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Public Response to the *Salmonella* Saintpaul Outbreak of 2008



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Abstract

The largest foodborne illness outbreak in a decade occurred in the summer of 2008, when 1,442 individuals were identified as having been sickened by *Salmonella* of the unusual serotype Saintpaul.^{1,2} As part of a larger national telephone survey on food recalls, researchers at the Rutgers Food Policy Institute assessed Americans' awareness of and responses to the *Salmonella* Saintpaul outbreak. This included an examination of their knowledge about which foods were believed to have caused the outbreak, their awareness of the status of the outbreak at the time of the interview, and the actions they may have taken to avoid becoming ill as a result of this outbreak. Results from this survey indicate that while communication about foodborne illness does receive significant attention from the American public, often the specifics of the outbreak and recommended actions are misunderstood or disregarded.

Overview of *Salmonella* Saintpaul Outbreak of 2008

The Centers for Disease Control and Prevention (CDC) first announced the *Salmonella* Saintpaul outbreak on June 2, 2008.³ The following day, June 3, the Food and Drug Administration (FDA) issued a warning to consumers in Texas and New Mexico not to eat raw red plum, red Roma, or round red tomatoes⁴ after epidemiological interviews comparing foods eaten by ill and well persons had identified consumption of raw tomatoes as the likely source of the illnesses.

On June 7, FDA expanded its warning to consumers nationwide.⁵ However, because not all types of tomatoes were implicated in the outbreak, FDA's advice to consumers was somewhat complex. The public was told to "continue to eat cherry tomatoes, grape tomatoes, and tomatoes sold with the vine still attached, or tomatoes grown at home." Moreover, FDA recognized that the source of the contaminated tomatoes was likely to be restricted to a specific geographical area and that tomatoes from areas not implicated in the outbreak were ready to be picked and sent to market. As a result, on June 5, the FDA established, and subsequently updated, a list of states, territories, and countries where tomatoes are grown but which had not been associated with the outbreak.⁶ Consumers were warned that they should not eat raw red Roma, raw red plum, raw red round tomatoes, or products containing those types of raw tomatoes unless they had been harvested in one of the areas on the FDA's list. Moreover, consumers were encouraged to contact their local retailers if they were uncertain where tomatoes they had purchased had been grown and harvested.

On June 30, the CDC announced that their epidemiological research had identified clusters of illnesses among persons who had eaten at restaurants and that as a result they were broadening their investigation to encompass food items commonly consumed with tomatoes.⁷ On July 7, the CDC identified fresh cilantro and fresh hot chile peppers such as jalapeños as possible sources of exposure to *Salmonella* Saintpaul.⁸ Two days later, on July 9, the CDC reported that accumulated data from its investigations indicated that jalapeño peppers caused some illnesses but did not explain all the cases associated with the outbreak. As such, it advised high-risk consumers—the immunocompromised, elderly and infants—to avoid consuming raw jalapeño and serrano peppers.⁹

On July 17, FDA withdrew its warning to consumers about tomatoes, issuing a statement that they had "determined that fresh tomatoes now available in the domestic market are not associated with the current outbreak". The agency warned however, that epidemiological and other evidence showed that raw jalapeño and raw serrano peppers then available in the U.S. market might be linked to illnesses in the outbreak. Therefore, they echoed the CDC's earlier advice that people in *high risk populations*, such as elderly persons, infants and people with impaired immune systems, should avoid eating raw jalapeño and raw serrano peppers.¹⁰

On July 21, Agricola Zaragoza, Inc. recalled jalapeño peppers that had been distributed in Georgia and Texas after June 30th, because of the potential that they could be contaminated with *Salmonella*. The

recall was the result of sampling by FDA, which revealed that some of the company's jalapeño peppers were contaminated with the same strain of *Salmonella* Saintpaul responsible for the outbreak.¹¹

On July 25, the FDA advised consumers that domestically grown jalapeño and serrano peppers and "commercially canned, pickled and cooked jalapeño peppers from any and all geographic locations" were not connected to the *Salmonella* Saintpaul outbreak. They also cleared the Agrícola Zaragoza produce-distribution center in McAllen, Texas. The site had yielded the jalapeño pepper sample which tested positive for the outbreak strain of *Salmonella* Saintpaul, leading to the announced recall. However, the FDA determined that the distribution center had not been the original source of the contamination. At the same time, the FDA advised consumers (not just high-risk consumers) to avoid raw jalapeño peppers and foods containing them if the peppers had been grown, harvested or packed in Mexico.¹² On July 30, the FDA extended its warning to include both raw serrano and raw jalapeño peppers from Mexico, and any foods containing them.

