



Most Americans are Not Prepared to Ensure Food Safety during Power Outages and Other Emergencies

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ABSTRACT

Natural disasters and other emergencies can endanger food safety and increase the risk of foodborne illness. We conducted a nationally representative Web-enabled survey ($n = 1,011$) to understand consumers' knowledge and use of recommended practices during extended power outages and other emergencies. Only 15% of respondents reported they are fully prepared to keep food safe during an extended power outage. Of those respondents who had experienced a recent power outage, 37% discarded frozen foods that had thawed, 31% discarded refrigerated perishable foods, and 15% stored food directly in snow/cold weather, a potentially unsafe practice. Additionally, 65% of respondents smelled food to determine whether it was safe to eat, another potentially unsafe practice. Only 33% of survey respondents knew to discard refrigerated perishable foods, such as meat, poultry, milk, eggs, and deli items, after 4 hours without power, and 60% knew to discard frozen food that had partially or completely thawed before power is restored unless it contains ice crystals or is 40°F or below. Americans are not prepared to ensure food safety during extended power outages and other emergencies despite widely available information on emergency preparedness and response. Educational materials need to address barriers and misconceptions and target specific practices and demographic groups.

INTRODUCTION

Since 9/11 and the subsequent anthrax incidents, concerns about intentional acts of food contamination, or foodborne bioterrorism, in the United States have been heightened. Although most foodborne disease outbreaks are unintentional, deliberate contamination of food in the United States has occurred and could happen again (11, 14). For example, in 1984, members of a religious cult contaminated salad bars and drinking glasses with *Salmonella* Typhimurium in 10 Oregon restaurants, which resulted in 751 people contracting salmonellosis, and in 1996, a laboratory worker deliberately infected colleagues by contaminating food with a reference strain of *Shigella dysenteriae* type 2 (6, 14). A deliberate contamination of a commercial food product could cause a widespread outbreak of foodborne illness geographically dispersed across the United States (12). The Centers for Disease Control and Prevention (CDC) has identified a list of possible biological agents that could be used to contaminate food and water sources (5). Although these biological agents, namely foodborne pathogens, rarely result in death if victims are properly treated, a sudden large increase

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in the number of foodborne illness cases could overwhelm medical resources, and appropriate treatment might not be available to all victims (12). Since 9/11, the U.S. government has worked with U.S. food processors and food producers to anticipate, prevent, and deter threats to the food supply (1). Consumers, however, also have a role in keeping food safe before, during, and after emergencies and possible acts of foodborne bioterrorism.

Natural disasters (e.g., earthquakes, wildfires, and hurricanes) and other events that can lead to an extended power outage can endanger the safety of food and cause an increased risk of foodborne illness. For example, in August 2003, 9 million residents of New York City (NYC) experienced a power outage that left some residents without electricity for 2 days. Over 20 NYC emergency departments experienced a statistically significant increase in patient visits for diarrheal syndrome, 70% more than expected, 2 days after the initial power outage (8). Additionally, there was an increase in sales of over-the-counter antidiarrheal medications and electrolytes and an increase in the number and proportion of worker absences due to gastrointestinal illness 3 days after the initial power outage (8). Of patients who were diagnosed with diarrheal syndrome or similar syndromes at 20 NYC emergency departments that participate in syndrome surveillance, 68% had consumed at least one food considered at risk of contamination (8).

To reduce the risk of possible foodborne illness, consumers must have the necessary tools (e.g., emergency kit and appliance thermometer) and knowledge to prepare for an emergency and to keep food safe during and after an emergency. Precautions that consumers can take during and after an emergency (whether an act of bioterrorism or an extended power outage) to ensure food safety include, but are not limited to, (1) keeping refrigerator and freezer doors closed as much as possible during a power outage to maintain cold temperatures; (2) discarding refrigerated perishable foods after 4 hours without power; (3) keeping an appliance thermometer in the home refrigerator and freezer at all times; and (4) preparing an emergency kit that contains a 3-day supply of drinking water and nonperishable foods for each household member (17).

