

Evaluating Risk Communication: Examining Target Audience Perceptions About Four Presentation Formats for Fish Consumption Health Advisory Information

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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.

KEY WORDS: Fish consumption health advisories; Great Lakes; reading level; risk communication; risk ladders.

1. INTRODUCTION

Communicating health risk information to audiences at potential risk is a key element of risk management. Risk communication is a transaction between the information sender and the intended receivers or target audiences.⁽¹⁾ Many factors influence the extent to which target audiences will understand and respond to the risk information transmitted. Some of these factors are characteristics internal to the audiences (e. g., personal experience with the hazard; perceived importance to the individual), which may be difficult for the risk communicator to influence directly or in a timely manner.^(2,3)

Other factors are external to the audiences, and include items such as the characteristics of the information provider (e.g., credibility),⁽⁴⁾ and the format in which the information is presented.⁽⁵⁾

Objectives or outcomes to achieve via communication programs may conflict between sender and receiver. A sender may even have multiple, conflicting objectives. For example, agency objectives may include (a) enabling people to make their own informed decision about exposure to a risk, and (b) reducing public health risks.⁽⁶⁾ Depending on the choices and response of the target audiences, achieving both objectives may be impossible.

Achieving communication program objectives will thus depend on many factors, including reaching the target audiences with the intended messages. Mere expo-

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sure to information about health risks, however, does not ensure the information is understandable to and received by the intended target.⁽⁵⁾ The manner in which risk information is presented to target audiences is a critical influence on their ultimate response in terms of attitudes, behaviors, and perceptions related to the risk.⁽²⁾ Velicer and Knuth⁽⁷⁾ demonstrated that perceptions differed between risk experts and target audiences about how and what types of risk information should be presented in risk communication programs. They advised that audience preferences for presentation formats should be an important consideration in developing effective risk communication programs. Chess *et al.*⁽⁸⁾ reported on a national symposium on risk communication at which a survey of researchers and practitioners indicated that two of the three most important issues for future research were: (1) communicating with communities of different races, ethnic backgrounds, and incomes, and (2) evaluation of risk communication. Practitioners rated more highly than researchers the need to conduct research on the effectiveness of different communication messages, strategies, and channels.⁽⁹⁾ Slovic *et al.*⁽¹⁰⁾ and Sandman *et al.*⁽¹¹⁾ noted the importance of research addressing the proper format of an effective information program. Weinstein and Sandman⁽¹²⁾ emphasized that one important indicator of a successful communication format is a positive rating by the audience.

1.1. Information Presentation Variables

This study focused on examining target audience perceptions associated with four variations in risk information presentation format. Using printed materials, we measured target audience response to: (a) reading level; (b) use of diagrams vs. text; (c) commanding vs. 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.

Fish consumption health advisories have been issued in the Great Lakes region since the 1970s in response to the discovery of chemical contaminants in fish tissue. Fish consumption advisories are now found nationwide. At least 38 states issue advisories in response to concerns about the potential negative human health consequences of consuming fish from contaminated waters.⁽¹³⁾ These health advisories target primarily anglers (fishermen) and their families. Enabling individuals to make their own decision about Great Lakes fish con-

sumption was identified as the primary objective for fish consumption advisory communication programs in the Great Lakes Region.⁽¹⁴⁾

Advisories are distributed predominantly through news releases and through special brochures developed for target audiences.⁽⁶⁾ State health, environmental quality, and fishery management agencies are the primary agencies involved with the risk assessment, management, and communication aspects of fish consumption advisory programs.⁽¹⁵⁾

For over a decade, the Great Lakes region has been the focus of concerted efforts to develop coordinated fish consumption advisory programs. Fish consumption advisories for the Great Lakes have been produced by nine different states or provinces, at times containing contradictory or inconsistent information. The Great Lakes Sport Fish Consumption Advisory Task Force was formalized in 1986 through the Great Lakes Governors' Toxics Agreement. The Task Force was charged with developing a uniform sport fish consumption advisory protocol applicable to all of the Great Lakes.⁽¹⁶⁾ Simultaneously with that effort, we conducted a study of Great Lakes' anglers awareness of and response to fish consumption advisories. The study was designed in part to help inform the Task Force about the effects of health advisories on angler attitudes and behaviors. A portion of the study focused on measuring angler response to four specific elements of advisory presentation format.

