
What We Know about Fish Consumption Advisories: Insights from Experts and the Literature



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EXECUTIVE SUMMARY

A consortium of the eight Great Lakes states' health and environmental departments formed in the 1980s to develop shared science-based protocols for fish consumption advice in the Great Lakes. This Consortium was funded by the U.S. Environmental Protection Agency through its Great Lakes Restoration Initiative to work together to enhance state fish consumption advisory programs by determining how to communicate information to the public more effectively. The Consortium worked with Cornell University's Human Dimensions Research Unit on several projects to achieve their objectives. The purpose of this report is to synthesize existing knowledge about effective fish consumption advisory practice. We relied on two sources of information in this synthesis:

- Insights from practitioners with expertise in fish consumption advisory communication (members of the Consortium); and
- Findings reported in the literature.

We conducted a Delphi survey to synthesize the knowledge of members of the Consortium about the characteristics of effective fish consumption advisory communication. A Delphi survey is a technique that is used to identify areas of agreement and disagreement among a group of experts who are in different locations. These experts participate in several rounds of surveys in which they initially offer their own answers to a question or questions posed to the group (e.g., what are the characteristics of effective fish consumption advisory communication?) and later indicate how much they agree or disagree with answers proposed by all other individuals in the group and offer explanations of their reasoning. The group identified a set of possible characteristics of effective fish consumption advisory programs through the Delphi survey. We focus our report on characteristics about which 90% of Consortium members agreed on the importance of and characteristics about which Consortium members disagreed.

We also conducted a review of the fish consumption advisory literature through 2012 to identify characteristics of effective fish consumption advisory communication particularly based on empirical study. We focused on research results that led to recommendations for approaches, methods of communication, or messages. We also included results that highlighted special considerations for different target audiences.

Several conclusions about effective fish consumption advisories are common to both practitioners and the literature. Both advocated that advisory messages should:

- Be simple and straightforward.
- Provide information on both the benefits and risks of fish consumption, emphasizing positive messages.

- Enable target audiences to make informed choices about eating fish.

Ten topics for advisory messages about which practitioners agreed were all also emphasized in the literature:

- Health risks of eating fish.
- Health benefits of eating fish.
- Which types of people are most at risk from fish consumption.
- How frequently different types of fish can be safely eaten.
- Which types of fish provide the most health benefits and the fewest health risks.
- What cleaning, cooking, and storage techniques can reduce health risks.
- Which types of fish should be limited or avoided.
- What waterbodies should be avoided.
- What contaminants in fish are of concern.
- Where to get additional information.

Both practitioners and the literature have concluded that messages should be communicated in multiple ways, and with methods through which target audiences will encounter them frequently. Messages should come from trusted and credible sources, which may vary for different target audiences. Particular ways of distributing advisory materials that were recommended included mass media, web sites, brief printed materials, and fishing regulations guides (for anglers).

Finally, both practitioners and the literature agreed that advisory messages and distribution methods should be tailored for different target audiences, with consideration of reading level, culture, and preferred ways to receive information. Taken together, these recommendations for good advisory communication represent some accepted guidelines for advisory practice.

Despite the areas of agreement between Consortium members and the literature, a number of questions about effective advisory practice remain unanswered. For example, the literature pointed to the importance of community-based programs conducted in partnership with local organizations to communicate with hard-to-reach audiences, such as low income, urban, and immigrant populations, and many practitioners also believed such approaches were valuable. As a group, however, Consortium members had varied perspectives about the value of a number of methods for distributing advisory messages that might be useful in community-based programs (community events, community-based organizations, social service organizations, schools and youth programs, and faith-based organizations). Because of the emphasis the Consortium has placed on developing effective methods for communicating with low income, urban, and immigrant populations (68, 69), developing guidelines for communicating with these audiences through community-based programs may represent an important topic for future research and exploration.

Additional recommendations for future research include:

- The existing literature has yielded insights into how key audiences interpret fish consumption advisory materials. However, little evidence exists to demonstrate the degree to which these materials actually influence behavior and reduce the exposure of target audiences to contaminants in fish. The types of evidence that would be worthwhile to collect fall into two areas: (1) If target audiences receive advisory materials based on lessons learned from past research and experience, to what degree do these materials increase awareness and knowledge, influence fish consumption behavior, and reduce exposure to contaminants? (2) What delivery mechanisms are effective for getting these materials to a large enough segment of a target audience to influence the behavior of that audience?
- A clear interest exists in using digital media (websites, cell phone apps, etc.) to communicate advisory information. However, this technology is still relatively new and evolving, and little research-based information about the most effective ways to communicate through digital media exists. This area is a potentially fruitful area for additional research.
- Both practitioners and the literature emphasize the importance of communicating about both the health risks and the health benefits of fish consumption. Beyond this recognition, however, few research-based recommendations have been offered about how to communicate about both the risks and benefits to achieve desired outcomes. We suggest additional research on this topic.

Research in these and other areas with key audiences (such as women of childbearing age and low-income, urban anglers) could build on the strong foundation that currently exists for effective fish consumption advisory practice and enable that practice to continue to improve into the future.

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INTRODUCTION

A consortium of the eight Great Lakes states' health and environmental departments formed in the 1980s to develop shared science-based protocols for fish consumption advice in the Great Lakes (53, 70). This Consortium has worked together since then, as time and funding have allowed, on various communication tools, data sharing, and additions to the protocols. Most recently, the group was funded by the U.S. Environmental Protection Agency through its Great Lakes Restoration Initiative to work together to enhance state fish consumption advisory programs by determining how to communicate information to the public more effectively, thereby increasing public knowledge about the risks and benefits of fish consumption and reducing exposure of the public to toxic substances from consumption of contaminated fish. The Consortium is working with Cornell University's Human Dimensions Research Unit on several projects to achieve their objective.

The purpose of this report is to synthesize existing knowledge about effective fish consumption advisory practice. We relied on two sources of information in this synthesis:

- Insights from practitioners with expertise in fish consumption advisory communication (members of the Consortium); and
- Findings reported in the literature.

Delphi Survey

We conducted a Delphi survey to synthesize the knowledge of members of the Consortium about the characteristics of effective fish consumption advisory communication. A Delphi survey is a technique that is used to identify areas of agreement and disagreement among a group of experts who are in different locations. These experts participate in several rounds of surveys in which they initially offer their own answers to a question or questions posed to the group (e.g., what are the characteristics of effective fish consumption advisory communication?) and later indicate how much they agree or disagree with answers proposed by all other individuals in the group and offer explanations of their reasoning. The facilitators of the survey synthesize the answers from each round of surveys and provide that synthesis back to the group so that their answers can be informed by the perspectives of others in the group. The technique has been found to be an effective way to facilitate discussion among individuals who cannot gather in a single location. It provides a clear focus to discussions and results in a series of concrete conclusions.

The survey was conducted in three phases. (See Appendix A for copies of the instruments used in each phase.)

- **Phase 1.** Initially, participants were asked to complete a survey instrument consisting of 6 open-ended questions that fit under a single overarching question: What are the

characteristics of effective fish consumption advisory communication? The 6 open-ended sub-questions were:

- What are the characteristics of effective fish consumption advisory messages?
- What specific messages are important to communicate in effective fish consumption advisory programs?
- What are the characteristics of effective fish consumption advisory materials?
- How are advisory materials distributed in effective fish consumption advisory programs?
- What characteristics of target audiences need to be considered when tailoring fish consumption advisory programs to meet their needs?
- What other characteristics that you have not already mentioned would effective fish consumption advisory communication have?

They answered these questions in their own words. After participants returned their responses, we synthesized them into a series of statements about the characteristics of effective fish consumption advisory communication.

- **Phase 2.** Participants were sent the list of statements describing proposed characteristics of effective fish consumption advisory communication and asked either:
 - How important they thought it was for fish consumption advisory communication to have these characteristics; or
 - Whether they agreed or disagreed that each was a characteristic of effective fish consumption advisory communication. Participants were also given the opportunity to offer reasons for their ratings of each statement and suggest additional characteristics of effective communication that may not have occurred to them originally.

After participants returned their responses, we summarized the ratings of each statement and synthesized the comments made about statements about which disagreement existed. Additional characteristics of effective communication suggested by participants were added to the list.

- **Phase 3.** Participants were sent the list of statements about effective communication again and asked to rate each statement a final time. In this case, however, they were also provided with information about the level of agreement with each statement within the Consortium as a whole. Participants' comments about particular statements were provided in cases in which opinions are not uniform.

Each state identified members of the Consortium within their state that they suggested should participate in the survey. Thirty-three were invited to participate. The number invited per state ranged between 2 and 9.

After participants returned their responses from the third phase, we calculated means and/or frequencies for each statement using IBM SPSS Statistics 20. Results were weighted by state (so that each state was weighted equally in the analysis) so that we could assess the consistency in perspectives about effective fish consumption advisories among states in the Consortium.

The results are organized into 7 sections focused on:

- Characteristics of effective advisory messages;
- Important topics;
- Important specific messages;
- Characteristics of effective advisory materials;
- Advisory material distribution;
- Advisory material formats; and
- Characteristics of target audiences.

For each of these sections:

- We identify characteristics of effective advisory programs that 90% of Consortium members thought were moderately or very important (for the first three topics) or with which they agreed or strongly agreed (for the last four topics).
- We identify characteristics about which the Consortium states disagreed. Specifically, we: (a) calculated the mean ranking for all respondents in each state; (b) grouped these mean state rankings into low, medium, and high groups; and (c) identified characteristics for which these rankings range from low to high.

Literature Synthesis

We conducted a review of the fish consumption advisory literature through 2012 to identify characteristics of effective fish consumption advisory communication. We focused on research results that lead to recommendations for approaches, methods of communication, or messages. We also included results that highlighted special considerations for different target audiences.

We identified empirical literature to review through a variety of methods: (1) searching on-line library databases, such as Google Scholar and Web of Knowledge, checking references of current literature, (2) accessing the personal libraries of researchers in the field, and (3) requesting reports and presentations from members of the Great Lakes Consortium for Fish Consumption Advisories. We reviewed the literature and compiled findings in an annotated bibliography (Appendix B). We included only literature that made recommendations about fish consumption advisory communication. Articles that examined health benefits and risks of fish consumption but did not test methods or offer suggestions about communication were not included. Work by a recent graduate of Cornell University (71) was particularly helpful because

he endeavored to identify “best practices” for advisory communication through a review of the literature up to 2006. We grouped the annotated bibliography into three sections: journal articles, reports, and presentations. We included the abstract for each journal article, and additional information from the body of the article or report, if it discussed relevant facts related to communication or made recommendations for effective communication. We included presentations only if they described research results on effective communication strategies that were not discussed in a journal article or report.

The complete references for all documents in the annotated bibliography will be available to Consortium members through a service at Cornell University called “Box.”¹ Several references (e.g., Knuth 1990, USEPA 1995) provide excellent background data and insightful suggestions for risk communication, but are somewhat dated. These references are included in “Box” and we suggest Consortium members access them directly for general, background information on risk communication. Additional references not listed in the annotated bibliography, but which were evaluated because of their potential value, are included in a separate section of the “Box.” These additional references are meant to provide a handy reference, but should not be considered a complete compendium of fish consumption advisory-related literature.

RESULTS

Delphi Survey

Of the 33 individuals invited to participate in the survey initially, 24 (73%) completed the first round, 25 (76%) completed the second round, and 26 (79%) completed the third and final round. The number of respondents per state in the final round (on which the results presented are based) ranged between 1 and 7.

Characteristics of Effective Advisory Messages

Agreements. Members of the Consortium identified 21 possible characteristics of effective fish consumption advisory messages (Table 1). Fifteen characteristics were considered moderately or very important by at least 90% of respondents. These 15 characteristics were concerned with a variety of aspects of the advisory messages.

Several addressed the ease with which target audiences could comprehend and follow advisory messages, specifying that messages should:

- Be concise.
- Be communicated in simple, straightforward language.

¹ Details on how to access “Box” will be sent to Consortium members via an email invitation.

- Be easy to understand.
- Communicate recommendations that are easy to follow.

Two were concerned with the accuracy of the information communicated in advisories and indicated that advisory messages should be:

- Honest and scientifically accurate.
- Based on up-to-date data.

Two characteristics addressed the balance between different types of information communicated in advisory messages (health risks vs. health benefits and positive vs. negative). These characteristics stated that messages should:

- Communicate balanced information about the health risks and health benefits of fish consumption.
- Emphasize the positive rather than the negative.

One of these characteristics argued for balance, while the other stressed communicating positive messages.

Three of the characteristics had to do with the way target audiences would perceive advisory messages. Messages should:

- Be credible to target audiences.
- Be respectful towards target audiences.
- Answer the questions of target audiences.

Four characteristics addressed the outcomes of advisory messages. Two emphasized enabling the decision-making of target audiences, but did not specify what those decisions should be.

- Enable recipients to make informed choices about eating fish.
- Provide recipients with the confidence to make decisions about eating fish.

The remaining two characteristics identified two specific behaviors advisory messages should attempt to achieve.

- Motivate target audiences to follow consumption advisories.
- Do not stop people from eating fish entirely.

Disagreements. We also identified characteristics about which substantial disagreement existed among Consortium states (Table 2). Two characteristics of advisory messages were considered not at all to slightly important by 2 states, slightly to moderately important by 3 to 4 states, and moderately to very important by 2 to 3 states.

These characteristics stated that messages should be:

- Limited in number.
- The solution to eating as much fish as you want and avoiding unsafe exposure to chemical contaminants

Table 1. Survey respondents’ perspectives on the characteristics of effective fish consumption advisory messages.

Characteristic	Percent of Respondents				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
Enable recipients to make informed choices about eating fish.	0	0	0	100	4.00
Do not stop people from eating fish entirely.	0	0	4	96	3.96
Are communicated in simple, straightforward language.	0	0	8	92	3.92
Are easy to understand.	0	0	10	90	3.90
Communicate recommendations that are easy to follow.	0	0	13	88	3.87
Are honest and scientifically accurate.	0	6	4	90	3.84
Are credible to target audiences.	0	2	15	83	3.81
Provide recipients with the confidence to make decisions about eating fish.	0	2	17	82	3.80
Are respectful towards target audiences.	0	2	21	77	3.75
Are concise.	0	0	39	61	3.61
Communicate balanced information about the health risks and health benefits of fish consumption.	0	8	32	60	3.52
Are based on up-to-date data.	0	2	46	52	3.51
Motivate target audiences to follow consumption advisories.	0	0	61	39	3.39
Answer the questions of target audiences.	0	4	58	38	3.35
Emphasize the positive rather than the negative.	2	8	49	41	3.29

Table 1. (continued)

Characteristic	Percent				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
Encourage rather than direct target audiences to make safe choices about fish consumption.	0	18	60	22	3.05
Are easy to remember.	0	19	57	24	3.05
Are tailored to particular target audiences.	0	16	65	19	3.03
Are limited in number.	19	30	31	20	2.52
Are consistent from state to state.	5	55	32	8	2.43
Are the solution to eating as much fish as you want and avoiding unsafe exposure to the chemical contaminants.	22	31	33	15	2.40

Table 2. Characteristics of effective fish consumption advisory messages about which Consortium states disagreed.

Characteristic	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Not at all to Slightly (1.00 to 2.00)	Slightly to Moderately (2.01 to 3.00)	Moderately to Very (3.01 to 4.00)		
Are limited in number.	2 (3)	3 (3)	3 (1)	2.52 (2.24)	1.00 to 4.00 (1.00 to 4.00)
Are the solution to eating as much fish as you want and avoiding unsafe exposure to the chemical contaminants.	2 (2)	4 (4)	2 (1)	2.40 (2.29)	1.50 to 3.50 (1.50 to 3.50)

Important Topics

Agreements. Twenty-one possible topics of advisory messages were identified by the Consortium (Table 3). Ten topics were considered moderately or very important by at least 90% of respondents.

Two topics addressed the health implications of eating fish:

- Health risks of eating fish.
- Health benefits of eating fish.

One topic was concerned with how the risks varied for different types of people:

- Which types of people are most at risk from fish consumption.

Five topics focused on strategies for reducing the health risks of eating fish:

- How frequently different types of fish can be safely eaten.
- Which types of fish provide the most health benefits and the fewest health risks.
- What cleaning, cooking, and storage techniques can reduce health risks.
- Which types of fish should be limited or avoided.
- What waterbodies should be avoided.

One topic had to do with why fish consumptions poses health risks:

- What contaminants in fish are of concern.

One topic was intended to help target audiences answer additional questions they might have.

- Where to get additional information.

Disagreements. We identified topics about which substantial *disagreement* existed among Consortium states (Table 4).

Only one topic fell into this category. Five states considered this topic moderately to very important and one state considered it not at all to very important:

- what waterbodies are best to eat fish from.

Table 3. Survey respondents’ perspectives on important topics for fish consumption advisory messages.

Topic	Percent of Respondents				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
Which types of people are most at risk from fish consumption	0	0	14	86	3.86
Health risks of eating fish	0	0	15	85	3.85
How frequently different types of fish can be safely eaten	0	2	12	86	3.85
Which types of fish should be limited or avoided	0	6	4	90	3.84
Health benefits of eating fish	0	2	26	72	3.71
Where to get additional information	0	0	41	59	3.59
What cleaning, cooking, and storage techniques can reduce health risks	0	2	42	56	3.54
Which types of fish provide the most health benefits and the fewest health risks	0	8	34	58	3.50
What waterbodies should be avoided	6	4	34	56	3.40
Which types of fish can be eaten without concern	0	16	27	57	3.40
How much fish to eat each meal	0	10	41	48	3.38
Cooking and cleaning methods to remove some chemicals	6	12	21	61	3.36
What contaminants in fish are of concern	0	10	55	36	3.26
What waterbodies are best to eat fish from	10	12	32	46	3.13
How contaminants get into fish	0	38	51	12	2.74

Table 3. (continued)

Topic	Percent of Respondents				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
The relative risks and benefits of eating sport-caught vs. farm-raised fish	21	50	23	6	2.15
How the risks of fish consumption compare to other risks	22	47	28	2	2.10
How consumption advice is developed.	24	55	13	8	2.05
How much fish people typically consume	28	63	10	0	1.82
Whether water-based activities besides fishing pose risks in waterbodies with advisories	61	27	5	6	1.57
How to obtain fish that is produced or harvested without harming the environment	65	22	10	4	1.52

Table 4. Topics in effective fish consumption advisory programs about which Consortium states disagreed.

Topic	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Not at all to Slightly (1.00 to 2.00)	Slightly to Moderately (2.01 to 3.00)	Moderately to Very (3.01 to 4.00)		
What waterbodies are best to eat fish from	1	2	5	3.13	2.00 to 4.00

Important Specific Messages

Agreements. Nineteen specific messages to be communicated in effective fish consumption advisory programs were identified by the Consortium (Table 5). Nine of these messages were considered moderately or very important by at least 90% of respondents.

Among these were three messages about what people “should” do:

- People should continue to eat fish.
- People should follow the fish consumption advisories.
- People should make informed choices about fish consumption.

Each of these recommendations was directly supported by another specific message that most Consortium members agreed on:

- Eating fish is good for your health.
- Following the advisories allows people to consume fish safely.
- Choices about fish consumption can maximize benefits and minimize risks.

Three messages provided information of one type or another about contaminants in fish:

- Some fish are very contaminated.
- Contaminants in fish can’t be detected visually or by smell or taste.
- Many contaminants are in the fat of fish.

The final message provided people information they would need to know to follow consumption advisories:

- Consumption advice varies for different types of people.

Disagreements. We identified 5 messages about which substantial disagreement existed among Consortium states.

One of these messages was one that was considered moderately or very important by 90% of respondents, but nevertheless the range of meant state ratings varied considerably:

- Consumption advice varies for different types of people.

Two messages focused on the risks of eating fish:

- Eating fish poses health risks.

- Most fish have some contaminants.

One message had to do with why fish were contaminated:

- Chemical contaminants are persistent and bioaccumulate in fish and organisms that eat fish.

The final message focused on the benefits of fishing, as opposed to fish consumption:

- Fishing has many benefits.

Table 5. Survey respondents' perspectives on important fish consumption advisory messages.

Message	Percent of Respondents				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
People should continue to eat fish.	0	0	13	88	3.88
Choices about fish consumption can maximize benefits and minimize risks.	2	0	10	88	3.85
Following the advisories allows people to consume fish safely.	0	0	18	82	3.82
Eating fish is good for your health.	0	2	20	79	3.77
People should make informed choices about fish consumption.	0	8	7	85	3.77
People should follow the fish consumption advisories.	0	10	14	76	3.66
Some fish are very contaminated.	8	0	40	52	3.36
Many contaminants are in the fat of fish.	2	12	40	46	3.31
Contaminants in fish can't be detected visually or by smell or taste.	2	8	50	40	3.28
Consumption advice varies for different types of people.	8	2	50	40	3.22
Risks and benefits from fish consumption exist for both store-bought and sport-caught fish.	2	24	29	45	3.17
Eating fish poses health risks.	6	13	52	28	3.02
The risks from fish consumption are chronic rather than acute.	2	26	47	26	2.97

Table 5. (Continued)

Message	Percent of Respondents				Mean (1-4)
	Not at all important	Slightly important	Moderately important	Very important	
Chemical contaminants are persistent and bioaccumulate in fish and organisms that eat fish.	2	24	50	24	2.96
Fishing has many benefits.	10	41	13	36	2.76
Most fish have some contaminants.	8	35	43	14	2.63
It is important to reduce sources of pollution and fish contamination.	16	36	38	10	2.42
People should limit fish consumption.	22	49	19	10	2.16
Information about the risks and benefits of fish consumption communicated in advisories is not available for many other types of foods.	47	44	10	0	1.63

Table 6. Specific messages about which Consortium states disagreed.

Messages	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Not at all to Slightly (1.00 to 2.00)	Slightly to Moderately (2.01 to 3.00)	Moderately to Very (3.01 to 4.00)		
Eating fish poses health risks	1	4	3	3.02	1.50 to 4.00
Fishing has many benefits	1	6	1	2.76	1.50 to 4.00
Consumption advice varies for different types of people	1	3	4	3.22	2.00 to 4.00
Chemical contaminants are persistent and bioaccumulate in fish and organisms that eat fish	1	5	2	2.96	2.00 to 3.50
Most fish have some contaminants	2	5	1	2.63	2.00 to 3.50

Characteristics of Effective Advisory Materials

Agreements. Twenty-six characteristics of effective advisory materials were identified by the Consortium (Table 7). At least 90% of respondents agreed or strongly agreed that 12 of these characteristics applied to effective advisory materials.

Five of these characteristics were concerned with making sure that the most relevant information would stand out to target audiences:

- Emphasize the most important messages.
- Communicate key messages in multiple ways.
- Break messages down into short statements.
- Allow users to identify the information they want quickly and easily.
- Clearly indicate which recommendations should be followed by different target audiences.

One characteristic addressed the comprehensiveness of the information communicated:

- Provide information that is comprehensive with regard to the types of fish people eat.

Three characteristics were concerned with making the materials available to target audiences, specifying that advisory materials should be:

- Easily accessible to target audiences.
- In formats that are easy to distribute.
- Communicated in ways that target audiences will encounter them frequently.

Three characteristics addressed the accuracy and appropriateness of material. Consortium members agreed that materials should be:

- Evaluated and revised as necessary.
- Designed so that they are easy to keep up to date.
- Developed free of external political, economic, or other pressures.

Disagreements. Disagreement existed among the Consortium states about 5 characteristics of advisory materials (Table 8).

Three of these characteristics addressed the formats of advisory materials, specifying that they should be:

- Small enough that people can carry them easily.
- Large enough that they can't be lost easily.
- In a variety of formats.

One characteristic was concerned with how information was presented in materials:

- Present information in charts and tables.

The final characteristic addressed how advisory materials were developed, indicating that materials should be:

- Developed in collaboration with target audiences.

Table 7. Survey respondents’ perspectives on the characteristics of effective fish consumption advisory materials.

Item wording	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Emphasize the most important messages.	0	0	0	8	92	4.92
Are easily accessible to target audiences.	0	0	0	21	79	4.79
Allow users to identify the information they want quickly and easily.	0	0	0	24	76	4.76
Are in formats that are easy to distribute.	0	0	0	37	63	4.63
Clearly indicate which recommendations should be followed by different target audiences.	0	2	2	30	66	4.61
Break messages down into short statements.	0	0	0	42	58	4.58
Are evaluated and revised as necessary.	0	0	0	52	48	4.48
Are designed so that they are easy to keep up to date.	0	2	0	50	49	4.45
Communicate key messages in multiple ways.	0	2	2	52	44	4.39
Are developed free of external political, economic, or other pressures.	0	0	10	42	49	4.39
Provide information that is comprehensive with regard to the types of fish people eat.	0	0	5	65	30	4.25
Are visually appealing.	0	2	10	57	32	4.18
Are designed to be regional- and site-specific as well as statewide.	0	0	14	58	29	4.15

Table 7. (continued)

Item wording	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Are communicated in ways that target audiences will encounter them frequently.	0	2	8	66	24	4.13
Include pictures of fish.	0	0	37	31	32	3.96
Are “layered” with the simplest advice and messages presented first and more detailed information available to those who seek it.	0	0	39	28	33	3.94
Are in a variety of formats.	13	0	5	46	36	3.93
Are designed to meet the needs of all audiences.	0	10	19	49	22	3.84
Are tailored to particular target audiences.	0	2	24	64	10	3.82
Are developed in collaboration with target audiences.	2	14	7	59	18	3.77
Are integrated with other types of information closely related to fishing or fish consumption (e.g., cookbooks, fishing licenses, etc.).	0	4	36	50	10	3.65
Rely more on visual tools than text.	0	4	49	30	18	3.62
Include maps.	0	4	61	23	12	3.42
Are small enough that people can carry them easily.	0	20	32	36	12	3.39
Present information in charts and tables.	0	21	44	24	12	3.27
Are large enough that they can’t be lost easily.	0	16	57	19	8	3.18

Table 8. Characteristics of effective advisory materials about which Consortium states disagreed.

Topic	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Strongly Disagree to Disagree (1.00 to 2.50)	Neutral (2.51 to 3.50)	Agree to Strongly Agree (3.51 to 5.00)		
Are in a variety of formats	1	0	7	3.93	1.00 to 4.57
Are developed in collaboration with target audiences	1	1	6	3.77	2.00 to 4.50
Present information in charts and tables	2	3	3	3.27	2.00 to 4.50
Are small enough that people can carry them easily	1	4	3	3.39	2.00 to 4.50
Are large enough that they can't be lost easily	1	6	1	3.18	2.00 to 4.50

Advisory Material Distribution

Agreements. We asked Consortium member whether or not they agreed that advisory materials should be distributed in 23 different ways (Table 9). At least 90% of respondents agreed or strongly agreed that 5 of these methods should be utilized.

These methods included:

- Sources trusted by target audiences.
- Sources currently utilized by target audiences.
- In response to requests.
- WIC clinics.
- Multiple partner agencies and organizations.

Only one specific source (WIC clinics) was among these five, presumably because it was a key source for a particular target audience. The sources trusted and utilized by target audiences would require an audience by audience evaluation in order to identify them.

Disagreements. We identified 11 methods of distributing advisory materials about which substantial *disagreement* existed among Consortium states (Table 10).

Eight of these methods were vehicles for getting materials distributed that were not specifically linked to key audiences such as anglers and women of childbearing age.

- Community events.
- Environmental education programs.
- Community-based organizations.
- Social service organizations.
- Schools and youth programs.
- Faith-based organizations.
- Nongovernmental conservation organizations.
- Academic institutions.

Two methods were ways to reach anglers specifically:

- Access points for fishing sites.
- Sportsmen's organizations.

The final method was “word of mouth” distribution.

Table 9. Survey respondents’ perspectives on ways to distribute fish consumption advisory materials.