The U.S. Department of Agriculture (USDA) and the U.S. Department of Homeland Security, and other organizations, such as the American Red Cross, have developed various Web sites and print materials to educate consumers about recommended food safety practices to prepare for and respond to emergency situations, including extended power outages and bioterrorism. However, few studies, especially at the national level, have been conducted to measure consumers' knowledge and use of these recommended food safety practices.

A national survey was conducted to understand consumers' food safety attitudes, knowledge, and practices with regard to emergency preparedness and response; specifically, the survey collected information on respondents' levels of preparedness to keep food safe during and after extended power outages, whether respondents had read or heard about specific food safety recommendations, and the likelihood that respondents would follow recommendations. Public health officials and educators can use the survey findings to identify gaps in consumers' food safety knowledge and practices, improve existing educational materials, and ultimately help reduce the risk of foodborne illness.

MATERIALS AND METHODS

A national survey of U.S. household grocery shoppers aged 18 years and older was conducted using a Web-enabled panel survey approach. RTI International's Committee for the Protection of Human Subjects, which serves as RTI's Institutional Review Board, reviewed and approved the study protocol. The survey administration and analysis procedures are described below.

Sample

The sample was selected from a Web-enabled panel developed and maintained by Knowledge Networks (Menlo Park, CA), a survey research firm. The Web-enabled panel, designed to be representative of the U.S. population (2), is based on a list-assisted, random-digit-dial (RDD) sample drawn from all 10-digit telephone numbers in the United States. Households that do not have telephones (approximately 2.4% of U.S. households) are not covered in the sample (15). In return

for a household's agreement to participate in the panel, they are provided with a free computer and Internet access. All new panel members are sent an initial questionnaire that collects information on a wide variety of demographic characteristics to create member profiles, which can be used for sample selection and weighting.

At the time of sample selection, approximately 45,000 panel members were actively participating in the Web-enabled panel. A sample of 1,619 panel members who had primary or shared responsibility for the grocery shopping in their households was randomly selected to receive the survey.

Questionnaire

The questionnaire collected information on consumers' food safety attitudes, knowledge, and practices regarding emergency preparedness and response. The first part of the questionnaire asked respondents whether they had experienced an extended power outage (i.e., 24 hours or more) within the past 5 years and if so, to describe their most recent extended power outage (i.e., cause and duration); whether they were prepared for the extended power outage; and whether they handled food safely during and after the extended power outage. The next set of questions asked respondents whether they had read or heard about specific food safety recommendations; how likely they would be to follow the recommendations during a future power outage or other emergency (i.e., floods); and where they would get food safety information on emergency preparedness and response (i.e., Internet, family member, government agency). The last set of questions asked respondents whether they had read or heard about other specific government recommendations regarding foodborne illness, food recalls, and intentional acts of contamination, including a terrorist attack on the U.S. food supply, and how likely they would be to follow these recommendations in the future.

Prior to survey administration, the survey instrument was evaluated with 10 adults who had recently experienced extended power outages, using cognitive interviewing techniques (20). After participants completed the survey, an interviewer asked each participant to provide his or her response, to explain the reason for the response choice, and whether the question or response items were confusing or difficult to understand. Subsequently,

TABLE 1. Precautions respondents took during most recent extended power outages to ensure food safety^a

	Weighted Percentage of Respondents (%)
Kept refrigerator and freezer doors closed as much as possible throughout power outage.	83.4
Cooked and/or ate perishable foods as soon as possible.	43.2
Discarded frozen foods that had thawed.	37.1
Put food in coolers with ice or gel packs.	32.3
Discarded refrigerated perishable foods.	31.3
Used generator.	17.1
Stored food outside directly in snow or cold weather.	14.8
Moved refrigerated foods to freezer.	13.4
Put dry or block ice in refrigerator or freezer.	7.3
Transported food to a house with electricity (write-in response).	3.2
Other.	1.5
None of the above.	2.0

^aRespondents could select multiple responses.

the survey instrument was refined based on the results from the cognitive interviews.