1.1.1. Reading Level

The majority of fish consumption advisory information in the U.S. is transmitted through written materials. It is critical to identify appropriate reading levels for the material to ensure the material has the potential to be understood by the target audiences.⁽¹⁷⁾ We hypothesized that the extent to which licensed anglers selected a fifth-grade vs. eleventh-grade reading level (Fig. 1), based on clarity and understandability, would vary according to sociodemographic characteristics, especially education level.

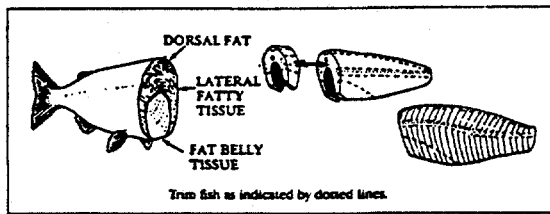
1.1.2. Graphics Versus Text

Ibrekk and Morgan⁽¹⁸⁾ suggested graphics could be used to improve the understanding of risk information by certain audiences. Some elements of fish consumption health advisory information are particularly conducive to the use of graphics. For example, line-drawing

- A. PCBs stay in your body when you eat fish. Large amounts of chemicals in your body may cause health problems for you. PCBs can hurt a baby before it is born. The baby may not grow or learn well. Because a child is smaller, eating the same amount of fish as you do may be more harmful to the child. Women who may have babies now or in the future and children under age 15 should be careful not to eat too many fish with chemicals.
- B. Exposure to chemical contaminants may interfere with children's normal growth and development. Medical studies indicate the risks for development or health problems from PCBs are highest for the developing fetus and nursing infant. A woman who has accumulated high levels of PCBs in her body can transfer large doses of PCBs directly to her fetus while pregnant, and later her infant can receive additional PCBs through her milk. Because they are smaller, children can receive a higher body-dose of PCBs than adults eating the same fish. Thus, if they eat any sport fish, young children (especially girls) and women of childbearing age should eat only those fish with the lowest levels of contaminants. For these reasons, the state health department advises extra caution for pregnant women, nursing mothers, women who intend to have children, and children under age 15.

Fig. 1. Text as it appeared in the questionnaire, comparing fifth-grade reading level (A), with eleventh-grade reading level (B).

- C. To reduce contaminants, trim fish as indicated by the dotted lines on the diagram below. Throw away the fatty parts and the skin.
- D. You can reduce the amount of fat and certain contaminants, such as pesticides and PCBs, in fish you eat by trimming fatty areas and removing the skin. It is important to trim all the fat from four key areas: the belly flap, lateral line, along the backbone, and just beneath the skin.



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Fig. 2. Text as it appeared in the questionnaire, comparing text/diagram example (C) with text only example (D).

illustrations of proper fat-trimming techniques can be used to help audiences understand how to reduce exposure to some contaminants.⁽⁶⁾ We evaluated whether target audiences would judge a diagram, text, or some combination of the two as the clearest and most easily understood (Fig. 2). We hypothesized that a diagram plus text would be perceived as clearest and most easily understood compared with a text-only format.

