This was supported by reports of eating undercooked and raw eggs. In addition to perceiving a low level of risk, 37% of participants indicated they ate runny eggs, and 26% indicated they ate homemade cookie dough (which contains raw eggs). Many participants were shocked to find out that runny eggs were not good for them. Most were even more shocked/surprised when they realized that by eating homemade

cookie dough they were eating raw eggs. One woman in particular commented, "It never dawned on me that raw eggs were in the dough when I ate it."

The second related to raw sprouts or alfalfa. Generally, participants rated risk to eating sprouts or alfalfa neutrally, saying they were "unsure" as to whether they posed a food safety risk. Twenty-six percent of respondents indicated they did, which is too high. Both of these two food items need to be addressed by food safety advocates to get the message out as to the correct behaviors to ensure proper food safety.

Food Preparation

Two areas within food preparation and handling pose food safety problems. The first area deals with cooking hamburger meat. Participants indicated, overwhelmingly, they did not know the proper temperature for cooking hamburger meat. They believed that the absence of pink indicated a hamburger is fully cooked. And, they did not use thermometers to check hamburgers for a safe degree of doneness. The second area has to do with the safety of leaving cooked food out on the counter for more than 2 hours after preparation. Again, an overwhelming majority of people indicated that cooked rice, meat and potatoes were safe to eat.

In both of these areas, the problem appears to be a lack of knowledge as to what is good and bad food preparation habits. The use of a thermometer, regardless of meat color, and putting food in a refrigerator after 30 minutes is knowledge that has long been identified by researchers. However, this knowledge has not been or is not being imparted to the public, thereby increasing the likelihood of foodborne illness. Both of these practices need to be addressed by food safety educators.

Conclusion

Though food-safety educators have made many advances to get the message to older adult consumers about how to avoid foodborne illness, there still are some areas of concern. Food-safety educators need to refocus their work towards people in higher education brackets; on specific foods (e.g., eggs, hamburger and sprouts); and on food preparation habits, i.e., putting food away in a timely manner and the use of a thermometer. Until these areas are addressed properly, older adults will keep putting themselves at risk, due to lack of knowledge, perceived risk and personal attitudes.

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References

- Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behavior. *Journal of Personality and Social Psychology*, 27, 41-57.
- Bean, N. H., Goulding, J.S., Lao, C., & Angulo, F.J. (1996). Surveillance for foodborne-disease outbreaks—United States, 1988-1992. *Morbidity and Mortality Weekly Report*, 45, 16-20.
- Buzby, J.C. (2002). Older adults at risk of complications from microbiological foodborne illness. *Food Review*, 25 (2), 30-35.
- Buzby, J.C., Roberts, T., Lin, C.-T.J., & MacDonald, J.M. (1996). Bacterial foodborne disease: Medical costs & productivity losses. ERS, USDA. *Agricultural Economic Report, No. 741*, Washington, D. C.
- Darley, J.M., & Batson, C.D. (1973). From Jerusalem to Jericho: A study of situational and dispositional variables in helping behavior. *Journal of Personality and Social Psychology*, 27, 100-108.
- Dillman, D. (2000). *Mail and internet surveys: The tailored design method*. New York: J.Wiley.
- Eagly, A.H., & Chaiken, S. (1996). The nature of attitudes. In *The Psychology of Attitudes* (pp. 1-22). Orlando, FL: Harcourt Brace and Company.
- Food and Drug Administration & U.S. Department of Agriculture Food Safety and Inspection Service. (2001). *To your health! Food safety for seniors*. Washington, D. C.
- Hanson, J.A., & Benedict, J.A. (2002). Use of the health belief model to examine older adults' food-handling behaviors. *Journal of Nutrition and Education Behavior*, 34 (Supplement 1), S25-S30.
- Manstead, A.S.R. (1996). Attitudes and behavior. In G. R. Semin & K. Fiedler (Eds.), *Applied Social Psychology* (pp. 3-29). London: Sage Publications.
- Mead, P.S., Slutsker, L., Diez, V., McCraig, L.F., Bresee, J.S., Shapiro, C., Griffin, P.M., & Tauxe, R.V. (1999). Food-related illness and death in the United States. *Emerging Infectious Diseases*, 5(5), 607-625.
- Medeiros, L.C., Kendall, P., Hillers, V., Chen, G. & DiMascola, S. (2001). Identification and classification of consumer food-handling behaviors for food safety education. *Journal of the American Dietetic Association* 101, 11, 1326-1339.
- Medeiros, L.C., Kendall, P., Hillers, V. & Mason, A. (2001a). Evaluation of food safety education for consumers. *Journal of Nutrition Education*, S27-S34.
- Medeiros, L.C., Kendall, P., Hillers, V. & Mason, A. (2001b). Food safety education: What should we be teaching to consumers? *Journal of Nutrition Education* 33, 2, 108-113.
- Sandman, P.M. (1987). Risk communication: Facing public outrage. *EPA Journal*, 13(9), 21-22.
- Smith, J.L. (1998). Foodborne illness in the elderly. *Journal of Food Protection*, 61(9), 1229-1239.
- United States Department of Health and Human Services, Administration on Aging. (2001). A profile of older America: 2001. [Online] Available <http://www.aoa.dhhs.gov/aoa/STATS/profile.pdf>, August 4, 2003.