Finally, on August 28, the CDC issued a statement that based on epidemiological evidence, the *Salmonella* Saintpaul outbreak appeared to be over.¹³ Consistent with this assessment, on the same day, FDA lifted its warning regarding the consumption of jalapeño peppers and serrano peppers from Mexico.¹⁴

Ultimately, 1,442 reported cases of illness in 43 states were linked to the outbreak.¹⁵ Of these, at least 286 resulted in hospitalization, and the infection may have contributed to the deaths of two individuals.¹⁶ However, the number of reported cases is likely to underestimate the true number of illnesses caused by the outbreak. Research suggests that for each case of reported illness, an additional 38.6 unreported cases may have occurred.¹⁷

Survey Methods

A national telephone survey was designed to explore the public's perceptions of the *Salmonella* Saintpaul outbreak. Data collection began on August 4 and concluded on September 24, 2008. (See Table 1 for an abridged timeline of the outbreak and the timing of data collection.) A private survey research firm conducted telephone interviews with a nationally representative sample of 1,101 Americans drawn from all 50 states. Proportional random-digit dialing was used to select participant households, and working, non-business numbers were contacted using a 12-call back design, resulting in a cooperation rate of 57%. All data presented here have been weighted by gender, age, race, region, and education to approximate United States Census figures. The weighted and unweighted demographics are presented in Appendix 1.

Table 1. Abridged timeline of *Salmonella* Saintpaul outbreak and survey data collection.

Date	Outbreak Timeline	Survey Data Collection
May 11	Onset of first illness.	
June 3	FDA warns consumers in Texas and New Mexico not to eat certain tomatoes.	
June 7	FDA expands tomato warning to entire nation.	
July 9	CDC advises high-risk consumers not to eat raw jalapeño or serrano peppers.	
July 17	FDA removes warning about tomatoes continues advice to high-risk consumers not to eat raw jalapeño or serrano peppers.	
July 21	Agricola Zaragoza, Inc. recalls jalapeño peppers distributed in Georgia and Texas after June 30 th .	
July 25	FDA extends warning, and advises consumers not to eat jalapeño or serrano peppers from Mexico.	
August 4		Data collection begins.
August 28	CDC issues a statement that “the outbreak appears to be over.” FDA removes warning about peppers imported from Mexico.	
September 24		Data collection completed.

Results

Were Americans Aware of the Outbreak?

At the beginning of the survey, the interviewers read, “Within the past few months, authorities suspected that a contaminated food product was causing illness in people in many states across the country. Have you heard about this?” In response, nearly eight-in-ten (78%) of the respondents reported that they had heard about such an outbreak of foodborne illness. Those aware of the outbreak were then asked what foods they believed were associated with causing the illness. Without additional prompting, 33% of the respondents identified tomatoes as causing the illness, 10% volunteered that peppers were responsible, and an additional 19% of the respondents mentioned both tomatoes and peppers.

Those respondents who did not mention tomatoes or peppers on their own were asked directly if they had heard that these foods had been suspected of causing illness within the previous few months. In response, an additional 41% said that they had heard that tomatoes were thought to be the cause of the outbreak (see Figure 1) and an additional 40% reported that they had heard that peppers had been suspected of causing the illnesses (see Figure 2). Only 7% of all respondents reported that they had not heard that tomatoes had been suspected as causing the illnesses, while nearly one-third (32%) had not heard that peppers had been implicated.

Figure 1. Did you hear that *fresh tomatoes* were suspected of causing illnesses within the past few months?

