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Are we reaching the target audience? Evaluation of a fish fact sheet

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Abstract

According to the US Environmental Protection Agency, over 16% of freshwater lakes and 7% of the rivers are under some sort of fish consumption advisory because of the presence of toxic chemicals. There is considerable interest in the issuing of information, advisories, and fact sheets concerning the consumption of wild-caught fish from contaminated waters, and in the actual consumption patterns of subsistence and recreational anglers. Despite the large number of consumption advisories issued by state agencies, there is little information on how these advisories, or other forms of risk communication, are perceived by target audiences, notably fishermen and women of child-bearing age. The states of South Carolina and Georgia issue consumption advisories for fish from the Savannah River, among other sites. To gain a greater insight into the perception of anglers about a supplemental fish fact sheet jointly developed by South Carolina, Georgia, federal agencies, and the Consortium for Risk Evaluation with Stakeholder Participation, we interviewed fisherman along the Savannah River. The objectives were to determine: (1) whether they had previously read the Fish Fact Sheet or had heard about the consumption advisories; (2) what major message they obtained from the sheet; (3) who they felt the fact sheet was aimed at, and who should get the Fish Fact Sheet; (4) who should be concerned about health risks from consuming the fish; and (5) the best method of disseminating such information. We interviewed 92 fishermen (37% black, 62% white) during the fishing season of 1999. Half had heard some information about consumption advisories, mainly from the media (64%). The study concluded that there were no ethnic differences in whether they had heard about the advisories, understood the major message of the fact sheet, felt they could reduce their risk from consuming the fish, or felt that it made a

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difference which agency issued the fact sheet. There were significant ethnic differences in the ways people thought the risk from eating fish could be reduced, sources of information about the risks from consuming fish, and what other information they would like about the risks associated with contaminated fish. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Fishing is an important activity for many Americans, both for recreation and for food, yet contaminant levels in some fish are sufficiently high to provide potential adverse health effects, particularly for developing fetuses and young children (Jacobson et al., 1989, 1990; Institute of Medicine, 1991; Sparks and Shepherd, 1994; ATSDR, 1995; Jacobson and Jacobson, 1996; Schantz, 1996). A positive relationship exists between mercury levels in fish, fish consumption by pregnant women, and deficits in neurobehavioral development in children (Weihe et al., 1996). The potential for adverse health effects from eating fish has led to management of the risk by issuing consumption advisories for some waters, and has resulted in cleanup directives from state and federal agencies. Consumption advisories stimulated a flurry of studies to determine consumption patterns, the perceptions of risk by anglers, and the compliance of anglers.

Fish, however, provide many benefits, both nutritional and social (Toth and Brown, 1997). For some fishermen, fish may be the main affordable source of protein, while for others, it may be the healthiest source. Fish provide Omega-3 oils, which offer the potential for reduction of cholesterol levels (Hunter et al., 1988; Kimbrough, 1991; Horn, 1992; Anderson and Wiener, 1995). Moreover, fishing is an enjoyable activity that has many social benefits (Toth and Brown, 1997), particularly for native Americans (Harris and Harper, 1997; Egeland and Midgaur, 1997; Burger 1999).

The US Environmental Protection Agency (1999) reported that 16% of the nation's total lake acres and 7% of the nation's total river miles are under consumption advisories, as well as all of the Great Lakes and their connecting waters.

Mercury accounts for most of the advisories; other contaminants that account for advisories include PCBs, chlordane, dioxins and DDT (EPA, 1996, 1999). Other countries, such as Canada, also have consumption advisories for fish. Yet there is often a gap in perception of risk by the fish-consuming public, and the agencies issuing the advisories (Belton et al., 1986; Fiore et al., 1989; EPA, 1989; Ebert, 1996; Reinert et al., 1996). The public frequently views eating fish as posing a less serious hazard than does the scientist or environmental manager. People often are aware of advisories, but continue to consume the fish nonetheless (Reinert et al., 1991; Burger and Gochfeld, 1991; Burger et al., 1992, 1993, 1999a; Velicer and Knuth, 1994; May and Burger, 1996). In some cases, people continue to consume fish or crabs even when there are bans on fishing, selling, and consumption (Burger et al., 1999b).

