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PEER-REVIEWED ARTICLE

Food Protection Trends, Vol. 41, No. 6, p. 547–554

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A Qualitative Evaluation of the Centers for Disease Control and Prevention Risk Communication Methods during Multistate Foodborne Outbreaks

ABSTRACT

Many efforts across the farm-to-fork continuum aim to reduce foodborne disease and outbreaks. Real-time risk communication is an important component of the Centers for Disease Control and Prevention (CDC) efforts, especially during outbreaks. To inform risk communication with the public during multistate foodborne outbreaks, we conducted a series of focus groups of adults in the Washington, D.C., metropolitan area to understand attitudes, perceptions, behaviors, and how people receive information around foodborne disease outbreaks. Results from these focus groups provided insight on factors that might influence consumer perception and behavior during an outbreak. Perceived outbreak proximity and personal consumption of an outbreak vehicle were identified as some drivers of perceived risk to an outbreak. Participants also reported hearing about multiple outbreaks per year through a variety of sources and following recommended actions during an outbreak, implying some existing penetration of current risk messages for multistate foodborne outbreaks. Findings from these focus groups are a first step in increasing understanding of how CDC messages affect the consumers' ability to access and act upon reliable information to protect their health during outbreaks and serve as a baseline for further evaluation efforts of CDC risk communication strategy for multistate foodborne outbreaks.

INTRODUCTION

The U.S. food production system, including farms, processors, distributors, restaurants, and consumers, is large, complex, and consists of many different stakeholders collaborating to provide food safely to the American people. Despite public health and industry food safety efforts, foodborne disease remains a significant cause of morbidity *(17)*. In addition to a large health burden, it is estimated that the top 14 pathogens of foodborne associated disease place a large yearly economic burden accounting for a loss of 61,000 quality-adjusted life years and US$14 billion in economic losses in the United States *(10)*. Many efforts across the U.S. food production system aim to reduce burden of disease on society; risk communication during multistate foodborne

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outbreaks is one important component of the Centers for Disease Control and Prevention's (CDC) overall effort. Risk communication to the public has proven, in many areas of public health, an effective tool to raise awareness, increase knowledge, and change behaviors *(2)*.

Although most foodborne outbreaks are local, multistate foodborne outbreaks cause a disproportionate number of illnesses, hospitalizations, and deaths. From 2010 to 2014, a common foodborne source was identified in 120 multistate foodborne outbreaks, and in 55 of these outbreaks, a food product recall occurred. Even though these outbreaks accounted for 3% of all reported foodborne outbreaks, they were responsible for 11% of illnesses, 34% of hospitalizations, and 56% of deaths *(7)*. Given the disproportionate impact of multistate outbreaks and given that consumers can often take actions to reduce their risk of illness, it is especially important to assess the attitudes, perceptions, behaviors, and how people receive information around multistate outbreaks.

Public notification is an essential part of the public health response effort, providing timely access to reliable information and encouraging the public to make informed choices to prevent additional illnesses. During the multistate outbreak investigations that CDC coordinates, a variety of communication avenues are used, including the CDC website, Facebook, Twitter, Instagram, partner social media accounts, and news media, to notify the public about ongoing multistate foodborne outbreaks and what people can do to protect themselves from becoming ill. Each outbreak investigation can require unique public health messages, making timely and accurate public communication essential to relay advice to consumers. Public communication during outbreaks serves several functions, including notifying consumers of an outbreak, sharing information about the results of an investigation, and providing advice and enumerating actions consumers and retailers can take to protect themselves and their customers. Such actions can include avoiding eating or selling certain foods for a specific time, returning or discarding foods, following routine food safety recommendations, and seeking health care. CDC uses two Web-based communication tools to deliver information about foodborne outbreaks to the public during outbreaks. These tools are referred to as food safety alerts or investigation notices *(5)*. A food safety alert provides urgent, specific advice to consumers, restaurants, and retailers about foods to avoid eating or selling. This advice may include information about a recall or other warnings. An investigation notice provides information about an outbreak not yet linked to a food source, or an outbreak linked to a general type or category of food, rather than a specific food.

Since 2006, CDC has provided communication on over 150 multistate foodborne outbreaks on the website. However, the message content and format have never been evaluated with the target audiences, and to our knowledge, there has been limited work exploring the attitudes and perceptions of consumers toward multistate foodborne outbreaks. To better inform the communication strategy for foodborne illness, we conducted a series of focus groups of adults in the Washington, D.C., metropolitan area to understand attitudes, perceptions, behaviors, and how people receive information around foodborne disease outbreaks.