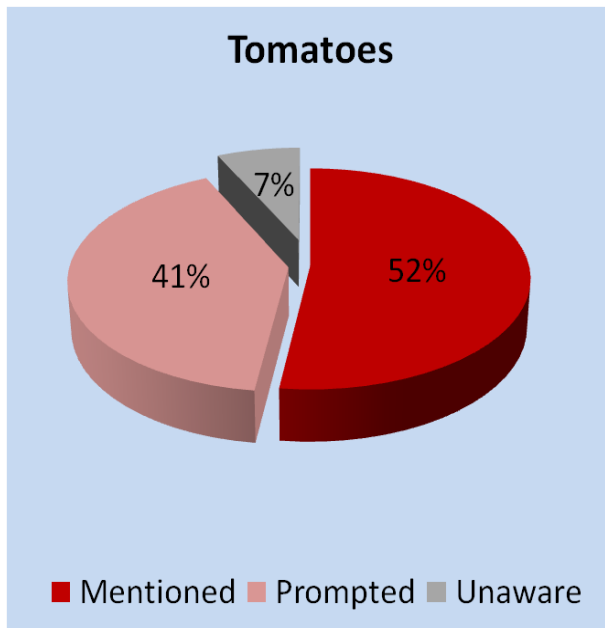
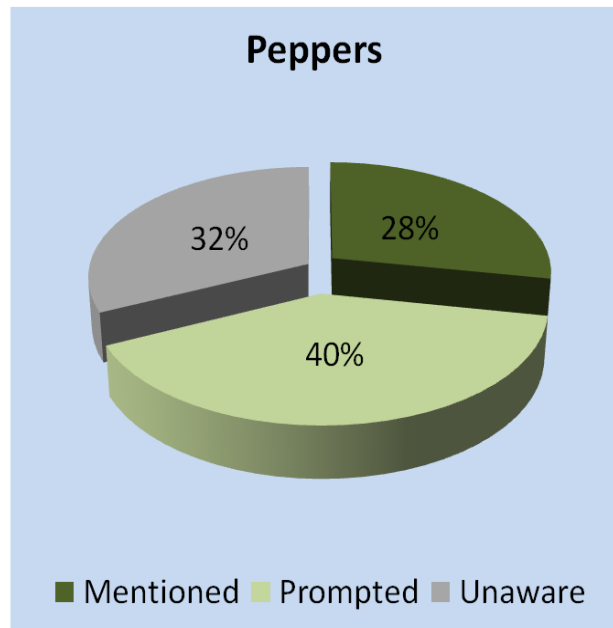


Figure 2. Did you hear that *fresh jalapeño peppers* were suspected of causing illnesses within the past few months?

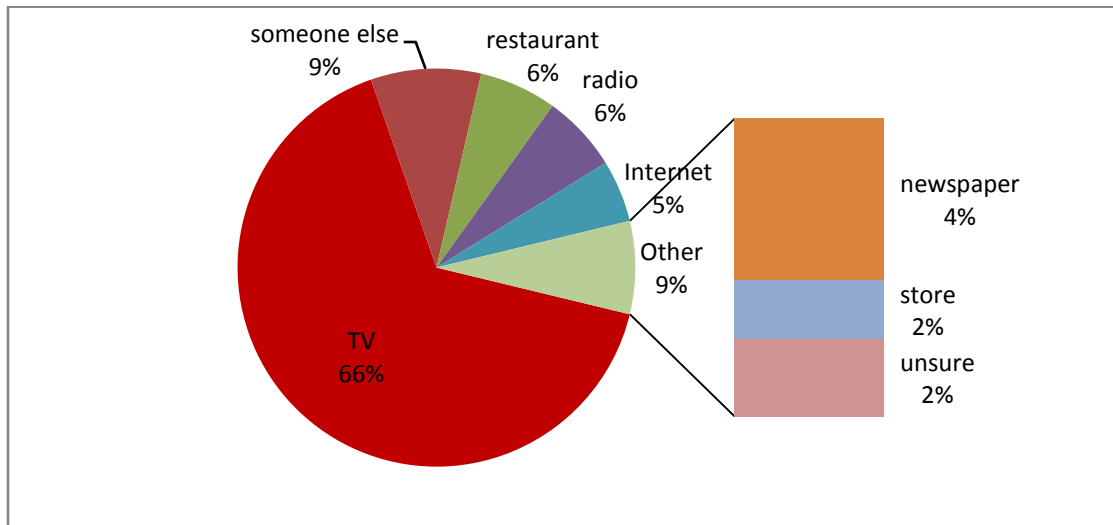


In the remainder of this report we focus on consumer knowledge of, and responses to, the FDA’s warning that certain types of tomatoes may have been the source of the *Salmonella* Saintpaul outbreak. We chose this focus within the constraints of posing a limited number of possible survey questions and recognizing that overall, more Americans consume tomatoes than chile peppers.¹⁸ Therefore the warnings not to eat certain kinds of tomatoes were likely to have had a greater impact on consumers than those involving peppers.

