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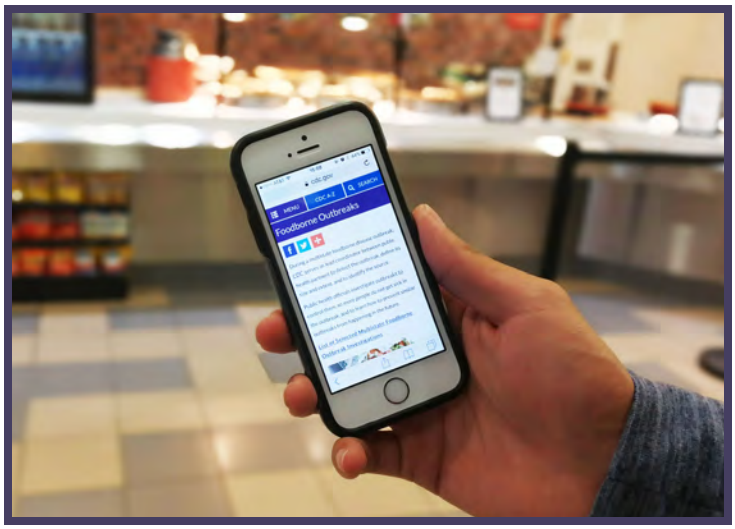

Food Safety Information on the Internet: Consumer Media Preferences

ABSTRACT

Broader food safety communication may help engage consumers and contribute to an overall improvement in food safety. Results of an online questionnaire demonstrate the importance of the Internet in food safety communications about foodborne illness outbreaks. Despite the great potential of social media, websites are currently the preferred platform for communication about foodborne illness outbreaks. Media properties such as searchability and interactivity, together with information quality (e.g., accuracy and timeliness) and source characteristics (e.g., trustworthiness), influence consumers' evaluation of and preference for media type. Information quality carried the most weight when users evaluated an Internet-based platform, and searchability was the most valued media functionality. The results of this study have important implications for resource allocation. Agencies interested in communicating foodborne illness outbreak information may want to focus their efforts on users' website experiences. Improvements in search abilities are needed, although provision of high-quality information should still take priority. When information quality is maintained, utilizing Internet-based platforms can help reduce costs and save resources. The fact that a small percentage of consumers do not want to use the Internet to find foodborne illness outbreak information indicates the need to employ a communication strategy that incorporates multiple media.

INTRODUCTION

Foodborne illness outbreaks can cause considerable losses to our society and economy *(8, 21)*. Efforts to ensure food safety should include communicating information about foodborne illness outbreaks to consumers. In fact, communicating food safety information has been shown to be effective in engaging consumers *(12, 46)* and improving food safety controls, such as improving inspection results *(3, 31)* and reducing the number of individuals hospitalized *(31)*. Media coverage of foodborne illness outbreaks can also affect a company or brand. For example, Jack in the Box, almost 30 years after their own outbreak, still suffers a

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stock price drop whenever an *E. coli* outbreak occurs *(51)*. Often, a company never fully recovers from a major food safety event *(51)*.

When considering communication efforts, it is important to evaluate separately the effects of information, source, and media, because evaluation and usage of information are impacted discretely by information quality, source characteristics, and media properties *(22, 52, 53, 64)*. The distinction between the source (from whom) and the medium (how) is especially important, because source and medium can have different impacts on communication outcomes. More specifically, when one source uses multiple media to communicate the same information, users may trust and thus use the information communicated over one medium more than that communicated over another. For example, users might trust a health professional more when he or she appears on television than when he or she uses a personal blog. Alternatively, people may view information differently if it is obtained from the same medium but from different sources. For instance, people may view news on the Internet from Fox News and from CNN differently. Similarly, medium effect and information effect should be considered discretely because of the distinctive influences these two communication elements have on communication outcomes. One possibility is that users may perceive outbreak information collected from different media to be of different quality. For example, users may perceive information collected online to be more timely than information obtained on TV.