Distribution Method	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Through sources trusted by target audiences.	0	0	2	24	74	4.73
Through sources currently utilized by target audiences.	0	0	0	38	62	4.62
In response to requests.	0	0	0	39	61	4.61
Through WIC clinics.	0	0	10	41	49	4.39
Through multiple partner agencies and organizations.	0	0	2	60	38	4.36
Through mass media (public service announcements, press releases, etc.).	0	0	24	36	41	4.17
Through health care providers.	0	13	10	27	50	4.15
Along with fishing licenses.	13	0	0	45	43	4.05
In as many different ways as possible.	13	0	10	27	50	4.03
Through social media.	0	0	16	66	18	4.02
At community events (e.g, fairs, fishing clinics, festivals).	13	0	2	62	24	3.85
Where fish can be purchased.	0	0	41	36	23	3.82
Through sportsmen’s organizations.	13	0	8	57	22	3.75
Through environmental education programs.	13	0	4	71	13	3.72
Through community-based organizations.	13	0	14	49	24	3.72
Through nongovernmental conservation organizations.	13	0	28	40	20	3.54

Table 9. (continued)

Distribution Method	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Through academic institutions.	13	0	27	44	16	3.51
Through word of mouth	14	2	18	52	14	3.50
Through schools and youth programs.	13	6	20	42	20	3.50
Through social service organizations.	13	7	17	47	17	3.48
At access points for fishing sites.	19	4	21	26	30	3.44
In presentations at scientific meetings.	0	8	51	27	12	3.44
Through faith-based organizations.	13	6	32	32	18	3.36

Table 10. Distribution methods about which Consortium states disagreed.

Distribution Method	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Strongly Disagree to Disagree (1.00 to 2.50)	Neutral (2.51 to 3.50)	Agree to Strongly Agree (3.51 to 5.00)		
At access points for fishing sites.	1	3	4	3.44	1.00 to 4.67
Through word of mouth	1	2	5	3.50	1.00 to 4.50
At community events (e.g., fairs, fishing clinics, festivals).	1	0	7	3.85	1.00 to 4.50
Through environmental education programs.	1	0	7	3.72	1.00 to 4.50
Through sportsmen's organizations.	1	1	6	3.75	1.00 to 4.50
Through community-based organizations.	1	1	6	3.72	1.00 to 4.50
Through social service organizations.	1	2	5	3.48	1.00 to 4.50
Through schools and youth programs.	1	2	5	3.50	1.00 to 4.50
Through faith-based organizations.	2	1	5	3.36	1.00 to 4.50
Through nongovernmental conservation organizations.	1	2	5	3.54	1.00 to 4.50
Through academic institutions.	1	1	6	3.51	1.00 to 4.50

Advisory Material Formats

Agreements. We asked Consortium member whether or not they agreed that advisory materials should be provided in each of 8 different ways (Table 11). At least 90% of respondents agreed or strongly agreed that 2 of these methods should be utilized. These methods were web sites and print materials (shorter/one-page/brochure).

Disagreements. Substantial *disagreement* existed among Consortium states about three formats (Table 12):

- Wallet cards
- Refrigerator magnets
- Signs posted near waterbodies

Table 11. Survey respondents’ perspectives on formats in which to provide fish consumption advisory materials.

Item wording	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Web sites.	0	0	0	18	82	4.82
Print materials – shorter/one-page/brochure.	0	0	6	36	58	4.52
Print materials – longer/comprehensive.	0	2	14	54	30	4.13
Cell phone apps.	0	0	18	52	30	4.13
Presentations.	0	0	26	58	17	3.91
Wallet cards.	13	0	31	35	21	3.50
Refrigerator magnets.	13	4	27	45	12	3.40
Signs posted near waterbodies.	13	17	22	34	15	3.20

Table 12. Advisory material formats about which Consortium states disagreed.

Advisory Material Format	Number of States with Mean Rating in Each Range			Overall Mean	Range of States’ Mean Ratings
	Strongly Disagree to Disagree (1.00 to 2.50)	Neutral (2.51 to 3.50)	Agree to Strongly Agree (3.51 to 5.00)		
Wallet cards	1	3	4	3.50	1.00 to 4.50
Refrigerator magnets	1	3	4	3.40	1.00 to 4.50
Signs posted near waterbodies	2	2	4	3.20	1.00 to 4.29

Characteristics of Target Audiences

Agreements. We asked Consortium members whether or not they agreed that 20 different characteristics of target audiences should be considered when tailoring fish consumption advisory programs to meet their needs (Table 13). At least 90% of respondents agreed or strongly agreed that 7 of these characteristics should be considered.

Three of these characteristics were concerned with how much and what types of fish audiences were likely to consume:

- Patterns of fish consumption (frequency, species, source, etc.).
- Who generally makes fish consumption choices for those audiences.
- Whether they depend on fish for food.

Three characteristics were concerned with how they were likely to receive advisory information and interpret it as intended:

- Reading level.
- Level of education.
- Preferred forms and sources of information.

The final characteristic – cultural traditions, beliefs, and habits – could help advisory programs understand both how much and what types of fish an audience was likely to consume and how they were likely to receive and interpret advisory information.

Disagreements. We identified characteristics of target audiences about which substantial disagreement existed among Consortium states about whether they needed to be considered (Table 14). Two of these characteristics were related to target audiences' receptivity to advisory messages and sources:

- Receptivity to fish advisory messages
- Level of trust in government and/or people outside of their community

One characteristic was concerned with knowledge and understanding:

- Current understanding of fish consumption advisories

The final characteristic was socio-economic status.

Table 13. Survey respondents’ perspectives on characteristics of target audiences that should be considered when tailoring fish consumption advisory programs to meet their needs.

Item wording	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Reading level.	0	2	0	56	42	4.39
Cultural traditions, beliefs, and habits.	0	0	4	57	40	4.36
Patterns of fish consumption (frequency, species, source, etc.).	0	0	10	45	45	4.35
Who generally makes fish consumption choices for those audiences.	0	0	4	60	36	4.32
Whether they depend on fish for food.	0	0	10	52	38	4.28
Whether and where they fish.	0	2	14	47	37	4.19
Level of education.	0	0	7	71	22	4.15
Primary language(s).	0	0	14	60	26	4.11
Preferred forms and sources of information.	0	0	10	79	11	4.01
Whether they share fish with others.	0	0	22	60	18	3.96
Whether they are exposed to contaminants.	0	6	27	46	20	3.80
Sensitivity to the effects of contaminants.	0	0	34	57	10	3.76
Level of trust in government and/or people outside of their community.	0	8	36	30	26	3.74
Demographic characteristics.	0	6	36	40	19	3.7
Their health and its relationship to fish consumption.	0	6	28	59	7	3.67
Current understanding of fish consumption advisories.	0	6	32	50	12	3.67

(continued on next page)

Table 13. (continued)

Item wording	Percent					Mean (1-5)
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
How practical it is for them to follow fish consumption advisories.	2	13	14	64	8	3.63
Receptivity to fish advisory messages.	0	13	27	44	16	3.63
Scientific literacy.	0	8	54	24	14	3.44
Socio-economic status.	13	8	23	38	19	3.42

Table 14. Characteristics of target audiences about which Consortium states disagreed about whether they needed to be considered.

Characteristic	Number of States with Mean Rating in Each Range			Overall Mean	Range of States' Mean Ratings
	Strongly Disagree to Disagree (1.00 to 2.50)	Neutral (2.51 to 3.50)	Agree to Strongly Agree (3.51 to 5.00)		
Socio-economic status	1	3	4	3.42	1.00 to 4.50
Level of trust in government and/or people outside of their community	1	3	4	3.74	2.50 to 5.00
Receptivity to fish advisory messages	1	2	5	3.63	2.50 to 4.50
Current understanding of fish consumption advisories	1	2	5	3.67	2.50 to 4.50

Summary of Delphi Survey Results

Widespread agreement in the Consortium existed about most of the characteristics of effective fish consumption advisory communication. Particularly strong agreement existed about the characteristics of effective advisory messages and the importance of particular topics for advisory messages. The most substantial disagreement existed about advisory material distribution and advisory material formats (about which some level of disagreement existed on nearly 50% of the items).

Literature Review

We divide the literature summary into six sections. The first section examines the characteristics of effective messages, covering the broad goals of advisory communication. The second section focuses on the specific content of messages that are effective. The third section examines advisory formats that have been found to be effective. The fourth section deals with distribution methods (e.g., websites, health care providers, etc.). The fifth section diverges a bit from the other sections and examines the characteristics of target audiences that should be considered when developing effective fish consumption advisory communication, and makes recommendations for communications with certain target audiences. The sixth and final section considers effective practices for advisory communication development. Numbers in parentheses refer to literature citations.

A note of caution is warranted for using this summary. We have not linked recommendations from the literature with the type of research method used, the extent of target audience sampling (e.g., sample size, diversity of participants), or the rigor of the analysis. Thus, not all recommendations included herein may be equally robust in terms of an empirical research basis, nor applicable to all types of target audiences. Readers are encouraged to cross-check particular recommendations of interest with the original articles from which they derive, as described in the annotated bibliography.

Recommendations for Effective Fish Consumption Advisory Messages

Keep messages simple

- Use simple, non-technical language. (52, 68, 69, 71, 83, 86)
- Use less “policy language,” perhaps with pictures and stories to reinforce the message. (55, 71)
- Make messages easy to remember. (50)
- Make people feel the message applies to them. (86)
- Describe desired behaviors in a clear and unambiguous manner. (75)
- Begin with, and emphasize, information that is relevant to the particular target audience. (64)
- Provide women of child-bearing age with information that is specific to the area where they live. (68)
- Provide more detailed messages for some key target audiences, sometimes called “layering” the messages. (74, 80, 86)

Include information about risks and benefits

When advisories were first issued they focused primarily on the risks of consumption due to certain chemical contaminants. Over time, agencies have changed their emphasis to present information on both the benefits and risks of fish consumption. This change has been supported by research on the benefits, as well as actions to reduce the risks people are exposed to when they consume fish with chemical contaminants. However, this makes the message more complex and can lead to a lack of clarity and consistency of message. (39)

Literature suggests that:

- The message should be fair and balanced between risks and benefits. (42)
- A holistic approach should be taken by providing information on the risks and benefits of fishing and fish consumption. (75)
- The key message to get across to consumers is that fish is part of a well-balanced, healthy diet if consumed in moderation. (75)
- The order of discussion of risks and benefits influences people's reaction to the information and their intended behavior, suggesting benefits should be discussed before risks (30, 35, 49).
 - The message mentioned first had the greatest influence on behavioral intention. (49)
 - If risks are mentioned first then the influence of benefits on the fish consumption decision are lessened. Furthermore, if people perceive the risks as high they will eat less fish regardless of the benefit level, but if the perceived risks are low then change in fish consumption is related to the change in benefit level. This suggests that benefits should be discussed before risks if the goal of the advice is some fish consumption. (30)
 - Benefits should be the dominant narrative, and risks and benefits should not be paired. Pairing suggests that to gain the benefits one must accept and endure the risks. A more effective message to get across is that by following the advisory one can obtain the benefits of eating fish without incurring risks associated with eating contaminated fish in unsafe quantities. (55)

Women are limiting their intake of fish because of the risks and are not getting the benefits by eating sufficient amounts of fish low in mercury. The literature suggests that this is due to their lack of knowledge of the benefits or which fish are safe to eat. (4, 19, 32) When pregnant women were faced with contradictory information (such as the health risks versus the health benefits of fish consumption), their role as protectors became most important, and health benefits from eating fish were seen as less important than potential risks of consuming mercury. (47)

Recommendations include:

- Help women to understand the benefits of eating fish, and the importance of proper choice of fish. (61, 72)
- Make the statements about the risks or benefits clear, and use a specific listing of which fish should be avoided, and which should be consumed. (45)
- Address the “spillover effect,” where people think that if consumption is risky for pregnant women then it is likely risky for others. (80)

Foster informed personal choice to be able to make own decision

Informed, personal choice is another common goal of fish consumption advisories. The challenge is how to provide information so that fish consumers feel comfortable making that choice.

- One approach is to present the message in a way that provides solutions. The requests for behavior change should be simple, easy, convenient, and understandable, not difficult. (75)
- The public needs more, but clear, information to make sound decisions for themselves. (8)
- Consider attitudes and behavior along with risk information in order to effect changes in consumption behavior. (7)

In a study of Russian consumers, those who were more optimistic about the risks and benefits were more likely to consume fish. (46)

Focus groups conducted with Great Lakes urban anglers and women of childbearing age found when general statements were made about criteria to consider when choosing fish, many participants wanted those statements paired with more specific follow up information. (69)

Provide information on sport and commercially-caught fish

Recent research has shown that Great Lakes anglers are less likely to be aware of the purchased fish advisories than the sport-caught advisories. (60)

- Advisories should integrate information on both sport-caught and commercially-caught fish. (1, 24, 42)
- Create a single, integrated advisory that considers all of the contaminants and advises the consumer to eat a variety of fish and seafood that are generally low in all known contaminants. (28)

Explain uncertainties

- Communications should be open and honest, explaining risk uncertainties, and reminding people that advisories change over time. (75)

Promote fishing

- Advisories are not intended to discourage fishing; they should be more positive about fishing. (86)
- In certain cases where “do not eat” recommendations exist, promoting catch and release fishing provides a viable alternative that still allows people to engage in sport fishing. (3)

Recommendations for Effective, Specific Advisory Messages

A variety of authors have made recommendations for specific message content. We present the suggestions by grouping them into four groups: 1) risks, 2) benefits, 3) desired behaviors, and 4) terms.

Describe risks

Authors have suggested that advisory communications should:

- Describe the nature of the contaminant and how it accumulates in fish tissue, humans, and the environment. (75)
- Describe the potential adverse health effects of consuming fish contaminated with chemicals for adults, children, and/or unborn children. (86)
 - Explain how chemicals are transferred from mother to fetus (placenta) and from mother to infant (breast milk).
- Explain how chemical contaminants are retained in the body for a long time and that those consumed now will be in the body 10 or 20 years later. (75)
- Explain that mercury concentrates in the muscle tissue of fish and cannot be significantly reduced through cooking or cleaning. Only 10% of women surveyed in Minnesota knew that mercury concentrates in the muscle tissue. (72)
- Explain that contaminants in fish are not visible to the naked eye—they cannot be seen, smelled, or tasted. (51, 60, 68, 69, 73)
- Present a combination of qualitative and quantitative risk information (e.g., severity of comparative risks, degree of contaminant exposure in fish species). (15)

- Provide information about risk-risk comparisons between species, locations, other protein sources, etc. as this was found to improve anglers' confidence in their decisions about fish consumption. (30)
- Describe how health risks are likely to change if risk-reducing cleaning and cooking techniques are used in applicable cases. (16, 38, 48)
 - Anglers are more likely to use risk-reducing cleaning techniques than risk-reducing cooking techniques. (60)
 - Some anglers are unwilling to forego fish consumption of high-risk species, so agencies should consider emphasizing the importance of using risk-reducing cleaning techniques and cooking techniques to reduce the adverse effects of fish consumption of highly contaminated species. (67)
- Compare the risks of fish consumption with: 1) other health risks, 2) other dietary health risks, including other protein sources (this comparison appears to inspire the most confidence among anglers that they are making an informed decision), and 3) other voluntary health risks such as driving, drinking, and smoking. (30)
- Avoid comparing voluntary and involuntary risks. (38)
- Make chemical-specific recommendations when the advice is different for different chemicals. (1)

Describe benefits

- Explain the main health benefits of eating fish: 1) high protein; 2) low fat; 3) cardiovascular benefits (low cholesterol, omega-3 fatty acids); 4) and fetal development benefits (omega-3 fatty acids). (75)

Women of childbearing age viewed statements that described characteristics of fish that were not shared by many other foods as persuasive. They found statements about protein and, particularly, omega-3 fatty acids in fish to be more persuasive than general statements about vitamins and minerals. (69)

Promote desired behaviors

Specific messages recommended to impact behavior include:

- Present messages that provide a solution. For example, "eat smaller fish." (52)
- Encourage the audience to: 1) eat smaller and younger fish; 2) avoid fish that are high on the food chain (e.g., shark, tuna, swordfish). (9) But these terms may need to be explained because not everyone knows which fish are higher on the food chain. (61, 69)
- Identify "safer" fish species, fish sizes, or fishing locations. (8, 63, 67)

- Encourage the audience to eat a variety of fish species from less contaminated waters. Be more positive about where to fish and what to eat. (86)
- Present the site-specific locations of the fish species under advisory. (9)
- Discuss risk-reducing behaviors such as how to clean and cook fish, as well as where to fish and what species to eat. (59, 63)
- “Do not eat” messages should be stark and arresting to reach anglers. Use of the word “warning” was recommended over “advisory.” (73)
- For women, be sure to convey the health benefits of fish consumption, especially during pregnancy; also convey that the benefits of nursing outweigh the risks and that women should limit fish consumption but continue breastfeeding. (61, 75)
- Concentrate more effort on providing women with advice for more commonly consumed fish containing low or moderate levels of mercury, than the “do not eat” advice for swordfish, etc. because most women are aware of the “do not eat” advice. (61, 72)

Use understandable terms

- Refer to women of childbearing age as “women 18-45” (44) or “women who are or could some day become pregnant” (61) or “women who might become pregnant.” (69)

Recommendations for Effective Advisory Material Formats

Use a positive, cajoling tone

- The tone of the message should be positive, not distant or unfeeling. (75)
- Great Lakes anglers prefer a cajoling tone, where they were encouraged to make their own decisions, rather than a commanding tone, which directed them to take a specific action. (15)
- Advisories should make recommendations rather than issue commands. (55)

Use both visuals and text

- Use a combination of visuals and text, as Great Lakes anglers prefer it in the context of fish cleaning advice. (15)
- Recommend signs with pictures and very little text for audiences, like Anacostia River anglers, who are very visually oriented. (73)
- The audience will look first at the symbols, so visuals will capture the audience’s attention and complement the text. (44, 86).
- Use vivid images because people are more likely to remember them and want to talk with others about them. (52).

Use intuitive graphics and illustrations

- Use pictures and icons. (71)
- Use a “point system.” Ha compared the use of a “point system” with a “reverse pyramid” in providing fish consumption guidelines and found that the “point system” had potential, but further study was needed due to the small sample sizes and limited audience diversity. (82) Focus groups conducted with Great Lakes urban anglers and women of childbearing age found almost universal support for the “point system” compared to recommendations that grouped fish into weekly, monthly, or do not eat categories. (69)
- Use a thermometer approach or “mercury meters” that look like speedometers for highlighting safe vs. unsafe fish species. (44)
- Include pictures of the fish species the advisory pertains to. (43)
- Use detailed maps that highlight the different water bodies covered under the advisory -- this approach is also effective when the advisory is intended to show target audiences safer locations to fish. (43, 86)
- Use tables to highlight fish consumption advice. (75)
- Use portion sizes that reflect commonly consumed amounts; use a hand for size comparison. (44)
- Express exposure information in terms of meal limits per time period. (75)

Recommendations for Effective Distribution Methods

Match the distribution method to the needs of the audience

- An audience-oriented risk communication program requires a variety of dissemination techniques in addition to written outreach materials that takes into account audience knowledge and lifestyle. (3)
- Advisory materials should be provided by different methods to meet needs of different audiences. (48, 55, 86)
- More needs to be done to reach the most at-risk groups. (1)

Consider the specific method for the type of audience

- Mass media (e.g., television, radio, newspapers) are effective resources for informing large and diverse audiences, particularly consider them for women and people with lower attained education. (11, 40, 59) Information also may need to be placed where people are likely to see it, because one study found that women with lower education levels were less likely to seek out information than those with more education. (61)

- However, others found that news stories focus more on the risks than the benefits of fish consumption, and they suggest that agencies need to work with media outlets to better convey both a benefits and risks message. (20)
- Websites are good for providing access to a wide variety of outreach materials. It has been suggested that the fishing regulations guide be used to direct anglers to the web site for more detailed information. (60, 74)
 - Agencies should think beyond using their own websites and provide results of efforts to promote advisory information through WebMD, for example. It is not enough to just post information, but that promotion of the availability of the information is necessary. (85)
 - Posting advice about consumption of commercially-caught fish has been pilot-tested in some grocery stores. In one study in Washington State the authors were surprised that the grocery stores allowed them to post information. Their interviews with consumers led them to conclude that posting material was helpful and should be further expanded. (78)
- Recommend hair mercury analysis with follow-up letters explaining the results for frequent consumers of fish containing mercury because it had a long-term impact on fish selection and mercury exposure. (29)
 - Hair mercury analysis and counseling for women of childbearing age was suggested as an effective way to reduce mercury levels. (31)

Use a credible source

- Advisory messages should come from trusted, credible sources appropriate for the target audience. (52)
 - Obstetricians for pregnant women. (4)
 - Doctors and government officials. (6)
 - Recent focus groups in Michigan concluded that the most trusted sources of information were local/state health departments, doctors/nurses, and brochures. (84)
 - The sources should work together to provide a consistent, unified message. The message should be developed recognizing the political, economic, and cultural context under which agencies and audiences operate. (75)

Use multiple methods, multiple exposures

- Redundancy helps get the message out. Reinforce messages several times by using multiple communication channels. Different media are needed that range from simple to complex, site-specific to geographically generalized. (37, 66, 73)

- A single outreach material should focus on a small number of message components/ themes in order to optimize message comprehension. For example, fish fact sheets that provide information on risk-reducing techniques as well as fish consumption limits in a short, clear format have proven effective. (12)
- Provide information for women of child-bearing age where they will encounter it during their daily routines, rather than needing to seek it out. (68)

Recommendations for Effectively Targeting Different Audiences

Tailor the message

The advisory messages should be tailored to address the information needs, risk perceptions, and concerns of the target audience.

- Context should be considered when communicating risk-benefit information--especially to populations with no alternatives. Many people need to eat fish (e.g., Native Americans, subsistence anglers). Don't tell them that they can't eat fish; say what is being done to solve the problem and what people can do to reduce risk. (74)
- Consider the reading level of the target audience. (15, 52, 64)
- Targeting women who eat fish with information will likely result in their children being protected because most children have fish consumption patterns similar to their mothers. (23)
- Communicators must be culturally sensitive. When communicating with targeted ethnic/cultural groups, discuss fish consumption recommendations within the context of the norms, traditions, practices, and customs related to fishing and fish consumption that the audience is familiar with, and don't use "government speak." (14, 74, 79). Culturally and linguistically appropriate interventions are needed. (42)

Recommendations for specific target audiences

The preferred communication method of the target audience should be used.

Anglers

- Anglers use and/or prefer warning signs posted at the fishing site. (13, 57, 60, 67, 76) However, signs are expensive and hard to maintain. Posted warnings thus should be used at sites where the most at-risk anglers fish, often these are in urban areas. (58, 67)
- Anglers have also listed newspapers, the fishing regulations guide, websites and other publications from the fisheries management agency, and friends as the most commonly used sources of information. (56, 57, 58, 59, 60, 76)

- The fishing regulations guide was more effective than all other sources, except personal contact with advisory experts. (58) Those using the fishing regulations guide were more likely to select the correct answer to the knowledge questions. (59) Anglers who used the fishing regulations guide felt most informed about the safety of eating fish (3.6 on a scale of 5); those using friends felt the least informed (3.0). (67)
- Since male anglers over age 50 rarely listed health care providers as a source of information, they should not be counted on currently for information dissemination to this audience. (76)
- In areas where the risk is great, personal contact has been recommended by many authors. (11, 12, 59, 71, 83) For example, hiring interns or local residents to inform anglers of the risks might be effective and worthwhile. (11, 12) Also one might take advantage of people's natural tendency to socialize. (73)
- Community-based programs conducted in partnership with local organizations were recommended by several authors as a way to reach low income, urban, or immigrant angler populations with messages focusing on risk-reduction strategies and encouragement of consumption of less contaminated species. (65, 68)
- Messages could also identify a variety of alternative protein sources, including foods that are accessible and affordable for low income individuals. (75)
- Another example of intensive communication with a high risk group (subsistence anglers in a public housing community) that proved promising included a presentation by a role model and distribution of low literacy written materials on several occasions. (18)
- For African Americans, targeting older anglers in educational sessions might be the way to disseminate advisory information, but the authors also cautioned that this was only a starting point for enhanced communications. (2)
- Anglers with lower education levels reported wanting to do what their family and friends think is best with regard to fish consumption, so communication strategies that involve social networks might be effective at reaching this group. (60)

Non-English speakers

- Communicate with target audiences in their native language. (3)
- Use visual-oriented messages with minimal explanatory text, preferably in the audience's native language, to communicate with communities who do not speak or read English. (81)
- To reach urban anglers speaking both English and Spanish, recommend personal contact and press releases to both English and Spanish language newspapers because anglers reported getting information about fish from other anglers, and getting information about health and food safety from newspapers. (36)

Southeast Asian communities

- To reach Southeast Asians with information about fish contaminants, use educational programs involving specialized advisories, translations, signs, a Hmong language video, and workshops. (41)
- Health care providers are key gatekeepers for health information, and face-to-face communication was preferred. (62)
- Information sharing should be primarily oral and visual, and presented by credible sources. These sources may be Hmong community leaders or those working in cooperation with them. (54)

Women of childbearing age

Several authors of recent studies have suggested that more needs to be done to reach women of child-bearing age with advisory information, as only 31% of women living near Pensacola, Florida (26), and 53% of female anglers living in Louisiana were aware of advisory information. (27) A national study found consumer awareness of mercury as a problem in fish was increasing over time, but the authors suggested that additional educational campaigns are needed to reach minority women and those with lower incomes and levels of education. (33)

- Recommend going to community organizations and healthcare providers to better understand the information needs of women and how to reach them. (74)
- Since pregnant women rely primarily on information from their health professionals, and distribution of advisory materials in OB/GYN offices was successful at raising awareness, recommend healthcare professionals as a source of information. (72, 77)
However, one study found that materials sent to healthcare organizations did not result in many women (13%) recalling seeing the information. (21) Another study found that TV news and newspapers were the primary sources of health risk information for women of childbearing age. (28)
- Community healthcare organizations were frequently cited as a good source of advisory information for women of childbearing age. Additionally, women exposed to a classroom lesson had a better understanding of the risks than those who read a brochure, but both methods provided women with some information. (10)
- Recommend materials at family practice offices or other means of mass media communication to reach women prior to getting pregnant, particularly for those who may not have regular access to medical care. (61)
- Relying on (mostly male) anglers to inform women of childbearing age about fish consumption guidance was not seen as a good avenue for communication. (60)

Recommendations for Effective Processes for Advisory Communication Development

Many authors have described the need to develop advisory materials in consultation with the target audiences. For example, a “risk dialogue approach” that involves community leaders in discussions of the best methods for dissemination of advisory information, while costly and time consuming, may result in better adherence to the risk messages. (31) Another author used information from a case study in a community in Alberta, Canada to develop “14 guiding principles” to help incorporate public participation and risk communication into the process of developing and reviewing fish consumption advisories. (25)

Recommendations include:

- Use a series of interlinked steps: (1) Define the target audience to suggest appropriate channels for disseminating outreach materials; (2) consult with the audience and outreach agents to shape the message and format; and (3) develop materials and pretest them with the target audience in the context in which they will be distributed and revised based on the results. (34)
- Use risk assessment and management protocols that involve those who will be affected the most, such as frequent consumers of Great Lakes fish, from the initial “risk characterization” stage through to any necessary risk communication. (17)
- Engage community members and relevant institutions in identifying and implementing more effective risk communication. (22).
- Engage in co-management of the risk from contaminated fish to increase public involvement, and therefore compliance. (5)
- Work with partners that reside and interact with the target audience. The idea is that people who work with a local population and live in that region will be better able to characterize target audiences, thus making the communication strategy and associated materials more audience-oriented. (65)

CONCLUSIONS

A number of conclusions about effective fish consumption advisories were common to practitioners and the literature. Both advocated that advisory messages should:

- Be simple and straightforward.
- Provide information on both the benefits and risks of fish consumption, with positive messages emphasized.
- Enable target audiences to make informed choices about eating fish.

Ten topics for advisory messages about which practitioners agreed were all also emphasized in the literature. Both argued for the importance of communicating about:

- Health risks of eating fish.
- Health benefits of eating fish.
- Which types of people are most at risk from fish consumption.
- How frequently different types of fish can be safely eaten.
- Which types of fish provide the most health benefits and the fewest health risks.
- What cleaning, cooking, and storage techniques can reduce health risks.
- Which types of fish should be limited or avoided.
- What waterbodies should be avoided.
- What contaminants in fish are of concern.
- Where to get additional information.

Both practitioners and the literature have concluded that messages should be communicated in multiple ways and in ways that target audiences will encounter them frequently. Messages should come from trusted and credible sources (which may vary for different target audiences). Particular ways of distributing advisory materials that were recommended included mass media, web sites, brief printed materials, and fishing regulations guides (for anglers).

Finally, both practitioners and the literature agreed that advisory messages and distribution methods needed to be tailored for different target audiences, with consideration of reading level, culture, and preferred ways to receive information. Taken together, these recommendations for good advisory communication represent some accepted guidelines for advisory practice.