Where Did Americans Hear that Tomatoes Were Suspected in the Outbreak?

Those respondents who had heard that tomatoes were suspected in the outbreak were asked where they had *first* heard that tomatoes were suspected of making people sick. The majority (66%) reported that they first had heard about it on television. The respondents cited other media outlets as their first source of information about the outbreak, including radio (6%), the Internet (5%), and newspapers (4%). Nearly one-in-ten (9%) reported that they first heard the news from another person, and smaller percentages said that they heard about the problems with tomatoes through restaurants (6%) and stores (2%); see Figure 3).

Figure 3. “Where did you first hear that tomatoes were suspected of making people sick?”

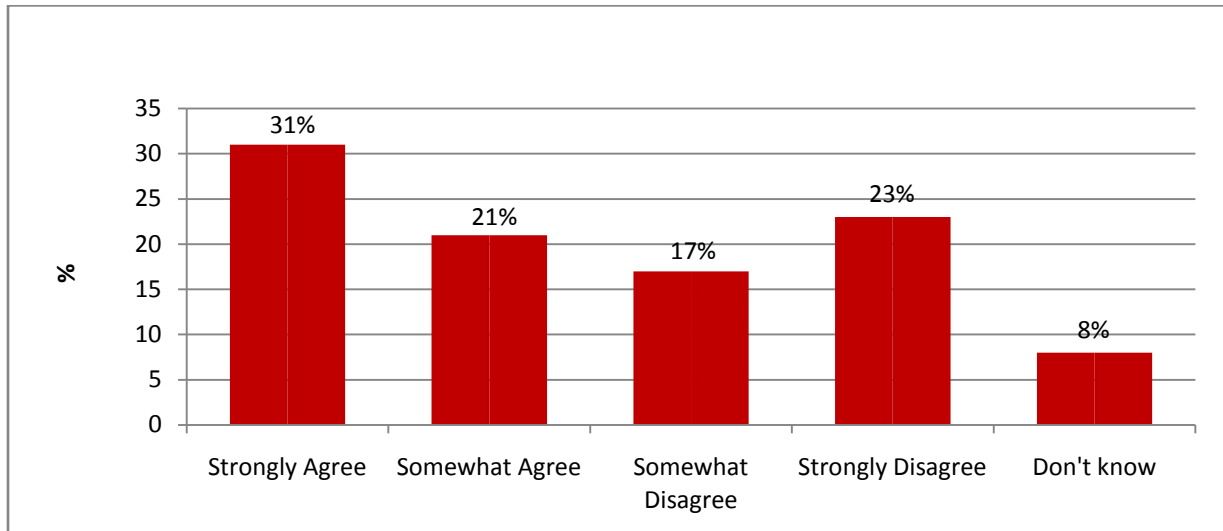


Note. $n = 1016$

Did Americans Know Which Tomatoes Were Considered Safe to Eat?

As outlined above, FDA’s advice to consumers concerning which tomatoes were considered safe to eat was complex, and its advice changed as the investigation developed. As a result, there was significant confusion about which types of tomatoes were considered safe to eat. As shown in Figure 4, among those who were aware that tomatoes had been implicated in the outbreak, only 52% “somewhat” or “strongly” agreed that that they knew which types of tomatoes the public was warned not to eat, leaving almost half of the population uncertain as to the specific tomatoes that were considered unsafe to consume.

Figure 4. “You knew which types of tomatoes the public was warned NOT to eat.”