From a risk management perspective, it is critical to understand how the target audience is perceiving the consumption advisories or other information provided to them. Yet, most agencies do not have the opportunity or resources to determine whether the target audience is receiving the intended message, and whether some aspects are misunderstood. In this paper, people who were fishing along the Savannah River were interviewed to determine the efficacy of a Fish Fact Sheet as a method of risk communication. The objectives of the study were to determine: (1) whether they had previously heard about the consumption advisories, or had read the Fish Fact Sheet; (2) what major message they obtained from the sheet; (3) who is the target audience; (4) who should be concerned about health risks from consuming the fish; and (5) suggestions for the best methods of disseminating such information.

This paper represents a continuation of a pro-

ject to understand the risk from the consumption of fish from the Savannah River by the Consortium for Risk Evaluation with stakeholder participation. Project phases include: (1) interviewing people fishing along the Savannah River to determine fish consumption patterns and risk perception (Burger, 1998; Burger et al., 1999a); (2) examining contaminant levels in the target fish species from the Savannah River (Burger et al., ms); (3) developing a Fish Fact Sheet for this target audience (Burger et al., in press); and (4) the present study to determine the efficacy of the Fish Fact Sheet and the best method of communicating such risk information.

While the data presented in this paper are specific for the Savannah River, they provide insights that will be useful for understanding risk perception concerning consumption advisories elsewhere. It is not unusual for different states sharing adjacent water to have different or conflicting advisories (Foran and VanderPloeg, 1989; Cunningham et al., 1994), or for the advisories to change from year-to-year. Along the Savannah River, both states issue consumption advisories, but they differ in some respects (SCDHEC, 1996, 1999; GDNR, 1999). The state-issued consumption advisories are specific for the individuals at risk, species of fish, and quantities of fish that can be eaten from specific locations. The advisories for the Savannah River were determined based on both the risk from mercury and from radionuclides, although mercury levels were the driver.

The intent of the Fish Fact Sheet was to provide easily understandable information about the risks from consuming fish from the Savannah River, while reaching the fishermen who actually fish along the river. Other objectives include information on the populations at risk and how to reduce risk. It complements the information provided by the states.

2. Method

Our overall protocol was to interview people fishing along the same stretch of river where we had previously conducted interviews concerning consumption patterns (Burger, 1998; Burger et

al., 1999a). Under a university-approved protocol, 92 people who were fishing on the Savannah River were interviewed. As in the previous study, we sampled three sections of river: along the Savannah River Site, upriver from the site to the Augusta lock and dam, and downriver from the site to the State Road 301 bridge (Fig. 1, approx. 90 km of river).

Interviews were conducted on land and on the water (by boat) during the fall fishing season (September through December 1999). We interviewed fishermen over a 4-month period, including weekdays and weekend days, and conducted interviews from dawn to dusk. We approached all fishermen we saw. We often saw the same people at the same fishing sites, and they expressed interest in the progress of the survey work. All interviews were conducted by the same three people; two of these were involved in the initial interviewing for the fish consumption study and had lived and worked in the region their entire lives (Burger et al., 1999a). The interviewers were all trained by us to ask questions and obtain information consistently. We initially identified ourselves as from Rutgers University, and told them we had a Fish Fact Sheet about the fish from the Savannah River that we would like them to read, and we would then ask them questions about the sheet. Only one person out of 93 approached refused to be interviewed because they did not have the time to participate. Thus, the response rate exceeds by far the typical rates of response for telephone and personal interviews (Dillman, 1978). Most interviews took 30–45 min because people were allowed 15 min. to read the questionnaire, and after the interview, wanted to talk about fishing, or to ask questions about consumption advisories or the risk from fish consumption.