Despite the areas of agreement between Consortium members and the literature, a number of questions about effective advisory practice remain unanswered. For example, the literature pointed to the importance of community-based programs conducted in partnership with local organizations to communicate with hard-to-reach audiences, such as low income, urban, and immigrant populations, and many practitioners also believed such approaches were valuable. As

a group, however, they had varied perspectives about the value of a number of methods for distributing advisory messages that might be useful in community-based programs (community events, community-based organizations, social service organizations, schools and youth programs, and faith-based organizations). Because of the emphasis the Consortium has placed on developing effective methods for communicating with low income, urban, and immigrant populations (68, 69), developing guidelines for communicating with these audiences through community-based programs may represent an important topic for future research and exploration.

In addition, it is important to reemphasize that the fish consumption advisory literature is quite fragmented and leads to conclusions with varying levels of robustness. Indeed, many of the recommendations summarized in this report come from a relatively small number of studies. We think that additional work in several key areas could strengthen the literature base for fish consumption advisory practice.

- The existing literature has yielded insights into how key audiences interpret fish consumption advisory materials. However, little evidence exists to demonstrate the degree to which these materials actually influence behavior and reduce the exposure of target audiences to contaminants in fish. The types of evidence that would be worthwhile to collect fall into two areas: (1) If target audiences receive advisory materials based on lessons learned from past research and experience, to what degree do these materials increase awareness and knowledge, influence fish consumption behavior, and reduce exposure to contaminants? (2) What delivery mechanisms are effective for getting these materials to a large enough segment of a target audience to influence the behavior of that audience?
- A clear interest exists in using digital media (websites, cell phone apps, etc.) to communicate advisory information. However, this technology is still relatively new and evolving, and little research-based information about the most effective ways to communicate through digital media exists. This area is a potentially fruitful area for additional research.
- Both practitioners and the literature emphasize the importance of communicating about both the health risks and the health benefits of fish consumption. Beyond this recognition, however, few research-based recommendations have been offered about how to communicate about both the risks and benefits to achieve desired outcomes. We suggest additional research on this topic.

Research in these and other areas with key audiences (such as women of childbearing age and low-income, urban anglers) could build on the strong foundation that currently exists for effective fish consumption advisory practice and enable that practice to continue to improve into the future.

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APPENDIX A: DELPHI SURVEY INSTRUMENTS

Delphi Survey – Phase 1

This survey is designed to synthesize the knowledge of members of the Great Lakes Fish Consumption Advisory Consortium about the characteristics of effective fish consumption advisory communication. We will ask you to respond to a series of three questionnaires as part of this survey. In this first questionnaire, we simply would like you to answer six questions – in your own words – about what you think makes fish consumption advisory communication effective. In the second and third questionnaires, we will ask you to tell us whether you agree with the ideas suggested by others.

Your identity will be kept confidential – no one besides the researchers conducting this study will be able to associate your responses with your name.

Your responses are important! We need each person we contact to respond if this survey is to reflect the perspectives of individuals within the Consortium. The results will help both the Consortium and other interested parties develop more effective fish consumption advisory programs.

As you complete this questionnaire, there are several things we would like you to keep in mind:

- As you respond to each question, keep thinking of the ideal case – fish consumption advisory communication that is particularly effective. Don't focus just on the way that fish consumption advisory communication currently occurs.
- Because this first round in the process is intended as a brainstorming exercise, offer as many ideas as you can about characteristics of effective advisories. Later rounds will allow us to determine which of these characteristics are most important.
- Offer your views on key characteristics in the form of bulleted statements, if possible. This will reduce the amount of time necessary to complete the questionnaire and it will facilitate quick and accurate synthesis of comments into categories that can be shared with others.
- Wherever you think it is necessary, please offer brief additional comments to clarify why you believe a particular characteristic is important. These explanations will be valuable to others when we send out the second and third questionnaires.

Questions

- (1) What are the characteristics of effective fish consumption advisory messages?
- (2) What specific messages are important to communicate in effective fish consumption advisory programs?
- (3) What are the characteristics of effective fish consumption advisory materials?
- (4) How are advisory materials distributed in effective fish consumption advisory programs?
- (5) What characteristics of target audiences need to be considered when tailoring fish consumption advisory programs to meet their needs?
- (6) What other characteristics that you have not already mentioned would effective fish consumption advisory communication have?

Delphi Survey – Phase 2

This survey is designed to synthesize the knowledge of members of the Great Lakes Fish Consumption Advisory Consortium about the characteristics of effective fish consumption advisory communication. This questionnaire is the second of three questionnaires we are asking you to complete.

In this questionnaire, we would like you to answer a series of standardized questions. We would like to know whether you agree with suggestions made by others about the characteristics of effective fish consumption advisories. These questions are based on responses to the first questionnaire that you and other members of the Consortium were asked to complete several months ago.

Because members of the Consortium suggested a large number of characteristics of effective fish consumption advisories, there are a large number of questions. We recommend that you complete the questionnaire in more than one sitting.

Your identity will be kept confidential – no one besides the researchers conducting this study will be able to associate your responses with your name.

Your responses are important! We need each person we contact to respond if this survey is to reflect the perspectives of individuals within the Consortium. The results will help both the Consortium and other interested parties develop more effective fish consumption advisory programs.

As you complete this questionnaire, there are several things we would like you to keep in mind:

- As you respond to each question, keep thinking of the ideal case – fish consumption advisory communication that is particularly effective. Don't focus just on the way that fish consumption advisory communication currently occurs.
- Wherever you think it is necessary, please offer brief additional comments to clarify why you believe a particular characteristic is important or unimportant. These explanations can be added at the bottom of each page.
- If you would like to suggest additional characteristics of effective fish consumption advisories that you don't see represented in our questions, please suggest these characteristics in your comments.

1. Please indicate how important you think it is for effective fish consumption advisory messages to have each of the following characteristics.

How important is it that effective fish consumption advisory messages... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Communicate balanced information about the health risks and health benefits of fish consumption.	1	2	3	4
b. Do not stop people from eating fish entirely.	1	2	3	4
c. Provide recipients with the confidence to make decisions about eating fish.	1	2	3	4
d. Enable recipients to make informed choices about eating fish.	1	2	3	4
e. Communicate recommendations that are easy to follow.	1	2	3	4
f. Are easy to remember.	1	2	3	4
g. Are consistent from state to state.	1	2	3	4
h. Answer the questions of target audiences.	1	2	3	4
i. Are tailored to particular target audiences.	1	2	3	4
j. Are honest and scientifically accurate.	1	2	3	4
k. Are based on up-to-date data.	1	2	3	4
l. Are concise.	1	2	3	4
m. Are limited in number.	1	2	3	4
n. Are easy to understand.	1	2	3	4
o. Are communicated in simple, straightforward language.	1	2	3	4
p. Are credible to target audiences.	1	2	3	4
q. Motivate target audiences to follow consumption advisories.	1	2	3	4
r. Are respectful towards target audiences.	1	2	3	4
s. Encourage rather than direct target audiences to make safe choices about fish consumption.	1	2	3	4
t. Emphasize the positive rather than the negative.	1	2	3	4

Comments (refer to item numbers):

2. Please indicate how important you think it is to communicate specific messages about each of the following topics in effective fish consumption advisory programs.

How important is it that effective fish consumption advisory programs communicate about... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Which types of people are most at risk from fish consumption.	1	2	3	4
b. Which types of fish provide the most health benefits and the fewest health risks.	1	2	3	4
c. Which types of fish can be eaten without concern.	1	2	3	4
d. Which types of fish should be limited or avoided.	1	2	3	4
e. What waterbodies are best to eat fish from.	1	2	3	4
f. What waterbodies should be avoided.	1	2	3	4
g. How frequently different types of fish can be safely eaten.	1	2	3	4
h. What cleaning, cooking, and storage techniques can reduce health risks.	1	2	3	4
i. Health benefits of eating fish.	1	2	3	4
j. Health risks of eating fish.	1	2	3	4
k. How much fish to eat each meal.	1	2	3	4
l. What contaminants in fish are of concern.	1	2	3	4
m. How contaminants get into fish.	1	2	3	4
n. The relative risks and benefits of eating sport-caught vs. farm-raised fish.	1	2	3	4
o. How the risks of fish consumption compare to other risks.	1	2	3	4
p. How much fish people typically consume.	1	2	3	4
q. Whether water-based activities besides fishing pose risks in waterbodies with advisories.	1	2	3	4
r. How to obtain fish that is produced or harvested without harming the environment.	1	2	3	4
s. How consumption advice is developed.	1	2	3	4
t. Where to get additional information.	1	2	3	4

Comments (refer to item numbers):

3. Please indicate how important you think it is to communicate each of the following specific messages in effective fish consumption advisory programs.

How important is it that effective fish consumption advisory programs communicate that... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Information about the risks and benefits of fish consumption communicated in advisories is not available for many other types of foods.	1	2	3	4
b. Consumption advice varies for different types of people.	1	2	3	4
c. Choices about fish consumption can maximize benefits and minimize risks.	1	2	3	4
d. People should continue to eat fish.	1	2	3	4
e. Eating fish is good for your health.	1	2	3	4
f. Eating fish poses health risks.	1	2	3	4
g. People should make informed choices about fish consumption.	1	2	3	4
h. People should follow the fish consumption advisories.	1	2	3	4
i. People should limit fish consumption.	1	2	3	4
j. Fishing has many benefits.	1	2	3	4
l. Chemical contaminants are persistent and bioaccumulate in fish and organisms that eat fish.	1	2	3	4
m. Most fish have some contaminants.	1	2	3	4
n. Some fish are very contaminated.	1	2	3	4
o. Contaminants in fish can't be detected visually or by smell or taste.	1	2	3	4
p. Many contaminants are in the fat of fish.	1	2	3	4
q. Risks and benefits from fish consumption exist for both store-bought and sport-caught fish.	1	2	3	4
r. The risks from fish consumption are chronic rather than acute.	1	2	3	4
s. Following the advisories allows people to consume fish safely.	1	2	3	4
t. It is important to reduce sources of pollution and fish contamination.	1	2	3	4

Comments (refer to item numbers):

4. Please indicate how strongly you agree or disagree that each of the following is a characteristic of effective fish consumption advisory materials.

Effective fish consumption advisory materials...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Are “layered” with the simplest advice and messages presented first and more detailed information available to those who seek it.	1	2	3	4	5
b. Clearly indicate which recommendations should be followed by different target audiences.	1	2	3	4	5
c. Are designed to meet the needs of all audiences.	1	2	3	4	5
d. Are tailored to particular target audiences.	1	2	3	4	5
e. Are easily accessible to target audiences.	1	2	3	4	5
f. Are communicated in ways that target audiences will encounter them frequently.	1	2	3	4	5
g. Provide information that is comprehensive with regard to the types of fish people eat.	1	2	3	4	5
h. Allow users to identify the information they want quickly and easily.	1	2	3	4	5
i. Break messages down into short statements.	1	2	3	4	5
j. Emphasize the most important messages.	1	2	3	4	5
k. Communicate key messages in multiple ways.	1	2	3	4	5
l. Rely more on visual tools than text.	1	2	3	4	5
m. Present information in charts and tables.	1	2	3	4	5
n. Include pictures of fish.	1	2	3	4	5
o. Include maps.	1	2	3	4	5
p. Are visually appealing.	1	2	3	4	5
q. Are in formats that are easy to distribute.	1	2	3	4	5
r. Are in a variety of formats.	1	2	3	4	5
s. Are integrated with other types of information closely related to fishing of fish consumption (e.g., cookbooks, fishing licenses, etc.)	1	2	3	4	5
t. Are small enough that people can carry them easily.	1	2	3	4	5
u. Are large enough that they can’t be lost easily.	1	2	3	4	5
v. Are designed to be regional- and site-specific as well as statewide.	1	2	3	4	5
w. Are designed so that they are easy to keep up to date.	1	2	3	4	5
x. Are evaluated and revised as necessary.	1	2	3	4	5
y. Are developed in collaboration with target audiences.	1	2	3	4	5
z. Are developed free of external political, economic, or other pressures	1	2	3	4	5

Comments (refer to item numbers):

5. Please indicate how strongly you agree or disagree that advisory materials should be distributed in each of the following ways in effective fish consumption advisory programs. Advisory materials should be distributed...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. In as many different ways as possible.	1	2	3	4	5
b. Through sources currently utilized by target audiences.	1	2	3	4	5
c. Through sources trusted by target audiences.	1	2	3	4	5
d. Through health care providers.	1	2	3	4	5
e. Through WIC clinics.	1	2	3	4	5
f. Along with fishing licenses.	1	2	3	4	5
g. At access points for fishing sites.	1	2	3	4	5
h. Through multiple partner agencies and organizations.	1	2	3	4	5
i. In response to requests.	1	2	3	4	5
j. Through nongovernmental conservation organizations.	1	2	3	4	5
k. Through sportsmen's organizations.	1	2	3	4	5
l. Through academic institutions.	1	2	3	4	5
m. Through environmental education programs.	1	2	3	4	5
n. Through schools and youth programs.	1	2	3	4	5
o. Through faith-based organizations.	1	2	3	4	5
p. Through social service organizations.	1	2	3	4	5
q. Through community-based organizations.	1	2	3	4	5
r. At community events (e.g, fairs, fishing clinics, festivals).	1	2	3	4	5
s. In presentations at scientific meetings.	1	2	3	4	5
t. Through mass media (public service announcements, press releases, etc.)	1	2	3	4	5
u. Where fish can be purchased.	1	2	3	4	5
v. Through social media.	1	2	3	4	5
w. Through word of mouth	1	2	3	4	5

Comments (refer to item numbers):

6. Please indicate how strongly you agree or disagree that advisory materials should be provided in each of the following formats in effective fish consumption advisory programs. Fish consumption advisory materials should be provided as...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Print materials – longer/comprehensive	1	2	3	4	5
b. Print materials – shorter/one-page/brochure	1	2	3	4	5
c. Refrigerator magnets	1	2	3	4	5
d. Wallet cards	1	2	3	4	5
e. Cell phone apps	1	2	3	4	5
f. Signs posted near waterbodies	1	2	3	4	5
g. Presentations	1	2	3	4	5
h. Web sites	1	2	3	4	5

Comments (refer to item numbers):

7. Please indicate how strongly you agree or disagree that the following characteristics of target audiences should be considered when tailoring fish consumption advisory programs to meet their needs.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Sensitivity to the effects of contaminants.	1	2	3	4	5
b. Whether they are exposed to contaminants.	1	2	3	4	5
c. Patterns of fish consumption (frequency, species, source, etc.).	1	2	3	4	5
d. How practical it is for them to follow fish consumption advisories.	1	2	3	4	5
e. Who generally makes fish consumption choices for those audiences.	1	2		4	5
f. Whether and where they fish.	1	2		4	5
g. Whether they depend on fish for food.	1	2	3	4	5
h. Their health and its relationship to fish consumption.	1	2	3	4	5
i. Whether they share fish with others.	1	2	3	4	5
j. Receptivity to fish advisory messages.	1	2	3	4	5
k. Level of trust in government and/or people outside of their community.	1	2	3	4	5
l. Current understanding of fish consumption advisories.	1	2	3	4	5
m. Cultural traditions, beliefs, and habits.	1	2	3	4	5
n. Demographic characteristics.	1	2	3	3	5
o. Level of education.	1	2	3	3	5
p. Socio-economic status.	1	2	3	4	5
q. Primary language(s).	1	2	3	4	5
r. Reading level.	1	2	3	4	5
s. Scientific literacy.	1	2	3	4	5
t. Preferred forms and sources of information.	1	2	3	4	5

Comments (refer to item numbers):

8. Do you have any additional comments?

Delphi Survey – Phase 3

This survey is designed to synthesize the knowledge of members of the Great Lakes Fish Consumption Advisory Consortium about the characteristics of effective fish consumption advisory communication. This questionnaire is the last of three questionnaires we are asking you to complete.

In this questionnaire, we will be asking you to respond to the same set of standardized questions that you responded to in the last survey. However, in this questionnaire, we also provide you with information about how other members of the Consortium responded to the same questions.

- For each item, we report both the mean response (out of 4 or 5, depending on the question) and the percentage of respondents who chose particular answers.
- For each question, the items are ordered from those with the highest mean (reflecting items that were considered most important or items with which most people agreed) to those with the lowest mean.
- The number of respondents in each state varied considerably. Because we wanted the data summary we provide to place equal weight on each state, we weighted the responses of each individual according to their state to balance the results.

Respondents to the last survey were given the opportunity to add written comments.

- When people wrote comments about particular items during the last survey, we have included these comments. Items marked with an * have comments.
- Two additional items were suggested during the last round. These are marked with “NEW ITEM.”

Your identity will be kept confidential – no one besides the researchers conducting this study will be able to associate your responses with your name.

Your responses are important! We need each person we contact to respond if this survey is to reflect the perspectives of individuals within the Consortium. The results will help both the Consortium and other interested parties develop more effective fish consumption advisory programs.

As you complete this questionnaire, there are several things we would like you to keep in mind:

- As you respond to each question, keep thinking of the ideal case – fish consumption advisory communication that is particularly effective. Don’t focus just on the way that fish consumption advisory communication currently occurs.
- Wherever you think it is necessary, please offer brief additional comments to clarify why you believe a particular characteristic is important or unimportant. These explanations can be added at the bottom of each page, and we will use them when we report the results from this survey.

Thank you!

1. Please indicate how important you think it is for effective fish consumption advisory messages to have each of the following characteristics.

- For each item, we report: the mean response (M) out of 4, the percentage of respondents who chose “very important” (VI), and the percentage of respondents who chose “not at all important” (NI).
- The items are ordered from those with the highest mean (most important) to those with the lowest mean (least important).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

How important is it that effective fish consumption advisory messages... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Communicate recommendations that are easy to follow. (M=3.98, VI=98%, N=0%)	1	2	3	4
b. Enable recipients to make informed choices about eating fish. (M=3.94, VI=94%, NI=0%)	1	2	3	4
c. Are communicated in simple, straightforward language. (M=3.92, VI=92%, NI=0%)	1	2	3	4
d. Are honest and scientifically accurate. (M=3.90, VI=90%, NI=0%)	1	2	3	4
e. Do not stop people from eating fish entirely. (M=3.88, VI=88%, NI=0%)	1	2	3	4
f. Provide recipients with the confidence to make decisions about eating fish. (M=3.78, VI=80%, NI=0%)	1	2	3	4
g. Communicate balanced information about the health risks and health benefits of fish consumption.* (M=3.78, VI=80%, NI=0%)	1	2	3	4
h. Are respectful towards target audiences. (M=3.76, V=87%, NI=5%)	1	2	3	4
i. Are credible to target audiences. (M=3.74, VI=81%, NI=2%)	1	2	3	4
j. Are easy to understand. (M=3.71, VI=84%, NI=0%)	1	2	3	4
k. Are concise. (M=3.55, VI=62%, NI=0%)	1	2	3	4
l. Are based on up-to-date data.* (M=3.45, VI=52%, NI=0%)	1	2	3	4
m. Motivate target audiences to follow consumption advisories. (M=3.45, VI=51%, NI=2%)	1	2	3	4
n. Answer the questions of target audiences. (M=3.37, VI=49%, NI=2%)	1	2	3	4

o. Are tailored to particular target audiences. (M=3.26, VI=42%, NI=2%)	1	2	3	4
p. Are easy to remember.* (M=3.26, VI=38%, N=0%)	1	2	3	4
q. Encourage rather than direct target audiences to make safe choices about fish consumption.*(M=3.12, VI=36%, NI=0%)	1	2	3	4
r. Emphasize the positive rather than the negative.* (M=3.10, V=23%, N=2%)	1	2	3	4
s. Are limited in number.* (M=2.75, VI=28%, NI=18%)	1	2	3	4
t. Are consistent from state to state.* (M=2.68, VI=8%, N=2%)	1	2	3	4
u. Are the solution to eating as much fish as you want and avoiding unsafe exposure to the chemical contaminants. (NEW ITEM)	1	2	3	4

Comments (refer to item numbers):

2. Please indicate how important you think it is to communicate specific messages about each of the following topics in effective fish consumption advisory programs.

- For each item, we report: the mean response (M) out of 4, the percentage of respondents who chose “very important” (VI), and the percentage of respondents who chose “not at all important” (NI).
- The items are ordered from those with the highest mean (most important) to those with the lowest mean (least important).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

How important is it that effective fish consumption advisory programs communicate about... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Which types of fish should be limited or avoided.* (M=3.87, VI=94%, NI=0%)	1	2	3	4
b. Health risks of eating fish.* (M=3.85, VI=85%, NI=0%)	1	2	3	4
c. How frequently different types of fish can be safely eaten. (M=3.83, VI=85%, NI=0%)	1	2	3	4
d. Which types of people are most at risk from fish consumption.* (M=3.82, VI=82%, NI=0%)	1	2	3	4
e. Health benefits of eating fish.* (M=3.78, VI=80%, NI=0%)	1	2	3	4
f. Which types of fish can be eaten without concern.* (M=3.71, VI=77%, NI=0%)	1	2	3	4
g. Where to get additional information. (M=3.71, VI=71%, NI=0%)	1	2	3	4
h. Which types of fish provide the most health benefits and the fewest health risks.* (M=3.56, VI=64%, NI=0%)	1	2	3	4
i. What cleaning, cooking, and storage techniques can reduce health risks.* (M=3.50, VI=53%, NI=0%)	1	2	3	4
j. What waterbodies should be avoided.* (M=3.49, VI=71%, NI=9%)	1	2	3	4
k. What contaminants in fish are of concern. (M=3.24, VI=40%, NI=0%)	1	2	3	4
l. What waterbodies are best to eat fish from.* (M=3.09, VI=35%, NI=2%)	1	2	3	4
m. How much fish to eat each meal.* (M=3.05, VI=28%, NI=2%)	1	2	3	4

n. How contaminants get into fish.* (M=2.63, VI=50%, NI=0%)	1	2	3	4
o. The relative risks and benefits of eating sport-caught vs. farm-raised fish.* (M=2.37, VI=4%, NI=14%)	1	2	3	4
p. How much fish people typically consume.* (M=2.20, VI=8%, NI=23%)	1	2	3	4
q. How the risks of fish consumption compare to other risks.* (M=2.18, VI=4%, NI=19%)	1	2	3	4
r. How consumption advice is developed. (M=2.08, VI=10%, NI=24%)	1	2	3	4
s. How to obtain fish that is produced or harvested without harming the environment.* (M=1.90, VI=12%, NI=38%)	1	2	3	4
t. Whether water-based activities besides fishing pose risks in waterbodies with advisories.* (M=1.75, VI=2%, NI=46%)	1	2	3	4
u. Cooking and cleaning methods to remove some chemicals. (NEW ITEM)	1	2	3	4

Comments (refer to item numbers):

3. Please indicate how important you think it is to communicate each of the following specific messages in effective fish consumption advisory programs.

- For each item, we report: the mean response (M) out of 4, the percentage of respondents who chose “very important” (VI), and the percentage of respondents who chose “not at all important” (NI).
- The items are ordered from those with the highest mean (most important) to those with the lowest mean (least important).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

How important is it that effective fish consumption advisory programs communicate that... ?

	Not at all important	Slightly important	Moderately important	Very important
a. Following the advisories allows people to consume fish safely. (M=3.86, VI=88%, NI=0%)	1	2	3	4
b. People should continue to eat fish. (M=3.84, VI=84%, NI=0%)	1	2	3	4
c. Eating fish is good for your health. (M=3.84, VI=84%, NI=0%)	1	2	3	4
d. Choices about fish consumption can maximize benefits and minimize risks. (M=3.82, VI=90%, NI=0%)	1	2	3	4
e. People should make informed choices about fish consumption. (M=3.80, VI=80%, NI=0%)	1	2	3	4
f. People should follow the fish consumption advisories. (M=3.76, VI=81%, NI=0%)	1	2	3	4
g. Risks and benefits from fish consumption exist for both store-bought and sport-caught fish.* (M=3.48, VI=58%, NI=2%)	1	2	3	4
h. Eating fish poses health risks.* (M=3.43, VI=55%, NI=0%)	1	2	3	4
i. Contaminants in fish can't be detected visually or by smell or taste. (M=3.19, VI=37%, NI=2%)	1	2	3	4
j. Some fish are very contaminated. (M=3.13, VI=38%, NI=9%)	1	2	3	4
k. Consumption advice varies for different types of people. (M=3.08, VI=36%, NI=8%)	1	2	3	4
l. Many contaminants are in the fat of fish.* (M=3.03, VI=39%, NI=4%)	1	2	3	4

m. Fishing has many benefits.* (M=2.85, VI=17%, NI=8%)	1	2	3	4
n. The risks from fish consumption are chronic rather than acute.* (M=2.83, VI=30%, NI=10%)	1	2	3	4
o. Chemical contaminants are persistent and bioaccumulate in fish and organisms that eat fish.* (M=2.75, VI=27%, NI=0%)	1	2	3	4
p. People should limit fish consumption.* (M=2.75, VI=24%, NI=10%)	1	2	3	4
q. It is important to reduce sources of pollution and fish contamination.* (M=2.69, VI=27%, NI=12%)	1	2	3	4
r. Most fish have some contaminants.* (M=2.50, VI=8%, NI=8%)	1	2	3	4
s. Information about the risks and benefits of fish consumption communicated in advisories is not available for many other types of foods.* (M=2.10, VI=4%, NI=27%)	1	2	3	4

Comments (refer to item numbers):

4. Please indicate how strongly you agree or disagree that each of the following is a characteristic of effective fish consumption advisory materials.

- For each item, we report: the mean response (M) out of 5, the percentage of respondents who chose “strongly agree” or “agree” (A), and the percentage of respondents who chose “strongly disagree” or “disagree” (D).
- The items are ordered from those with the highest mean (most agreement) to those with the lowest mean (least agreement).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

Effective fish consumption advisory materials...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Emphasize the most important messages. (M=4.64, A=100%, D=0%)	1	2	3	4	5
b. Allow users to identify the information they want quickly and easily. (M=4.62, A=98%, D=0%)	1	2	3	4	5
c. Clearly indicate which recommendations should be followed by different target audiences. (M=4.54, A=96%, D=2%)	1	2	3	4	5
d. Are easily accessible to target audiences. (M=4.48, A=100%, D=0%)	1	2	3	4	5
e. Break messages down into short statements. (M=4.41, A=94%, D=0%)	1	2	3	4	5
f. Are designed so that they are easy to keep up to date. (M=4.39, A=98%, D=0%)	1	2	3	4	5
g. Are evaluated and revised as necessary. (M=4.39, A=98%, D=0%)	1	2	3	4	5
h. Are in formats that are easy to distribute. (M=4.33, A=97%, D=0%)	1	2	3	4	5
i. Communicate key messages in multiple ways. (M=4.26, A=84%, D=2%)	1	2	3	4	5
j. Are visually appealing. (M=4.22, A=89%, D=2%)	1	2	3	4	5
k. Are communicated in ways that target audiences will encounter them frequently. (M=4.21, A=84%, D=0%)	1	2	3	4	5
l. Are “layered” with the simplest advice and messages presented first and more detailed information available to those who seek it.* (M=4.21, A=89%, D=2%)	1	2	3	4	5
m. Are developed free of external political, economic, or other pressures.* (M=4.16, A=82%, D=2%)	1	2	3	4	5
n. Provide information that is comprehensive with regard to the types of fish people eat. (M=4.13, A=73%,	1	2	3	4	5

D=0%)					
o. Are designed to be regional- and site-specific as well as statewide. (M=4.08, A=82%, D=0%)	1	2	3	4	5
p. Include pictures of fish.* (M=4.02, A=78%, D=0%)	1	2	3	4	5
q. Are developed in collaboration with target audiences. (M=4.00, A=72%, D=13%)	1	2	3	4	5
r. Are tailored to particular target audiences.* (M=3.82, A=75%, D=2%)	1	2	3	4	5
s. Are designed to meet the needs of all audiences.* (M=3.80, A=65%, D=14%)	1	2	3	4	5
t. Include maps.* (M=3.61, A=50%, D=2%)	1	2	3	4	5
u. Rely more on visual tools than text.* (M=3.56, A=49%, D=6%)	1	2	3	4	5
v. Present information in charts and tables.* (M=3.42, A=51%, D=11%)	1	2	3	4	5
w. Are in a variety of formats.* (M=4.05, A=76%, D=14%)	1	2	3	4	5
x. Are integrated with other types of information closely related to fishing or fish consumption (e.g., cookbooks, fishing licenses, etc.).* (M=3.62, A=65%, D=15%)	1	2	3	4	5
y. Are small enough that people can carry them easily.* (M=3.57, A=54%, D=14%)	1	2	3	4	5
z. Are large enough that they can't be lost easily.* (M=3.25, A=24%, D=6%)	1	2	3	4	5

Comments (refer to item numbers):

5. Please indicate how strongly you agree or disagree that advisory materials should be distributed in each of the following ways in effective fish consumption advisory programs.