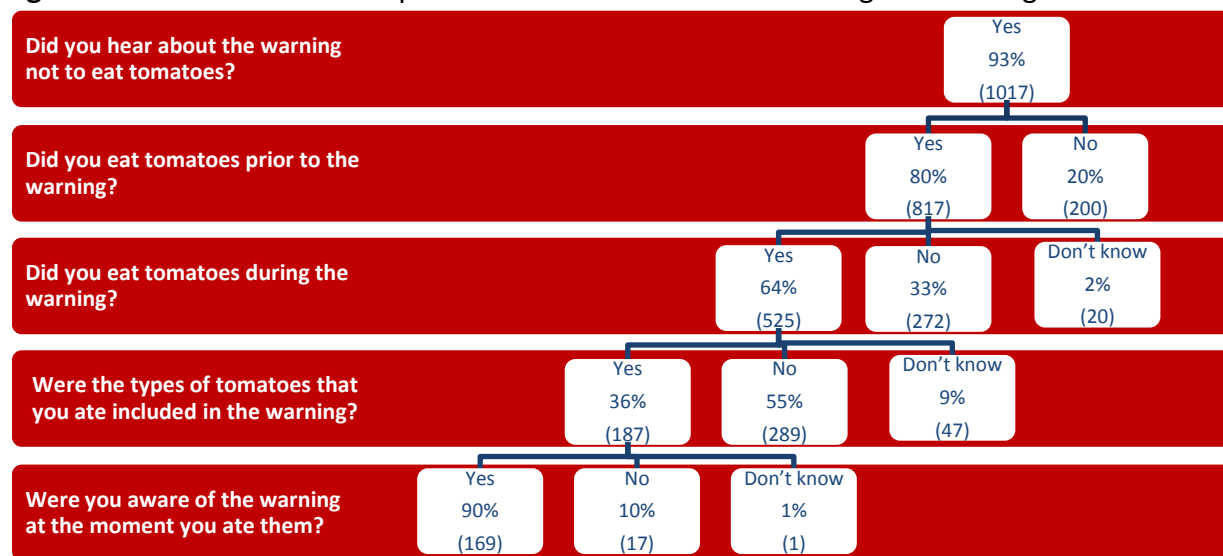


Note. n= 1,016.

What Did Consumers Do in Response to the Outbreak?

Those respondents who were aware that tomatoes were implicated in the outbreak were asked if they had eaten fresh tomatoes “before the recent fresh tomato warning.” The majority (79%) said that they had, as shown in Figure 5. These “tomato consumers” were asked about their behaviors during the two months of the tomato warning. In response, one-third (33%) reported that they did not eat *any* tomatoes while the FDA warning was in effect.

Figure 5. Flowchart of consumption of tomatoes before and during the warning.



Note. The number in parentheses represents the number of respondents in each cell.

The majority of tomato consumers (64%) reported that they *had* eaten tomatoes while the warning was in effect. Of these, more than one-third (36%) said they had eaten one or more of the types of tomatoes FDA had specifically warned consumers *not* to eat. Moreover, 89% of those who reported eating the types of tomatoes included in the warning also reported that they had been aware that the warning was in effect at the time that they ate those tomatoes. Confusion about the types of tomatoes included in the warning led some respondents to report that they had eaten home-grown tomatoes that they erroneously believed they were not supposed to eat. As described above, home-grown tomatoes were not included in the warning. Excluding those who reported eating tomatoes they had grown themselves, a total of 124 of the 1,101 respondents interviewed said that they had eaten the types of tomatoes they knew they had been warned not to eat. In other words, 11% of Americans intentionally disregarded FDA’s advice.

Interviewers asked this subsample to explain why they had decided to eat the tomatoes despite the warning. These open-ended responses were coded, and the most frequently cited categories appear in Table 3. The largest percentage of the respondents (41%) reported that they ate the tomatoes because they thought the tomatoes would not hurt them. A common theme among these respondents was the belief that the risk was exaggerated. This was also clearly expressed by the 13% of the subsample who said that they did not trust or believe the government and media warnings. In contrast, 13% of the subsample placed their faith in their retailers, saying that if the stores were selling them, the tomatoes must have been safe.

Table 3. “Why did you eat the tomatoes that were considered not safe to eat?”

Statement	% citing
I thought they wouldn't hurt me.	41%
I distrust the government and/or media	13%
It must be safe if it is being sold.	13%
I made it safe (e.g., washed it, cooked it).	12%
Other	20%

Note. *n* = 124.