The questions on the questionnaire are shown in Table 1. All demographic questions were asked at the end of the interview (sex, age, ethnicity/racial, residence) because some people are sensitive (income, education and employment) and we wanted to reduce rejection rates. Hereafter, racial refers to ethnic and racial differences. Prior surveys had indicated that some people are reluctant to disclose their income or education. However, after a friendly and lengthy interview by local

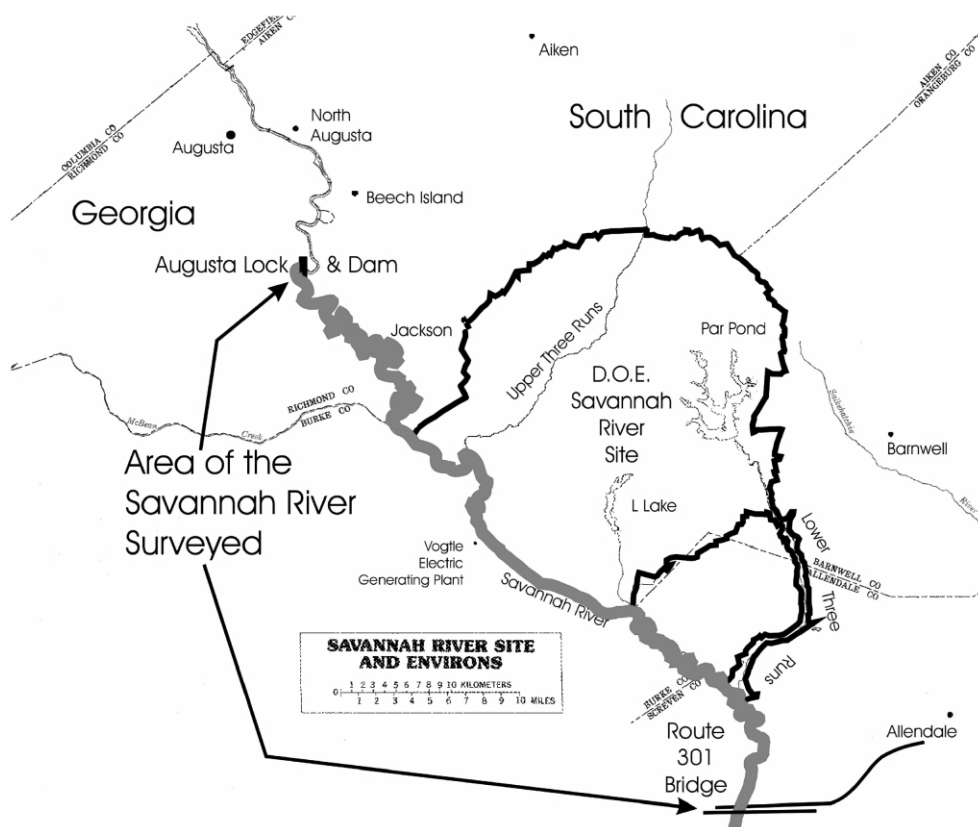


Fig. 1. Map showing the area of concern for the Fish Fact Sheet, and where fishermen were interviewed.

interviewers, most people were willing to give this information at the end of the survey. People were asked to give their household income. Since our sample was largely male, we did not examine the data by gender.

For open-ended questions, we read all responses for each question, and then categorized them into themes (Mason, 1996). All responses were coded into one category. We used non-parametric analysis of variance (SAS Proc NPAR1WAY with

Table 1

Questions asked of subjects fishing along the Savannah River about the Fish Fact Sheet

1. Have you seen this fact sheet, or information like it. If so, where?
2. What is the major message you get from this sheet, and a secondary message?
3. Are there groups of people who should limit the amount of fish they eat? If so, who?
4. After reading the fact sheet, are there groups of people who should limit the amount of fish they eat?
5. Are there ways to reduce the health risks from eating fish, if so, what are they?
6. Who should get the fish fact sheet?
7. Is there a better way to get this information to fishermen, or to others who eat fish?
8. What other information would you like?
9. Do you have any other questions or comments?
10. Does it matter which agencies created this fact sheet?