- For each item, we report: the mean response (M) out of 5, the percentage of respondents who chose “strongly agree” or “agree” (A), and the percentage of respondents who chose “strongly disagree” or “disagree” (D).
- The items are ordered from those with the highest mean (most agreement) to those with the lowest mean (least agreement).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

Advisory materials should be distributed...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Through sources currently utilized by target audiences. (M=4.48, A=94%, D=0%)	1	2	3	4	5
b. Through sources trusted by target audiences. (M=4.44, A=89%, D=0%)	1	2	3	4	5
c. In response to requests. (M=4.43, A=95%, D=0%)	1	2	3	4	5
d. Through mass media (public service announcements, press releases, etc.). (M=4.36, A=90%, D=0%)	1	2	3	4	5
e. Through WIC clinics. (M=4.29, A=87%, D=0%)	1	2	3	4	5
f. Through multiple partner agencies and organizations. (M=4.28, A=98%, D=0%)	1	2	3	4	5
g. Through social media. (M=4.28, A=87%, D=2%)	1	2	3	4	5
h. Through health care providers. (M=4.27, A=85%, D=0%)	1	2	3	4	5
i. Along with fishing licenses. (M=4.15, A=73%, D=14%)	1	2	3	4	5
j. Where fish can be purchased.* (M=4.06, A=72%, D=2%)	1	2	3	4	5
k. In presentations at scientific meetings. (M=3.81, A=65%, D=0%)	1	2	3	4	5
l. Through word of mouth (M=3.78, A=71%, D=19%)	1	2	3	4	5
m. At community events (e.g, fairs, fishing clinics, festivals). (M=3.77, A=70%, D=14%)	1	2	3	4	5
n. Through environmental education programs.* (M=3.73, A=76%, D=13%)	1	2	3	4	5
o. In as many different ways as possible.	1	2	3	4	5

(M=3.71, A=51%, D=17%)					
p. Through sportsmen's organizations. (M=3.56, A=56%, D=13%)	1	2	3	4	5
q. Through community-based organizations.* (M=3.53, A=60%, D=14%)	1	2	3	4	5
r. Through social service organizations.* (M=3.44, A=57%, D=14%)	1	2	3	4	5
s. Through schools and youth programs.* (M=3.37, A=56%, D=14%)	1	2	3	4	5
t. Through faith-based organizations.* (M=3.32, A=49%, D=14%)	1	2	3	4	5
u. Through nongovernmental conservation organizations.* (M=3.30, A=47%, D=14%)	1	2	3	4	5
v. Through academic institutions.* (M=3.30, A=47%, D=16%)	1	2	3	4	5
w. At access points for fishing sites. (M=3.19, A=42%, D=21%)	1	2	3	4	5

Comments (refer to item numbers):

6. Please indicate how strongly you agree or disagree that advisory materials should be provided in each of the following formats in effective fish consumption advisory programs.

- For each item, we report: the mean response (M) out of 5, the percentage of respondents who chose “strongly agree” or “agree” (A), and the percentage of respondents who chose “strongly disagree” or “disagree” (D).
- The items are ordered from those with the highest mean (most agreement) to those with the lowest mean (least agreement).
- Items marked with an * have comments about the item (on the next page) offered by respondents during the last survey.

Fish consumption advisory materials should be provided as...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Web sites. (M=4.80, A=100%, D=0%)	1	2	3	4	5
b. Print materials – shorter/one-page/brochure.* (M=4.62, A=100%, D=0%)	1	2	3	4	5
c. Cell phone apps. (M=4.24, A=90%, D=0%)	1	2	3	4	5
d. Print materials – longer/comprehensive.* (M=3.98, A=84%, D=8%)	1	2	3	4	5
e. Presentations.* (M=3.79, A=62%, D=0%)	1	2	3	4	5
f. Wallet cards.* (M=3.70, A=60%, D=23%)	1	2	3	4	5
g. Refrigerator magnets.* (M=3.36, A=40%, D=29%)	1	2	3	4	5
h. Signs posted near waterbodies.* (M=3.05, A=50%, D=36%)	1	2	3	4	5

Comments (refer to item numbers):

7. Please indicate how strongly you agree or disagree that the following characteristics of target audiences should be considered when tailoring fish consumption advisory programs to meet their needs.

- For each item, we report: the mean response (M) out of 5, the percentage of respondents who chose “strongly agree” or “agree” (A), and the percentage of respondents who chose “strongly disagree” or “disagree” (D).
- The items are ordered from those with the highest mean (most agreement) to those with the lowest mean (least agreement).
- Items marked with an * have comments about the item offered by respondents during the last survey.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. Patterns of fish consumption (frequency, species, source, etc.). (M=4.37, A=90%, D=0%)	1	2	3	4	5
b. Cultural traditions, beliefs, and habits. (M=4.36, A=87%, D=8%)	1	2	3	4	5
c. Who generally makes fish consumption choices for those audiences. (M=4.26, A=98%, D=2%)	1	2	3	4	5
d. Whether they depend on fish for food. (M=4.21, A=82%, D=4%)	1	2	3	4	5
e. Reading level. (M=4.19, A=77%, D=2%)	1	2	3	4	5
f. Preferred forms and sources of information. (M=4.17, A=65%, D=0%)	1	2	3	4	5
g. Their health and its relationship to fish consumption. (M=4.05, A=82%, D=4%)	1	2	3	4	5
h. Primary language(s). (M=4.04, A=76%, D=0%)	1	2	3	4	5
i. Demographic characteristics.* (M=4.02, A=82%, D=2%)	1	2	3	4	5
j. Sensitivity to the effects of contaminants. (M=3.97, A=83%, D=4%)	1	2	3	4	5
k. How practical it is for them to follow fish consumption advisories.* (M=3.92, A=81%, D=7%)	1	2	3	4	5
l. Whether and where they fish. (M=3.92, A=79%, D=4%)	1	2	3	4	5
m. Level of education.* (M=3.86, A=74%, D=0%)	1	2	3	4	5
n. Receptivity to fish advisory messages.* (M=3.82, A=76%, D=6%)	1	2	3	4	5

o. Scientific literacy.* (M=3.82, A=61%, D=2%)	1	2	3	4	5
P. Whether they are exposed to contaminants. (M=3.79, A=63%, D=2%)	1	2	3	4	5
q. Whether they share fish with others. (M=3.75, A=53%, D=2%)	1	2	3	4	5
r. Current understanding of fish consumption advisories. (M=3.70, A=71%, D=13%)	1	2	3	4	5
s. Level of trust in government and/or people outside of their community. (M=3.65, A=55%, D=10%)	1	2	3	4	5
t. Socio-economic status.* (M=3.45, A=41%, D=2%)	1	2	3	4	5

Comments (refer to item numbers):

8. Do you have any additional comments?

APPENDIX B: ANNOTATED BIBLIOGRAPHY

Journal Articles:

1. Anderson, H. A., Hanrahan, L. P., Smith, A., Draheim, L., Kanarek, M., & Olsen, J. (2004). The role of sport-fish consumption advisories in mercury risk communication: A 1998–1999 12-state survey of women age 18–45. *ENVIRON RES*, 95, 315-324.

Abstract: Background: In 2002, in the United States, 48 states issued advisories for sport-fish consumers that included 39 chemical contaminants. The most commonly identified chemical was methyl mercury, which is linked to reproductive and developmental effects. Advisories to reduce consumption of contaminated fish have been issued by states since the early 1970s. Advisories are being integrated to include both sport and commercial fish. Methods: As part of a comprehensive risk-communication project, from December 1998 through August 1999 the Wisconsin Division of Public Health and the State of Maine Bureau of Health conducted 12-state random-digit-dial telephone survey of 3015 women of childbearing age (ages 18–45). The goal was to assess the prevalence of fish consumption, understanding of mercury toxicity, and awareness of state sport-fish consumption advisories for mercury. We gathered information concerning respondents' demographic characteristics, understanding of mercury toxicity, fish consumption during the preceding 12 months, and sport-fish consumption advisory awareness. Results: The overall survey completion rate was 57% with a Council of American Survey Research Organizations (CASRO)-calculated response rate of 50%. Completion rates varied from 37% in New Jersey to 73% in Minnesota. Fish consumption during the previous 12 months was reported by 87% of respondents (range by state of 82–90%). Nearly 10% of women reported consuming two or more fish-meals per week over the prior 12 months. Twenty-nine percent reported sport-fish consumption during the same time period, with a greater state-to-state variability (14–43%). Most women (71%) were aware of mercury's toxicity to a developing child (87% among those aware of an advisory and 67% among those unaware of an advisory). However, awareness of state advisories was only 20%, ranging by state from 8% to 32%. Women who were older, had more than a high school education, and had a household member with a fishing license were the most informed about mercury and fish-consumption advisories. Conclusions: Most women of childbearing age consume commercial fish and a substantial number also consume sport-caught fish. Despite this potential exposure to dietary mercury, most are unfamiliar with their state's mercury fish-consumption advisory. Most women were aware of the most toxic effects of mercury but less informed about mercury and its relationship to types of fish and fish characteristics. Minorities, women over age 30, family incomes above \$25,000, and those with some college education were more likely to be consuming two or more fish-meals per week. Until source control and environmental remediation efforts can reduce the environmental burden of mercury below levels of concern, combined sport and commercial fish consumption advisories will remain the primary means of reducing human exposure to methylmercury. Assuring and assessing the effectiveness of such advisories is paramount. Our survey documents that current efforts to inform vulnerable populations are far from optimal.

Additional info: p. 322 From the perspective of total methyl mercury exposure, advisories must be comprehensive and include both sport and commercial species.

p. 323 To avoid confusion it may be necessary to separate rather than combine the chemical-specific advisories when the advice is different.

p. 323 Principles of risk communication indicate that messages designed for specific audiences are often needed to reach diverse subgroups within a population. The weight of evidence from the risk-communication literature, surveys of licensed anglers, and this population-based survey suggests that expanded use of targeted advisory communication methods would be useful.

2. Beehler, G. P., McGuinness, B. M., & Vena, J. E. (2001). Polluted fish, sources of knowledge, and the perception of risk: Contextualizing African American anglers' sport fishing practices. *Human Organization*, 60(3), 288-297.

Abstract: Risk reduction advisories exist for the Great Lakes because exposure to chemicals in sport fish could lead to adverse health effects in sport fish consumers. Concern has focused on minority anglers who consume more sport fish than white anglers. To determine the fishing and sport fish consumption context, including concepts of pollution and perceptions of risk, focus groups were conducted with African American anglers in western New York. Anglers viewed fishing as a beneficial, low-risk activity in which they engaged in their sport of choice, relaxed by the water, and socialized. Participants were either unaware or tended not to use health advisory information to direct their fishing practices, preferring to rely on traditional knowledge gained by personal experience or by learning from other anglers. Local waters were considered polluted, but this pollution was not thought to be typically hazardous or unavoidable. Judgments about pollution were empirical, based on what anglers could detect with their unaided senses. Specific waters and fish were purposely avoided based on personal judgments of safety. Discussion focuses on lay models of pollution and risk, the role of culture, and application of findings to risk communication.

p.296 Older anglers, because of their high level of involvement in angling combined with what has been described as a general respect toward elders and a tradition of oral communication in African American culture (Bailey 2000:49), stand out as the ideal conveyers of new information to all ages in the angling community. Targeting older anglers in educational sessions may prove to be particularly fruitful in the dissemination of enhanced knowledge of how best to avoid pollution in the environment while angling. Suggestions such as these are merely starting points for more elaborate risk communication and education strategies. Yet, the advantage is that these approaches acknowledge an emic, cultural model of environmental contamination and are grounded in the target group's folk knowledge.

3. Beehler, G. P., McGuinness, B. M., & Vena, J. E. (2003). Characterizing latino anglers' environmental risk perceptions, sport fish consumption, and advisory awareness. *MED ANTHROPOLOGICAL Q*, 17(1), 99-116.

Abstract: Sport fish advisories for the Great Lakes states suggest limiting consumption of fish taken from the lakes and their tributaries because of chemical contamination. It appears, however, that minority anglers are less aware of the advisories and also consume greater amounts of sport fish than white anglers. We conducted focus groups in western New York with Latino anglers and partners of anglers to explore these patterns. Analysis revealed that older anglers believed local waters were of good quality and that it was safe to consume fish taken from them. They based their evaluation of both water and fish primarily on visual inspection. In contrast, younger Latinos believed that area waters were highly polluted because of dumping of waste from local industries. They fished away from urban areas in an effort to find cleaner, more swiftly moving waters. They considered consuming sport fish from urban areas highly risky, given their occasional illness experiences following meals of what they thought were polluted fish. For all Latino anglers, however, state-sponsored advisories were minimally effective because of their limited distribution and complex wording. Results point to differences in lay and scientific models of pollution and a need to bridge this gap in future risk-communication strategies.

Additional Info: p. 113 For example, the current findings point to fishing as a non-subsistence activity. In other words, the activity of fishing itself is more important than the fact that it yields fish for consumption. Because anglers are not dependent on fishing as a way of providing meals, they may be more amenable to changing their behavior with regard to this activity. Practicing catch and release, which preserves the leisure activity but returns the still viable fish to the water, may provide an acceptable alternative to those who engage in sport fishing.... This article suggests that the key to risk reduction is to move beyond simple, written risk communications and provide educational intervention that appreciates and integrates local knowledge and lifestyles.

4. Bloomingdale, A., Guthrie, L. B., Price, S., Wright, R. O., Platek, D., Haines, J., & Oken, E. (2010). A qualitative study of fish consumption during pregnancy. *AM J CLIN NUTR*, 92, 1234-1240.

Abstract: Background: Many pregnant women in the United States do not consume enough docosahexaenoic acid (DHA)—an essential nutrient found in fish. Apparently conflicting findings that fish consumption is beneficial for the developing fetus, yet potentially toxic because of mercury contamination, have created uncertainty about the appropriate fish-consumption advice to provide to pregnant women. Objective: Our objective was to determine knowledge, behaviors, and received advice regarding fish consumption among pregnant women who are infrequent consumers of fish. Design: In 2009–2010 we conducted 5 focus groups with 22 pregnant women from the Boston area who ate 2 fish servings/wk. We analyzed transcripts by using immersion-crystallization. Results: Many women knew that fish might contain mercury, a neurotoxin, and had received advice to limit fish intake. Fewer women knew that fish contains DHA or what the function of DHA is. None of the women had received advice to eat fish, and most had not received information about which fish types contain more DHA or less mercury. Because of advice to limit fish intake, as well as a lack of information about which fish types they should be eating, many of the women said that they would rather avoid fish than possibly harm themselves or their infants. The participants thought that a physician's advice to eat fish and a readily available reference regarding which fish are safe to consume during pregnancy would likely have encouraged them to eat more fish. Conclusion: Pregnant women might be willing to eat more fish if this were advised by their obstetricians or if they had an accessible reference regarding which types are safe.

5. Burger, J. (2000). Consumption advisories and compliance: The fishing public and the deamplification of risk. *J Environ Plan Manage*, 43(4), 471-488.

Abstract: Managers and regulators have recognized that the fishing public often ignores fish consumption advisories, and the reasons for non-compliance are explored in this paper. Risk assessors acknowledge that there is a social amplification (intensification) of risk where the public perceive a risk as much more severe than do the 'experts' or scientists, and this social amplification is a function of the interaction of hazards with social, psychological and cultural processes. I propose that non-compliance of consumption advisories occurs because of the deamplification of risk in hazards that are familiar and enjoyed, such as fishing and fish consumption. Although the public are generally aware of consumption advisories, they continue to believe the fish are safe to eat, and a high percentage eat the fish they catch. Unlike the amplification of risk, the deamplification of risk from fishing in the face of consumption advisories is partly legitimized by the actions of some governmental agencies, as well as by society at large. It is suggested a variety of economic benefits and social institutions lead to a discounting of consumption advisories, and the delayed nature of adverse health effects allows for additional disregard. Further, it is suggested that co-management of the risk from contaminated fish would increase public involvement, and therefore compliance.

6. Burger, J. (2005). Fishing, fish consumption, and knowledge about advisories in college students and others in central New Jersey. *ENVIRON RES*, 98, 268-275.

Abstract: Risks to humans and other organisms from consuming fish have become a national concern. Over the past 3 years there have been a number of national advisories regarding saltwater fish. Although information on fishing, consumption patterns, and public knowledge about advisories has been examined for at-risk populations, there is little information about the latter for a general population. Overall knowledge about advisories, ratings for information about the risks and benefits of eating fish, and the relationship between fishing, consumption patterns, and knowledge about advisories was examined in a sample of 180 college students and others residing in central New Jersey, USA. The null hypothesis of no differences in fishing, consumption, and knowledge about advisories as a function of age, gender, ethnicity, and education was tested. A significantly higher proportion of men fished compared to women, and significantly fewer Blacks and Asians fished than did Whites or Hispanics. More Asians who fished did so in salt water, compared to others. There were no gender differences in consumption patterns, and few age or ethnic differences, mainly due to low sample sizes in some ethnic groups. Significantly fewer young people and fewer Asians ate fish compared

to others. Overall, more people knew about the benefits of eating fish than the risks. Half as many people had heard about advisories concerning tuna, and less than a third knew about advisories concerning shark and swordfish than had heard general warnings. There were no gender differences in knowing about advisories, but there were several ethnic differences: a lower percentage of Asians generally knew that there were advisories, and fewer Blacks knew that there were benefits from eating fish than others. People in the age group 21–45 years were less aware of both the benefits and the risks from eating fish compared to older people. These data suggest that risk managers need to target younger people for information about the risks and benefits of consuming fish, particularly given that this is the population that will become pregnant over the next few years. Contrary to some previous research, subjects trusted family, friends, and other fishermen less for knowledge about the risks and benefits of fish consumption than other sources, such as doctors, governmental officials, and university professors. Even with this limited sample size, it is clear that people have heard more about the benefits of fish consumption than the risks, and a relatively low percentage have heard about the recent US Food and Drug Administration warnings about swordfish and shark.

Additional info: p. 273 An adequate knowledge base is the first step to making informed decisions. It does not ensure any changes in behavior (switches in diet), but without knowledge, informed decisions cannot be made... these studies indicate that risk communicators should target their outreach efforts to different sources, notably doctors and governmental officials, as well as family and friends.

7. Burger, J., & Gochfeld, M. (2006). A framework and information needs for the management of the risks from consumption of self-caught fish. *ENVIRON RES*, 101, 275-285.

Abstract: Governmental agencies deal with the potential risk from consuming fish contaminated with toxic chemicals by issuing fish consumption advisories. Yet such advisories are often ignored by the general public, who continue to fish and consume self-caught fish that are the subject of advisories and are from contaminated waters. Further, people are often unaware of specific warnings (which species to avoid, who is vulnerable, when they are vulnerable). In this paper we propose a more inclusive framework for examining consumption behavior of self-caught fish and identify information needs for effective communication. We include not only the usual variables that are used for calculating risk from fish consumption (meal frequency, meal size, contaminant levels) but also other aspects of behavior that contribute to risk. These include attitudes (trust, risk aversion, environmental concerns), behavior (sources of information, cultural mores, personal preferences), exposure (physical proximity, ingestion rates, bioavailability, target tissues), contaminant levels, individual host differences, and hazards (levels of contaminants). We suggest that attitudes and behavior shape risk as much as exposure and hazards and that all four of these factors must be considered in risk management. Factors such as gender, age, pregnancy status, and nutrition all influence who is at risk, while other consumption factors affect these at-risk populations, including meals/week, meal size, cooking method, fish species and sizes eaten, and years of fish consumption. Similarly, contaminant levels in fish vary by fish species, fish size and age, part of the fish, and collection location. Elucidating the risk to individual consumers involves integrating this range of factors, and managing the risk likewise involves incorporating these factors. We suggest that development of appropriate advisories and compliance with advisories will occur only if managers, risk assessors, and public policy makers consider this whole range of factors and not just the traditional fish consumption rate (often underestimated) and contaminant levels in fish (often undersampled). Merely informing the public of contaminant levels or the risk from contaminants will not ensure a public that has enough information to make informed decision, or to be in compliance with consumption advisories, or to effect changes in consumption behavior where public health is at risk.

8. Burger, J., & Gochfeld, M. (2008). Knowledge about fish consumption advisories: A risk communication failure within a university population. *Science of the Total Environment*, 390(2–3), 346-354.

Abstract: Considerable attention has focused on whether people are aware of fish consumption advisories, particularly among fishermen and as a function of demographic variables. Yet little attention has been directed

at the messages people are receiving from fish consumption advisories. This study examines knowledge about the benefits and risks of fish in relation to ethnicity and the degree of knowledge in a general university population in New Jersey. Subjects were asked open-ended questions about risks and benefits and responses were grouped into categories. A far greater percent of people had heard something about the risks and benefits of eating fish than could report specific information about the risks or benefits. While only 16% of subjects did not know what the benefits of eating fish were, 62% did not have any specific information about why there were warnings. However, for people who had some specific information, a higher proportion (57%) could identify the chemicals (PCBs, mercury) causing the risks, than could identify omega-3 fatty acids as contributing to benefits (40%). Much of the knowledge was very general, such as eating fish is “good for the heart”, “good for you”, or “brain food”. Less than half of the subjects could name species of fish that were either high or low in contaminants. There were ethnic disparities in knowledge about both the benefits and the risks from fish consumption. A higher percentage of whites knew about both the benefits and risks of fish consumption than others; Asians knew the least about the risks, and blacks and hispanics knew the least about the benefits. There were also ethnic differences in ability to name fish that are low in contaminants, or high in contaminants. Minorities, particularly hispanics, were unable to list species that are high in contaminants. We identified three levels of knowledge about fish consumption: 1) whether people are aware of the risks or benefits of fish consumption, 2) whether they have any specific knowledge about the benefits or risks from fish consumption, and 3) whether that knowledge is correct. We suggest that for people to make informed decisions about whether to eat fish, and what fish to eat (amount, fish size, species), they must have knowledge at all three levels about both the risks and benefits. Although agencies such as FDA are concerned that the public will be confused by advisory details, we find that the lack of details is a major component of ineffective communication. To provide the public with sufficient information to make sound risk decisions, public agencies and the media have to provide clearer, more directed messages dealing with the basis for making risk decisions.

9. Burger, J., & Gochfeld, M. (2009). Perceptions of the risks and benefits of fish consumption: Individual choices to reduce risk and increase health benefits. *ENVIRON RES*, 109, 343-349.

Abstract: Studies of fish consumption often focus on awareness of and adherence to advisories, how much fish people eat, and contaminant levels in those fish. This paper examines knowledge and accuracy of risks and benefits of fish consumption among fishers and other recreationists in the New York Bight, indicative of whether they could make sound dietary decisions. While most respondents knew about health risks (70%) and benefits (94%) of consuming fish, far fewer could name specific risks and benefits. Less than 25% of respondents mentioned mercury and less than 15% mentioned that pregnant women and children were at risk. Far fewer people mentioned polychlorinated biphenyls (PCBs). Nearly 70% said it was healthy to eat fish, and 45% were aware that fish were rich in healthful oils. Despite the lack of details about what specific risks and benefits of fish, well over a third did not feel they needed more information. Other respondents had basic questions, but did not pose specific questions about the fish they caught or ate that would have clarified their individual risk-balancing decisions. Knowledge of which fish were high in contaminants did not match the mercury or PCB levels in those fish. There was a disconnect between the information base about specific risks and benefits of fish consumption, levels of mercury and PCBs in fish, and the respondent’s desire for more information. These data indicate that respondents did not have enough accurate information about contaminants in fish to make informed risk-balancing decisions.

Additional info: p. 348 The lack of specific information about risk (and benefits) indicate the need for a risk communication campaign that provides detailed information about risks and benefits that allow people to make informed decisions....Some very basic information about which species are high in contaminants was lacking. Respondents generally did not mention that predatory fish have higher levels of contaminants, or that contaminant levels increase with age and size of fish. These two observations would arm the public with information that would allow them to reduce their exposure to contaminants. Another method of informing the public would be to provide them with site-specific, fish species- specific information. The data suggest that there is a need to publish a short list of the local recreational and subsistence fish along with the levels of mercury and PCBs, and if possible, the levels of omega-3 and other fish oils.

10. Burger, J., McDermott, M. H., Chess, C., Bochenek, E., Perez-Lugo, M., & Pflugh, K. K. (2003). Evaluating risk communication about fish consumption advisories: Efficacy of a brochure versus a classroom lesson in Spanish and English. *Risk Analysis: An International Journal*, 23(4), 791-803.

Abstract: Presentation format can influence the way target audiences understand risk-related information. Brochures or fish fact sheets are the methods traditionally used by state agencies to inform the public about fish consumption advisories and the risks from consuming fish. This study examines the efficacy of presenting information about the risks from consuming contaminated fish and shellfish in two different formats: a brochure and classroom presentation. The two instruments were developed and tested in Spanish and English, reflecting the local ethnic composition in the Newark Bay Complex. The instruments were tested on women of childbearing age at the Women, Infants, and Children Center in Elizabeth, New Jersey. Detailed diagrams were used in both presentations, including contaminated fish species, fish preparation methods, and food chain bioaccumulation and transmission to the fetus. There were few language-related differences in the efficacy of the classroom lesson, and the main ideas were understood by both groups. Where there were significant differences in understanding about the risks from consuming fish or crabs from the contaminated waters of Newark Bay, in all cases the women exposed to the classroom lesson had a better understanding than those who read the brochure. Ninety-six percent of the women who heard the lesson understood that it was unsafe to eat fish from the port, compared to 72% of those reading the brochure. Both formats succeeded in imparting information to most women about the area under advisories, the fish species under advisories, and transmission of toxins to the fetus. Information on fish preparation was recalled less clearly, partly because women were asked to relate methods to reduce the risk from consuming fish from 11 presented, and most recalled only two or three of the list. The advantages and disadvantages of conducting short classes to women of child-bearing age are discussed.

11. Burger, J., Pflugh, K. K., Lurig, L., Von Hagen, L. A., & Von Hagen, S. (1999). Fishing in urban New Jersey: Ethnicity affects information sources, preception, and compliance. *Risk Analysis*, 19(2), 217-229.

Abstract: Recreational and subsistence angling are important aspects of urban culture for much of North America where people are concentrated near the coasts or major rivers. Yet there are fish and shellfish advisories for many estuaries, rivers, and lakes, and these are not always heeded. This paper examines fishing behavior, sources of information, perceptions, and compliance with fishing advisories as a function of ethnicity for people fishing in the Newark Bay Complex of the New York-New Jersey Harbor. We test the null hypothesis that there were no ethnic differences in sources of information, perceptions of the safety of fish consumption, and compliance with advisories. There were ethnic differences in consumption rates, sources of information about fishing, knowledge about the safety of the fish, awareness of fishing advisories or of the correct advisories, and knowledge about risks for increased cancer and to unborn and young children. In general, the knowledge base was much lower for Hispanics, was intermediate for blacks, and was greatest for whites. When presented with a statement about the potential risks from eating fish, there were no differences in their willingness to stop eating fish or to encourage pregnant women to stop. These results indicate a willingness to comply with advisories regardless of ethnicity, but a vast difference in the base knowledge necessary to make informed risk decisions about the safety of fish and shellfish. Although the overall median income level of the population was in the \$25,000- 34,999 income category, for Hispanics it was on the border between \$15,000-24,999 and \$25,000-34,999.

Additional info: p. 227 Newspapers and warning signs seem to be the information source where people heard about fish consumption advisories. With adequate resources, both could be utilized more frequently... We were impressed with the relative change in attitudes that occurred within the period of the interview ... This suggests that a campaign that included hiring students, interns, or local residents to talk to fishermen about the hazards from fish and crab consumption might be effective.

12. Burger, J., & Waishwell, L. (2001). Are we reaching the target audience? Evaluation of a fish fact sheet. *Science of the Total Environment*, 277(1–3), 77-86.

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 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.

Additional info: p. 84 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.

13. Cable, T. T., & Udd, E. (1990). Effective Communication of Toxic Chemical Warnings to Anglers. *N Am J Fisheries Mgmt.*, 10, 382-387.