MATERIALS AND METHODS

The project used qualitative methods of cognitive interviews and focus groups, which are a representation of the attitudes and beliefs of the participants and should not be generalized to a larger population. The project consisted of four focus groups (25 participants) designed to assess the attitudes, perceptions, behaviors, and how people receive information around foodborne disease outbreaks. Two groups were traditional 100-min focus group sessions (18 total participants), while the remaining two were hybrid groups (7 total participants) that consisted of a one-on-one 40-min cognitive interview session, followed by a 45-min traditional focus group in which the individuals separately interviewed came back together. Despite a relatively small sample size of 25 participants, the hybrid methodology of mixing both focus groups and individual interviews allowed for more comprehensive findings by expanding the depth of responses *(11)*. Ultimately, we felt that the depth of responses would provide more actionable results to inform risk communication strategy compared with additional focus groups to increase the total sample size of participants *(16)*. The cognitive interviewing method *(20)* is a technique in which respondents are asked to report directly on cognitive or mental processes as they are being interviewed. The question response process model *(21)* evaluates the four stages an individual goes through to respond to a survey item: comprehension, retrieval, judgement, and response. Cognitive interviewing has become a technique commonly employed to evaluate and assess warning label effectiveness *(22)* as a test of comprehension of communication and messaging materials, because it helps determine how well respondents understand messaging. The open-ended format used in the cognitive interviewing method offers insight on respondents' understanding of messaging, reactions to the message, and existing knowledge on the content and is generally considered free from interviewer-imposed bias. One of the hybrid groups was limited to adults aged 65 and older because they are at a higher risk for serious health complications as a result of foodborne illness *(3)*, and we felt it useful to identify the attitudes and perceptions of participants within this specific age group to consider any implications for risk communication strategy. Potential differences in attitudes, perceptions, behaviors, and how people receive information from the general public were also identified to inform future risk communication strategy among this high-risk group. All sessions were segmented by education level to create homogenous groups to avoid potential bias that might arise from varied levels of understanding, behavioral impacts, or perceptions.

Sampling and participant screening

A quota sampling method was used to select participants to form a sample with varying demographic characteristics. Quota sampling is a nonrandom sampling technique in which participants are chosen on the basis of predetermined characteristics so that the total sample will have a similar distribution of characteristics as the target population *(19)*. Nonprobability sampling methods are commonly used in qualitative research to better understand complex issues and behaviors because they allow us to explore a variety of attitudes, perceptions, and behaviors among demographic characteristics *(13)*. This sampling strategy was chosen to help explore consumer attitudes and perceptions toward multistate foodborne outbreaks among groups diverse in age, gender, education, parenthood, and race. Initially, potential participants were recruited by phone and/or email and asked to complete a short online screening tool. These people were drawn from an internal database to Eureka Facts containing information from tens of thousands of individuals in the Washington, D.C., metropolitan area, from which we were able to recruit participants of varying demographic characteristics, including educational attainment levels, gender, age, urbanicity (urban, suburban, rural), race and ethnicity, and adults with and without children. All demographic characteristics were self-identified by participants during the recruitment process. Participants from the internal database underwent a screening process that consisted of preselecting participants on the basis of defined demographic eligibility criteria. Potential participants were invited to complete an additional screening tool that was programmed into a computer-assisted telephone interview system to ensure that the screening procedure was uniformly conducted, instantly quantifiable, and able to be checked and monitored throughout the recruitment effort. There were three exclusion criteria for participant screening: (i) having participated in a focus group within the past 6 months; (ii) being currently employed in the risk communication, market research, or advertising fields, website design, food safety, restaurant management, public health, health care practitioner, cheesemaker or cheese monger, and leafy green produce grower, distributor, or seller; and (iii) having experienced a severe illness requiring hospitalization that was attributed by a health care provider to consumption of contaminated food within the past 6 months.

If respondents met the recruitment criteria, potential participants were provided with a study description, including study objectives, purpose, and participation requirements of the data collection effort, the activities that it entails, and any potential risks associated with participation. If respondents agreed to participate, all contact information, including telephone numbers, email, and postal contact information, was collected. After scheduling qualified and screened individuals, a confirmation email and letter were sent that included the date, time, and location of the focus groups. Participants also received a telephone reminder at least 24 h before the session to confirm participation.