1.1.3. Command Versus Cajole

Issuing fish consumption health advisories is only one option states have considered and implemented to address fish consumption from contaminated waters. Other approaches include bans on fishing, or on possessing certain fish.⁽¹³⁾ These restrictive regulatory approaches have largely been abandoned except for

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| <p>E. <u>Limit your fish consumption.</u> You should limit the amount of Great Lakes fish you eat. If you do eat contaminated fish, you should space your meals out over time rather than eating several meals over a short time period.</p> | <p>F. <u>How much fish should you eat?</u> Some Great Lakes fish should be eaten in moderation. Exactly how much fish you should eat depends on how often you eat fish and the level of fish contamination. A person who only eats fish during a one-week vacation has little to worry about compared to the person who eats fish every week during the summer. We eliminate contaminants from our bodies, and we do it more efficiently than fish do. You can help that process by simply spacing meals of more contaminated fish out over time.</p> |
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Fig. 3. Text as it appeared in the questionnaire, comparing a commanding tone (E) with a cajoling tone (F).

extreme contaminant conditions in local areas, in part because such restrictions eliminate potential benefits associated with fishing activities (e.g., recreation, local economic impacts). Because fish consumption advisories are not intended to be regulatory, but rather seek to instill voluntary compliance by influencing individual perceptions and behavior, we evaluated target audience response to a commanding versus cajoling tone in the advisory materials. Adler and Pittle⁽¹⁹⁾ suggested cajolery is appropriate when risk communication programs are designed to educate about risks and let individuals choose whether or not to take those risks, similar to the objectives associated with health advisory programs.⁽¹⁴⁾ Golding *et al.*⁽²⁰⁾ hypothesized differences in target audience response to technical and authoritative versus personal and narrative information.

The commanding statement in our study was directive and authoritative. The cajoling statement was more explanatory and suggestive rather than directive, indicating factors an individual might consider when deciding in what quantity to eat Great Lakes fish (Fig. 3). We hypothesized that perceptions of target audiences about a health advisory would differ based on the tone of the presentation.

1.1.4. Qualitative Versus Quantitative Risk Ladders

The final presentation format comparison involved the use of qualitative vs. quantitative information. Smith *et al.*⁽²¹⁾ noted evidence from fields as diverse as psychology, economics, and decision sciences that individuals may have difficulty understanding risks expressed as numerical probabilities. Patterned after their work, we

evaluated anglers' responses to qualitative and quantitative descriptions of the health risks associated with Great Lakes fish consumption. The quantitative risk ladder included specific estimates of the increased mortality risk associated with various activities, including Great Lakes fish consumption. The qualitative risk ladder included the same activities, but described risks as "higher," "moderate," and "lower" (Fig. 4). We hypothesized that licensed anglers would perceive the quantitative risk ladder as helping them better understand the health risks from eating Great Lakes fish compared with the qualitative risk ladder.

The purpose of this study was to measure anglers' perceptions and anticipated responses to various health advisory presentation formats so that risk communicators producing advisories could consider likely audience response when preparing information for anglers. Characterizing probable differences in response to presentation formats among specific target audiences (e.g., specific ethnic or socioeconomic groups) should help communicators focus their messages for those audiences.

2. METHODOLOGY

We used a mail survey approach to measure audience response to the four presentation formats. A sample of 8000 licensed anglers was obtained from all Great Lakes states. The sample size for each state was determined by estimated angler use of the Great Lakes from each state's shoreline as calculated from the 1985 National Survey of Fishing, Hunting, and Wildlife-associated Recreation.⁽²²⁾ However, to obtain a sufficient sample size from states with relatively lower use rates,

G.

Risk Comparisons Risk of Death	
Level of Risk	Activity
Higher Risk	Smoking 1-2 packs of cigarettes per day
	Having 200 chest x-rays per year
	Eating 1-10oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels
	Driving a motor vehicle
Moderate Risk	Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels
	Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1987 contaminant levels
	Breathing air in U.S. urban areas at early 1980's contaminant levels
	Recreational boating
Lower Risk	Drinking 1-12oz beer per day
	Recreational hunting
	Complications from insect bite or sting

H.