Abstract: This study addresses the following questions: (1) How do anglers know if toxic chemicals are present? (2) What information sources do anglers rely on to get information about toxic chemical contamination? (3) Who do anglers believe is responsible for warning them about toxic contamination/ (4) What communication strategies do anglers believe should be used to warn anglers of toxic chemical contamination/ Data were collected from personal interviews of 318 anglers in Michigan and 272 anglers in Kansas. The results indicated that there was not a strong consensus among anglers about any of these four issues. Thirty-nine different answers were given by anglers asked how they would know if toxic chemicals were present. In Michigan, 41.8% were erroneously relying on sensory detection of contamination, whereas in Kansas, 60.7% used sensory information to detect contaminants. An additional 27.4% of Michigan anglers and 15.1 % of Kansas anglers said they did not know how to detect contamination. The respective state fisheries management agencies were the most frequently mentioned sources of information about toxic chemicals. The Michigan Department of Natural Resources was mentioned by 47.8% of Michigan anglers, and the Kansas Fish and Game Commission (KFGC) was mentioned by 23.9% of Kansas anglers. In Kansas, the KFGC was most frequently thought to be responsible for issuing warnings (32.5%), and only 2.6% of the anglers correctly identified the state agency that is officially responsible for issuing water-quality warnings. Posting signs at affected sites to warn anglers about contamination was recommended by 40.3% of the anglers.

14. Chess, C., Burger, J., & McDermond, M. H. (2005). Speaking like a state: Environmental justice and fish consumption advisories. *Soc Natur Resour*, 18, 267-278.

Abstract: Government agencies fail to communicate effectively to key audiences about the hazards of eating self-caught, contaminated fish. As a result, government is not protecting African Americans, Latinos, and other ethnic groups that are disproportionately exposed to chemicals that contaminate the catch of recreational anglers. This review argues that remedying this environmental injustice requires agencies to change “government-speak” (bland, generic communication) to communication that is culturally relevant to minority audiences. We summarize research indicating that these audiences understand the meaning and significance of properly targeted risk communication. Finally, we explore the organizational problems within government that may hinder effective communication, perpetuating this environmental injustice.

15. Connelly, N. A., & Knuth, B. A. (1998). Evaluating risk communication: Examining target audience perceptions about four presentation formats for fish consumption health advisory information. *Risk Analysis*, 18(5), 649-659.

Abstract: Information format can influence the extent to which target audiences understand and respond to risk-related information. This study examined four elements of risk information presentation format. Using printed materials, we examined target audience perceptions about: (a) reading level; (b) use of diagrams vs. text; (c) commanding versus cajoling tone; and (d) use of qualitative vs. quantitative information presented in a risk ladder. We used the risk communication topic of human health concerns related to eating noncommercial Great Lakes fish affected by chemical contaminants. Results from the comparisons of specific communication formats indicated that multiple formats are required to meet the needs of a significant percent of anglers for three of the four format types examined. Advisory text should be reviewed to ensure the reading level is geared to abilities of the target audience. For many audiences, a combination of qualitative and quantitative information, and a combination of diagrams and text may be most effective. For most audiences, a cajoling rather than commanding tone better provides them with the information they need to make a decision about fish consumption. Segmenting audiences regarding information needs and communication formats may help clarify which approaches to take with each audience.

16. Connelly, N. A., Knuth, B. A., & Brown, T. L. (1996). Sportfish consumption patterns of Lake Ontario anglers and relationship to health advisories. *N Am J Fish Manage*, 16, 90-101.

Abstract: Accurate fish consumption estimates are necessary to determine the risks anglers face associated with consumption of contaminated fish and to assess compliance with fish consumption health advisories. Based on a 12-month diary methodology, anglers who fished Lake Ontario in 1992 consumed an average of 30.3 fish meals in 1992, of which 28% were sport-caught. When meal size was factored in, an estimated 17.9g of fish per day from all sources were consumed by Lake Ontario anglers. Virtually all diary participants (>95%) who fished Lake Ontario in 1992 said they were aware of the New York State health advisory. However, 36% of 1992 Lake Ontario anglers consumed fish in excess of the fish consumption limits recommended for Lake Ontario; 14% ate fish from Lake Ontario but did not exceed limits recommended in the advisory; the remainder (50%) did not consume any fish from Lake Ontario in 1992. Furthermore, 90% of those who actually consumed over the limit said they believed their consumption was within the recommended limits in 1992. These anglers may have believed that use of risk-reducing cleaning techniques decreased their risk sufficiently to allow increased consumption of listed species. Clarification of how risk is calculated and whether it assumes use of risk-reducing cleaning techniques should be included in the health advisory. Communication efforts should address this lack of consumers' "compliance," especially in light of our finding that most of these anglers believed that their consumption was within the limits recommended in the advisory.

17. Dawson, J., Sheeshka, J., Cole, D. C., Kraft, D., & Waugh, A. (2008). Fishers weigh in: Benefits and risks of eating Great Lakes fish from the consumer's perspective. *Agric Hum Values*, 25, 349-364.

Abstract: Three decades of concern over consumption of potentially contaminated Great Lakes fish has led government agencies and public health proponents to implement risk assessment and management programs as a means of protecting the health of fishers and their families. While well-meaning in their intent, these programs—and much of the research conducted to support and evaluate them—were not designed to accommodate the understandings and concerns of the fish consumer. Results from a qualitative component of a multi-disciplinary, multi-year research project on frequent (average 108 meals per year) consumers of Great Lakes fish tell the fishers' side of the story. We present data from 87 tape recorded interviews conducted with Vietnamese, Chinese, and English-speaking participants that underscore the quality of freshly caught Great Lakes fish and the important social and cultural benefits of fish and fishing to the consumer. We also outline the participants' understandings of risk from eating Great Lakes fish and the way in which fishers and their families manage this risk. The paper concludes with a discussion of these benefits, risks, and risk management strategies as ways that Great Lakes fish consumers "construct" rather than "perceive" risk. We advocate for risk assessment and management protocols that involve those who will be affected the most, such as frequent consumers of Great Lakes fish, from the initial "risk characterization" stage through to any necessary risk communication.

18. Derrick, C. G., Miller, J. S. A., & Andrews, J. M. (2008). A fish consumption study of anglers in an at-risk community: A community-based participatory approach to risk reduction. *Public Health Nursing, 25*(4), 312-318.

Abstract: Objective: To determine the effectiveness of a community-partnered risk communication intervention tailored for subsistence anglers in a public housing community. Design and sample: A one group, pretest, posttest design was used to test the effectiveness of the intervention in a sample ($n=23$, age range 18–75 years, 100% African American) of subsistence anglers residing in a public housing community in close proximity to a Superfund clean-up site. Face-to-face surveys were conducted at baseline and 3 months post the intervention to assess changes in knowledge and behaviors. Intervention: A socioculturally appropriate risk communication intervention was developed, implemented, and evaluated in the targeted community. The risk communication included an interactive power point presentation, visual demonstration by a role model, and distribution of low literacy written materials, followed by a booster mailing of materials 1 month past the initial intervention. Evaluation measures included survey instruments on knowledge and self-reported fishing behaviors. Results: Participants showed improved knowledge and behavior change related to trimming fish, consumption by pregnant women and children, and consumption of large fish. Conclusions: The sociocultured tailored risk communication intervention demonstrated promising outcomes in this community and should be evaluated in a larger population of subsistence anglers.

19. Firthsen, I., MD., & Goodnight, W., MD. MSCR. (2009). Awareness and implications of fish consumption advisories in a women's health setting. *J Reprod Med, 54*(5), 267-272.

Abstract: OBJECTIVE: To determine awareness of fish consumption advisories and fish consumption patterns among women and to explore demographic associations with advisory awareness and fish consumption. STUDY DESIGN: An anonymous survey was given in 2006-2007 to women seeking care at the Medical University of South Carolina Departments of Obstetrics and Gynecology and Family Medicine. RESULTS: The population ($N = 453$) was predominantly black, with an annual income of $< \$50,000$, and 36.5% were pregnant. Overall, 47.0% reported awareness of fish consumption advisories, with pregnant women more knowledgeable compared to nonpregnant, and whites more aware than blacks. Fish consumption in this population is low, with 97.3% of respondents consuming fish twice per week or less. Fish advisory information is commonly obtained via the popular media. CONCLUSION: Fewer than half of the women in a health care setting report knowledge of fish consumption advisories. Fewer than 5% of women consumed fish above Food and Drug Administration and Environmental Protection Agency advisory levels. Pregnant women report higher advisory awareness, but also higher fish avoidance, potentially missing beneficial aspects of fish consumption during pregnancy. Novel educational interventions targeting specific populations should be developed to encourage safe consumption of fish, especially in reproductive-age women.

20. Geiner, A., Smith, K. C., & Guallar, E. (2010). Something fishy? News media presentation of complex health issues related to fish consumption guidelines. *Public Health Nutrition*, 13(11), 1786-1794.

Abstract: Objective: The news media are an important source of dietary information. Understanding news content, particularly the portrayal of risks and benefits of certain foods, is relevant for effective public health communication. Fish consumption may reduce risk for CVD and aid neonatal development, but recent work shows public confusion about the benefits of fish, challenged by the evidence of mercury and other contaminants in fish. We present an analysis of the messages about fish in US news media over 15 years, identifying trends in coverage and highlighting implications of current messaging. Design: We conducted a descriptive text analysis and coded for manifest content: locality of focus, story frame, reference to studies, inclusion of government guidelines and portrayal of uncertainty. We identified chronological patterns and analyzed the data for statistically significant relationships between media source and content. Setting: News stories were selected from five daily newspapers and five television networks (1993–2007). Subjects: We analyzed 310 health-related news stories on fish. Results: Risk messages outweighed benefit messages four to one, and health benefits only became prominent after 2002. No difference existed in coverage topic by news source. Fish consumption has increasingly become a national issue. Conclusions: With the bulk of messages about fish consumption focused on risk, the benefits may be lost to consumers. This gap creates a need for public health to work with news media to more effectively communicate benefits and risks around fish consumption and health and to consider options for communicating tailored information where it can be more readily utilized.

21. Gliori, G., Imm, P., Anderson, H. A., and Knobeloch, L. (2006). Fish consumption and advisory awareness among expectant women. *Wiscon Med J*, 105(2), 41-44.

Abstract: During the spring of 2003, the Wisconsin Department of Health and Family Services (DHFS) piloted a fish consumption advisory program targeted at pregnant women. Fish consumption recommendations and information about the prenatal effects of methylmercury were illustrated in multilingual posters, brochures, fact cards, and other promotional items. These materials were mailed to Women, Infants and Children (WIC) program providers, local health departments, and medical clinics, along with a cover letter that encouraged them to display the materials in waiting areas and distribute them to new mothers and expectant women who visited their facilities. In August 2003, a survey was mailed to 1000 women who had given birth during the first week of June 2003. The survey was intended to provide an estimate of the number and types of fish meals the women had consumed during pregnancy and evaluate their familiarity with the outreach materials. On average, survey respondents consumed 3 fish meals a month. The most frequently consumed fish were canned tuna and frozen fish. Approximately one third of women knew that older fish and predatory fish have the highest levels of mercury. While almost half of the women were aware of Wisconsin's sport fish advisory, only 13% of them remembered seeing any of the outreach materials.

22. Habron, G., Barbier, M., & Kinnunen, R. (2008). Local understanding of fish consumption advisory risks in Michigan's Upper Peninsula: The role of structure, culture, and agency. *Rural Soc*, 73(2), 275-299.

Abstract: Fish consumption advisories fail to adequately help communities address the benefits and risks of eating potentially contaminated fish. We engaged community members and relevant institutions in identifying and implementing more effective risk communication in Michigan's rural Upper Peninsula. In 2004-2005, we collected data in four Michigan counties through focus groups, community dinners, public meetings and angler interviews. Residents express a strong affinity toward eating Great Lakes fish, though a minority of participants have read the official fish advisory. Participants lack an understanding of how bioaccumulation affects consumption risk depending on the type of contaminant. We attribute the situation to conditions of post-normal risk that emerge through interaction of the structural dimensions of science and bureaucracy with a strong natural resource-based culture that affects the agency of residents. The implications loom large as Michigan's Department of Community Health no longer distributes hard copies of the Michigan Fish Advisory.

23. Imm, P., Knobeloch, L., & Anderson, H. A. (2007). Maternal recall of children's consumption of commercial and sport-caught fish: Findings from a multi-state study. *Environ Res*, 103, 198-204.

Abstract: A randomized telephone survey of 3015 women was conducted in an effort to assess the effectiveness of local sport-fish consumption advisories. Survey participants were between the ages of 18 and 45 and lived in the states of Arkansas, California, Connecticut, Florida, Maine, Minnesota, Montana, New Jersey, New Mexico, North Carolina, and Wisconsin. At the time of the women's interview, fish and shellfish consumption information was obtained for children under 18 years of age living in the household. One child (aged 2–17) from each household (1852) was randomly selected to evaluate fish consumption among children. Based on maternal recall, 84% of these children had consumed fish or shellfish at least once during the previous 12 months. This percentage ranged from 73% in New Jersey to 94% in Louisiana and was higher among children who lived with a licensed angler compared to those who did not. Eight percent of the children ate fish and/or shellfish more than twice a week. Of the total number of fish and shellfish meals eaten by children, 67% was commercial finfish, 22% was shellfish, and 11% was sport-caught finfish. Among those who ate fish, the average consumption rate was 47 meals per year—slightly less than one meal per week. This consumption frequency rate varied by state of residence ranging from 37 meals per year in Montana and Wisconsin to 62 in Florida. Because of these regional differences, the use of national average fish consumption rates may over- or under-estimate consumption in localized areas. This survey suggests that targeting information to women who eat fish may also protect children; more than 80% of children have fish consumption patterns that are similar to that of their mothers. Additional research and biomonitoring is needed to improve our understanding of the risk and benefits associated with childhood consumption of fish and shellfish.

24. Imm, P., Knobeloch, L., Anderson, H. A., & the Great Lakes Sport Fish Consortium. (2005). Fish consumption and advisory awareness in the Great Lakes Basin. *Environ Health Perspect* 113(10), 1325-1329.

Abstract: More than 61 million adults live in the eight U.S. states bordering the Great Lakes. Between June 2001 and June 2002, a population-based, random-digit-dial telephone survey of adults residing in Great Lakes (GL) states was conducted to assess consumption of commercial and sport-caught fish and awareness of state-issued consumption advisories for GL fish. On the basis of the weighted survey data, approximately 84% of the adults living in these states included fish in their diets. Seven percent (an estimated 4.2 million adults) consumed fish caught from the Great Lakes. The percentage of residents who had consumed sport-caught fish (from any water source) varied regionally and was highest among those who lived in Minnesota (44%) and Wisconsin (39%). Consumption of GL sport fish was highest among residents of Michigan (16%) and Ohio (12%). Among residents who had eaten GL fish, awareness of consumption advisories varied by gender and race and was lowest among women (30%) and black residents (15%). However, 70% of those who consumed GL sport-caught fish twice a month or more (an estimated 509,000 adults across all eight states) were aware of the advisories. Findings from this survey indicate that exposure to persistent contaminants found in GL fish is likely limited to a relatively small subpopulation of avid sport-fish consumers. Results also underscore the public health importance of advisories for commercial fish because an estimated 2.9 million adults living in these states consume more than 104 fish meals per year and may be at risk of exceeding the reference doses for methylmercury, polychlorinated biphenyls, and other bioaccumulative contaminants.

Additional info: p. 1329 The need to educate the adult population about persistent toxins present in some commercial fish is evident from these survey data.... Advisories that focus only on sport-caught fish miss much of the fish-consuming population. Based on our survey, > 2 million residents of the Great Lakes Basin who eat only commercial fish eat enough commercial fish to exceed safety guidelines for exposure to a variety of persistent, bioaccumulative pollutants.

25. Jardine, C. G. (2003). Development of a public participation and communication protocol for establishing fish consumption advisories. *Risk Analysis: An International Journal*, 23(3), 461-471.

Abstract: Enabling people to make an informed choice on whether to change consumption behavior is ultimately the objective of any fish consumption advisory. This will occur only if people are aware of the advisory, know and understand the advisory information, and believe the information to be true. Interactive, meaningful communication and the opportunity to participate in the process to develop and review advisories are key to achieving these attributes. A case study was undertaken in a community in Alberta, Canada (where an existing advisory was under consideration for review) to determine public awareness, knowledge, compliance, communication effectiveness, information needs, and desire for involvement related to the advisory. The information obtained from this case study was used to develop 14 guiding principles as a foundation for the incorporation of public participation and risk communication into the process of developing and reviewing fish consumption advisories.

26. Karouna-Renier, N. K., Rao, K. R., Lanza, J. J., Rivers, S. D., Wilson, P. A., Hodges, D. K., Levine, K. E., Ross, G. T. (2008). Mercury levels and fish consumption practices in women of child-bearing age in the Florida Panhandle. *Environ Res*, 108, 320-326.

Abstract: The southeastern United States, and in particular the coastal areas along the Gulf of Mexico (Gulf Coast) in Florida, experience some of the highest levels of mercury deposition in the country. Although the State of Florida's coastal border is among the longest in the United States, and the State has issued fish consumption advisories due to mercury on multiple fish species, few data have been systematically collected to assess mercury levels in the human population of the state or to assess the efficacy of the consumption advisories. Because of the generally high rate of seafood consumption among coastal populations, the human population in the Florida Panhandle, near Pensacola, FL is potentially exposed to elevated levels of mercury. In the present study, we analyzed hair mercury levels in women of child-bearing age (16-49 years) who had resided near Pensacola, FL for at least 1 year. We also surveyed the fish consumption practices of the cohort and evaluated awareness of the Florida Fish Consumption Advisory. Hair mercury levels were significantly higher in women who consumed fish within the 30 days prior to sampling ($p < 0.05$) and in those women who were unaware of the consumption advisory ($p < 0.05$). Only 31% of the women reported knowledge of the consumption advisory and pregnant women exhibited lower awareness of the advisory than non-pregnant women. The data suggest that public health interventions such as education and fish advisories have not reached the majority of women in the counties surrounding Pensacola who are most at risk from consumption of fish with high levels of mercury.

27. Katner, A., Ogunyinka, E., Sun, M., Soileau, S., Lavergne, D., Dugas, D., & Suffet, M. (2011). Fishing, fish consumption and advisory awareness among Louisiana's recreational fishers. *Environ Res*, 111, 1037-1045.

Abstract: This paper presents results from the first known population-based survey of recreational fishers in Louisiana ($n=1774$). The ultimate goal of this study was to obtain data in support of the development of regional advisories for a high exposure population with unique seafood consumption patterns. Between July and August of 2008, a survey was mailed to a random sample of licensed recreational fishers to characterize local fishing habits, sportfish consumption, and advisory awareness. Eighty-eight percent of respondents reported eating sportfish. Respondents ate an estimated mean of four fish meals per month, of which, approximately half were sportfish. Over half of all sportfish meals (54%) were caught in the Gulf of Mexico or bordering brackish areas. Sportfish consumption varied by license and gender; and was highest among Sportsman's Paradise license holders (2.8 ± 0.2 meals per month), and males (2.2 ± 0.1 meals per month). The most frequently consumed sportfish species were red drum, speckled trout, catfish, bass, crappie and bream. Advisory awareness rates varied by gender, ethnicity, geographic area, license type, age and education; and were lowest among women (53%), African-Americans (43%), fishers from the southeast of Louisiana (50%), holders of Senior Hunting and Fishing licenses (51%), individuals between 15 and 19 years of age (41%), and

individuals with less than a high school education (43%). Results were used to identify ways to optimize monitoring, advisory development and outreach activities.

28. Knobeloch, L., Anderson, H. A., Imm, P., Peters, D., & Smith, A. (2005). Fish consumption, advisory awareness, and hair mercury levels among women of childbearing age. *Environ Res*, 97, 220-227.

Abstract: The Wisconsin Division of Public Health and the State of Maine Bureau of Health collaborated on a 12 state mercury awareness project. The primary goals of this initiative were to evaluate mercury sport fishing advisory awareness among women of childbearing age and assess the methylmercury exposure among this subpopulation. The project, which was conducted between December 1998 and December 1999, involved a randomized telephone survey of 3015 women of childbearing age and hair mercury analyses for a subset of 414 women. While 92% of these women had consumed fish or shellfish during the past year, less than one third (29%) of them had eaten any sport-caught fish. More than two thirds of the women who consumed sportfish were not aware that their state had issued fish consumption guidelines to protect against methylmercury exposure. Hair mercury levels ranged from 0.005 to 4.62 ppm and were positively correlated with recent fish consumption rates ($P < 0.0001$). Women who ate sport-caught fish did not have significantly higher hair mercury levels than others (mean 0.51 vs. 0.48 ppm). Among women who ate sportfish, advisory awareness had no effect on their mercury exposure. Demographic indicators associated with higher hair mercury levels included residence in northeastern USA, marital status of married, college education, annual household income greater than \$75,000, and Asian race.

Additional info: p. 226 The majority of women in the cohort indicated that TV news and newspapers were their primary sources of health risk information. The potential of these sources to effectively spread awareness can be seen by the successes of public health agencies' anti-tobacco outreach messages.... There is a need for a single, integrated advisory that considers all of these contaminants and directs the consumer to eat a variety of fish and seafood that are generally low in all known contaminants.

29. Knobeloch, L., Tomasallo, C., & Anderson, H. (2011). Biomonitoring as an intervention against methylmercury exposure. *Public Health Reports*, 126, 568-574.

Abstract: Objectives. We evaluated the effectiveness of biomonitoring as an intervention against methylmercury exposure. Methods. During 2004, the Wisconsin Department of Health Services assessed fish consumption and methylmercury exposure among 2,031 men and women who responded to a statewide press release. People whose hair mercury levels exceeded 1 microgram per gram ($\mu\text{g/g}$) were advised to reduce their intake of large, predatory fish. Others were informed that mercury exposure was not an issue for them and were encouraged to continue to eat fish as part of a healthy diet. In 2008, follow-up questionnaires and hair sampling kits were mailed to all 2004 study participants. Results. Completed surveys and hair samples were received from 1,139 individuals. While overall fish intake for this group increased slightly, from 8,561 to 8,785 servings per month between 2004 and 2008, the intake rate was significantly reduced among people whose 2004 hair mercury levels were $.1 \mu\text{g/g}$, and 30% of the cohort reported eating different types of fish or smaller fish in 2008. The number of people who had a hair mercury level $.1 \mu\text{g/g}$ fell from 300 in 2004 to 206 in 2008. Conclusions. Hair mercury analysis and explanatory result letters appear to have had a long-term effect on methylmercury exposure and the selection of fish. These findings support the public health benefit of methylmercury screening in conjunction with results-based education among frequent consumers of commercial and sport-caught fish.

30. Knuth, B. A., Connelly, N. A., Sheeshka, J., & Patterson, J. (2003). Weighing health benefit and health risk information when consuming sport-caught fish. *RISK ANAL*, 23(6), 1185-1197.

Abstract: Fish consumers may incur benefits and risks from eating fish. Health advisories issued by states, tribes, and other entities typically include advice about how to limit fish consumption or change other

behaviors (e.g., fish cleaning or cooking) to reduce health risks from exposure to contaminants. Eating fish, however, may provide health benefits. Risk communicators and fish consumers have suggested the importance of including risk comparison information, as well as health risk-benefit comparisons in health advisory communications. To improve understanding about how anglers fishing in waters affected by health advisories may respond to such risk-risk or risk-benefit information, we surveyed Lake Ontario (NY, USA) anglers. We interviewed by telephone 4,750 anglers, 2,593 of which had fished Lake Ontario in the past 12 months and were sent a detailed mail questionnaire (1,245 responded). We posed questions varying the magnitude of health risks and health benefits to be gained by fish consumption, and varied the population affected by these risks and benefits (anglers, children, women of childbearing age, and unborn children). Respondents were influenced by health benefit and health risk information. When risks were high, most respondents would eat less fish regardless of the benefit level. When risks were low, the magnitude of change in fish consumption was related to level of benefit. Responses differed depending on the question wording order, that is, whether “risks” were posed before “benefits.” For a given risk-benefit level, respondents would give different advice to women of childbearing age versus children, with more conservative advice (eat less fish) provided to women of childbearing age. Respondents appeared to be influenced more strongly by risk-risk comparisons (e.g., risks from other foods vs. risks from fish) than by risk-benefit comparisons (e.g., risks from fish vs. benefits from fish). Risk analysts and risk communicators should improve efforts to include risk-risk and risk-benefit comparisons in communication efforts, and to clarify to whom the health risks and benefits from fish consumption may accrue.

31. Kuntz, S. W., Ricco, J. A., Hill, W. G., & Anderko, L. (2010). Communicating methylmercury risks and fish consumption benefits to vulnerable childbearing populations. *J Obstetric Gynecologic & Neonatal Nursing*, 39(1), 118-126.

Abstract: Methylmercury is a known neurotoxin especially harmful to the fetus, infant, and child. Preventing exposure to this environmental toxin is best accomplished through consumer messages specifically adapted for local populations. Health care providers play an important role in the dissemination of information. The purpose of this article is to review the benefits and risks of fish consumption and identify strategies for presenting effective risk communication messages to vulnerable groups, particularly women of childbearing age.

32. Lando, A. M., Fein, S. B., & Choiniere, C. J. (2012). Awareness of methylmercury in fish and fish consumption among pregnant and postpartum women and women of childbearing age in the United States. *Environ Res*, 116, 85-92.

Abstract: In 2004, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) reissued joint advice recommending that pregnant women, nursing mothers, young children, and women who may become pregnant not consume fish high in mercury such as shark, swordfish, king mackerel, and tilefish, and not consume more than 12 ounces (340.2g) of other lower mercury fish per week. These groups were encouraged to eat up to 12 ounces (340.2g) of low mercury fish per week to get the health benefits of fish. Using a survey of 1286 pregnant women, 522 postpartum women, and a control group of 1349 non-pregnant/non-postpartum women of childbearing age, this study evaluated awareness of mercury as a problem in food and examined fish consumption levels across groups using regression analysis. We also compared awareness of mercury as a problem in food to awareness of Listeria, dioxins and PCBs. We found that the majority of all 3 groups of women were aware of mercury and that nearly all women in all 3 groups limited consumption consistent with the advice; they ate less than 340.2g (12oz) of fish per week and no high mercury fish. Compared with the control group, pregnant and postpartum women were more likely to be aware of mercury as a problem in food, and pregnant women ate less total fish and were less likely to eat fish, to eat more than 340.2g (12 oz) of fish, and to eat high mercury fish. However, all groups ate much less than the recommended 340.2g (12 oz) of low mercury fish per week for optimum health benefits. Among women who ate fish, the median intake of total fish was 51.6 g/wk (1.8 oz/wk), 71.4g/wk (2.5 oz/wk), and 85.3 g/wk (3.0 oz/wk) for the pregnant, postpartum, and control groups, respectively. Thus, it appears that the targeted groups of women were more aware of mercury and were eating fish within the FDA/EPA guidelines, but these

women may be missing the health benefits to themselves and their children of eating a sufficient amount of fish.

Additional info: p. 90 It appears that educational efforts and the related media coverage targeting pregnant women (e.g. US FDA,2005; US FDA, 2006) have been reaching the relevant audience and are effective in communicating the risks of mercury from eating fish but may not adequately communicate the benefits of eating sufficient amounts of low mercury fish.

33. Lando, A. M., & Zhang, Y. (2011). Awareness and knowledge of methylmercury in fish in the United States. *Environ Res*, 111(3), 442-450.

Abstract: In the 1970s several states in the Great Lakes region became concerned about mercury contamination in lakes and rivers and were the first to issue local fish consumption advisories. In 2001, the Food and Drug Administration (FDA) advised pregnant women, nursing mothers, young children, and women who may become pregnant not to consume shark, swordfish, king mackerel, and tilefish and recommended that these women not exceed 12 ounces of other fish per week. In 2004, FDA reissued this advice jointly with the U.S. Environmental Protection Agency (EPA) and modified it slightly to provide information about consumption of canned tuna and more details about consumption of recreationally caught fish. Though several studies have examined consumers' awareness of the joint FDA and EPA advisory as well as different state advisories, few used representative data. We examined the changes in awareness and knowledge of mercury as a problem in fish using the pooled nationally representative 2001 and 2006 Food Safety Surveys (FSS) with sample sizes of 4482 in 2001 and 2275 in 2006. Our results indicated an increase in consumers' awareness of mercury as a problem in fish (69% in 2001 to 80% in 2006, $p < .001$). In our regression models, we found that in both years, parents having children less than 5 years of age were more aware of mercury in fish and knowledgeable about the information contained in the national advisories about mercury in fish ($p < .01$) than other adults. In both 2001 and 2006, women of childbearing age (aged 18–45) were less aware and knowledgeable about this information than other women. However, women of all age groups had larger gains in awareness and knowledge than their male counterparts during this time. Participants' race, education, income, region, fish preparation experiences, having a foodborne illness in the past year, and risk perceptions about the safety of food were significant predictors of their awareness and knowledge.