Table 2
Demographics of people interviewed about the Fish Fact Sheet along the Savannah River

	Black	White	Wilcoxon X^2
Sample size	34	58	
Male (%)	85	88	0.13 (NS) ^a
Mean income	\$32 600 ± \$5370	\$34 000 ± 3080	1.08 (NS)
Mean age	45.5 ± 2.3	45.1 ± 2.2	0.15 (NS)
Mean education level	11.1 ± 0.4	12.8 ± 0.3	11.2 (0.0008)

^aContingency X^2 test.

Wilcoxon option), yielding an X^2 statistic to examine differences among groups. We also used ANOVA, (SAS, 1988, GLM procedure). We used a significance level of $P < 0.05$.

3. Results

Of those approached, only one person did not participate in the survey due to time constraints and only two (2%) did not read well enough to complete the survey on their own. These two individuals both asked to have the Fish Fact Sheet read to them, and then they answered the questions. At the time of the survey, nearly everyone we interviewed was engaged in fishing along the Savannah River.

3.1. Angler demographics

Of those interviewed ($N = 92$), 37% were black, and only 12% were female. Ages ranged from 23 to 77 years. Only four men reported working on the Savannah River site. There were significant racial differences in years of schooling, but not in age or income (Table 2).

3.2. Major message

There were no significant racial differences in the major messages obtained (Table 3). The major perceived messages were: (a) do not eat the fish; (b) limit, in some way, the fish eaten; and (3) there are specifically identified contaminants of concern. These results reflect the major communication messages of the Fish Fact Sheet.

3.3. Target audience

We were interested in determining who our subjects felt should get this fact sheet (or similar information). Of the 92 people interviewed, only 8 did not suggest specific people who should get the sheet. Only one person said the information only ‘scares people for nothing’. Over half (56%) replied that everyone should get the Fish Fact Sheet, regardless of whether they fished or ate fish from the Savannah River, and another 37% said it should go to whom it concerns, such as those who fish from the river, live beside the river, buy fishing licenses, are outdoors people, or are high government officials.

Table 3
Responses of people fishing along the Savannah River to the question about the major message they received from the Fish Fact Sheet^a

	%Black	%White
What is the major message ^b		
Don't eat the fish from the river	35	25
Limit fish (or fish species) in some way	21	31
Identifying a contaminant	21	22
Other	12	12
Don't know/no response	11	10
What ways can you reduce risk from eating fish ^c		
Limit fish intake in some way	86	81
Clean up the pollution	0	15
Other ^d	10	4
Inform people	4	0

^aShown also are their responses about reducing risk.

^b X^2 (P) = 1.61 (NS).

^c X^2 (P) = 22.7 (0.005).

^dSuch as ‘read the Fish Fact Sheet’.

3.4. Who should limit fish consumption?

One of the objectives of the Fish Fact Sheet was to convey the information that some people are more at risk than others, and we wanted to determine whether this was a clearly received message. After reading the Fish Fact Sheet, subjects were asked if there were groups of people who should limit the amount of fish they eat from the Savannah River. Only 9% responded no, thus most people felt that some groups of people should limit the amount of fish they eat. This demonstrated that a major message of the Fish Fact Sheet was understood.

The Fish Fact Sheet states that ‘mercury is more harmful to babies and children than adults’ and that ‘pregnant women can pass mercury to their unborn children’. Of those interviewed, over 40% correctly identified the primary audience for the fact sheet, noting that pregnant women and young children were most at risk. There were no racial/ethnic differences in their perception of the people who were most at risk.

3.5. Ways to reduce risk

One of the objectives of the writers of the Fish Fact Sheet was to convey the information that there were ways to reduce the risk of contaminants in fish, and to provide information on some methods of risk reduction. The present study was designed, in part, to assess if the major message had been received accurately.

When then asked whether there were ways they could reduce their risks from eating fish, 71% responded ‘yes’. While some people ($N = 6$) commented that one way to reduce risk was to get companies to stop dumping toxics (or to clean up the river), an overwhelming majority of the people noted that limiting fish intake in some way reduced risk (Table 3). There were racial/ethnic differences in the response to this question in that some whites responded that authorities should clean up the river to reduce their risk, while some blacks noted that people should be informed or should receive the Fish Fact Sheet (Table 3).