Generally speaking, there are two forms of communication: push and pull. Communication is considered "pull" if users request and retrieve the information and is considered "push" if the information is sent in anticipation of users' needs, that is, the information is not directly solicited *(15)*. Traditionally, food safety information, along with other health-related information, has been communicated through push media such as TV and newspapers. The major drawback of push communication is that users have few choices about what information they receive and when. This has limited the reach and relevance of food safety communication and thus its impact *(10, 18)*. Consumers have indicated that they would be more likely to use food safety information if it were more accessible *(66)*. In this regard, the Internet, especially emerging platforms such as social media sites, presents great possibilities for communicating food safety information to the public.

Internet-based platforms, particularly social media sites, have the potential to be effective for food safety communication *(9)*. Social media on Web 2.0 is an important innovation that supports fast and interactive communications with user-generated content *(41)*. Examples of social media include Facebook, YouTube, wiki, twitter, and blogs *(19)*. Social media platforms offer timeliness *(56)*, high accessibility *(17)*, improved media integration *(20)*, cost effectiveness *(55, 57)*, high scalability *(25)*, and high message fidelity *(54)*. Social media have been widely adopted and have very high user engagement, especially among younger groups but also increasingly among older consumers *(44, 45)*. Thus, social media may help food safety communication reach a broader audience, including previously hard-to-reach populations *(6, 13, 24, 40, 48)*. Social media are widely used in health and risk communication *(7, 43)* and have proven to be useful *(56)* in prompting changes in health behaviors *(39, 62, 63)*. Also, they have been shown to improve transparency, engagement, and relationships because of their interactive nature *(5, 14, 59, 60, 61)*.

Although use of social media in communicating health information has been increasing *(28, 55)*, it has not always been effective because consumer preferences and expectations, especially regarding media, are not clearly understood *(36)*. Research on food safety communication in the past has focused on the benefits of new media *(50)*, the effects of communication and intervention *(37, 38, 47)*, user typology *(35)*, and message formation *(26)*. Without a clear understanding of users' media preferences, efforts to improve food safety communication are likely to have little success.

To understand consumer media preferences, it is necessary to explore the underlying reasons. For example, characteristics of communication components such as information (e.g., timeliness) and source (e.g., trustworthiness) can play important roles in consumer evaluation and later selection of a medium *(1, 2, 4, 16, 23, 27, 29, 33, 34, 42, 58, 65, 67)*. This study adapted the most commonly cited media, information, and source characteristics *(2, 4, 23, 33, 34, 42, 58, 65, 67)* to the context of foodborne illness outbreak communication to frame consumers' priorities in media preference and selection. These characteristics include accuracy, timeliness, trustworthiness, applicability/saliency, interactivity, searchability, usability, linkability, familiarity, and security. The following research questions were examined.

1. Which media do consumers prefer to use to obtain information about a foodborne illness outbreak?
2. What priorities do consumers have in their media selection?

MATERIALS AND METHODS

An online questionnaire was used to capture consumers' responses in five areas related to obtaining foodborne illness outbreak information: (1) current usage, (2) preferred media type, (3) preferred Internet platform, (4) priorities in media selection, and (5) demographic information.

A foodborne illness outbreak scenario was used to frame the questions. The participants were given a scenario in which foodborne illness outbreak occurred in their area, a number of people became sick and many of those were

hospitalized. Additionally, information such as suspected foods was given to strengthen relevancy and make the scenario more believable: "likely foods were thought to be chicken, lettuce, ground beef, or possibly dairy products, including ice cream." Then participants were asked to evaluate different communication media options (e.g., Internet and TV) and Internet-based platform options (e.g., social media and websites) in the process of selecting a restaurant to visit. To compare consumers' overall preference for each media type, a "preference score" in the form of a weighted average was calculated. Scores were assigned for media choices; five points were given for the first choice, four points for the second choice, etc., finishing with one point for the fifth choice. An average was then determined by dividing by the number of respondents.