Additional info: p. 449 Our findings also suggest that additional educational campaigns are needed to reach minority women and those with lower incomes and levels of education.

34. McDermont, M. H., Chess, C., Perez-Lugo, M., Pflugh, K. K., Bochenek, E., & Burger, J. (2003). Communicating a complex message to the population most at risk: An outreach strategy for fish consumption advisories. *Appl Environ Educ Comm*, 2, 39-48.

Abstract: Across the United States, dissemination of state-issued health advisories has been largely ineffective in communicating the risks from eating contaminated fish. We describe an effective alternative approach that consists of a series of interlinked steps: (1) Define the target audience to suggest appropriate channels for disseminating outreach materials; (2) consult with the audience and outreach agents to shape the message and format; and (3) develop materials and pretest them with the target audience in the context in which they will be distributed and revised based on the results. This article reports how this approach to risk communication was employed to inform Latina and low-income women in Elizabeth, New Jersey, about the health hazards associated with consumption of contaminated fish.

35. Marette, S., Roosen, J., Blanchemanche, S., & Verger, P. (2008). The Choice of Fish Species: An Experiment Measuring the Impact of Risk and Benefit Information. *J. Agric. And Res. Econ.*, 33(1), 1-18.

Abstract: An experiment was conducted in France to evaluate the impact of health information on consumers' choice. Fish have positive and negative health attributes, and we focus on fish species of diverging risk-

benefit ratios. Successive messages revealing risks (methylmercury) and benefits (omega-3s), along with consumption recommendations, were delivered to experiment participants. Results show significant differences in reaction among participants depending on the sequencing order of information on risks and benefits. The results of the experiment are combined with a partial equilibrium model to determine the value of information. Acknowledging adjustments of equilibrium prices, health information is shown to have significant value to consumers.

36. Pflug, K. K., Lurig, L., Von Hagen, L. A., Von Hagen, S., & Burger, J. (1999). Urban anglers' perception of risk from contaminated fish. *Sci. of the Total Env.*, 228(2-3), 203-218.

Abstract: The Newark Bay Complex includes the Newark Bay, tidal portions of the Hackensack River, Passaic River, Arthur Kill, and Kill van Kull. It is a highly industrialized urban area including five counties and more than 20 local governments with a large racially-mixed population of more than 3 million people. In 1982, research conducted by the New Jersey Department of Environmental Protection (NJDEP) showed elevated levels of chemical contaminants in five species of fish and one type of crab in the Newark Bay Complex. Subsequently, the State of New Jersey adopted advisories to guide citizens on safe consumption practices for fish and crabs. Since then, fish consumption advisories have been issued primarily through the Fish and Game Digest, a publication distributed by the state to licensed anglers. However, anglers in the Complex are not required to have a fishing license because the waters are marine. Therefore, most anglers in this area do not receive advisory information. To gain greater insight into the information sources and risk perceptions of urban anglers, a survey was conducted of 300 anglers at 26 fishing and crabbing locations in the Newark Bay Complex during the summer and early fall of 1995. The objectives of the study were to learn anglers': (1) knowledge of fish consumption advisories; (2) belief in the advisories; (3) perception of how safe fish are to eat; (4) sources for information about fish and fishing; and (5) sources for information on fish consumption advisories. The study concluded that while 60% had heard about advisories, they either did not believe or were unconcerned about health effects from eating contaminated species. In addition, the most used source for information about fish and fishing was other fishermen, while newspapers were selected as a source for information about community news, health, and food safety.

Additional info: p. 216 A strategy that includes personal contact with anglers, as well as press releases to both English and Spanish language newspapers, is likely to be more effective in reaching this audience.

37. Pieniak, Z., Verbeke, W., Scholderer, J., Brunso, K., & Olsen, S. O. (2007). European consumers' use of and trust in information sources about fish. *Food Quality Preference*, 18, 1050-1063.

Abstract: This paper focuses on identifying segments of consumers based on their use of and trust in information sources about fish. Cross-sectional data were collected through the SEAFOODplus pan-European consumer survey (n = 4786) with samples representative for age and region in Belgium, the Netherlands, Denmark, Spain and Poland. Three distinct clusters, based on use of and trust in fish information sources, were identified: Sceptic (24.0%), Enthusiast (41.4%) and Confident (34.6%). Those consumer segments differed significantly with respect to use of and interest in information cues on fish labels, knowledge and behaviour towards fish, and socio-demographic profile. Recommendations for the use of multiple sources targeted to a particular audience's interest and behavioural profile were formulated.

38. Reinert, R. E., Knuth, B. A., Kamrin, M. A., & Stober, Q. J. (1991). Risk assessment, risk management, and fish consumption advisories in the United States. *Fisheries*, 16(6), 5-12.

Abstract: Differences among states in the procedures used to formulate fish consumption advisories and increased use of cancer risk- based advisories are sources of confusion for fishery professionals and anglers. One of the most controversial aspects of fish consumption advisories is the accuracy of their estimates of risk. Unfortunately, our ability to detect trace concentrations of contaminants in the environment far surpasses our

ability to accurately predict the effects of these contaminants on human health. Mathematical models are most frequently used to estimate the cancer risk of low levels of contaminants to humans. At best these models give a crude estimate of the health effects. Consequently, as fishery professionals, we must do a better job of informing anglers about these advisories. We can put the health risks involved in eating contaminated fish in perspective by comparing them with other types of risks. We can also inform anglers of various alternative behaviors that will decrease the health risks associated with eating contaminated fish, such as changing their fishing habits and the proper techniques for cleaning and cooking fish. A proper understanding of fish consumption advisories will increase anglers' concern for water quality, protect their health, and still encourage their enjoyment of the fishery.

39. Scherer, A. C., Tsuchiya, A., Younglove, L. R., Burbacher, T. M., & Faustman, E. M. (2008). Comparative analysis of state fish consumption advisories targeting sensitive populations. *Environ Health Persp*, 116(12),1598-1606.

Abstract: OBJECTIVE: Fish consumption advisories are issued to warn the public of possible toxicological threats from consuming certain fish species. Although developing fetuses and children are particularly susceptible to toxicants in fish, fish also contain valuable nutrients. Hence, formulating advice for sensitive populations poses challenges. We conducted a comparative analysis of advisory Web sites issued by states to assess health messages that sensitive populations might access. DATA SOURCES: We evaluated state advisories accessed via the National Listing of Fish Advisories issued by the U.S. Environmental Protection Agency. DATA EXTRACTION: We created criteria to evaluate advisory attributes such as risk and benefit message clarity. DATA SYNTHESIS: All 48 state advisories issued at the time of this analysis targeted children, 90% (43) targeted pregnant women, and 58% (28) targeted women of childbearing age. Only six advisories addressed single contaminants, while the remainder based advice on 2–12 contaminants. Results revealed that advisories associated a dozen contaminants with specific adverse health effects. Beneficial health effects of any kind were specifically associated only with omega-3 fatty acids found in fish. CONCLUSIONS: These findings highlight the complexity of assessing and communicating information about multiple contaminant exposure from fish consumption. Communication regarding potential health benefits conferred by specific fish nutrients was minimal and focused primarily on omega-3 fatty acids. This overview suggests some lessons learned and highlights a lack of both clarity and consistency in providing the breadth of information that sensitive populations such as pregnant women need to make public health decisions about fish consumption during pregnancy.

40. Shimshack, J. P., Ward, M. B., & Beatty, T. K. M. (2007). Mercury advisories: Information, education, and fish consumption. *J Environ Econ Manag*, 53, 158-179.

Abstract: This paper examines responses to a US national FDA advisory that urged at-risk individuals to limit store-bought fish consumption due to the dangers of methyl-mercury. We investigate consumer response using both parametric and nonparametric methods. Some targeted consumers significantly reduced canned fish purchases as a result of the advisory, suggesting that information-based policies can achieve the issuing agency's goals. Education and newspaper readership were important determinants of response, suggesting that information acquisition and assimilation are key factors for risk avoidance. While some groups reduced consumption as a result of the advisory, we do not find a response among the relatively large group of at-risk households which met neither the education nor readership criteria. The advisory also had unintended spillover effects; some consumers not considered at-risk reduced consumption in response to the advisory.

41. Shubat, P. J., Raatz, K. A., & Olson, R. A. (1996). Fish consumption advisories and outreach programs for Southeast Asian immigrants. *Toxicology and Industrial Health*, 12(3/4), 427-434.

Abstract: Southeast Asian immigrants and refugees, in particular the Hmong people of Laos, have settled in large numbers in metropolitan areas of Minnesota. These communities, accustomed to hunting and fishing for food in Laos, now fish in some of the most contaminated waters of Minnesota. Fishing and fish preparation customs of their homeland emphasize using all fish caught and discarding very little waste. These practices result in a potentially high exposure to PCBs and mercury. Educational outreach efforts to inform this population of the potential health hazards from consuming the fish are hindered by language and cultural barriers. While most Hmong anglers welcome information about contaminants and fishing, the typical press releases and mailings that convey fish advisory information to the public do not reach this community. The Minnesota Department of Health and the Minnesota Department of Natural Resources collaborated to determine the health messages and communication methods that would best meet the needs of these communities. Using the results of interviews and a behavioral survey, the Minnesota Department of Health has tailored fish consumption advisories to meet the unique needs of Southeast Asian anglers. Over the past four years, educational programs involving specialized advisories, translations, signs, a Hmong language video, and workshops have been used to inform Hmong anglers and other Southeast Asians about fish contaminants.

42. Silver, E., Kaslowa, J., Leeb, D., Lee, S., Tan, M. L., Weis, E., & Ujihara, A. (2007). Fish consumption and advisory awareness among low-income women in California's Sacramento–San Joaquin Delta. *Environ. Res.*, *104*, 410-419.

Abstract: Fishing is a culturally important activity to the ethnically diverse population living in California's Sacramento–San Joaquin Delta. Due to runoff from abandoned gold mines, certain Delta fish are contaminated with methylmercury, a neurodevelopmental toxin. A state health advisory recommends limited consumption of certain Delta fish, to be followed in conjunction with a federal advisory for commercial and sport fish. We conducted a survey of low-income women at a Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinic, to characterize commercial and sport fish consumption patterns and advisory awareness. Ninety-five percent of women consumed commercial fish. Thirty-two percent consumed sport fish; this proportion was much higher in Hmong (86%) and Cambodian (75%) women. Ninety-nine percent of sport fish consumers also consumed commercial fish. The overall fish consumption rate among consumers was 27.9 g/day (geometric mean, past 30 days, cooked portion); commercial and sport fish consumption rates were 26.3 and 10.5 g/day, respectively. We found ethnic differences in overall fish consumption rates, which were highest in African Americans (41.2 g/day) and Asians (35.6 g/day), particularly Vietnamese and Cambodians. Pregnant women ate less fish overall than other women (16.8 vs. 30.0 g/day, $p=0.0001$), as did women who demonstrated specific advisory awareness (23.3 vs. 30.3 g/day, $p=0.02$). Twenty-nine percent of all women exceeded federal fish consumption advisory limits. These results highlight the need for culturally and linguistically appropriate interventions that address both commercial and sport fish consumption.

Additional info: p. 418 Clearer, integrated educational messages for the public are needed about mercury contamination of fish.... This underscores the need for culturally and linguistically appropriate interventions that integrate messages about both commercial and sport fish, balancing information on the risks of mercury and other chemicals with the benefits of fish consumption.

43. Surgan, M. H., Davis, J., Congdon, T., & Kellerman, L. (2008). Fish consumption advisories: one agency's focus on families. *Soc. Nat. Resour.*, *21*, 266-270.

Abstract: The New York State Attorney General's Environmental Protection Bureau undertook an effort to publicize fish consumption advisories regarding fish found in the waters around New York City. With informational brochures in English, Spanish, Chinese, Creole, and Russian, we reached out to minority and ethnic women who select and prepare family meals. To enhance the utility of the brochures, we illustrated the New York State Department of Health (NYSDOH) consumption advisories with pictures of the fish and maps of relevant locations. Follow-up questionnaires indicated that the brochures were generally well understood and readers were likely to change their meal selection and preparation practices as a result of reading the brochures. We accomplished this outreach at minimal expense and with no special funding.

44. Tan, M. L., Ujihara, A., Kent, L., & Hendrickson, I. (2011). Communicating fish consumption advisories in California: What works, what doesn't. *Risk Anal*, 31(7), 1095-1106.

Abstract: State agencies face many challenges in creating sport fish consumption advisories that can be readily understood by diverse populations. In this study, our objectives were to identify barriers to understanding consumption advisories and recommend more effective approaches for communicating advisory concepts. We conducted key informant interviews with demographically diverse consumers of sport fish from the Sacramento-San Joaquin Delta watershed in California to explore how intended audiences perceive consumption advisories and identify factors that influence comprehension. Some barriers to communication included the use of portion sizes that departed from commonly consumed amounts, poorly understood terminology, misleading category headings, and ineffective visual tools. Comprehension was enhanced when advisory information did not contradict existing beliefs about fish or fish consumption, and when advisories provided information about contaminant levels in specific kinds of fish. Using certain methods, such as portion sizes that reflect commonly consumed amounts, mercury meters to convey contaminant levels, three advice categories (e.g., high, medium, low), and population definitions that identify specific age ranges, improved the clarity of advisory concepts for intended audiences.

45. Teisl, M. F., Fromberg, E., Smith, A., Boyle, K. J., & Engelberth, H. M. (2011). Awake at the switch: improving fish consumption advisories for at-risk women. *Sci Total Environ*, 409, 3257-3266.

Abstract: Eating fish provides health benefits; however, nearly all fish contain at least some methylmercury which can impair human health. While government agencies have been issuing fish consumption advisories for 40 years, recent evaluation efforts highlight their poor performance. The benefit of an advisory can be measured by its ability to inform consumers as to both the positive and negative attributes of their potential choices, leading to appropriate changes in behavior. Because of the health benefits, fish advisories should not reduce fish consumption, even among at-risk individuals, but should lead consumers to switch away from highly contaminated fish toward those less contaminated. Although studies document how advisories reduce fish consumption (a negative outcome), no study indicates whether they lead to switching behavior (a positive outcome). We explore the effects of Maine Center of Disease Control and Prevention's advisory aimed at informing women who may become pregnant, nursing mothers and pregnant women about the benefits and risks of fish consumption. We examine how the advisory changes consumption, especially related to switching behavior. We demonstrate such changes in behavior both during and after pregnancy and compare the advisory induced changes with those induced by other information sources. Although we find the advisory reduced some women's consumption of fish, we find the decrease is short-lived. Most importantly, the advisory induced appropriate switching behavior; women reading the advisory decreased their consumption of high risk fish and increased their consumption of low-risk fish. We conclude a well-designed advisory can successfully transform a complex risk/benefit message into one that leads to appropriate knowledge and behavioral changes.

Additional info: p. 3262 The finding that a balanced risk/benefit advisory is key to inducing this switch... These results support the contention of Burger and Gochfeld (2008) that consumers can correctly process and weigh the benefit and risk information related to fish consumption when statements about the risks or benefits are clear, and there is a specific listing of which fish should be avoided, and which should be consumed.

46. Van Dijk, H., Fischer, A., Honkanen, P., & Frewer, L. J. (2011). Perceptions of health risks and benefits associated with fish consumption among Russian consumers. *Appetite*, 56(2), 227-234.

Abstract: Knowledge about differences in consumer perceptions of health risks and benefits related to fish consumption is important for the development of targeted health interventions associated with dietary choice.

The purpose of this study is to identify individual differences in Russian consumers according to their perceptions of health risks and benefits associated with fish consumption. By application of a cluster analysis on perceptions of personal risks and benefits associated with the consumption of fish, four groups of Russian consumers were classified as: very positive; positive; moderately positive; and 'high risk-high benefit' about the healthiness of fish consumption. Differences in perceptions of personal risks and benefits across consumers were related to self-reported fish consumption, optimism about personal risks and benefits, and optimism about personal knowledge about risks and benefits. Implications for the development of targeted health interventions to influence perceptions of risks and benefits associated with fish consumption, and ultimately fish consumption, are discussed. It is concluded that optimism regarding perceptions and knowledge of health risks, and health benefits should be taken into account when developing interventions aimed at consumer health.

47. Vardeman, J. E., & Aldoory, L. (2008). A qualitative study of how women make meaning of contradictory media messages about the risks of eating fish. *Health Commun, 23*, 282-291.

Abstract: This study employed qualitative, in-depth focus groups with women to determine their perceptions of contradictory information portrayed in media about fish consumption safety. The women's perceptions were understood in terms of how much they recognized eating fish to be a problem, how personally relevant the problem of eating fish was for them, and whether they perceived barriers to eating fish safely. Findings from this study indicate possible factors that influence information-seeking behavior when women are confronted with contradictory health information in the media.

Additional info: p. 289 The caregiver role is significant for making meaning of health risks: when pregnant participants were faced with contradictory information, their role as protectors became priority, and health benefits from eating fish were less important than potential risks of consuming mercury. This study extends our understanding of how conflicting information complicates caregiving situations because the women made cognitive decisions based on the health of others rather than themselves.

48. Velicer, C. M., & Knuth, B. A. (1994). Communicating contaminant risks from sport-caught fish: The importance of target audience assessment. *Risk Anal, 14*(5), 833-841.

Abstract: A fish consumption health advisory has existed for New York Lake Ontario sport-caught fish since 1978. Our study objectives were to evaluate the effectiveness of the advisory for reaching potential target audiences and to identify appropriate advisory content, style, and dissemination methods using a risk communication planning model as an evaluation framework. We used a combination of mail surveys and personal interviews with three target audiences (opinion leaders among recreational anglers and charter boat operators, migrant farm workers, and low-income individuals) and two communicator groups (fishery experts and health care experts). The New York Lake Ontario advisory appeared to be successful in reaching and encouraging risk-mitigating fish consumption behavior in recreational angler opinion leaders and low-income individuals but not in migrant farm workers. The advisory may not be reaching two sensitive subpopulations, women of childbearing age and children. Communicators and target audiences differed in their assessments of important information to include in an advisory. The health advisory could be improved with additional information such as risk-reducing cooking and cleaning methods and by diversifying the dissemination methods to reach the variety of audiences who potentially consume Lake Ontario fish.

49. Verbeke, W., Vanhonacker, F., Frewer, L. J., Sioen, I., De Henauw, S., & Van Camp, J. (2008). Communicating Risks and Benefits from Fish Consumption: Impact on Belgian Consumers' Perception and Intention to Eat Fish. *Risk Anal., 28*(4), 951-967.

Abstract: Communicating about the health effects of fish and seafood may potentially result in a conflict situation: increasing intake is desirable because of health and nutritional benefits, but higher consumption may also lead to an increased intake of potentially harmful environmental contaminants. In order to anticipate the communication challenge this conflict may pose, the research presented here aimed to assess the impact of

risk/benefit communication on Belgian consumers' fish consumption behavior and fish attribute perception. Data were collected in June 2005 from a sample of 381 women, aged between 20 and 50 years. An experimental design consisting of four message conditions (benefit-only; risk-only; benefit-risk; and risk-benefit) combined with three information sources (fish and food industry; consumer organization; government) was used. Exposure to the benefit-only message resulted in an increase from a self-reported fish consumption frequency of 4.2 times per month to an intended fish consumption frequency of 5.1 times per month (+21%), while fish attribute perceptions only marginally improved. The risk-only message resulted in a strong negative perceptual change in the range of two points on a seven-point scale. This translated into an 8% decrease of behavioral intention (from eating fish 4.5 times per month to an intention of eating fish 4.1 times per month). Balanced messages referring to both risks and benefits yielded no significant change in behavioral intention, despite a significant worsening of fish attribute perception. The presentation order of benefits and risks in the balanced message showed a tendency to affect both behavioral intention and attribute perception, with the first message component being most influential. Information source did not yield any significant impact either on behavioral intention or on attribute perceptions, independent of the message content. The results from this study provide valuable insights for future risk/benefit and balanced communication about seafood.

50. Verger, P., Houdary, S., Marette, S., Roosen, J., & Blanchemanche, S. (2007). Impact of a risk-benefit advisory on fish consumption and dietary exposure to methylmercury in France. *Regulatory Toxicology and Pharmacology*, 48, 259-269.

Abstract: We designed the CORAI (COConsumer Risk Advisory Inquiry) study to observe consumer reactions' after an advisory revealing risk of methylmercury contamination together with benefits of Long-Chain Poly Unsaturated Fatty Acids of the n-3 variety (LC n-3 PUFA). The message was very close to the ones commonly delivered by national food agencies and included recommendations for women of childbearing age and children below 15 years old. Two groups of subjects including consumers at risk were selected. Participants recorded the frequency of their fish consumption detailed by species for them and their family over a one-month period one month before, a month immediately after and 3 month after the advisory. Results were compared between consumers receiving the advisory and controls. Results show that the message revelation led to a significant decrease in total fish consumption which is greater for children below 6 years old than for the children between 6 and 15 years old and women. The consumption of the most contaminated fish quoted in the advisory, rarely consumed and poorly known by French consumers did not decrease in any group despite the advice to avoid their consumption. The consumption of other fish products quoted in the advisory but frequently consumed and better known, as canned tuna, did decrease and was a major contributor to the overall reduction of exposure for the advised group. Before the information, about 3% of women of childbearing age are exceeding the PTWI for MeHg and both the average and the high percentiles of the exposure to MeHg are decreasing significantly in the advised group. Regarding the number of subjects of the advised group exceeding the PTWI, they were 6, 3 and 2, respectively, in May, June and September. Accompanying questionnaires show that consumers imperfectly memorize most of the fish species quoted in the recommendation. This paper concludes that consumer advisory, which is a major tool for risk management, has a minimal effect under our experimental conditions to reduce the exposure of groups at risk. Messages to be carried to consumers should be carefully tested for long term memorization in order to become more effective.

51. Westphal, L. M., Longoni, M., LeBlanc, C. L., & Wali, A. (2008). Anglers' appraisals of the risks of eating sport-caught fish from industrial areas: Lessons from Chicago's Calumet region. *Hum Ecol Rev*, 15(1), 46-62.

Abstract: We conducted a participant observation study of recreational fishing in the industrialized Calumet region of northwest Indiana and southeast Chicago to gage the extent of fishing for consumption and to learn about perceptions of the risks of eating contaminated fish. Of the 97 study participants who provided definitive information about their fish consumption habits, 70% reported ever eating fish from Calumet waters. When assessing pollution, anglers relied mainly on their senses, personal experiences, judgment, and/or information from friends, family, and other anglers rather than on written fishing guides, local officials, or the media. When considering consumption risks, they focused on four primary factors: the general environment, water

quality, fish characteristics, and observable human health. Different anglers used different risk assessment cues. There were also differences in risk perceptions and fish consumption patterns across racial-ethnic lines. Finally, we consider the challenges of disseminating risk information to diverse urban populations.

Other Publications:

52. AFS. (2000). *Proceedings of the 1999 American Fisheries Society Forum on Contaminants in Fish*. American Fisheries Society, Bethesda, MD.

Additional info: p.107 The professional judgment of public health communicators is important for designing effective communication programs, but our paramount concern is addressing the needs of the audiences with whom we hope to communicate. The risk communication session of the conference was designed to encourage the exchange of ideas among public health communicators. Lisa Weaver and Richard Brooks presented their communication strategies, summarized below. Their presentations were followed by a question-and-answer session and an open-mike discussion. The purpose of the open forum was to allow exchange of effective communication ideas—what has worked, what has not worked. Some of the risk communication techniques that participants felt worked well are listed below:

- Whenever possible, present the message in a way that provides a solution; for example, “Eat smaller and younger fish”
- Give people information and alternatives from credible sources that they can trust
- Translate the message into terminology that people can understand, and conduct readability testing on your materials
- Make the message vivid using images or promotional materials people will remember and want to talk about

53. Anderson, H. A., Amrhein, J. F., Shubat, p., & Hesse, J. (1993). *Protocol for a uniform Great Lakes sport fish consumption advisory*. Great Lakes Sport Fish Advisory Task Force.

(Cited in report, but not annotated because it does not contain recommendations for effective communication.)

54. Barton, K. (2007). *Hmong water research project: assessing attitudes, perceptions and behavior about water in Minnesota’s Hmong community*. Final report to the Mississippi Watershed Management Organization and City of Minneapolis, Department of Public Works.

Additional info: While the study did not focus on fish consumption advisories, it did focus on a closely related topic – water, with an audience of concern for fish consumption advisory communication.

p. 2 Water education needs to provide basic information about water as well as honor the traditions, mythology and interests of the Hmong community today. Most importantly, information sharing should be primarily oral and visual and presented in a lively, dynamic way by credible sources. Information must accommodate the different communication styles of the five groups within the Hmong community and help participants feel more confident and informed about being in the United States. An education campaign should proceed in cooperation with Hmong community leaders, offering them opportunities and support for major leadership and visibility.

55. Cherney, J. L., & Stewart, N. T. (2011?). *Rhetoric and risk: Analysis of 2010 Michigan fish advisory*. Report prepared for the Michigan Department of Community Health.

Additional info: The report reviews the 2010 Michigan Fish Advisory pointing out concerns and making recommendations for modifications. No specific research was conducted, so the recommendations are the suggestions of the authors, based in part on research by others discussed in the introduction. The main concerns and recommendations are listed below:

II. Concerns

- A. Tension between Risks and Benefits Must be Negotiated
 - 1. Current Language Emphasizes Risks over Benefits
 - 2. Text Conceptually Pairs Risks and Benefits
 - 3. Risks Form the Dominant Narrative
- B. Paternalistic Tone Can Generate Audience Resistance
 - 1. Commanding Tone Can Provoke
 - 2. Reliance on Source Authority Implies Passive Acceptance Is Required
 - 3. Unsolicited Advice Implies Ignorance
 - 4. Images Reinforce Parental Perspective
- C. Some Audiences Appear Privileged
- D. Complex Material Risks Information Overload
- E. Insufficient Information Can Cause Misinterpretation
 - 1. Species Identification Not Facilitated
 - 2. Filet Weights May Not Be Readily Available
 - 3. Eating Restrictions Need Additional Information
 - 4. Examples of Compliance Are Absent
 - 5. Explanation of Size Restrictions Needed
- F. Mixed Messages Can Create Confusion
 - 1. When Is Buying Fish Included?
 - 2. Are There Different Advisories?
 - 3. Which Guideline Should Be Followed?

III. Recommended Criteria for Future Advisories

- A. Avoid pairing benefits and risks
- B. Make benefits the dominant narrative
- C. Make the guidelines into a single set of recommended practices
- D. Consistently employ a variety of communication methods and media
- E. Articulate recommendations instead of commands
- F. Provide a rationale for compliant behavior
- G. Avoid ideological baggage associated with government regulations
- H. Diversify evidence by including anecdotal and testimonial sources

56. Connelly, N. A., Brown, T. L. & Knuth, B. A. (1990). *New York statewide angler survey 1988*. NYS Department of Environmental Conservation, Bureau of Fisheries. 158 pp.

Additional info: p.101 The most common source of information about the advisories was the newspaper, followed by the fishing regulations guide, friends, and magazines, television or radio. Out-of-state anglers relied most heavily on the fishing regulations guide as their source of information...

57. Connelly, N. A., & Knuth, B. A. (1993a). *Great Lakes fish consumption health advisories: angler response to advisories and evaluation of communication techniques*. Human Dimensions Research Unit Publ. 93-3, Dep. Nat. Resour., N.Y.S. Coll. of Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 109pp.

Additional info: p. vii In this study we sought to contact people with Great Lakes fishing experience.

p.viii The majority of respondents who had fished the Great lakes in the preceding five years were aware of the health advisories (83%).... Anglers listed the various states fishing regulations guides and posted warnings as the two most important sources of health advisory information. A plurality of respondents (43% } favored the fishing regulations guide as the best vehicle to get health advisory information to them.

See Connelly and Knuth (1998) for a discussion of effective communication strategies, which are also detailed in this report.

58. Connelly, N. A., Knuth, B. A. & Bisogni, C. A. (1992). *Effects of the health advisory and advisory changes on fishing habits and fish consumption in New York sport fisheries*. Human Dimensions Research Unit Publ. 92-9, Dep. Nat. Resour., N.Y.S. Coll. of Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 120pp.