Table 4

Responses of people fishing along the Savannah River to the question of where they have seen information about the safety of consuming fish from the Savannah River^a

	% Black	% White
Media	11	79
Friends and other non-professionals	56	5
Other professionals in the field	22	5
Government	11	5
Other	0	5

^a $\chi^2 (P) = 14.5 (0.005)$.

3.6. Media sources

When asked where they had seen the information presented on the Fish Fact Sheet before, there were significant racial differences (Table 4). Most whites reported media, while most blacks reported friends as the source of this information. When asked whether it made a difference what agency created the Fish Fact Sheet, 30% said it enhances the availability and credibility, 20% said it detracts, and the rest said it did not matter. There were no racial differences in their responses.

3.7. Additional desirable information

One of our objectives was to determine additional information people might like on such a fact sheet. We asked this in several different ways, but grouped the information using the process described by Mason (1996). People were interested in a wide range of topics from ecological pathways and contaminant levels to risk levels (Table 5). There were significant racial differences, with blacks being most concerned about risk levels and where to get additional Fish Fact Sheets, and whites being most interested in the contaminant levels in the fish (Table 5). Interest in the Fish Fact Sheet was corroborated by the fact that people took the sheets with them, rather than putting them in the nearby trash cans or dropping them on the ground and most people asked for additional copies to give to their family or friends.

Everyone who we interviewed wanted to keep

Table 5
Additional questions and comments from people fishing along the Savannah River after reading the Fish Fact Sheet^a

	% Black	% White
Clean up river	8	12
Ecological pathways	12	6
Exposure	3	0
How to get fish sheet — when available	17	10
Levels in fish	6	18
Risk levels	17	4
Source of contamination	6	10
Who has gotten sick	0	10
What is cesium/strontium	3	1
Other	28	30

^aFor this question only, people were allowed to have more than one answer. $X^2 (P) = 64.8 (0.0001)$.

the Fish Fact Sheet, and most asked for more copies to give to family and friends.

4. Discussion

The objectives of the study were to determine whether people fishing along the Savannah River had seen the fact sheet, had heard about consumption advisories, and understood the major message (the target audience, ways to reduce risk from consuming fish), and if there were other effective ways to communicate the message.

Most anglers had not seen the Fish Fact Sheet, which was not surprising since it had not been widely distributed yet, but half of the people had heard of some consumption advisories. This is similar to the number of fishermen who reported knowing about some warnings on the previous consumption survey (Burger, 1998, 2000; Burger et al., 1999a,b).

4.1. Interest in the Fish Fact Sheet and in risk information

One question that often comes up with respect to consumption advisories and other sources of information about consumption advisories (such as the Fish Fact Sheet examined in this study) is whether the target audience is interested in re-

ceiving this information if it is available, and whether they will read it in the present form.

In this study, 99% of the people approached while they were fishing or present along the river with fishing gear agreed to read the Fish Fact Sheet and answer the questions. Since the whole process, including reading the sheet, required at least a half hour, it is remarkable that we had such a high acceptance rate. Such a high acceptance rate indicates high interest in knowing about the information. Furthermore, everyone took the sheet with them, rather than returning it to us and most people asked for more to give friends or family.

While there are no other evaluative studies to compare this with, we can compare acceptance rate on interviews concerning consumption patterns and recreational rates, which are on the same target audience (fishermen). When questionnaires are administered by mail, response rate is often less than 75% (Ebert et al., 1993), when administered by phone, the final response rate is 90% or less, which only occurs after repeated attempts (Dillman, 1976). In this study, response rate was 99%, indicating strong interest in the topic.

4.2. Ability to correctly identify the major message

When asked if there were ways to reduce risk, most people said yes, and most said fish intake should be limited in some way. In general, the people fishing along the Savannah River obtained the intended message about the risks, populations at risk, and ways to reduce their risk from fish consumption. Thus, the majority of the people obtained the correct message from the Fish Fact Sheet, indicating that a significant message can be delivered from a communication instrument that is only one double-sided piece of paper.