Content experts representing media communication, the hospitality industry, and health inspections helped to develop the questions and response choices. The questionnaire was revised and finalized after two rounds of pilot testing. Text entries were allowed to provide an opportunity for additional responses. Upon IRB approval, the researchers distributed the questionnaire to U.S. participants through an online company (mTurk). This provided access to U.S. consumers across the nation. On average, the survey took the participants 15 minutes to complete. A total of 405 responses were collected in January 2016 *(32)*. If respondents were from the same IP address, used the same mTurk worker ID, were from outside the U.S., used a repeating mTurk code, incorrectly completed attention check questions, or completed the questionnaire in less than 5 minutes, they were excluded from the analyses. After this cleaning process, a total of 370 usable questionnaires were analyzed by use of SPSS version 23. Not all of the respondents answered all of the questions.

RESULTS

The demographic characteristics of the participants are summarized in *Table 1* (U.S. census data is given in parentheses). More females (58.0%) than males (41.9%) completed usable questionnaires. Slightly more than half (58.8%) of the participants were between the ages of 18 and 39. Possibly because of the age distribution of the participants, more than half (58.7%) did not have children. As for education, 47% of the participants had less than a bachelor's degree, 35.2% had a bachelor's degree, and 17.8% had degrees higher than a bachelor's. Overall, the respondents had more education than the U.S. population as a whole. Participants' residential areas were similar to those obtained from census data.

TABLE 1. Profiles of respondents (n = 370)

Characteristics	n[a]	%[b]	Characteristics	n	%
Gender			*Education*		
Male	118	41.9 (49.2)	Less than Bachelor's Degree	132	47.0 (70.7)
Female	163	58.0 (50.2)	Bachelor's Degree	99	35.2 (18.9)
			Higher than Bachelor's Degree	50	17.8 (10.4)
Age					
18 – 29	81	28.7 (18.9)	*Residential Area*		
30 – 39	85	30.1 (17.8)	New England	10	3.6 (4.7)
40 – 49	50	17.7 (19.3)	Mid Atlantic	42	15.3 (13.3)
50 – 59	45	16.0 (18.6)	East North Central	50	18.2 (15.2)
60 +	21	7.4 (25.3)	West North Central	22	8.0 (6.6)
			South Atlantic	63	22.9 (19.3)
Household with Children			East South Central	11	4.0 (6.0)
No Children	165	58.7	West South Central	29	10.5 (11.7)
Children under 6 years old	43	15.3	Mountain	11	4.0 (7.2)
Children 6 years old and over	63	22.4	Pacific	37	13.5 (16.1)
Others	10	3.6			

[a]Not all participants answered all of the demographic questions.
[b]Numbers in parentheses are 2012 U.S. census data.

Media preference

The vast majority of the participants (96%) indicated that they have looked for information about foodborne illness outbreaks, which demonstrates the high interest consumers have in foodborne illness outbreak information. In general, consumers preferred to obtain foodborne illness outbreak information from the Internet rather than from other types of media *(Table 2)*. The calculated preference scores indicated that the Internet received the highest average among the media with 3.62 points. This result is consistent with the results related to participants' current practices in looking for information about foodborne illness outbreaks; the Internet is the most commonly used medium, with 37.7% of participants indicating it as their chosen media. Face-to-face communication (25.2%) and TV (15.4%) are also used to gather foodborne illness outbreak information.

Interestingly, while the Internet was the most preferred medium for a great number of participants (43%), some consumers ranked it as their least preferred choice (13%); see *Table 2*. Although not noticeably different in demographic characteristics from the rest of the sample (insignificant results of *t*-tests), this group of consumers, as shown by their responses to an open-ended question, was particularly concerned about information accuracy and trustworthiness; they felt it was sometimes hard to determine the accuracy and trustworthiness of information communicated over the Internet and preferred face-to-face exchanges.

Among the Internet-based platforms, the first choice for slightly more than half of the participants (55%) was to use websites to find foodborne illness outbreak information. Among social media sites, Facebook was ranked highest, with 24% indicating it as their first choice. Although Twitter is considered a platform for news releases and timely updates *(11, 30)*, it was least often selected as the respondents' first choice (4%). These results were also observed in the overall preference scores: Web sites ranked the highest *(3.27)*, followed by Facebook (2.78) *(Table 2)*.