Additional info: p. viii The purposes of this study were to (1) assess New York licensed angler awareness and knowledge about advisories and contaminants in fish, and fishing and fish-consuming behavior, and (2) identify changes in these factors that have occurred since the explanatory information in the advisory was expanded.

p. ix Use of the Fishing Regulations Guide had increased since 1988, with the Guide the most-used information source in 1991... In many cases, respondents using experts (New York State Department of Environmental Conservation or Department of Health personnel) as an information source were more likely to be correct than respondents using the Guide and any other source of information except experts. The Guide, therefore, appears to be an effective mechanism for educating people about advisories when compared to other information sources such as mass media (e.g., newspapers), but not as effective as personal contact with an advisory expert.

p. xi Of special interest to fishery and public health professionals may be the group of fish consumers eating greater quantities of listed species than recommended in the advisory. These anglers demonstrated the same opinions as other fish consumers regarding the level of concern the general public should feel about health risks from fish consumption, but were less concerned about the risks for themselves and their families than other fish consumers. Weinstein (1989) reported that people tend to be optimistic about hazards judged to be controllable by personal action. Choosing how to catch, clean, cook, and eat sport-caught fish is largely under individual control. To address optimistic biases associated with personal risk, Weinstein (1984) suggested health communications should not only point out risky behaviors, but also stress the link between specific behaviors and susceptibility to the risk.

p.xiv Communication mechanisms should be evaluated for potential improvement, focusing on (1) mass media information changes to improve knowledge among anglers who do not use the Regulations Guide for information, (2) posted warnings to reach potential high-risk anglers such as nonwhite, and low income anglers, and anglers in households with children, and (3) personal contact methods that, in this study, were linked to higher levels of knowledge about the health advisory.

59. Connelly, N. A., Knuth, B. A. & Vena, J. E. (1993b). *New York State angler cohort study: health advisory knowledge and related attitudes and behavior, with a focus on Lake Ontario*. Human Dimensions Research Unit Publ. 93-9, Dep. Nat. Resour., N.Y.S. Coll. of Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 57pp.

Additional info: p. v The focus of this report is on health advisory awareness, knowledge, and associated perceptions and behaviors among the cohort of anglers, who bought a fishing license in a county in close proximity to Lake Ontario, New York.

p. vi Over 90% of respondents were aware of the New York advisory.

p. vii Respondents who were aware of the health advisory cited the Fishing Regulations Guide (82%), newspaper articles (83%) and friends (81%) most frequently as advisory information sources... Overall knowledge was high on questions dealing with the negative health effects of fish consumption (>70% correct), whereas accurate knowledge of the advisory recommendations was generally low (25-53% correct)... Respondents using the Fishing Regulations Guide as a source of information were the most likely to select correct answers for each of the knowledge questions.

p. x Recommendations: 1. Target information to specific audiences of concern. These include groups at potentially increased health risk, such as women of childbearing age, and groups among whom advisory awareness is substantially lower than average, such as women of childbearing age and minority populations. 2. Continue advisory dissemination through the Fishing Regulations Guide but ensure that the Guide includes not only consumption limits but also the related explanations about why the limits are needed and what other behaviors (e.g., fish preparation) can also reduce risk. Female spouses/partners are more likely to keep fish consumption within recommended limits if the male angler is knowledgeable about the specific advisory limits for women of childbearing age. 3. Health advisory communicators should work actively with a variety of dissemination mechanisms, particularly newspapers, television, and radio to reach women and those with lower attained education. 4. Use personal contacts such as trained volunteers at fishing access sites to disseminate health advisory information. 5. Clarify the general consumption recommendations of the health advisory, especially in the Fishing Regulations Guide. In particular the special advice for women of childbearing age as listed in the Fishing Regulations Guide is quite obscure compared to the specific advice in the New York State Department of Health health advisory brochure. 6. Emphasize the potential effects of contaminated fish consumption for women throughout the years of childbearing intention, not only during times of pregnancy, to increase adherence to the advisory recommendations throughout the childbearing years. 7. Continue to emphasize the importance and availability of a variety of risk-reducing behaviors, such as changing locations, species fished for, and methods of preparation.

60. Connelly, N. A., Lauber, T. B., Niederdeppe, J. & Knuth, B. A. (2012). *Factors affecting fish consumption among licensed anglers living in the Great Lakes region*. HDRU Publ. No. 12-3. Dept. of Nat. Resour., N.Y.S. Coll. Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 78 pp.

Additional info: p. i Cornell University's Human Dimensions Research Unit was asked by the Consortium to conduct a survey of anglers living in the Great Lakes states... The specific objectives of the survey were to:

1. Quantify current fish consumption behaviors of anglers (and their household members);
2. Identify the most important factors influencing those behaviors;
3. Assess advisory awareness and general knowledge; and
4. Assess current and preferred sources of advisory-related information.

p. ii Self-reported awareness of purchased fish advisories was lower than awareness of sport-caught fish advisories among licensed anglers (70% vs. 92%). Not all state agencies focus efforts on making anglers aware of purchased fish advisories, perhaps explaining in part the lower level of awareness. Increasing state efforts (either on their own or by partnering with other organizations) to publicize purchased fish advisories may increase awareness above current levels... One key misperception, that may merit communication attention, is the fairly widely held perception that fish contaminated with chemicals will taste odd... Anglers favor receiving information in the fishing regulations guide... The regulations guide typically does not provide a complete listing of all advisory information and recommendations. To address this concern, regulations guides could direct the reader to websites containing more complete information that some anglers (especially those with higher education levels) appear likely to access for advisory information... Most anglers only fished in the state in which they lived. However, some Illinois and Indiana anglers commonly traveled to nearby states, primarily Wisconsin and Michigan, to fish. Consistent advisory messages across states and shared water bodies may be less confusing to anglers, especially those who cross state borders to fish.

p. iii Anglers were more likely to use fish cleaning techniques that reduce possible exposure to some types of

contaminants than risk-reducing cooking techniques... Many anglers believe that the risks are minor and that eating some types of sport-caught fish is fine, but many do not believe that the health benefits outweigh the health risks. Discussing the health benefits of fish consumption is a goal of many of the agencies that issue state fish consumption advisories (Lauber et al. 2011b), but is likely an area that will need additional attention through focused communication strategies. Three-quarters of anglers indicated interest in learning about health benefits from fish consumption. Such a message may also need to be communicated in a way that includes family and friends, whose views are important to anglers.

p. iv Targeting women of childbearing age more directly with fish consumption guidance may be more effective than relying on (mostly male) anglers to transmit this information to women in their households... Anglers with lower education levels - No source of information was favored more by this group; perhaps communication methods other than the standard ones should be considered. This group was more likely to report wanting to do what their family and friends think is best with regard to limiting the amount anglers themselves eat, suggesting communication methods that involve social networks might be effective.

61. Connelly, N. A., Smith, K. K., Lauber, T. B., Niederdeppe, J., & Knuth, B. A. (2013). *Factors Affecting Fish Consumption among New Mothers Living in Minnesota, Pennsylvania, and Wisconsin*. HDRU Publ. 13-01. Dept. of Nat. Resour., N.Y.S. Coll. Agric. and Life Sci., Cornell Univ., Ithaca N.Y. 62pp.

Additional info: p. i Cornell University's Human Dimensions Research Unit conducted a survey of mothers living in three Great Lakes states to better understand factors influencing their fish consumption and suggest ways Great Lakes states could improve their advisory communications to this at-risk group.

The specific objectives of the survey were to:

1. Assess fish consumption behaviors (before, during, and after pregnancy);
2. Identify the most important factors influencing those behaviors;
3. Assess awareness and general knowledge of fish consumption recommendations for women of child-bearing age;
4. Assess use of information sources for fish consumption recommendations; and
5. Assess understanding of terms describing "women of child-bearing age."

p. iii Increase emphasis on eating at least some low-risk fish during pregnancy. It appears that many women are changing their behavior and consuming less fish in general during pregnancy than before. For example, the percent of women who ate sport-caught fish dropped by half during pregnancy compared to before pregnancy. Our recommendation would be to try to change this behavior by focusing messages on eating healthy fish and describing why it is important to eat healthy fish during pregnancy.

Increase emphasis on eating low-risk fish after pregnancy. After giving birth, women's consumption remained the same or increased a little. Again, communicating with women about the benefits of consuming of less-contaminated fish, even while breastfeeding is important.

High-risk commercial species do not require additional emphasis. Consumption of fish that most organizations recommend against eating seems to be very low (i.e., shark, swordfish, tilefish, or king mackerel). Either through awareness from the advisories or lack of access to these species, it appears that agencies need not be concerned about women of child-bearing age having too much exposure to chemical contaminants from these specific species.

Increase availability of fish consumption information for women prior to pregnancy. Half to two-thirds of women had not received information about fish consumption prior to getting pregnant. If a goal of agencies is to make women aware of recommendations before pregnancy, then communication methods in addition to the OB/GYN offices (a primary source during pregnancy) likely will be needed. Perhaps materials at family practice offices or other means of mass media communication will be needed, particularly for those who may not have regular access to medical care.

Continue targeting information to pregnant women; increase emphasis on eating more less-contaminated fish while pregnant. Women received information primarily during pregnancy about the types of fish and how much fish to eat. The three sources of information used most frequently (health care providers, web sites, and health information brochures) were seen by two-thirds of the mothers as being very useful. Awareness and access to information that women find useful is not a concern to be addressed during pregnancy for most women, but rather we suggest that agencies keep doing what they are doing.

Many women are changing their behavior and consuming less fish during pregnancy than before they were pregnant. The women who had received information during their pregnancy were more likely to have decreased their consumption. Those who had not received information during pregnancy were more likely to either eat the same amount during pregnancy as before, or not eat fish to begin with. If the decrease was caused by the message, which seems likely, but cannot be proven using our data, then it appears to be the message, rather than the communication method, that needs to change in order to encourage women to eat more of the less-contaminated species.

Targeted communication methods and messages are needed to reach less-educated women. Women with lower education levels ate less fish, were less likely to have received information about fish consumption, were less knowledgeable, and were less likely to try to follow the recommendations. Access to fish was more of a problem for less-educated women than those with a college degree, both when and when not pregnant. Communication with this group should focus on providing information to increase basic knowledge, but also informing/changing beliefs that consumption of less contaminated fish is good for their health and the health of their baby. Women in this group are less likely to seek out information, so methods of communication must focus on putting information where they are likely to see it. Our study findings also indicate that this group is more likely to contain Hispanic women and thus any materials produced for this group might be produced in Spanish as well as English.

Use the terminology of “women who are or could some day become pregnant” instead of “women of child-bearing age.” When organizations are giving advice to women of child-bearing age they refer to the group using a variety of terms. Respondents to this study thought the descriptor “women who are or could some day become pregnant” was the best term for describing the group. Simply providing an age range did not appear to describe the group for most respondents.

Explain more clearly advice regarding sport-caught fish; don’t assume women know sport-caught fish concepts. Women knew the correct answer to some of the knowledge questions, particularly that children’s health can be harmed more than adults, and that chemical contaminants build up over time, but in many cases they indicated they “didn’t know.” The items that they didn’t know about are more often currently associated with advice for sport-caught fish (i.e., older fish, bigger fish, fish that eat other fish have more contaminants), so increasing knowledge for this part of the message, while important for all women, may be especially important for women eating sport-caught fish because many of them didn’t know the answers either.

The most important health advisory messages appear to be that eating fish is good for you and for your baby, that it is important to eat fish, and that it is important to follow health advisory recommendations. In summary, from our examination of factors influencing women to try to follow the recommendations on fish consumption, the strongest connection was from believing that eating fish was good for you and your baby, to thinking it is important to eat fish, to trying to follow the recommendations. What other people think or do is less important, and access is not generally a constraint. Focusing future messages on the most important factors is most likely to change behavior.

62. Eshenaur, T., McCann, P., & Berglund, M. E. (no date). *Building on existing knowledge: updating Minnesota’s fish consumption educational outreach for the Hmong community.* Minnesota Dept. of Health.

Additional info: p. 3 The goal of this project was to gain information about fish eating practices and communication preferences of the Hmong community living in Ramsey County by learning from the

community and to use this knowledge to guide communication of information on fish consumption advice. Products from this project include: 1. a novel survey method for use with limited English proficiency populations, and, 2. Talk about Eating Fish and Way of Eating Fish, a DVD about mercury in fish in the Hmong language.

p. 4 Health care providers are a key gatekeeper for health information in the Hmong community as they are trusted and respected.

p. 5 Face-to-face communication is clearly preferred. There is a strong sense that full participation of the Hmong community is essential to the success of any efforts to develop new resources.

p. 18 The first draft of the video was developed to address questions and misunderstandings discovered through the listening sessions. The tone of the DVD was conversational and authoritative without being threatening or condescending.

63. Faulds, A., Connelly, N., Knuth, B., Benowitz, J., Matassino, J., & Norton, K. (2004). *Patterns of sport-fish consumption at six Pennsylvania sites along the tidal portion of the Delaware River with special emphasis on shore anglers*. Final Report, Delaware Estuary Fish Consumption Survey, Pennsylvania Coastal Zone Management Program.

Additional info: Personal interviews were conducted with anglers fishing the tidal portion of the Delaware River from six urban sites along the Pennsylvania shoreline....Most of the recreational fishing was catch and release, however, this practice seemed to be based more on a general fear or hearsay rather than on solid understanding of the advisories. Future Action: (1) The production of easy-to-understand printed materials to effectively communicate current Pennsylvania fish consumption advice for the five target ethnicities (Caucasian, Afro American, Vietnamese, Cambodian and Puerto Rican) that will stress the benefits and risks associated with eating locally caught wild fish. The educational message will also stress the types of wild fish that present a lower health risk and ways to fillet and cook fish that reduce fat-soluble contaminants such as PCBs. (2) Media education. Editors of ethnic newsletters and newspapers, which in the Philadelphia region, include El Hispano, La Actualidad, the Philadelphia Tribune, as well as some smaller publications targeting the Asian communities, may benefit from a workshop identifying the risk some members of their community may be facing. Sports editors of larger publications like the Philadelphia Daily News, as well as some recreational magazines, such as the Fly Fisherman and the Pennsylvania Angler and Boater Magazine should also be targeted. (3) Using our community contacts, we plan to develop an on-the-dock and/or indoor cooking program that will demonstrate ways to reduce the level of contaminants when preparing and cooking wild fish. Recipes and samples will also be given away as an attention getter to draw people's attention to the educational message about safe fish consumption practices. One version of the cooking demonstration program could be adapted for a weeklong media event providing the opportunity to educate a variety of audiences at different marinas along the Southeastern Pennsylvania Coastal Zone. (4) We are also evaluating the feasibility of developing other printed communications such as: on-site signage to inform anglers about the fish advisories; Is Seafood Safe? a series of articles and press releases available for syndication in small organizational newsletters; and health care provider brochures available in different languages - one version geared for the health care professional, another geared for the patient. We also envision having a workshop to further the knowledge of the health care providers, particularly those who serve at-risk audiences identified by the 2003 survey.

64. Fischhoff, B., Brewer, N. T., & Downs, J. S. (2011). *Communicating risks and benefits: an evidence-based user's guide*. FDA, US Dept. of Health and Human Services.

Additional info: This is a general reference for risk communication.

p. 4 Three simple goals of risk communication – share information, change beliefs, and change behavior.

p. 41 Useful communication must address the outcomes that interest users... Non-persuasive communications, which make no recommendations, succeed if recipients know enough to choose the option most likely to achieve their goals. Persuasive communications succeed if recipients feel that they are being told to do the things that they would choose, were they fully informed.

p.101 Characteristics of the message, the sender, recipients, channel, and situation can affect how audiences respond. Evaluation is essential to measure success and should be based on the message purpose and the resources available.

p. 129 More than 1,000 studies have documented the problem that most health information, including risk communication, greatly exceeds the comprehension of the average US adult. We describe specific ways to assess text readability and usability and practical steps to make risk communication more understandable, especially by engaging users in its design and testing.

p. 205 Communicators find most success when they shape messages to begin with key information that is relevant for the target audiences. Communicators should use plain language and formats and use pictures and stories to help clarify and reinforce the message for the audience. Communicators should check audience understanding and plan ahead for communicating in times of crisis.

65. Groetsch, K. J., & Manente, S. (2010). *Case studies of community-based fish consumption advisories at three Michigan Great Lakes areas of concern*. Michigan Department of Community Health.

Additional info: p. 1 An audience-oriented communication requires that the characteristics of the audience be incorporated into the communication process. One approach is to work with partners that reside and interact with the target audience. ...The concept is to find local partners that have an interest in community health, local fish consumption, or the water body. Partners that already communicate with the local population on other community issues are important to the CBFCA process. The CBFCA process relies on local partner input for the communication strategy, design of communication materials, and ultimately the implementation of that strategy. The expectation is that people who work with a local population and live in that region will be better able to characterize target audiences, thus making the communication strategy and associated materials more audience-oriented.

66. Knuth, B. A., Connelly, N. A., & Matthews, B. E. (1998). *Children's fishing and fish consumption patterns*. HDRU Publ. No. 98-3. Dept. of Nat. Resour., N.Y.S. Coll. Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 30pp.

Additional info: Conducted a survey of families involved in a youth sport fishing and aquatic resources education program, and had children keep a diary of the fishing activity and fish consumption.

p. vii Although advisory awareness was high, knowledge of specific advice for women of childbearing age and children was lower. More risk communication effort could focus on highlighting information important to certain subgroups (e.g., families with children). The greatest knowledge was associated with use of multiple information sources. Risk communicators could attempt to reach at-risk audiences through multiple channels to maximize the impact of their message. Risk communicators may be able to extend their own efforts by working through "information gatekeepers" such as SAREP, 4-H, Scout, and other youth group leaders to inform children and their families about safe fish consumption.

67. Knuth, B. A., Connelly, N. A., & Shapiro, M. A. (1993). *Angler attitudes and behavior associated with Ohio River health advisories*. Human Dimensions Research Unit Publ. 93-6, Dep. Nat. Resour., N.Y.S. Coll. of Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 163pp.

Additional info: This report presents results from two surveys of anglers with Ohio River fishing experience.

p. x An estimated 83% of anglers (adjusted for nonresponse bias) who had fished the Ohio River in the past five years were aware of the health advisories.

p. xi The most important source of health advisory information and the one used most frequently by respondents (adjusted for nonresponse bias) was the newspaper. Respondents who used the fishing regulations

guide felt most informed about the safety of eating fish (3.6 on a scale of 5); those using friends felt the least informed (3.0). Although newspapers have been noted as a frequently used and important source of information for respondents, when asked about the best way to get information to them a plurality of respondents (43%) said the television or radio would be best.

p. xv Advisory awareness (as percent of respondents aware of advisory) was lowest among anglers purchasing licenses in states using mainly news releases to disseminate advisory information, and highest in those states in which the health advisory is printed in the fishing regulations guide. Although survey respondents did not choose the regulations guide as being the most effective means of communication, they did feel most informed about the safety of eating fish after reading the regulations guide. States should consider the merits of including health advisory information in the fishing regulations guide, as well as in news releases to printed, audio, and video media. Newspapers and posted warnings appeared to be particularly important in urban areas... The listed-species consumers also appeared to be more committed to fish consumption as an important lifestyle activity. Agencies should therefore consider emphasizing the importance of using risk-reducing cleaning techniques especially if anglers do not reduce fish consumption to recommended levels, because some anglers will be unwilling to forego fish consumption altogether. Further, because respondents listed more thoughts soon after advisories were issued than later in the year, advisory reminders later in the fishing season or posted at fishing areas may help anglers think more about the advisories.

p.xvii A substantial portion of respondents indicated they felt they had insufficient information in the advisory to choose safer alternatives (e.g., safer fishing locations, types or sizes of fish with less contaminants, risk-reducing fish preparation methods). Although such information can be included in detail in news releases, it is limited in extent in the advisory news releases currently used by agencies. Further, agencies have little control over what the media chooses to include in articles or broadcasts stemming from the news release. The fishing regulations guide provides a more certain vehicle for including detailed advice about contaminant levels at different locations, species and sizes of fish less-affected by contaminants, and risk-reducing fish preparation methods.

68. Lauber, T.B., Connelly, N. A., Knuth, B. A. & Niederdeppe, J. (2011). *Factors influencing fish consumption in key audiences in the Great Lakes region*. HDRU Publ. No. 11-8. Dept. of Nat. Resour., N.Y.S. Coll. Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 65 pp.

Additional info: p. i As part of this work, Cornell University's Human Dimensions Research Unit conducted a series of focus groups with key audiences of fish consumption health advisories. The purpose of these focus groups was to identify factors that influence consumption of fish in each target audience.

p. ii Focus groups with women of childbearing age. Although many focus group participants recognized that women needed to reduce their exposure to contaminants in fish more than men, considerable uncertainty existed about which types of women needed to reduce their exposure: pregnant women, women actively trying to become pregnant, all sexually mature girls and women, or all girls and women who might become pregnant in the future... Many women held misconceptions about how to judge whether or not fish were safe to eat... Women varied widely with regard to how much information they wanted about the health risks and benefits of fish consumption. Most expressed a preference for clear, simple messages presented in ways that they would not be able to miss, in the course of their routine media exposure or daily routines... Some women expressed a strong preference for information that was specific to the particular areas in which they lived and fished, disregarding information that seemed designed to apply across broader regions... The term "sport-caught fish" was widely interpreted to apply only to those fish that were valued game or trophy fish (rather than any caught fish)... Because an apparent majority of women are not inclined to seek out advisory information, being proactive about the distribution of advisory information could be beneficial.

p. iii Focus groups with urban anglers. Some at-risk urban audiences, such as immigrant groups and low income anglers, may be easiest to reach through community-based communication programs conducted in partnership with local organizations...Because some urban anglers may not have any choice but to eat fish, focusing advisories on communicating risk-reduction strategies may be worthwhile...Since warnings about fish consumption risks discourage some anglers from eating fish at all, positive advisory messages that

encourage them to eat particular species may make it more likely that they will get the health benefits of fish consumption...Because certain misconceptions are common about which factors influence whether or not fish are safe to consume, developing advisory materials that identify and refute these misconceptions could be helpful.

69. Lauber, T.B., Niederdeppe, J., Connelly, N. A., & Knuth, B. A. (2013). *Fish consumption advisory interpretation by key audiences in the Great Lakes region*. HDRU Publ. No. 13-X. Dept. of Nat. Resour., N.Y.S. Coll. Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. XX pp.

Additional info: p. i The Consortium worked with Cornell University's Human Dimensions Research Unit on a series of focus groups to determine how key audiences would interpret and respond to different fish consumption advisory materials. The audiences of interest were women of childbearing age and urban/Areas of Concern (AOC) anglers.

p. ii Women viewed statements that described characteristics of fish that were not shared by many other foods as persuasive. They found statements about protein and, particularly, omega-3 fatty acids in fish to be more persuasive than general statements about vitamins and minerals.

Women found statements about particular health benefits that could be attributed to omega-3 fatty acids most influential. These statements provided the most concrete information about why they should continue to eat fish.

As with the women of childbearing age, urban/AOC anglers preferred succinct statements.

Statements that pointed out contaminants could be present in fish, bodies of water, and people who consume fish without the anglers being able to detect these contaminants captured participants' attention.

Focus group participants from both audiences almost universally considered the point system (second format) the most clear and easy to use. The other approaches had too much ambiguity and could be misinterpreted.

When general statements were made about criteria to consider when choosing fish, many participants wanted those statements paired with more specific follow up information. In particular, when participants read statements about some species of fish or bodies of water being more affected by contaminants than others, they wanted specific information about *which* fish and *which* bodies of water.

A number of phrases used in the materials were unclear to many focus group participants, although experienced anglers were more likely to understand some of these phrases than novices or non-anglers. The terms and phrases most likely to cause confusion were:

"Eat a variety."

"Fish that eat other fish."

"Smaller, younger fish" vs. "Larger, older fish"

Terms to describe "women of childbearing age" as a target audience also either raised many questions or were misunderstood. Of all terms discussed during the groups, the one most likely to be understood as intended was "women who might become pregnant."

70. McCann, P. J., Anderson, H. A., & G. L. S. F. Consortium. (2007). *A protocol for mercury-based fish consumption advice: an addendum to the 1993 "Protocol for a uniform Great Lakes sport fish consumption advisory"*. Great Lakes Sport Fish Advisory Task Force.

(Cited in report, but not annotated because it does not contain recommendations for effective communication.)

71. McCann, P. (no date). *Focus group comparisons*.

Additional info: p. 1 Focus groups were conducted with African-American, Native American, and Hispanic/Latino anglers.

p.2 Means to connect:

- Simple, easy-to-understand communications, less “policy language,” more images to convey messages (see highlighted sections of attached article—which is focused on communicating about fisheries advisories, but has key points about effective communications with minority groups)
- More personal connections (to Twin Cities Native American organizations to get “word of mouth” communication about FIN programs going; to African-American groups to get programs going)
- Understand the unique challenges Hispanics/Latinos face in buying a license... identification issues, language barriers. Ways to allow purchase of license without official state identification? Spanish language materials?
- Programs to address safety concerns related to water... water based programs that incorporate swimming and fishing (work with YMCAs?)
- Expense, transportation/access, racial biases are issue—programs that take groups out and provide equipment, transportation, and a group setting might help?

72. Minnesota Department of Health (MDH). (2012). *Fish consumption and fish advisory awareness among Minnesota women who recently gave birth*. Minnesota Dept. of Health.

Summary: The Minnesota Department of Health (MDH) conducted a mail survey of Minnesota women to assess their fish consumption during pregnancy, awareness of health guidelines for eating fish, and familiarity with MDH outreach materials... Thirty-nine percent of respondents had seen at least one of two MDH fish advisory brochures (Moms’ Guide or Eat Fish Guide). Knowledge of mercury in fish (mercury levels are higher in older fish, carnivorous fish, and in the flesh of the fish) was significantly greater among women who had seen the brochures. Respondents were least knowledgeable about the part of fish containing the highest level of mercury, with only 10% correctly identifying higher levels of mercury in the flesh versus other parts of the fish... The majority of respondents (62%) reported knowing at least “a little” about the guidelines for eating sport-caught fish. Knowledge about MDH guidelines for eating sport fish was significantly higher among sport fish consumers and those who had seen MDH advisory brochures. Respondents reported having modified their fish consumption after they had become aware of the issues associated with mercury in fish. The most common dietary change among these respondents was to reduce their fish consumption. However, women who had seen the “Moms’ Guide” were significantly more likely to modify their diet by eating different types of fish than those who had not seen it.

Additional info: p. 11 In general, the distribution of advisory outreach materials, most commonly by OB/GYNs, appears successful at raising awareness among pregnant women.... It may help to separate the advice by contaminant when it is different (Anderson et al. 2004).

p. 12 One notable finding is that only one respondent in this survey reported eating one of the four commercial fish species listed in the brochure’s “Do not eat” list for pregnant women (i.e., shark, swordfish, tile fish, and king mackerel). That respondent reported that she had stopped eating swordfish when she learned about its high mercury content. Future outreach efforts in Minnesota should perhaps focus more intensely on more commonly consumed fish containing “low” and “moderate” levels of methyl mercury. For example, this survey supports the popularity of canned tuna among women (78% of fish consumers) and highlights the need for education among women of childbearing age on guidelines for safe tuna consumption (type, frequency).

p. 13 Considering that most pregnant women in this survey ate only a modest quantity of fish and one-third modified their diet by eating less fish, emphasis should be placed on helping women to understand the benefits of eating fish and to manage proper choice of fish.

73. OpinionWorks. (2012). *Addressing the risk: understanding and changing anglers’ attitudes about the dangers of consuming Anacostia River fish*.