Risk Comparisons Risk of Death	
Level of Risk (chances out of 1,000)	Activity
35-125	Smoking 1-2 packs of cigarettes per day
7-30	Having 200 chest x-rays per year
5-30	Eating 1-10oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels
17	Driving a motor vehicle
11-12	Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels
3-6	Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1987 contaminant levels
0.1-6	Breathing air in U.S. urban areas at early 1980's contaminant levels
3.5	Recreational boating
1-2	Drinking 1-12oz beer per day
1.5	Recreational hunting
0.014	Complications from insect bite or sting

Fig. 4. Comparative risk charts, as they appeared in the questionnaire, with the qualitative chart on the left (G) and the quantitative chart on the right (H).

a minimum sample size criterion of 450 was established. Based on an expected questionnaire response rate of 50-60%, this minimum sample size would be large enough to allow for comparisons between Great Lakes states, including both high- and low-use states. After lower-use states were assigned this minimum sample size, the remaining sample was divided among the larger states using proportions from the National Survey.

Any license that permitted fishing (i.e., resident annual, resident short-term, nonresident annual, nonresident short-term) in 1989-1990 was considered for inclusion in the sample. However, to increase the chances of contacting anglers who fished the Great Lakes, licenses purchased in counties bordering the Great Lakes were used where practical. Because most states do not require that license records be returned to a central location, a cluster sampling approach was

needed, which involved traveling to counties bordering the Great Lakes and drawing the sample from records at county offices and license sale outlets. Each state had its own idiosyncrasies for license sale procedures and thus sample selection was conducted slightly differently in each state.

A mail questionnaire was designed to test attitudinal and intended behavioral responses to "model" advisories and to current Great Lakes health advisories. A large section of the questionnaire was devoted to asking respondents to compare different presentation formats for health advisory information. Information from actual state health advisories was used when possible. Respondents were asked to compare two versions of the same information that differed in presentation format. We attempted to keep other aspects of each version as similar as possible (e.g., chemicals discussed, risky activities

compared), within the constraints of modifying the format being tested. As described earlier, the four presentation format comparisons involved: (1) reading level (5th grade vs. 11th grade as measured by the Flesch-Kincaid Index)⁽²³⁾; (2) a diagram with descriptive text vs. text only; (3) a commanding, authoritative tone vs. a cajoling, more conversational tone; and (4) qualitative vs. quantitative information on a comparative risk ladder. Depending on the format being examined, respondents were asked to indicate which format (a) presented information most clearly and understandably; (b) helped the reader best understand the health risks or other factors; (c) stimulated the reader's intention to engage in a particular behavior; or (d) provided the reader the information needed to make his/her own decision. Other portions of the questionnaire were devoted to assessing health advisory awareness, fishing participation, and fish consumption.

The mail survey was implemented in October 1991. Up to three follow-up mailings were sent to nonrespondents over the course of the following month. The SPSSX computer program⁽²⁴⁾ was used for analysis. Chi-square tests were used to test for statistically significant differences at the $p \leq 0.05$ level.

A telephone follow-up to 100 nonrespondents was conducted in November and December 1991 to provide an estimate of the degree to which nonrespondents to the mail survey differed from respondents. Questions on presentation format were not included in the nonresponse follow-up due to the difference in technique (mail vs. telephone).

3. RESULTS

3.1. Survey Response and Population Definition

Of the 8000 questionnaires mailed, 963 were undeliverable, and 3536 completed questionnaires were returned. This resulted in an adjusted response rate of 50.2%. Results of nonresponse bias comparisons confirm the conclusions of previous research that nonrespondents fish much less and eat fewer sport-caught fish meals than respondents.⁽²⁵⁻²⁷⁾ Respondents and nonrespondents did not differ in their general fish consumption or sociodemographic characteristics.

This study sought to contact people with Great Lakes fishing experience. However, it was not practical nor economically feasible to conduct a creel survey or draw a sample of only those anglers who had fished the Great Lakes. Thus, some anglers with no knowledge or

experience in the Great Lakes were included in the sample using the license record method outlined above. To more clearly define these two populations we chose as a definition of Great Lakes fishing experience only those respondents who had fished the Great Lakes in the past 5 years. Respondents who had not fished the Great Lakes in the past 5 years accounted for 16% of our sample. For this paper, only respondents (84%) who had Great Lakes fishing experience (i.e., fished the Great Lakes in the past 5 years) were used in the analysis. Thirteen percent of these respondents were female.