Most state agencies issue very long and detailed fish consumption advisories because the advisories vary depending upon fish species, fish size, and location (different rivers or lakes or sections thereof). The agencies are being very specific and explicit about the consumption advisories. Such consumption advisories are usually available when and wherever fishing licenses are

sold, as well as from the issuing agency. However, despite the issuance of consumption advisories by nearly all states in the US, many states do not have shorter communication tools for target populations that are particularly at risk, nor have they examined the efficacy of their consumption advisory booklets for target audiences.

In this study we examined a particular mechanism (the Fish Fact Sheet) for communicating risk from consuming fish. Nearly everyone participated despite the time required to read the Fish Fact Sheet and answer the questions, nearly everyone took their sheet with them, and most people asked for additional Fish Fact Sheets for their family and friends. This indicates that the Fish Fact Sheet was useful for the target audience (people fishing along the Savannah River), that personal approach was effective with the fishermen, that the Fish Fact Sheet was appropriate for the audience, and that it was valued by the fishermen.

By distributing the Fish Fact Sheet on a personal level to people fishing along the river, we reached the target audience when they were fishing and the subject was on their minds. We believe that distributing such a Fact Sheet to the affected parties ensures that the audience of concern is reached. Although the high response rate may have been due to our personal approach, the understanding of the fishermen about the Fact Sheet was not due to the method of approach since no additional information was provided prior to being questioned. While the Fish Fact Sheet does not take the place of state-issued advisories, it provides an additional tool for reaching people who might not take time to read the state advisories, and might interest them in learning more information by contacting the sources listed on the sheet.

The Fact Sheet provides an additional communication tool to be used in conjunction with state-issued advisories. We suggest that such a Fact Sheet is useful because it is short and easy to read, gives background information on contaminants and why certain people are at risk, and provides specific information about how to reduce risk. However, we did not examine the efficacy of the state-issued advisories, nor evaluate other al-

ternative communication instruments. Further research is necessary to provide comparative evaluations, to determine the best instruments for communicating risk, and to understand how best to provide information to specific target audiences on the linkages between people at risk, the nature of the risks, and ways to reduce risk.

4.3. Risk reduction

Part of reducing risk to consumers of fish is to ensure that all people fishing in areas with consumption advisories are aware of the advisories. Furthermore, compliance is often dependent upon people being able to take knowledge from the consumption advisory and apply it to their own lives. It is also important to bear in mind that fishing is an enjoyable activity, and one that provides significant protein to some people (Toth and Brown, 1997). Some people fishing along the Savannah exceed the total fish consumption used to compute the risk from recreational (19 kg/year) and subsistence (50 kg/year) fishing (Burger et al., 1999a). It is unrealistic to assume that people will stop fishing. Instead, people should be provided with enough risk information so that they can make informed decisions, and understand how to reduce their own risk.

This paper focused on analyzing a communication tool to support risk reduction for those who are particularly at risk (pregnant women, those about to get pregnant, and young children). Risk can often be reduced by a change in the species and size of fish consumed, as well as in preparation and cooking methods. The levels of mercury vary among fish species; those that are higher on the food chain (Rowan and Rasmussen, 1994) and are older and larger (Lange et al., 1994) have higher levels than others. Some contaminants (such as PCBs) can be altered by different cooking methods (Morgan et al., 1996) or by eating only fillets. All people can reduce their risk from mercury by limiting their exposure to larger, older, higher-trophic level fish. This message, which was communicated in the Fish Fact Sheet, may be more understandable to the people fishing along the river than other more traditionally-used methods. Furthermore, we feel that the face-to-

face dissemination of the Fish Fact Sheet contributed to its efficacy. We suggest that a Fish Fact Sheet can serve an additional need by providing the fishing public with information on risk reduction, rather than just fish consumption limits, and it can do so in a short, easily-readable, clear format.

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