Data collection and analysis

Both focus group and hybrid group sessions were audio and video recorded with a note taker to monitor each session. Notes were taken by using Microsoft Excel (Microsoft Corporation, Redmond, WA), and transcripts were developed from the audio recordings by using (Rev, San Francisco, CA), a professional audio transcription service. All transcribed interviews were reviewed by using a 5% quality control spot-check method involving review of data accuracy by cross-referencing transcribed data with the audio recordings *(12)*. Each participant was identified by unique identification; names and other means of identification were not used in the notes or in the transcripts to protect participants' identities and maintain confidentiality. All transcripts and recordings were maintained on a secure password-encrypted computer within an internally certified and accredited network with its own system security plan that followed National Institute of Standards and Technology standards.

Interview guides were constructed to ask participants about perceptions of foodborne outbreaks and illness, behaviors taken in response to foodborne outbreaks, perceptions of messaging associated with CDC communication tools, frequency of exposure to CDC messaging, and sourcing of outbreak-related messaging. A traditional coding methodology or grounded theory approach *(9)* was used to analyze transcripts from each session. Analysis was conducted by using the software NVivo (QSR International, Doncaster, Australia), a qualitative data analysis computer software package. The research software was used to log, organize, and analyze interview and focus group data. Data were cleaned by identifying cases with large numbers of missing fields, outliers, and inconsistencies, and developing a file for coding and analysis. A consensus approach was used to create codes into themes from the sessions. Three individuals coded the same data set and coded data were reviewed between coders to ensure that results were matched, compared, and revised for consistency and accuracy. In cases of inconsistencies between data codes, coders met for each case of identified inconsistency to reach consensus. Coders underwent training by the research team on the type of patterns and relationships to identify on the basis of knowledge of research objectives, instruments, and content analysis.

RESULTS

Four focus group sessions were conducted from May 11, 2019, to June 8, 2019 (*Table 1*, session type). Twenty-five people participated across the four focus group sessions (*Table 2*, demographics). Two sessions were traditional focus groups (eight and nine participants each), and two were hybrid group sessions (three and five participants each).

TABLE 1. Session Type

Session date	Session type	Participant type	No. of participants	Topic area	Education level
11 May 2019	Hybrid group	General population	4	Knowledge and practices	Mixed
18 May 2019	Focus group	General population	9	Knowledge and practices	Bachelor's degree
6 June 2019	Hybrid group	Adults 65+	3	Knowledge and practices	Mixed
8 June 2019	Focus group	General population	9	Knowledge and practices	High school diploma or General Educational Development; some college but no degree or associate degree

One hybrid group session was limited to adults age ≥65 years. Among the 25 participants, 22 (88%) participants were age 18 to 64 years, and 3 (12%) were over age 65. Eleven (44%) participants identified as male, and 14 (56%) identified as female. Nine (36%) participants identified as White, 9 (36%) as Black or African American, 3 (12%) as Asian, 1 (4%) as Hispanic or Latino, 2 (8%) as other, and 1 (4%) preferred not to answer. Fourteen (56%) participants had obtained a bachelor's degree or higher, and 24 (96%) reported living in suburban or urban settings. A total of 14 (56%) of participants reported no children living at home. No differences were found between hybrid and traditional focus groups for all results, including for the hybrid session of adults over age 65.

Perceived seriousness of foodborne outbreaks and personal susceptibility

Perceived proximity to the outbreak (how close an outbreak was to a participant), severity of disease (how many illnesses and deaths were reported for the outbreak), and frequency of message delivery (how often a participant heard about an outbreak) were reported factors that influenced participant perception of the severity of an outbreak. Participants explained that outbreaks that involved illnesses in the respective state and/or had hospitalizations or deaths were more serious than outbreaks that did not involve illnesses in their state or had no hospitalizations or deaths. It was not evident from these focus groups if a higher rate of hospitalizations or deaths in an outbreak increased participant perception of outbreak seriousness. Regarding message frequency, participants reported that if they were exposed to a message about an outbreak message multiple times, through one or more platforms, they perceived that outbreak as more serious. One participant stated, "Yeah. As I was, you need to repeat it because maybe I missed the news yesterday, I'll catch it today. And if I hear it two or three times, it'll sink in that this is serious. So, you need that." Participants also touched on perceived differences of recalls versus outbreaks, indicating that recalls are perceived to be less serious than outbreaks and stated that a recall was a recommendation to avoid consuming a specific product. A participant stated, "The entity issuing the recall is just saying it lightly. But if it's actually 'we don't want you to eat it,' they're going to say, 'Don't eat it! Throw it away! Bring it back!' … I think they're going to be a little harsher about it."