3.2. Presentation Formats

3.2.1. Reading Level Comparisons

The reading level comparison described the potential effects of chemical contaminants on humans using two reading levels, fifth-grade and eleventh-grade (Fig. 1). Both passages focused on the effects of PCBs, particularly in women and children. The majority of respondents (68%) felt the example with the eleventh-grade reading level was clearest and easiest to understand. As expected, those with less than a high school education were more likely than others to find the fifth-grade reading level materials clearest and easiest to understand ($\chi^2 = 7.3$, $p < 0.01$), although only 40% of this less-educated group selected the Grade 5 materials. Differences existed by age ($\chi^2 = 20.9$, $p < 0.01$) and gender ($\chi^2 = 4.3$, $p < 0.05$) as well. For example, about 70% of respondents in the 16-49 age group felt the Grade 11 materials were clearest and easiest to understand compared to 56% in the 65+ age group. About 67% of men felt the Grade 11 materials were clearest and easiest to understand compared with 72% of women respondents.

Respondents were also asked which example helped them to understand the health risks from eating fish and which example made them want to tell women of childbearing age and children under 15 to limit their fish consumption (the topic of the examples). For both questions, few respondents (5% and 6%, respectively) indicated the fifth-grade reading level materials helped their understanding the most or would prompt them to talk with women and children about limiting their fish consumption. Respondents were split evenly between the eleventh-grade reading level (45%) and both reading levels (46%) as helping their understanding. The majority of respondents (59%) chose the eleventh-grade read-

ing level material as the format that made them want to tell women and children to limit their consumption.

3.2.2. Graphics Versus Text Only Comparison

The second set of comparisons described how to clean a fish to reduce exposure to contaminants. One version used a diagram with descriptive text; the other version used text only (Fig. 2). Overall, a slight majority (58%) felt the example with the combined diagram and text was the clearest and easiest to understand. Education ($\chi^2 = 9.3, p < 0.01$) and age ($\chi^2 = 34.5, p < 0.01$) were associated with the choice of presentation format. Anglers with at least a high school education were more likely to find the text/diagram combination clearest and easiest to understand than those with less education (59% vs. 49%). The youngest anglers (16–39) found the text/diagram combination clearest and easiest to understand (63%), while the oldest (65+) were more likely to choose text only (56%). Female respondents of child-bearing age and anglers living in households with children under 15 (who are believed to be at greater risk from contaminants), hereafter referred to as households of concern, were more likely to choose the text/diagram combination (62% vs. 56%; $\chi^2 = 9.8, p < 0.01$).

Respondents were almost evenly split between either example (text/diagram 33%; text only 26%) or both examples (39%) helping them to understand how to clean fish to reduce risks. Education ($\chi^2 = 27.4, p < 0.01$), income ($\chi^2 = 20.6, p < 0.05$), race ($\chi^2 = 26.6, p < 0.01$), age ($\chi^2 = 22.0, p < 0.05$), household type ($\chi^2 = 15.8, p < 0.01$), and awareness of the health advisory ($\chi^2 = 19.7, p < 0.01$) were each associated with differences in understandability. As education increased, the percentage choosing the text only format decreased (32% among those without a high school degree; about 20% among college graduates). A similar trend was noted with increasing income (30% found text only more understandable among the lowest income category; 23% among the highest category). The opposite effect was noted for age; as age increased so did the percentage choosing the text only format (24% among youngest to 33% among oldest). White respondents were more likely to find the text/diagram example more understandable (45%), whereas Hispanics and those from other ethnic backgrounds were more likely to find both examples equally understandable (41%). Those aware of the health advisory were more likely to find either example understandable (41%), whereas those not aware of the advisory were more likely to find the text/diagram example more understandable (40%). Households of concern

(37%) were more likely to find the text/diagram example more understandable than other households (31%).