Priorities in media selection

To better understand reasons behind consumer media preferences, participants were asked for their priorities in media selection. ANOVA and post-hoc Tukey comparison results suggest that the criteria used to evaluate Internet platforms/sites carried different weights ($F = 186.254$, $P < 0.001$). Media, information/content, and source characteristics were all important in evaluation and selection of a medium. More specifically, information quality (accuracy and timeliness) carried the most weight in the evaluations of an Internet-based platform. The most important media characteristic was that the platform had a search function *(Table 3)*.

Results suggest that social media's characteristics do not match consumers' priorities when seeking foodborne illness outbreak information from the media. Social media support more personalization and interactions, which this study

TABLE 2. Consumer media preference based on calculated preference score

Media[a]	Preference score
Internet	3.62
TV	3.13
Face to face	2.92
Newspaper, book, magazine, or other printed material	2.81
Phone call or texts	2.52
Internet based platform[b]	**Preference score**
Websites	3.27
Facebook	2.78
Twitter	2.09
Instagram	1.76

[a]Assigning 5 points every time someone picked that medium as their number one choice, 3 points for a second choice, 2 points for a third, and 1 point for a fourth choice, after which an average was created by dividing by the number of respondents.

[b]Assigning 4 points every time someone picked that Internet platform as their number one choice, 3 points for a second choice, 2 points for a third, and 1 point for a fourth choice, after which an average was created by dividing by the number of respondents.

TABLE 3. Consumer priorities in media selection for foodborne illness outbreak information and platform performance comparisons (social media vs. Web sites)

Priorities	n	Mean[1,2]	SD	Platform[3]	
				Websites	Social media[4]
Accuracy	315	6.57[a]	0.97	89%	11%
Timeliness	314	6.27[ab]	1.04	57%	43%
Searchability (e.g., search function)	315	6.00[bc]	1.33	71%	29%
Security – less likely to have a virus	315	5.70[cd]	1.52	54%	46%
Trustworthiness (source)	314	5.57[de]	1.53	88%	12%
Linkability (e.g., links to additional information)	313	5.48[de]	1.42	51%	49%
Security – allows control of privacy setting	313	5.34[def]	1.61	20%	80%
Interactivity	315	5.30[def]	1.67	30%	70%
Applicability/Saliency	345	5.22[def]	1.63	50%	50%
Security – less likely to track user data	314	5.20[ef]	1.63	83%	17%
Security – fewer or no advertisements	315	5.19[ef]	1.6	75%	25%
Enhanced usability – visuals (e.g., pictures and videos)	314	5.02[f]	1.68	53%	47%
Familiarity	344	4.88[g]	1.75	54%	46%

[1]Mean is rated by participants on a 7-point Likert scale where 1= not at all important and 7 = extremely important.

[2]The superscript letters in this column represent results of multiple group comparisons (Tukey comparisons at $\alpha = 0.05$).

[3]The percentages represent the proportion of participants who indicated that websites or social media deliver superior performance against each criterion.

[4]e.g., Facebook, Twitter and Instagram.

found to be relatively unimportant to consumers *(Table 3)*. In addition, social media do not provide a particularly strong search function, which consumers considered to be the most important media characteristic. Social media may also suffer from their limited control over design features. For example, search functions on social media sites are controlled by the social media owners or corporate owners of the sites, making it very difficult if not impossible to improve this feature.

Many participants expressed concerns about using social media to gather food safety information, especially with regard to information accuracy. The results were echoed when social media and websites were directly compared by use of the performance criteria *(Table 3)*. Respondents' perceptions were that the websites performed better for all criteria except interactivity. Participants felt that websites, compared with social media, supported better searchability, provided more timely and accurate information, supplied more security, and stood out for their ability to provide more accurate and trustworthy information. In fact, 78% and 76% more participants indicated that websites outperform social media with regard to accuracy and trustworthiness.

DISCUSSION

Conclusions and implications

Broader dissemination of foodborne illness outbreak information may help engage consumers and contribute to overall improvement in food safety. Results of this study demonstrate the importance of the Internet in food safety communications about foodborne illness outbreaks. Despite the great potential of social media, at present, websites are the preferred platform for communication about foodborne illness outbreaks. This does not mean that the advantages of social media are not valuable; their potential in other aspects (e.g., supporting greater interaction) should still be explored.