In their press releases, FDA and CDC had advised consumers not to eat *raw* tomatoes of certain types. However, very few of the communications from either agency provided specific guidance to consumers concerning what to do with the tomatoes they already had, or whether it was possible to render potentially contaminated tomatoes safe to eat. This is important to note, as 12% of those who disregarded the warning reported that they had done something to the tomatoes (such as washing or cooking) that they thought would make them safe for consumption. However, neither washing nor cooking was addressed in the press releases, and washing has been shown to inadequately remove *Salmonella* from tomatoes.¹⁹ Moreover, while cooking the tomatoes held the potential to make them safe to eat, no time or temperature guidelines were included in any of the warnings, leaving open the possibility that they could have been cooked at too low a temperature or for too short a time to kill the pathogen.

Did Americans Know that the Tomato Warning Had Been Lifted?

As described above, the survey interviews began soon after the warning to consumers not to eat raw tomatoes and domestic fresh jalapeño and serrano peppers had been lifted (the warning about imported peppers was still in effect). We asked respondents about the status of tomatoes at the time of the interview using two survey items; one regarding whether tomatoes are considered safe to eat, and one concerning whether the tomato warning was still in effect. Table 4 illustrates that more than three-quarters (77%) of the respondents “strongly” or “somewhat” agreed that all fresh tomatoes were considered safe to eat at the time of their interview, and two-thirds (66%) disagreed that the tomato warning was still in effect. However, significant portions of those who had heard about the warning thought that tomatoes were still unsafe to eat or did not know (23%). Moreover, one third (33%) were unaware that the warning had been lifted. This lack of awareness is even more evident when one considers that fewer than half of the respondents replied that they felt “strongly” that the warning had been lifted and that tomatoes were considered safe to eat, leaving more than half uncertain or incorrect. Thus, the message that tomatoes were once again considered safe to eat did not reach all consumers.

Table 4. Perceptions of the status of tomatoes at time of interview.

	%				
	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know
All fresh tomatoes are now considered safe to eat.	45.8	31.5	8.8	6.9	6.8
The tomato warning is currently in effect.	7.2	11.9	23.0	43.1	14.8

Note. *n* =1,016. Cells in pink indicate the responses that indicate a belief that the contamination had ended and tomatoes were safe to eat.

Did Americans Return to Consuming Tomatoes after the Warning Was Lifted?

Almost three-quarters (74%) of those who had heard of the warning and were tomato consumers reported that they had eaten tomatoes since the warning had been lifted (see Table 5). However, many of these respondents had not stopped eating tomatoes during the warning (64% of all tomato consumers aware of the warning ate at least some tomatoes during the warning). Of the remaining 34% who either did not eat or could not remember if they had eaten tomatoes during the warning, 62% (23% of tomato consumers aware of the warning) reported that they had eaten tomatoes *since the warning was lifted*. This indicates that only about a quarter (23%) of tomato consumers aware of the warning had not gone back to eating

tomatoes since the warning was lifted, which is supported by reports that tomato sales are lower than they were at the same time last year²⁰.

Table 5. Percentage of tomato consumers aware of the warning who ate tomatoes during and after the warning.

		AFTER THE WARNING			Total
		% Have eaten tomatoes	% Have NOT eaten tomatoes	% Don't know	
DURING THE WARNING	% Did eat tomatoes	48.1	13.5	2.6	64.1
	% Did NOT eat tomatoes	23.6	9.3	.4	33.3
	% Don't know if they ate	2.0	.6	.0	2.6
	Total	73.7	23.4	2.9	100.0

Note. n=817

Conclusions

The *Salmonella* Saintpaul outbreak of 2008 was the largest foodborne illness outbreak in more than a decade, and it came at a time when public concern about food safety had been heightened by a number of large-scale and well-publicized problems with the American food supply.^{21,22} There are many ways to examine the efficacy of the outbreak communications. The data presented here allow us to look at the communications from the perspective of the American consumer. Thus, this report addresses the following key issues: whether Americans were aware of the outbreak, and where they first heard about it; what consumers did in response to the outbreak; whether Americans knew the tomato warning had been lifted; and whether Americans returned to consuming tomatoes after the warning was lifted.