Additional info: p. 5 This study was designed to create an accurate picture of Anacostia River anglers through field interviews, to explore their views in-depth through qualitative interviewing, and to assess the broader community's experience through a representative survey.

p. 4 While it may not be surprising that contaminated fish are being shared in the community, the extent and ingrained culture of sharing fish are surprising. The partners to this study will use its findings to create and implement a public awareness campaign, targeted and framed as effectively as possible, to lessen the problem of contaminated fish consumption. More challenging, this report identifies a complex, interlocking set of factors that must be addressed together to lessen the consumption of contaminated fish. As an outcome, the sponsors and advisors of this study hope to engage leaders and citizens of the broader community in a discussion that will address not just fishing, but the long-term and sometimes difficult challenges of clean water, human health, and food security, as well. In the end, this is social marketing research. The observations made in this report are based on the perceptions and attitudes of the angler audience. This research is designed to learn how the audience makes decisions about fish consumption, and what information might move them to think and act differently. Sometimes, the needs and perceptions of the audience do not square with established science, or the expectations of advocates and experts. While this report may call into question well established practices used to communicate health risks, it offers new approaches that will be received more readily by the audience.

p. 6 This research study shows poor and inconsistent knowledge among anglers and the broader community about the health risks of consuming fish from the Anacostia River. This study also uncovers widespread sharing of fish, exposing many people to unseen contaminants. The study leads us to these major recommendations: Those communications must come through multiple channels. Any outreach must be multilingual. Communicators must be aware of those misconceptions and address them. An outreach campaign should take advantage of that natural tendency to socialize, delivering messages through trusted peers, friends, and experts in a comfortable setting where anglers come together to talk about fishing. The campaign should consider organizing or encouraging events such as catch-and-release tournaments, and using these events to educate the public. This audience is primarily visually oriented. Text-heavy signs, ads, or posters will have limited impact, and this research shows that the intended meaning is sometimes completely lost. In designing communications, the greatest emphasis should be placed on the symbols and images that are chosen, as that is where the audience will tend to look first. Text that is included must be concise and direct. Measured or equivocal messaging is ineffective. For example, based on this qualitative research a "Warning" is much stronger than an "Advisory," which anglers said enables them to rely on their own judgment in assessing the risk. Similarly, being told that small portion sizes or less-frequent consumption are acceptable allowed the anglers in this study to rationalize that their own consumption falls within acceptable bounds, even if it falls outside the stated limits. Based on this research, definitive no-consumption guidelines may be more effective in bringing about change in many anglers' behavior. In a related idea, anglers insist that the health message must be stark and arresting to break through to them.

74. USEPA. (2001). *Proceedings of the National Risk Communication Conference*. USEPA, Chicago, IL.

Additional info: From the Proceedings Summary (p. I-6) - Determining what your audience wants to know. Recommendations of the five topic sessions include the following:

1. **Women's Health Issues—Pregnant, Nursing, Childbearing Age.** Go to community organizations and leaders as well as health care providers to better understand the information needs of women and how to best reach women. Include women in the communication process and test messages and evaluate success throughout.
2. **Cultural/Traditional or Geographically Isolated Subsistence Fishers, Including Native Americans.** Communicators must spend time with tribal communities; government-to-government relationships must be developed with tribes; and the social, cultural, spiritual, as well as nutritional benefits of fish and native diets and the need for replacement protein must be addressed in communicating fish advisory information. Messages that emphasize options and choices are better received than the "do not eat" message. In addition,

fish advisories are not a substitute for reducing toxic discharges or removing existing contaminants from the environment.

3. **Fish Eaters Whose Native Language Is Not English.** Involve and use community-based organizations to build trust, understand the community, and carry out a communication plan. Each ethnic group may learn and communicate differently. An important research effort is to understand each community's risk perception, customs, traditions, and practices.

4. **Economically Dependent Fish Eaters—Urban and Rural Poor.** Involve and use leaders within the community targeted for a communication project. Use positive messages that emphasize options and choices rather than the “do not eat” message.

5. **General Population Sport Anglers.** Provide anglers with core information on advisories, but also let them know where to find in-depth information. Focus messages on family members and friends as well as the angler. Include a range of healthy choices to reduce exposure, and research the health benefits of eating fish and the safety of alternatives to eating fish.

75. Williamson, J. Y. (2007). *An evaluation of best practices for effective public outreach in government-issued methylmercury fish consumption advisories*. M.S. Thesis, Cornell University, Ithaca, NY.

Abstract: Over the last two decades, the United States government agencies responsible for public health have expressed a desire for more research on how to improve risk communication within state and federal fish advisory programs. This charge to risk communication researchers led to the development of a variety of best practices that offer potential solutions to many of the major barriers to effective public outreach. However, numerous studies suggest that government agencies have been resistant to adopting the targeted, interactive risk communication strategies proposed by researchers and that these best practices may have a limited impact in shaping government policy. To date, little is known about the degree to which best practices from the risk communication literature are present in government-issued fish consumption advisories. Further, some health and environmental agencies have expressed that they would be more amenable to adopting the recommendations of risk communication researchers if they were practical and accessible. In order to address these issues, a list of 125 best practices for effective advisory design were compiled from the risk communication literature and adapted into a practical coding scheme that was used to evaluate a sample of 221 government-issued methylmercury advisories. The results of this evaluation revealed a series of gaps between risk communication research and agency practice that are largely driven by conflicting objectives and the inability of many risk communication studies to adequately define effective risk communication. Evaluation is discussed as a means to strengthen ties between risk communication researchers and agency fish advisory programs. Moreover, connections are drawn between the findings of this study and other risk contexts, raising the possibility that the outsider status of risk communication researchers is less problematic than originally thought.

Additional info: p. 12 is effective risk communication defined by the transfer of knowledge, persuasion, or public engagement? Should the advisory result in a compliant public, an informed public, or an empowered public?

p. 14 One important barrier to effective risk communication that has received little exploration is the resistance of government agencies to adopt the recommendations of risk communication researchers when communicating with public audiences. As discussed by Chess, Burger & McDermott (2005), this issue is particularly salient in fish advisory programs.

p. 17 According to the USEPA (1995), fish advisory programs attempting to design an effective risk communication strategy should consider three primary factors: 1) style; 2) content; and 3) dissemination. Each of these factors is characterized by key considerations that have been examined in the risk communication literature.

p.20 a best practice was defined as a message design concept, strategy or technique pertinent to the design of fish consumption advisories that was recommended by a credible source as a means to improve risk communication.

List of Best Practices:

STYLE

Format

Visuals & Text

1. Use a combination of visuals and text-- use clear and simple visuals (including graphs, tables, and diagrams) to capture audience attention and complement the text; also, use the text to explain the visuals.

Visual Clarity

2. Use pictures and icons to show how contaminants accumulate in humans and fish.

3. Show the fish species under advisory and label the fish that are safe and are not safe to eat

4. A stoplight approach (i.e., green=safe, yellow=caution; red=do not eat) is effective especially for audiences who do not speak or read English.

5. Use a scorecard approach to highlight safe vs. unsafe fish species, sizes or locations.

6. A thermometer approach is useful for highlighting safe vs. unsafe fish species.

7. Include pictures of the fish species the advisory pertains to.

8. Use detailed maps that highlight the different waterbodies under advisory--this approach is also effective when the advisory is intended to show target audiences safer locations to fish.

9. Use advisory tables to highlight fish consumption advice.

Simple vs. Complex Messages

10. Both simple, explanatory messages and more detailed, technical/prescriptive messages are needed to address the information needs of diverse target populations.

11. When dealing with different audiences, messages must be presented in a range of formats from simple to complex.

12. Use simple, nontechnical language in explanatory messages; avoid unnecessary jargon and relate technical terms to common sense concepts.

Production Quality

13. The message must look professional.

14. The format must be appropriate for the intended dissemination medium

15. The message must be translated into terminology that the target audience can understand

Tone

Commanding vs. Cajoling

16. Use a cajoling rather than a commanding tone.

Positive

17. The text should be positive and upbeat.

18. The message should avoid arousing fear and anxiety.

19. Benefits should be used to discourage over-reaction to the risk.

20. Avoid distant, abstract, and unfeeling language.

21. The message should emphasize the value/importance of fishing

Qualitative vs. Quantitative Risk Comparisons

22. Present a combination of qualitative and quantitative risk information (e.g., severity of comparative risks, degree of contaminant exposure in fish species).

23. Provide a qualitative list of specific health risks and benefits to help consumers to determine how acceptable the risk is to them.

24. Quantitate risks and benefits--how many fish meals can an individual safely consume and still obtain the benefits of fish consumption?

Reading Level

25. Target the reading level of the message to the reading abilities of the target audience; conduct readability tests and adapt messages accordingly

CONTENT

26. The challenge to risk communicator is to develop health advisory content so that it is relevant to the variety of target audiences who will be reached and characterized by clarity, balance, and accuracy.

27. The content of the message should contain the following information: 1) on the nature of the risk; 2) on the nature of the benefits that might be changes if risk were reduced; 3) on the available alternatives; 4) on uncertainty in knowledge about risks and benefits; and 5) on management issues.

Encouraging Audience Involvement

28. Encourage public involvement in risk assessment and/or risk management activities whenever possible and as early as possible.

29. Request input and feedback from the target audience to evaluate the effectiveness of different types of messages; good evaluations must occur throughout the advisory program.

30. Develop mechanisms to involve individuals potentially at risk who are not typically involved in the decision- making process.

31. When discussion risk issues with the public, it is better to emphasize small, informal meeting (e.g., interviews and focus groups) rather than large formal ones such as public hearings.

32. Encourage target audiences to support advisory programs or take action to clean up or stop pollution in local waters.

33. Encourage shared ownership of fish consumption issues--build partnerships with diverse at-risk communities and other relevant stakeholders by engaging them in the risk assessment, management, and communication processes.

34. Encourage a two-way dialogue with target audiences--initiate contact, rather than waiting to respond to requests.

Information-Seeking

35. Encourage the audience to engage in information-seeking behavior (e.g., redirect information or links on the internet)

36. Initiate contact with target audiences--ask them to contact advisory programs with questions or concerns, and provide timely responses that express interest and understanding.

37. Make use of community healthcare organizations as a source of advisory information—establish partnerships with these organizations and encourage audiences to contact their healthcare providers for advisory information.

Core Recommendations

38. The key message to get across to consumers is that fish is part of a well-balanced, healthy diet if consumed in moderation.

39. Exposure information is best expressed in terms of meal limits per time period.

40. Describe the desired behaviors (i.e., practical strategies to reduce risk) in a clear and unambiguous manner.

41. Make it clear that advisory messages are not intended to provide an acceptable solution to pollution.

42. Provide information about the fish species that are both high and low in mercury with corresponding risk estimates.

43. Distinguish between mercury levels in store-bought vs. commercial fish species in advisories.

44. Present the site-specific locations of the fish species under advisory.

45. Discuss behavioral issues such as how to buy, store, and cook fish, as well as which fish to eat at restaurants.

Alternatives

46. Give people a sense of personal control and personal choice. Whenever possible, present the message in a way that provides solutions--present concrete actions that people can take to minimize risks and maximize benefits. Requests for behavior change should be simple, easy, convenient, and understandable, not difficult.

47. Encourage the audience to choose fish low in mercury: 1) eat smaller and younger fish; 2) avoid fish that are high on the food chain (e.g., shark, tuna, swordfish).

48. Identify "safer" fish species, fish sizes, or fishing locations.

49. Promote catch and release fishing.

50. Encourage the audience to eat a variety of fish species from less contaminated waters.

51. Identify a variety of alternative protein sources, including foods that are accessible and affordable for low income individuals.

Health Effects

52. Provide information on a holistic approach to diet including the risks and benefits of fishing and fish consumption

High Risk Groups

53. Be clear who is most at risk, who is least at risk, and why.

54. Identify worst-case scenarios and identify a range of health estimates when applicable.

Severity

55. Address key risk perception factors in the message, including: 1) the likelihood people will become ill; 2) and the immediacy of the risks of fish consumption.

Health Risks

54. Describe the potential adverse health effects of consuming fish contaminated with methylmercury for adults, children, and/or unborn children.

55. Describe how health risks are likely to change as more or less fish are consumed.

56. Explain how mercury can affect fetuses, infants, and young children

57. Explain mercury is retained in the body for a long time and that mercury consumed now will be in the body 10 or 20 years later.

58. Explain how mercury accumulates in humans and fish.

59. Explain how mercury is transferred from mother to fetus (placenta) and from mother to infant (breast milk).

Health Benefits

60. Explain the main health benefits of eating fish: 1) high protein; 2) low fat; 3) cardiovascular benefits (low cholesterol, omega-3 fatty acids); 4) and fetal development benefits (omega-3 fatty acids).

Contaminant Description

61. Describe the nature of the contaminant and how it accumulates in fish tissue and the environment.

62. Be clear that mercury is not visible to the naked eye—it cannot be seen, smelled, or tasted.

63. State that mercury concentrates in the muscle tissue of fish and cannot be significantly reduced through cooking or cleaning.

Comparisons

64. Compare the risks of fish consumption with other health risks.

65. Compare the risks of fish consumption with other dietary health risks, including other protein sources.

66. Compare the risks of fish consumption with other voluntary health risks such as driving, drinking, and smoking.

67. Compare the risks and benefits of fishing and fish consumption.

68. Compare the benefits of fish consumption with other dietary health risks, including other protein sources.

68. Present a range of risk-benefit estimates (e.g., comparing estimates for different species, sizes, and/or fishing locations) and enable target audiences to select acceptable substitutions for themselves.

69. Consider context when communicating risk-benefit information--especially to populations with no alternatives. Clearly identify goals of what the target audience should do.

70. Avoid comparing voluntary and involuntary risks.

71. Use risk comparisons only if :1) they are targeted to a specific audience; 2) they take into account target audience needs, concerns, and levels of knowledge; 3)they are specific in their intent; 4) they acknowledge and discuss all assumptions and uncertainties in the calculation of comparative data and caution against drawing unwarranted conclusions; 5) they present different measures of risk to illustrate the effects of alternative ways of expressing comparative risk data; 6) they are targeted to substances, products, or activities that are similar or related; 7) they respect distinctions that people consider important in evaluating risks; and 8) they do not attempt to preempt or prejudice decisions by individuals and communities about the acceptability of the risk being compared.

Uncertainty

72. Be open and honest with the target audience--explain the risk assessment (e.g., dose/response models, body weight, meal size, fish sampling procedures) and risk management (e.g., social and economic considerations, conservative Rfd estimates) assumptions and uncertainties that form the basis for issuing advisories.

73. Discuss data strengths, weaknesses, and uncertainties.

74. Admit mistakes.

75. Tell people what you can and cannot do and why.

76. To avoid misunderstanding, the limits of participation should be made known to the target audience from the outset.

77. Acknowledge that advisories are subject to change and interpretation.

Balance

78. Present a fair and balanced message that offers different perspectives on the fish consumption issue (e.g., risks and benefits; pros and cons of different risk assessment and/or risk management assumptions).

Personalizing the Message

79. Tailor the fish consumption recommendations to address the information needs, risk perceptions, and concerns of the target audience.
80. Discuss the health characteristics, nutritional choices, and fish consumption patterns of the target audience and how they relate to advisory recommendations
81. The message should be presented by credible, trustworthy sources who adequately allow audiences to make a choices among alternatives.
82. Use vivid metaphors and similes that directly apply to the circumstances of the target audiences.
83. For women, be sure to convey the health benefits of fish consumption, especially during pregnancy; also convey that the benefits of nursing outweigh the risks and that women should limit fish consumption but continue breastfeeding.
84. Develop the message recognizing the political, economic, and cultural context.
85. Target the audiences most at risk (e.g., pregnant women, subsistence anglers) with messages that address their needs and concerns.
86. Agencies should separate the activity of fishing from the risk of fish consumption when communicating with fishermen.
87. Describe what agency efforts are being made to solve the contamination problem.
88. Address if/when fish from contaminated bodies of water will ever be safe to eat.

Cultural Sensitivity

89. Tailor the message so that it is socially/culturally relevant to the target audience.
90. Communicate with target audiences in their native language; bilingual messages can also be appropriate, especially when communicating with immigrants and their English-speaking children.
91. Use visual-oriented messages with minimal explanatory text, preferably in the audience's native language, to communicate with communities who do not speak or read English.
92. Many people need to eat fish (e.g., Native Americans, subsistence anglers). Don't tell them that they can't eat fish; say what is being done to solve the problem and what people can do to reduce risk.
93. When communicating with targeted ethnic/cultural groups, discuss fish consumption recommendations within the context of the norms, traditions, practices, and customs related to fishing and fish consumption that the audience is familiar with.
94. For Native American communities, explain that contaminants in fish do not necessarily indicate a larger imbalance in the ecosystem.
95. Be sure to target communities as discrete populations--don't generalize.
96. Mention that contaminants in fish are not visible to the naked eye—they cannot be seen, smelled, or tasted.
97. Relevant cultural factors to discuss in advisory messages: 1) the importance of fish and fish consumption for local communities, either economically or for social networks; 2) the importance of fish in the diet, either as a convenient and inexpensive protein source, or for religious and spiritual significance; 3) the relationship of the agency with the target community, including the degree of trust and credibility in agencies; 4) the relationship of the polluter or chemicals of concern to the local community.

DISSEMINATION

Multiple Channels

98. Increase effectiveness of advisory messages by using multiple dissemination channels that target subpopulations who may not have access to traditional channels used by government.
99. Deliver advisory messages in the preferred communication style(s) of the target audience.

Consistency/Uniformity

100. Work with other agencies, interpersonal contacts, and the mass media to ensure that target audiences are receiving consistent, unified messages--not mixed messages.

Mass Media

101. Adapt the message to meet the needs of the mass media; ensure press releases are uncomplicated, interesting, and accurate.
102. Mass media (e.g., television, radio, newspapers) are effective resources for informing large and diverse audiences; but the message(s) must address audience needs and concerns.
103. Television, newspaper, magazines, and radio are important sources of information for fish consumers; risk communicators must use these media to inform anglers of fish consumption guidelines and information.

Specialized Media

104. Specialized media should be designed and disseminated to reach targeted demographics, with the needs and abilities of the target audience in mind.

105. Water-body specific media should be used to highlight the characteristics of particular fisheries and the advisories for those locations.

106. Newsletters are effective in developing ongoing relationships with target audiences and can be effective in reaching opinion leaders such as health practitioners.

107. Fact sheets should be used to target specific components of advisory programs in detail that may be of interest to audiences seeking more information, but are not as effective for general distribution.

108. Posters are effective advertising tools for alerting audiences about advisory programs or advisory warnings.

109. Postcards are an effective way to make additional outreach materials available to target audiences.

110. Post mercury warning signs in supermarkets to inform customers.

Interpersonal Contacts

111. An audience-oriented risk communication program will require a variety of dissemination techniques in addition to written outreach materials.

112. Ensure the sender(s), messages, and dissemination channels and media are credible to target audiences.

113. Especially for low income groups and ethnic minorities, build partnerships with opinion leaders and credible community members that target audience(s) trust; train them to support and reinforce advisory messages.

114. Educate at-risk audiences and ask them to pass advisory information to their friends and family.

115. To get the message across to women and children, integrate advisory information into the science curriculum at elementary, junior high, and high schools.

116. Teach classroom lessons that target particular audiences and address their needs and concerns.

Web-Based

117. Use web sites to provide target audiences with user-friendly access to a wide variety of outreach materials that address their needs.

118. Icons of fish or maps are good ways to steer individuals to additional information.

119. An internet clearinghouse of available advisories and publications would help increase accessibility to advisory materials.

120. Use new technologies for citizen involvement (e.g., interactive software, electronic town meetings, bulletin boards, email).

One Message vs. Many Messages

121. If using one message, ensure the message is appropriate for all audiences under consideration.

122. If there is one message, it needs to push people to find out more.

123. A single outreach material should focus on a small number of message components/ themes in order to optimize message comprehension.

124. Different media are needed that range from simple to complex, site-specific to geographically generalized.

125. Redundancy helps get the message out. Reinforce messages several times by presenting them in several formats.

Presentations:

76. Anderson, H., Knobeloch, L., Imm, P., & Schrank, C. (2012). *Enhancing Wisconsin's fish advisory program: emerging chemicals, angler awareness, exposure, health status and outreach*. Presentation for the Great Lakes Consortium Fish Consumption Advisory Enhancement Project.

Summary: Conducted an on-line survey of men aged 50 or older who live and fish in Wisconsin. Most common sources of advisory information:

- Fishing regulation guide provided with license – 73%
- DNR website and publications (refers to any materials published by this agency) – 65%
- Warning signs posted along the lakes and rivers they fish – 60%

One of the least common responses:

- Health care provider – 4%

In the future suggest continuing improvements in communication methods using social media and interactive web programs, and target ways in which to steer anglers and fish consumers towards these websites, online programs and similar messaging.

77. Bradbard, S. (2007). *Awareness of mercury among pregnant women (EPA/FDA National Study)*. Proceedings of the 2007 National Forum on Contaminants in Fish. USEPA, Washington, DC.

Abstract: In 2004, the U.S. Food and Drug Administration (FDA) and the U.S. Environmental Protection Agency (EPA) released a joint advisory addressing methylmercury in seafood. The advisory provided pregnant women, nursing mothers, women of child-bearing age, and caregivers for young children with recommendations for consumption of commercial and wild-caught fish. FDA and EPA collaborated to assess the impact of the advisory on consumers' awareness and understanding and reported behaviors related to the information found in the advisory. A mail survey of almost 5,000 women in their seventh month of pregnancy found that approximately two-thirds of them were aware of mercury as a problem in food and that more than 80% of those were aware linked the problem to fish. Younger pregnant women (ages 18–24 years) were less likely to have heard of this problem than any older group of women. Black and Hispanic women and those women with less education and lower income were less aware of this problem. Also, WIC participants were less likely to be aware of this problem than were non-participants. Eighty percent of the pregnant women in the sample reported not eating swordfish, shark, tilefish, or king mackerel before or during their pregnancy. An additional 13% said they ate less of these fish during their pregnancies. Among those women who reported reducing their consumption of fish, more than 75% said the reason was that it may harm their babies.

Additional info: Pregnant women most frequently rely on a health professional for information about their diet or about feeding their babies. While they also get information from websites, they rarely look at government sites.

78. Carr, L. & McBride, D. (2009). *Washington State's fish advisories and the healthy fish guide*. USEPA National Forum on Contaminants in Fish.

Summary: Conducted a pilot study using materials to encourage consumption of safe, commercially-caught fish. Displayed material in grocery stores. Surprised grocery stores were willing to display materials. Surveyed consumers in the store. More than half noticed material. 26% said material helped them with their choice. Felt it was a worthwhile program to expand.

79. Corey, F. (2007). *Aroostook Band of Micmacs: fish consumption advisory issues*. Proceedings of the 2007 National Forum on Contaminants in Fish. USEPA, Washington, DC.

Abstract: The Aroostook Band of Micmacs and the State of Maine have implemented statewide fish consumption advisories due to the presence of chemical contaminants in fish tissue. As a result of the changes to Tribal lifestyles and diets caused by these contaminants and the general depletion of Maine's natural resources, the incidence of diabetes, obesity, cardiovascular disease, and other related diseases has skyrocketed in the Micmac Tribal community. The Aroostook Band of Micmacs' health program is working to counter these health problems by counseling the Tribal community to avoid fatty foods; consume leaner sources of protein, such as fish; and to exercise regularly; however, this message is being compromised by the existing fish consumption advisories. To avoid sending mixed messages about the risks and benefits of consuming fish, environmental and public health experts must coordinate their efforts to ensure effective risk communication to the public. In addition, the associated benefits of fishing and consuming fish, such as the exercise opportunities afforded by fishing, the family activity benefits, and the importance of maintaining and

practicing ancient Tribal cultural practices associated with fishing, must all be considered when evaluating and communicating risk to the public.

80. Davidson, M. L. (2004). *Overview of focus groups*. 2004 National Forum on Contaminants in Fish.

Summary: Conducted focus groups to examine risk communication formats and gauge consumer response to the mercury consumer advisory for women of childbearing age. Found most people want a simple message. Some people want more information. Concern about the “spillover effect” – if fish can be risky for pregnant women, it probably isn’t good for other people.

81. Fung, M. (2009). *Communicating fish advisories to the Chinese-Canadian community*. USEPA National Forum on Contaminants in Fish.

Summary: Conducted focus groups with Chinese-Canadian women who were pregnant to find out information needs and the best communication methods. Recommended translating information into Chinese, list information for the fish most commonly consumed by Chinese-Canadians, label fish in English and Chinese, use visuals, and make text short and concise. Communicate through the Internet, grocery stores, and physician’s offices.

82. Ha, C. N. (2009). *Exploring the potential of a point system for communicating fish consumption guidance*. USEPA National Forum on Contaminants in Fish.

Summary: Conducted focus groups with women of childbearing age in an urban area of Alaska. Compared fish consumption guidelines presented as a “point system” versus a “reverse pyramid.” Women preferred the “point system” because it was clearer and easier to understand, and similar to Weight Watchers. In the reverse pyramid the “ORs” were confusing. Indicated point system has potential, but sample sizes were small and audience limited.

83. Hockett, K. (2005). *Fish consumption patterns and advisory awareness among Baltimore Harbor anglers*. Proceedings of the 2005 National Forum on Contaminants in Fish. USEPA, Washington, DC.

Additional info: The Conservation Management Institute at Virginia Tech received a grant from the Chesapeake Bay Program (CBP): (1) to identify populations at risk for consuming contaminated self-caught fish, and (2) to examine the fish consumption advisories and protocols to identify possible improvements. We conducted 8 weeks of onsite angler interviews in the three regions of concern: Baltimore, MD; Washington, DC; and the Tidewater area of Virginia. This presentation focuses on the results from the Baltimore Harbor and adjacent waterways, where we conducted a total of 135 interviews between early June and mid-August 2004... However, compliance—the real crux of the issue—is still a challenge. We offer some suggestions for addressing this problem that emerged from our research, including additional research avenues as well as possible shifts in message format (simplification) and communication modes (onsite and interpersonal).

84. Michigan Department of Community Health (MDCH). (2012). *The Michigan fish consumption advisory: now known as ... the “Eat Safe Fish Guide.”* Presentation for the Great Lakes Consortium Fish Consumption Advisory Enhancement Project.

Summary: Conducted a survey of students at Wayne State University. Concluded that messages in an advisory should address the inconsistency of information in a direct manner at the beginning of a communication piece. Readers/viewers who “discover” the inconsistencies may be more likely to discount the overall message.

Conducted focus groups in Michigan. Found the most trusted channels of information were local/state health departments, doctors/nurses, brochures. Uncertain from presentation slides what the conclusions for material content would be.

85. Robinson, S. (2005). *Promoting fish advisories on the Web: WebMD case study*. Proceedings of the 2005 National Forum on Contaminants in Fish. USEPA, Washington, DC.

Additional info: A case study was presented for a pilot project that the Agency for Toxic Substances and Disease Registry (ATSDR) did in collaboration with the U.S. Environmental Protection Agency (U.S. EPA) this past summer (summer 2005) to see how consumers of fish could be reached directly. Traditional methods to reach target audiences are carried out through intermediaries such as health care providers, conferences, presentations, brochures in multiple languages, and direct mail. This project was designed to look at how the Web could be used to reach the target audience (i.e., the consumer). The objective of the project was to educate users about the potential risks of mercury in fish.

In summary, think beyond your destination site (.gov) to achieve reach into desired audiences. Another project that would be useful to undertake would be online promotion to physicians, perhaps through the WebMD Physician Channel or another Web site. Also, good content is key, but promotion is crucial. Match your needs with the needs of your potential Web outlet partners. Understand your partners' constraints (e.g., editorial, policy, etc.), and work out the details of the promotion strategy with them, because this makes or breaks whether or not people actually see your great content. ATSDR and the U.S. EPA would consider purchasing sponsored space at WebMD where they could control the content completely. Also, it would be good to create Web public service announcements (PSAs) to run in the Web site's advertising space.

86. New York State Department of Health (NYSDOH). (2012). *Fish consumption advisory communication: New York's experience and lesson learned*. Presentation for the Great Lakes Consortium Fish Consumption Advisory Enhancement Project.

Summary: They summarized the lessons learned from a variety of methods/inputs:
Lessons from Partners and Other Professionals:

- Simplify the message
- Be more positive – what people can do vs. what they can't
- Be more positive about recreational fishing
- Improve brochure design to be more like tourism pieces (the look as well as display size)
- Judge appeal by popularity of material
- Be culturally sensitive
- Trusted community group can get better access to info. (e.g. frying is the most popular way to cook fish)
- Modes of communication should be tailored to specific audiences (e.g. food bank poster, angler card)
- Ideas for simplifying language emerge from direct experience (e.g. urban park rangers explained it as "who, what, where")
- "Layer" information – do not lose the detail
- Improve information access by species, waterbody, audience
- Have a variety of materials; regional approach with visual/map is good
- Be more positive about where to fish and what to eat

Lessons from In-person interviews:

- Brochure is an effective communication tool
- Design and format make a difference in likelihood of picking up and/or reading brochure
- People like
 - maps (include points of interest, but not advisory)
 - regional approach
 - trimming and skinning tips
- Highlighting women and children as a vulnerable population helps to drive home the message
- People want more information on health effects and ways to reduce exposure

Lessons from Focus Groups:

- All want the message as simply as possible
- Be informative without being alarmist
- Attract people by using graphics
- Make people feel the message applies to them