Survey procedures and response

The survey was e-mailed to a random sample of panel members aged 18 years old and older who had primary or shared responsibility for the grocery shopping in their household. To maximize response rate, two e-mail reminders were sent and one telephone call was made to nonrespondents. Data were collected over a 14-day field period. Of the 1,619 sampled panelists, 49 individuals were not eligible and 559 individuals did not respond. The total number of completed interviews was 1,011, which yielded a 64% completion rate.

Weighting procedures

The data were weighted to reflect the selection probabilities of sampled units and to compensate for differential nonresponse and undercoverage (7). The weights were based on the inverses of their overall

selection probabilities with adjustments for undersampling of telephone numbers for which an address was not available during panel recruiting; households with multiple telephone lines; oversampling of certain geographic areas, African American and Hispanic households, and households with computer and Internet access; and undersampling of households not covered by MSN TV. Using a raking, or iterative proportional fitting, technique, data on age, gender, race/ethnicity, geographic region, education, Internet access, and metropolitan status were used in a post-stratification weighting adjustment to make the sample reflect the most current population benchmarks (16). The final weights were trimmed and scaled to sum to the total U.S. population aged 18 years and older; hence, the weighted survey results are representative of the U.S. adult population.

Analysis

Weighted frequencies were calculated for each survey question. For selected questions, analyses were conducted to assess

whether responses varied by respondent characteristics. The following sociodemographic and other variables were included in this analysis: gender, age (18 to 44 years old versus 45 years old and older), education level (high school or less versus some college or college degree), marital status (married versus not married), household size (one versus two or more individuals), race/ethnicity (white, non-Hispanic versus other), household income (less than \$35,000 versus \$35,000 or more), U.S. region (Northeast, Midwest, South, and West), and metropolitan status (metropolitan versus nonmetropolitan) based on the metropolitan statistical area (MSA) for the household. A chi-square test was performed for the relationships between the variables of interest and the sociodemographic and other variables. The analysis was conducted with the Stata release 8.2 software package (13).

RESULTS

Of the 1,011 respondents, 72% were women; 73% were white, non-Hispanic; and 61% were between the ages of 30

TABLE 2. How respondents determined whether food was safe to eat during/after most recent extended power outages: weighted percentage of respondents (%)^a

	Refrigerated Foods	Frozen Foods
Considered the type of food (perishable vs. nonperishable).	76.2	NA
Considered amount of time food was in refrigerator or freezer after loss of power.	72.3	59.8
Considered whether refrigerator or freezer was still cold.	68.1	65.6
Smelled the food.	65.1	44.7
Looked at the food.	51.8	52.3
Touched the food.	33.6	40.5
Tasted the food.	28.5	19.6
Used thermometer to check internal temperature of food.	8.9	13.7
Asked another household member.	8.8	NA
Used generator to power refrigerator or freezer (<i>write-in response</i>).	3.2	3.3
Considered whether the food was still frozen.	NA	78.4
Other.	2.0	2.0
No response.	0.0	0.8

^aRespondents could select multiple responses.
NA = not asked.

and 59 years old. Approximately 61% of respondents had some college education or a college degree, and 61% of respondents had annual household incomes of \$35,000 or more. Twenty-seven percent of respondents had children living in their households at the time of the survey.

Responses regarding most recent power outage

Thirty percent of respondents had experienced an extended power outage (24 hours or more) in the past 5 years. Of these respondents, 48% of respondents lived in the South, and 23% of respondents lived in the Midwest. The extended power outages were caused by ice or snow storms (28%), thunderstorms (25%), and hurricanes (23%). Thirty percent of respondents experienced a power outage that lasted 3 or more days. Forty-two percent of respondents experienced an extended power

outage during the summer when thunderstorms and hurricanes are more prevalent, and 35% of respondents experienced a power outage during the winter months when ice or snow storms occur.