Personal susceptibility (how likely a participant could be affected by an outbreak) was influenced by a participant's perceived proximity to an outbreak (how close an outbreak was to a participant), as well as whether they ate or usually eat the food identified in an outbreak. Participants explained that outbreaks that perceived were closer to them and that involved a food they generally consumed were more likely to affect them. If an outbreak appeared to be in another state or implicated a food they do not consume, participants expressed they were less likely to be susceptible to the outbreak. One participant stated, "I usually go by proximity, and I'll be like eating the lettuce and my kids will say, 'Mom, there was an outbreak or you shouldn't be eating this,' and mentally I'll be like oh, but that was in California or Washington state, it's not close to me. If I hear about Pennsylvania or Maryland or Montgomery County, that's going to make me put the lettuce down!"

TABLE 2. Focus Group Participant Demographics

	Total (n = 25)	
	Frequency	(%)
Age range		
18–30	2	8
31–40	5	20
41–50	8	32
51–60	6	24
61–64	1	4
65+	3	12
Gender		
Male	11	44
Female	14	56
Race/ethnicity		
Asian	3	12
Black or African American	9	36
Hispanic/Latino	1	4
White	9	36
Other	2	8
Prefer not to answer	1	4
Education		
High school diploma or General Educational Development	4	16
Some college but no degree	6	24
Associate degree (e.g., A.A., A.S.)	1	4
Bachelor's degree (e.g., B.A., B.B.A., B.S.)	10	40
Master's degree (e.g., M.A., M.S.)	4	16
Professional degree (e.g., M.D., J.D.) or doctorate (e.g., Ph.D., Ed.D.)	0	0
Urbanicity		
Urban	7	28
Rural	1	4
Suburban	17	68
Children residing at home		
Yes	11	44
No	14	56

Behaviors in response to foodborne outbreaks

Participants reported on actions that they may take during an outbreak to protect themselves and others. These actions included sharing outbreak information and messages with others, switching to a similar type of food or a different brand of the same food, throwing away or returning food, consuming the food in a different way (such as cooking longer), or avoiding the food altogether. One participant stated, "Well, I check my refrigerator if it's something that I might have … I mean, I, I just tend to avoid whatever it is at that point. If I have it, I usually throw it away." Another participant added, "Well, I know, I know me, it's like most of

those, you can eradicate it if you cook it to a safe thing." When participants shared outbreak information and messages with others, they shared information with those they thought could be affected by the outbreak. For example, if an outbreak was in another state, and they knew individuals residing in that state, they would share relevant messaging from CDC.

Perceptions of the CDC's two types of multistate foodborne outbreak communication tools

Participants perceived that the differences in the format of CDC messages was because they pertained to two different types of problems. For messaging related to food safety alerts where a specific product was mentioned (e.g., brand X ground beef), participants perceived that this meant that contamination occurred somewhere along the food supply chain. For messaging related to investigation notices, where only a general food commodity was mentioned (e.g., ground beef), participants perceived that the issue was not necessarily contamination along the food supply chain, but rather they reported having a sense of heightened personal responsibility to practice proper food safety habits for food preparation in the kitchen. One participant stated, "So, it sounds like you're talking about two different issues. One is problems that start at a source; a factory, a field, a manufacturer. And other areas that we should take on ourselves; washing our fruits and vegetables .... One is the issue of the, whoever the distributor is for the company, and then there's the personal responsibility to wash salads and handle meat carefully."

Another participant added, "Yeah. It's a separate type of message to tell me I need to be more careful about how I package my chicken from the grocery, how I handle my food. So, there's two different things going on there in my mind."