Results suggested a number of possible reasons for consumers' preference for websites over social media for obtaining foodborne illness outbreak information. First,

websites outperformed social media in 9 of the 10 most important criteria used to evaluate and select a medium *(Table 3)*. Second, websites appeared to better match consumers' priorities in media selection when looking for foodborne illness outbreak information. In fact, 14% to 78% of participants indicated that websites performed better in the three most important priorities they have when selecting a medium *(Table 3)*. For example, consumers placed high value on a good search function, and websites generally provided better search capabilities, including the use of indexing. Social media, in contrast, provided superior functionality in areas that consumers believed to be less important, such as interactivity. Third, social media may have appeared to be overwhelming to consumers trying to locate needed information quickly. In agreement with these results, Robert and Dennis *(49)* have suggested that social media can hinder the motivation and the ability to process the information communicated, e.g., because of high social presence. Fourth, consumers may not have been aware of the use and potential of social media in obtaining this kind of information. Consumers currently regard social media as a tool for socializing rather than information seeking *(2, 18)*. Furthermore, despite the growth of social media adoption (for example, Facebook is now being used by a number of health departments, including the New York State Health Department), social media have not yet been widely used in general food safety communications *(28)*. Fifth, websites may be more appealing to consumers because they may be perceived to be more secure. For example, websites are less likely to track user data, as users generally do not need to "log in" to view information.

Additionally, results of this study suggest that consumers not only prefer to use websites but are, to a certain extent, unlikely to use social media to obtain foodborne illness outbreak information. This may be due largely to the interactive and participative (user-generated content) nature of social media. While this allows collective intelligence to be harnessed, information quality and accuracy in social media cannot be guaranteed, and the trustworthiness of the source is difficult to evaluate. With a pressing need to obtain the most accurate, timely, and specific information available, consumers prefer to use a website. Thus, despite social media's other benefits (speed, ease of use, and ability to get more personalized information), it is not the preferred information media. Social media may be more suitable as supplements to websites. For example, they could be used to send updates with links to websites with the most current information, thus serving as a "shortcut" that directs consumers to websites with more detailed information.

Consumer preferences for websites may be good news for entities such as health departments and other government agencies, because websites afford greater flexibility in designing and controlling feature availability, including the search function. While social media features are largely designed by the holding company — for example, Facebook designs the look and the search functionality on a Facebook page – website feature designs are almost always in the hands of the account holder. As such, entities may better match consumer preferences by using their websites rather than social media and thus be more effective in communicating foodborne illness outbreak information.

The results of this study have important implications for resource allocation. Agencies may want to focus their efforts on improving users' website experiences. In particular, providing a better search experience to locate needed information quickly and effortlessly should become a priority. Providing an advanced search function that allows targeted searches (e.g., sort by dates, locations, food sources, types of illness, etc.) may also be desirable.

Websites could perhaps be even more attractive to consumers if they provided not only searchability but some aspects of interactivity as well. The results of this study indicate that consumers prefer opportunities to offer feedback, functions that allow them to sign up for newsletters, and options for following updates on RSS feed on websites. Such functionality would also help to build relationships with the public.

Social media may still have potential in foodborne illness outbreak communication, but additional research is needed to determine whether they should be used purely as an extension of websites — e.g., posting links to websites — or whether they could enhance communication beyond what can be accomplished via websites. This study suggests that future scholarly efforts may want to focus on studying Facebook's potential. Twitter, despite being suggested as a feasible alternative, was not the preferred platform in this study, because Twitter's maximum of 140 words does not allow detailed information (links are almost always used).

Because information quality is highly valued by consumers, providing high-quality information (information that is accurate, up-to-date, and trustworthy) should still be the most important priority in communicating foodborne illness outbreak information. When information quality is maintained, consumers are flexible about where they get this information. This reinforces the potential of using Internet-based platforms in reducing costs and saving resources. However, this study also showed that a small percentage of consumers do not want to use the Internet to find foodborne illness outbreak information. This group is highly concerned about information accuracy and trustworthiness, and the Internet presents them with challenges in evaluating the accuracy and trustworthiness of the information communicated. This indicates that, although powerful, the Internet will not completely replace traditional media. Agencies may want to use the Internet as a supplement or extension to traditional media, for example, alerting consumers about an outbreak through television and providing the name of a website

where additional accurate and trustworthy information can be found. In addition, Internet platforms could be used for different purposes – for instance, social media can be used to post timely updates and websites can be linked to provide more detailed information.