Of those respondents who had experienced a recent extended power outage, 23% reported they were very prepared, 56% were somewhat prepared, and 21% were not at all prepared for the power outage. Respondents with some college education or a college degree were more prepared than respondents with a high school education or less (66.7% versus 46.2%; $P=0.0042$). White, non-Hispanic respondents were more prepared for the most recent extended power outage compared to respondents of other races/ethnicities (64.0% versus 45.9%; $P=0.0594$). Table 1 presents precautions respondents took during extended power outages to ensure food safety. Fifteen percent of respondents reported they stored food

outside directly in snow or cold weather, a potentially unsafe practice.

Eighty-one percent of respondents reported eating food that was in the refrigerator during or after the most recent power outage, and 71% of respondents reported eating food that was in the freezer. Table 2 presents how respondents determined whether food was safe to eat during or after the outage. Some respondents reported they used their senses to determine whether refrigerated and frozen foods were safe to eat during or after the extended power outage. For example, 20 to 29% of respondents reported they tasted food to determine whether it was safe to eat, a potentially unsafe practice.

After the most recent power outage, 66% of respondents reported they bought supplies and/or equipment to keep food safe during a future power outage. Forty-four percent of respondents reported they purchased a stock of canned or other

TABLE 3. Respondents' level of preparedness to keep food safe during future extended power outages or other emergencies

	Weighted Percentage of Respondents (%)
Level of preparedness for extended power outages	
Fully prepared.	14.6
Did a lot but not fully prepared.	17.8
Did some things but could do more to be prepared.	28.1
Took no special steps to be prepared.	39.3
Why respondents are fully prepared	
Experienced extended power outage or other emergency before.	43.1
Believe it is important to be self-sufficient.	32.0
Responsible for children.	12.9
Live in high risk area.	6.6
Responsible for an elderly or disabled person.	3.4
Other.	1.8
Why respondents have not done more to be prepared ^a	
Have not thought about it enough.	44.2
Do not think an extended power outage or other emergency will happen where I live.	22.2
Do not have enough room to store items in the event of an emergency.	20.3
Costs too much money to prepare.	15.8
Do not know how to prepare.	10.6
Nothing I could do to prepare would help.	7.2
Do not want to think about it.	7.0
Takes too much time to prepare.	2.1
Other.	6.3
No response.	0.8

^aRespondents could select up to two responses.

nonperishable foods, 40% of respondents purchased bottled drinking water, 24% of respondents purchased ice or gel packs, and 14% of respondents purchased a generator or cooler(s).

Responses regarding future power outage

Table 3 presents respondents' answers to questions regarding their level of preparedness to keep food safe in the event

of a future extended power outage or other emergency. Fifteen percent of respondents reported they are fully prepared to keep food safe in the event of a future extended power outage or other emergency, 46% of respondents reported they have made at least some preparations but are not fully prepared, and 39% of respondents reported they "have taken no special steps to be prepared." The top four reasons why respondents are not

fully prepared to keep food safe in case of a future extended power outage or other emergency included lack of cogitation (44%), concern (22%), storage space (20%), and money (16%).

Only 15% of all survey respondents reported they are fully prepared for a future extended power outage. These respondents are prepared because they have previously experienced an extended power outage (43%) or believe it is important

to be self-sufficient (32%). Respondents who had experienced an extended power outage in the past 5 years reported they were more prepared to keep food safe in case of a future extended power outage or other emergency compared with respondents who had not recently experienced an extended power outage (55.1% versus 22.5%; $P < 0.0001$). White, non-Hispanic respondents reported they were more prepared to keep food safe in the event of a future extended power outage or other emergency compared to respondents of other races/ethnicities (36.4% versus 22.1%; $P = 0.0031$).