Early epidemiological evidence indicated a strong statistical association between the outbreak illness and eating raw tomatoes. Based on this evidence, the FDA issued its initial warnings to consumers to avoid eating certain types of tomatoes.²³ Yet, this *Salmonella* Saintpaul outbreak has never been definitively linked to tomatoes. None of the tomatoes linked to ill persons or those collected at random from the distribution chain in several states yielded cultures of the outbreak strain of *Salmonella*. Moreover, the FDA's traceback investigations were unable to identify specific packers, distributors, or growing areas responsible for the outbreak.²⁴ Ultimately, the CDC concluded that, "The investigation showed that jalapeño peppers were a major source of contamination and that serrano peppers also were a source. In addition, tomatoes were possibly a source, particularly early in the outbreak."²⁵

Ironically however, the results of this study show that while the vast majority of Americans heard the federal government's message to avoid certain tomatoes because of their possible connection with *Salmonella* Saintpaul, significantly fewer were aware of the warnings concerning fresh chile peppers. There are a number of likely causes of this disparity, including the fact that fewer Americans eat chile peppers than

tomatoes and that the initial advisories concerning fresh chile peppers were targeted primarily to high-risk consumers.

The results of this study suggest that the government was successful in ensuring that most Americans were aware that they should not eat certain types of tomatoes and peppers. However, a recent report²⁶ is highly critical of how the CDC and FDA handled the communication of this outbreak, arguing that, “From the beginning of the outbreak, public-health communication to the media and the public was disjointed and confusing.” The data presented here lend some support to the notion that some of the communication was confusing. For example, 40% of the respondents reported that they did not know which types of tomatoes they were not supposed to eat. In addition, the data provide evidence that some Americans were unaware that home-grown tomatoes were not included in the warning.

Especially of concern is that some consumers knowingly ate the types of tomatoes the government had warned against eating. This poses a challenge to government officials, retailers, and others concerned with public health who must both alert the public about a problem in the food system, and convince them of the need to follow the government’s recommendations.

A small percentage of the respondents said that they had washed or cooked their tomatoes to make them safe to eat. In their responses to future outbreaks, communications may be warranted from FDA and CDC that specifically address the adequacy of washing and cooking to render potentially contaminated produce safe to eat.

Communications concerning outbreaks of foodborne illnesses related to specific food products differ from many other types of health communications, in that in outbreak situations, consumers are typically urged to change their behaviors for a limited time *only*. Unlike nutrition communication, where the goal is to have consumers change their behaviors permanently, the advice given to avoid consuming specific food products during outbreaks of foodborne illness is typically meant to be disregarded once the source of the problem has been identified and rectified. That the public would return to eating tomatoes once the warning was lifted was of particular importance to tomato growers, processors, and retailers, who reportedly suffered significant losses as a result of this outbreak.²⁷ The data here provide evidence that the communication of the end of this outbreak was only moderately effective, with only some Americans certain that the warning had been lifted. However, by the time of our interview, only a minority reported not having eaten tomatoes since the warning was lifted.

This brief report details consumers’ knowledge of, and responses to, the *Salmonella* Saintpaul foodborne illness outbreak. Forthcoming reports based on other data from this national telephone survey will identify patterns of beliefs and behaviors associated with other food safety incidents and will provide recommendations about how to improve food safety communications.

APPENDIX 1

Sample Demographics

	Unweighted %	Weighted % Using US Census Weights
Age		
18 to 24	4	13
25 to 34	10	19
35 to 44	16	21
45 to 54	26	18
55 to 64	19	12
65 to 74	15	10
75 to 84	7	6
85 or older	1	1
Don't know/Refused	1	1
Education		
Some high school or less	9	19
High school graduate	25	28
Some college	26	27
4 year college degree	21	14
Some graduate school or more	18	11
Ethnicity		
White, non-Hispanic	78	71
Black, non-Hispanic	10	11
Other, non-Hispanic	4	6
Hispanic	6	11
Refused/don't know	2	2
Gender		
Female	54	52
Male	46	48
Income		
Under \$50,000	39	43
\$50,000 to \$100,000	36	34
Over \$100,000	16	13
Refused/Don't know	9	9
Marital Status		
Married	62	57
Not married	37	41
Refused/Don't know	1	2

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