Additionally, it is important to note that media, information, and source characteristics all influence consumers' usage of information. This shows that while the media have a great impact on communication outcomes, simple improvements in media functionality may not yield the best results. Information quality has to be maintained or improved before better media functionality can produce effective communication outcomes.

Moreover, it appears that the line between source and medium is somewhat blurred in the minds of consumers; for example, news sites (e.g., CNN.com) appeared to be viewed as both the source and the medium. To a certain degree, there does appear to be some inseparability of the medium and source on the Internet, compared with traditional news sources that include more print media. This is particularly true if the source mainly communicates over Internet-based platforms. For example, it is hard for participants to distinguish between msn news [source] on the msn.com website [media]. Entities interested in leveraging the Internet should keep this in mind and be aware that, especially in online communication, the reputation of the information source will influence media usage, and the ways media are used will reflect back (positively or negatively) on the reputation of the information source.

Lastly, it appears that it is not necessary to use separate platform communication strategies for different demographic groups, except for the group that is somewhat against the use of the Internet. While previous studies have suggested the existence of potential individual differences, this study found that individual characteristics had no significant impact on platform preferences for social media vs. websites, perhaps because social media and websites are both Internet-based platforms. This finding suggests that the use of websites might be sufficient in contacting hard-to-reach populations, such as younger consumers, with food safety information. On the other hand, the existence of a group that would refuse to use the Internet for foodborne illness outbreak information indicates the need to maintain traditional media for food safety communication; if the Internet is not a preferred platform for certain populations, it may be better used as a supplement to other forms of communication.

Limitations

In distributing the questionnaires, the goal was to get a representative sample of the U.S. population, but as seen, the participants are concentrated in the younger age groups. However, this relatively young sample may in fact be highly appropriate for the purpose of this study, since younger groups have long been hard to reach in health communication *(6)* and understanding their food safety information needs can provide needed insights. Further, because the data were collected online, the response group may have had more access to the Internet. Additionally, it is possible that the participants, instead of evaluating source and medium together, misunderstood the terms and thus did not distinguish between source and medium; further investigation is needed.

Future research

First, although the Internet was clearly the most preferred medium in this study, the possibility of employing multiple media should be explored. Additionally, as websites were identified as the preferred Internet platform, investigation is recommended into how consumers form their perceptions towards a website; for example, what makes consumers perceive information as being accurate and trustworthy, and what makes consumers feel the platform is easy to use? In this regard, a qualitative study that observes consumers' actual interactions with a website would be particularly useful in providing insights.

Further, it would be valuable to dive deeper into consumers' reasons for their current preferences. For example, why do consumers feel that websites outperform social media with regard to the criteria found to be important to their food safety information seeking? Is it because the current food safety communication primarily happens on websites, so consumers feel social media would not suit their needs in seeking information or because websites provide superior functionality or because the reputations of entities using various media are different? Further, investigating source and information preferences of consumers can be useful. Lastly, information, source, and media characteristics appear to be, to a certain extent, inseparable in consumers' evaluation and selection of a medium, so it would be valuable to examine the relationships among these characteristics and determine how they interact and influence communication outcomes.

Efforts to ensure food safety cannot be successful unless the resulting information is effectively communicated to others. Although consumers may first find out about a foodborne illness outbreak on social media, they prefer to use websites to obtain more information about the outbreaks. Media characteristics play an important role in consumers' choice of where to find food safety information. Compared to social media's interactivity, websites' existing advantages (e.g., more control over feature availability and greater perceived security) are more important to consumers, although websites' introduction of aspects of interactivity (e.g., functions to sign up for updates, leave comments, and share information) could leverage consumer preferences for them even further and lead to better communication outcomes. Usability matters in food safety communication.

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