To reduce the risk of contracting foodborne illness, USDA recommends that all consumers use an appliance thermometer to make sure their refrigerators are at a temperature of 40°F or below (18). Thirty-one percent of all survey respondents reported they have a thermometer in their refrigerators, and 60% of respondents correctly reported the recommended refrigerator temperature.

USDA recommends that all consumers should assemble and store a 3-day supply of drinking water and nonperishable food items for each household member in case of an extended power outage or other emergency (19). About 73% of all survey respondents have read or heard this recommendation, and 40% of respondents have assembled a supply of drinking water and nonperishable food for each household member. Male respondents (48.4% versus 37.3%; $P = 0.0102$), respondents aged 45 years and older (49.1% versus 29.1%; $P < 0.0001$), respondents without children living in their households (44.5% versus 29.3%; $P = 0.0010$), and respondents with a household member at risk for foodborne illness (44.6% versus 35.9%; $P = 0.0320$) were significantly more likely than their counterparts to have a 3-day supply of drinking water and nonperishable food. Respondents who reported they are very prepared to keep food safe in the event of an extended power outage or other emergency were significantly more likely than those not very prepared to have a 3-day supply of drinking water and nonperishable food items for each household member (81.9% versus 33.3%; $P < 0.0001$). Ninety-five percent of respondents reported that they or another household member had updated or checked the supply within the past year.

Table 4 presents survey respondents' awareness and likelihood of following specific food safety recommendations for extended power outages and other emer-

gencies. Respondents' level of awareness of each of the four food safety recommendations varied from 33 to 96%. An awareness index of 0 to 4 was calculated to measure the mean number of the four food safety recommendations of which respondents read or heard. The mean awareness index was 2.74. The mean awareness index was significantly higher among female respondents (2.80 versus 2.58; $P = 0.0019$), respondents aged 45 years and older (2.82 versus 2.63; $P = 0.0037$), and white, non-Hispanic respondents (2.78 versus 2.62; $P = 0.0192$). A majority of respondents reported they would be very likely or likely to follow each of the four recommendations during a future power outage or other emergency. A likelihood index of 1 to 5, where "1" = very unlikely and "5" = very likely, was calculated to measure the likelihood of following the four food safety recommendations. The mean likelihood index was 4.30. The mean likelihood index was significantly higher among female respondents (4.36 versus 4.12; $P < 0.0001$) and respondents with a household member at risk for foodborne illness (4.33 versus 4.26; $P = 0.0543$).

Responses regarding other emergencies

Half of all survey respondents live in areas that experience floods. The majority of respondents reported they were aware of and would be very likely or likely to follow the three recommendations if their homes flooded. The mean awareness index was 2.27 for the three recommendations (index of 0 to 3). The mean awareness index was significantly higher among white, non-Hispanic respondents (2.42 versus 1.87; $P < 0.0001$), respondents aged 45 years and older (2.43 versus 2.09; $P < 0.0001$), respondents without children living in their households (2.33 versus 2.13; $P = 0.0335$), respondents who live in non-metropolitan areas (2.60 versus 2.21; $P = 0.009$), and respondents with a household member at risk for foodborne illness (2.41 versus 2.15; $P = 0.0024$). The mean likelihood index for the three recommendations (index of 1 to 5) was 4.73. The mean likelihood index was significantly higher among female respondents (4.80 versus 4.55; $P < 0.0001$), respondents aged 45 years and older (4.78 versus 4.67; $P = 0.0337$), white, non-Hispanic respondents (4.76 versus 4.64; $P = 0.0425$), and respondents

with some college education or a college degree (4.80 versus 4.61; $P = 0.0003$).