Frequency and sources of foodborne outbreak messaging

Participants reported hearing or seeing a message about a foodborne disease outbreak between 2 to 24 times annually. They reported hearing information from the following sources: news media on television and radio, social media and online sources, word of mouth from family and friends, and health care institutions. Participants also mentioned hearing about foodborne outbreaks from the local or state health department and federal government agencies, such as CDC, the U.S. Food and Drug Administration, the U.S. Department of Agriculture, and the Federal Emergency Management Agency. Participants expressed that they wanted to hear about all outbreaks that CDC identified, including those that are not directly relevant to them, so they could share messaging with those who may be affected. One participant stated, "I want to hear the information. As much as they can feed me, I want to get … To be able to prevent something from happening… or help somebody else."

DISCUSSION

Risk communication is an important part of the overall public health response during a foodborne outbreak. To prevent additional illnesses, hospitalizations, and deaths during an outbreak, communicators must use available information to quickly craft and disseminate actionable messages to target audiences. Successful communication during these outbreaks raises consumer awareness, allowing the public to make informed choices to prevent or mitigate illness. The results from these focus groups provide insight into three areas that could help to improve risk communications during foodborne outbreaks. The first area includes factors that could influence consumer perception and behavior during a foodborne outbreak. Two identified factors include perceived outbreak proximity and personal consumption of an outbreak vehicle. The second area includes consumer perception of CDC multistate outbreak communication tools. Focus group participants appeared to misinterpret aspects of CDC communication tools, indicating that the messaging associated with each tool pointed to where the contamination occurred, rather than on the basis of the status of the investigation. The third area includes information on what consumers find most important and where they obtain this information from. Focus group participants revealed they wanted to hear about all outbreaks and obtained current outbreak information through multiple sources.

Factors that influence consumer perception and behavior around foodborne outbreaks

Public health interventions based in social behavioral science theory have been proven to be more effective than those without a strong theoretical basis *(8)*. The health belief model represents a social behavioral science theory that has been widely applied to a variety of public health topics and interventions *(8)*. This model consists of six constructs used to predict behavior change: perceived susceptibility; perceived seriousness; benefits to action; barriers to action; self-efficacy; and cues to action *(1, 6, 15)*. Although this exploratory work did not measure each of these constructs, the health belief model was used in the creation of interview guides to explore elements of messages that may influence consumer perception of seriousness of a foodborne outbreak and personal susceptibility to a foodborne disease. Information provided by participants on factors that influence perception of outbreak seriousness and susceptibility to illness can serve as important indicators of how consumers interpret messages. This informs how messaging can be tailored to ensure consumers take action to prevent illness. For example, a message can be tailored to highlight an outbreak's exposure risk and severity by emphasizing this content as a top-line message in the public health announcement. Another example of tailoring could involve focused message dissemination by targeting public health messaging to geographic areas that are most affected by

an outbreak. Ultimately, consumer perception of seriousness and personal susceptibility to a foodborne outbreak was largely dependent on perceived proximity to the outbreak, severity of health outcomes, frequency of message delivery, and consumption of the identified food. These factors may serve as the drivers for consumer behavior during a foodborne outbreak and could help frame outbreak communications.

Health officials communicate with the public during foodborne outbreaks so that consumers can take steps to protect themselves. Participants identified behaviors they would take during an outbreak that were consistent with recommended behaviors from past foodborne outbreak messaging, implying that outbreak communication can drive consumer behavior. Outbreaks provide an opportunity to influence health behaviors by delivering tailored messaging directly to the public. Tailored health messaging has been shown to be more effective at driving long-term behavior change *(14)* when compared with general health messaging. Although participants stated they would take or have taken immediate actions upon seeing a foodborne outbreak message, longer term behavior change, including general food safety behaviors, was not explored. For example, participants reported they would avoid recalled or outbreak-linked food, but it is unclear for how long they would avoid it.

Participants reported perceiving an outbreak as more serious if they saw multiple messages about it. CDC takes several factors into account when deciding how frequently to update the public about multistate outbreaks, including whether advice to consumers has changed, if there is new investigational information to report, or if the outbreak is expanding in size or scope. Message fatigue is a related concept that focuses on frequency of exposure to health-related messages. There is a potential concern with how message fatigue correlates to message avoidance, annoyance, information seeking, and desensitization *(18)*. Although participants expressed that they wanted to hear about all outbreaks, including those that are not directly relevant to them, and were open to hearing it multiple times, message fatigue should be further explored in the context of risk communication for foodborne outbreaks.