USDA encourages consumers to follow specific recommendations regarding reporting foodborne illness, responding to food recalls, and reporting intentional acts of contamination. The majority of respondents reported they would be very likely to follow these recommendations. The mean likelihood index for following these recommendations (index of 1 to 5) was 4.44. The mean likelihood index was significantly higher among female respondents (4.47 versus 4.37; $P = 0.0392$), respondents aged 45 years and older (4.58 versus 4.26; $P < 0.0001$), respondents with a high school education or less (4.55 versus 4.37; $P < 0.0001$), respondents with a household income less than \$35,000 (4.57 versus 4.36; $P < 0.0001$), respondents without children living in their households (4.47 versus 4.36; $P = 0.0141$), and respondents with a household member at risk for foodborne illness (4.54 versus 4.34; $P < 0.0001$).

When respondents reported where they would obtain information on food safety recommendations for extended power outages or other emergencies, 51% of respondents reported they would use the Internet, and 43% of respondents reported they would contact their local health department. Other information sources included family members or friends (25%), the American Red Cross (18%), and government agencies (17%).

Forty-two percent of respondents reported they thought it was very likely or likely that there would be a terrorist attack on the U.S. food supply in the next 10 years. Female respondents (15.6% versus 7.1%; $P = 0.0359$), respondents aged 45 years and older (46.1% versus 37.4%; $P = 0.0438$), and respondents with incomes of \$35,000 and more (45.6% versus 37.1%; $P = 0.0442$) were significantly more likely than their counterparts to believe a terrorist attack on the U.S. food supply is forthcoming. Sixty-two percent of respondents reported they are not very prepared or not at all prepared for a terrorist attack on the U.S. food supply. Male respondents (46.0% versus 33.6%; $P = 0.0034$), respondents aged 45 years and older (42.6% versus 29.8%; $P = 0.0022$), and respondents who reported they thought it was very likely or likely that there would be a terrorist attack on the U.S. food supply (42.6% versus 33.1%; $P = 0.0175$) were significantly more likely than their counterparts to report they would be very or somewhat prepared for a terrorist attack on the U.S. food supply.

TABLE 4. Respondents' awareness and likelihood of following food safety recommendations for future extended power outages and other emergencies

Recommendations	Heard or Read Recommendation: Weighted Percentage of Respondents (%)	Likelihood of Following Recommendation: Mean ^a
Practices during an extended power outage		
Keep refrigerator and freezer doors closed as much as possible to maintain cold temperatures.	96.3	4.81
Do not eat refrigerated perishable foods, such as meat, poultry, milk, eggs, and deli items, after 4 hours without power.	32.8	3.78
Discard food in your freezer that has partially or completely thawed before power is restored unless the food contains ice crystals or is 40°F or below.	59.9	4.16
Never taste a food to determine its safety. When in doubt, throw it out.	84.5	4.49
Practices after a flood^b		
Use bottled water that has not been exposed to flood waters if it is available. If bottled water is not available, then boil or disinfect water before drinking.	91.0	4.77
Discard all food that comes in contact with flood waters if the food is not in a waterproof container or if the food is in a damaged can.	73.0	4.78
If exposed to flood waters, thoroughly wash countertops, pots, pans, dishes, and utensils with soap and hot water if available. Rinse and then sanitize them with a mild bleach solution.	64.1	4.74
Other recommended food safety practices		
If you suspect you have gotten sick from eating food that was prepared outside the home, USDA recommends you contact your local health department.	NA	4.21
If a food product has been recalled, USDA recommends consumers not eat the product and return it to the place of purchase or discard it.	NA	4.74
USDA recommends consumers contact their local health department or law enforcement agency if they suspect a food product has been intentionally tampered with.	NA	4.39

^aRespondents answered on a 5-point scale, where “1” was equivalent to “very unlikely” and “5” was equivalent to “very likely.”

^bResults exclude respondents who live in an area that does not flood.

NA = not asked.

DISCUSSION

Consumers need to be prepared in the event of an emergency or an intentional attack on the U.S. food supply. Government agencies and other organizations have developed Web sites and print materials to inform and educate consumers about recommended food safety practices to prepare for and respond to extended power outages and bioterrorism. However, little research, especially at the national level, has been conducted to measure consumers' awareness, knowledge, and use of these recommended food safety practices.

Results from this national survey showed that only 15% of respondents are fully prepared to keep food safe during an extended power outage. The survey findings suggest lack of cogitation, concern, storage space, and money as barriers to not being fully prepared. To better understand how to help consumers address these barriers, additional consumer research is needed, and educational materials on consumer readiness need to provide specific information on how consumers can overcome these barriers. For example, with regard to lack of money, consumers may be encouraged to assemble an emergency kit over a period of several months instead of spending one lump sum to buy and assemble a kit.

Few respondents followed recommended practices to keep food safe during and after an extended power outage. For example, only 31% of respondents discarded refrigerated perishable foods, and only 37% of respondents discarded frozen foods that had thawed. Additionally, 20 to 65% of respondents relied on their senses (i.e., smell, sight, touch, and taste) to determine whether food was safe to eat, a potentially unsafe practice. In focus groups with consumers, participants were skeptical of some of the recommended food safety practices, such as the recommendation to discard refrigerated, perishable foods after 4 hours without power (4). Many participants said they were unlikely to follow the 4-hour rule because they thought food could be stored in the refrigerator safely for more than 4 hours without power and still be safe to eat. Many focus group participants said they would rather use their best judgment and/or rely on their senses than follow the 4-hour rule to determine whether food was safe to eat.

The survey findings suggest that information on emergency preparedness and food safety during extended power outages may not be reaching consumers, or consumers are not responding to this information. For example, only one-third

of respondents knew not to eat refrigerated perishable foods after 4 hours without power, and of those respondents who had experienced an extended power outage, only 31% discarded refrigerated perishable foods. Most of the currently available educational materials on consumer readiness do not focus on a specific area of the country or a specific type of disaster, whereas the survey results showed that extended power outages are more prevalent in the South than in other parts of the United States and that most power outages are caused by ice or snow storms and thunderstorms. Research has shown that messages that are locally relevant or provide information on specific geographic areas lead to increased perception of risk and increased probability of behavioral change (3, 10). Furthermore, the more detailed a message is, the more likely people are to pay attention to it and change their behaviors (9). Thus, public health officials and educators should tailor information on emergency preparedness to specific geographical areas by focusing on the types of natural disasters that occur in the area and precautions that individuals should take to prepare and respond to those types of natural disasters.

The survey results suggest that there are some demographic differences with regard to consumer awareness, knowledge, and use of recommended food safety practices. For example, we found that white, non-Hispanic respondents reported being more prepared for extended power outages as well as future power outages than respondents of other races/ethnicities. Additionally, we found respondents aged 45 years old and older were significantly more likely to have a 3-day supply of food and water for emergency purposes and follow the three flood recommendations than respondents under 45 years old. Thus, it may be useful to develop educational materials and interventions that are tailored to specific demographic groups.

Survey respondents preferred to receive information on emergency preparedness from the Internet and their local health department. According to Glik (3), people actively seek to confirm, qualify, and explain disaster messages that they receive by searching for additional information from other sources they deem credible. Thus, it is important that information comes from sources that are perceived as credible by the target audience. Focus group research identified USDA, the American Red Cross, and the U.S. Food and Drug Administration (FDA) as credible sources of information (4). Public health officials and educators should partner with local branches of these government agencies

when developing information on how to ensure food safety during emergencies.

The strengths of this study include the nationally representative sample and the high cooperation rate. A limitation of the study was the relatively small number of respondents who had recently experienced a power outage (n = 315).

In conclusion, the survey findings suggest that most consumers are not prepared to ensure food safety during extended power outages and other emergencies. Public health officials and educators can use the survey findings to identify gaps in consumers' food safety knowledge and practices, improve existing educational materials, and ultimately help reduce the risk of foodborne illness.

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