Consumer perception of CDC multistate outbreak communication tools

Public communication may be needed at various points during an outbreak investigation; however, communication strategies can differ, depending on how each outbreak investigation evolves. Some factors that are considered when choosing a communication strategy include the number and severity of illnesses (groups at elevated risk of severe illness), how geographically widespread illnesses are, the availability and strength of the data supporting a particular food as the source of an outbreak, and specific characteristics of the food, such as shelf life, how widely consumed the food is, whether the food has been involved in previous outbreaks, and whether the food is typically cooked before consuming or not. As part of its multistate foodborne outbreak communication strategy, CDC uses food safety alerts (example at https://www.cdc.gov/listeria/outbreaks/countryham-10-18/index.html) or investigation notices (example at https://www.cdc.gov/salmonella/reading-07-18/index.html) as two Web-based communication tools to rapidly provide information to the public and other stakeholders during multistate outbreaks. The food safety alert and investigation notice tools used in the CDC communication strategy are deployed on the basis of the best available data CDC has at the given time. Focus group participants appeared to interpret that the messaging associated with each tool pointed to where the contamination occurred, rather than based upon the investigation process. As a result of this perception, CDC is strategizing about ways to better educate the public about the investigation process and developing a potential investigation progression bar graphic for use in Web-based tools.

We found that participants perceived the seriousness of recalls differently than outbreaks, particularly that recalls that were not linked to an outbreak were merely suggestions to avoid a food. It was also not clear whether participants understood the relationship between a recall and an outbreak. Food recalls happen for a variety of reasons, including reasons not attributed to illnesses and outbreaks. More research with a generalizable population is needed to verify the relationship between the perceptions of recall messages generally versus recall messages that are associated with a specific foodborne disease outbreak.

Where consumers obtain information and what they want to know

Consumers reported various methods of obtaining information about foodborne outbreaks. Although government agencies were mentioned as one source of outbreak information, participants also stated that information about outbreaks was obtained through the news media and social media as opposed to directly from CDC website. Potential challenges with dissemination of CDC outbreak messages through both news media outlets and through social media include retaining the accuracy of the message, whether the most salient messages are communicated, or whether the message is communicated at all. Although high-profile foodborne outbreaks are often covered by local and national news and discussed in conversations on social media, outbreaks linked to foods that are not consumed as widely may not be covered or discussed. This finding reinforces the importance of CDC proactively disseminating outbreak messages to news media and on social media. Further evaluation is needed against a generalizable population for a deeper understanding of how consumers get information during outbreaks, which will lead to more effective outbreak communication practices.

To further explore general public interest in foodborne outbreak communication, in November of 2019, CDC submitted a question to the Porter Novelli Styles survey, which is representative of the U.S. population *(4)*. The question submitted was, "More than 800 foodborne outbreaks happen each year. Which do you want to know about?" Fifty-two percent of the people surveyed (n = 3,598) wanted to know about all types of foodborne outbreaks (general advice versus specific brand), while 15% of those surveyed did not want to hear about either type. This finding is similar to the sentiment expressed by focus group participants and suggests that the public may have interest in receiving communications about all outbreaks and investigations, even when not relevant to them personally. More research is needed to explore the optimal frequency of foodborne outbreak messaging and how message frequency drives outbreak-related behavior change.

Limitations

We used qualitative methods including cognitive interviews and focus groups, which are not intended to yield results which can be generalized to the overall population. Focus group recruitment was limited to the Washington, D.C., metropolitan area and could be associated with a population familiar with government work and functions. Hispanic ethnicity was also underrepresented in these groups. Overall education levels of these groups were higher compared with the general population, although groups were segmented by education levels to capture any potentially different perspectives. In addition, the sample size for this evaluation was relatively small and consisted of mainly urban and suburban residents. The findings reported are only indicative of the knowledge and beliefs of the participants from these focus groups.

Public health implications

The findings from these focus groups are a first step in increasing our understanding of how CDC risk communication strategy affects consumers' ability to access and understand foodborne outbreak risk messages to make informed choices to protect their health. The findings also serve as an important baseline for further evaluation efforts of CDC risk communication strategy during multistate foodborne outbreaks. Subsequent evaluation strategies will build on this exploratory work to help further improve risk communications for multistate foodborne outbreaks.

ACKNOWLEDGMENTS

We thank Eureka Facts for work on this project. Disclaimer: The findings and conclusions in this article are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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