3.2.3. Commanding Versus Cajoling Tone

The third comparison involved two presentation tones: a commanding, authoritative tone vs. a cajoling, more conversational tone (Fig. 3). The theme of both passages was the same (limit fish consumption). The majority of respondents felt the cajoling tone best provided them with the information they needed to make their own decision about eating Great Lakes fish (79%) compared with the commanding tone (21%). Education ($\chi^2 = 18.4, p < 0.01$), income ($\chi^2 = 12.7, p < 0.01$), race ($\chi^2 = 7.4, p < 0.05$), age ($\chi^2 = 17.7, p < 0.01$), and household type ($\chi^2 = 7.8, p < 0.01$) were each associated with differences in choice of the two presentation tones. Although majorities in each group examined chose the cajoling tone, the size of the majority was less among those with less education, less income, or higher age. Choice of the cajoling tone among those without high school degrees (71%) was lower than among those with postgraduate education (84%). Seventy-four percent of respondents with incomes below \$20,000 chose the cajoling tone vs. 82% of those with incomes $\geq$ \$50,000. Choice of the cajoling tone was higher for younger (82%) than older respondents (73%), for households of concern (82% vs. 78%), and for Hispanic (80%) and White (78%) respondents than those from other ethnic backgrounds (69%).

The majority (56%) also felt that the cajoling tone made them want to keep their consumption within the recommended limits. Twenty-nine percent said both presentation tones would make them want to keep their consumption within limits. Respondents who consumed the most highly-contaminated fish (and thus were not following the recommendations in the current advisories) did not differ from other respondents in terms of tone preference. When asked which presentation tone would encourage respondents to continue fishing the Great Lakes, one-third said neither, 38% chose the cajoling tone, and very few (10%) chose the commanding tone.

3.2.4. Qualitative Versus Quantitative Risk Ladder

The fourth and final comparison involved qualitative vs. quantitative information on a comparative risk ladder (Fig. 4). The descriptions of risky activities and the physical placement of fish consumption on the risk ladder were the same for both ladders. One ladder de-

scribed the level of risk in chances out of 1000, whereas the other ladder described risk as higher, moderate, or lower. A majority of respondents (57%) felt that the quantitative ladder helped them to best understand the health risks associated with eating Great Lakes fish. No significant differences were found between the various sociodemographic groups on this measure.

Respondents were more evenly divided between the ladders when asked which provided them with information to enable them to make their own decision about eating fish. Thirty-nine percent chose the quantitative ladder, and 29% indicated both ladders achieved that result. Some preference by older respondents was shown for the qualitative ladder ($\chi^2 = 26.3, p < 0.01$), but the majority favored the quantitative ladder or either ladder as providing them with the needed information. Households of concern ($\chi^2 = 9.8, p < 0.05$) and respondents aware of the health advisories ($\chi^2 = 9.7, p < 0.05$) were more likely to choose the quantitative or either ladder compared to other households and those unaware of advisories. Among those who were uncertain when asked if the health risks from eating contaminated fish were minor compared with other risks to which they were exposed, a plurality (42%) chose the quantitative ladder as a way to provide them with information to make their own decision about risks.

Both ladders (49%), and specifically the quantitative ladder (31%) gave respondents the impression that most activities involve some risk. Sociodemographic groups did not differ on this measure.

4. DISCUSSION

4.1. Presentation Formats

Several factors are related to the complexity of the information presented in health advisories. We focused on three in our study: reading level, the use of text vs. graphics, and qualitative vs. quantitative information.

4.1.1. Reading Level

Reading level of health advisory text can vary according to the abilities of the target audience. Reading level is important to assess to assure that materials are written at a level most of the target audience can understand.⁽¹⁷⁾ The national median educational attainment level in 1990 was estimated at the twelfth-grade

level.⁽²⁸⁾ We compared reading levels at approximately the median education attainment level and below. We hypothesized that the selection of fifth-grade vs. eleventh-grade reading level advisory information for clarity and understandability by licensed anglers would vary according to sociodemographic characteristics, especially education level. As hypothesized, those with less than a high school education were more likely than others to find the fifth-grade reading level materials clearer and easier to understand, although less than half of this less-educated group selected the Grade 5 materials. This may in part reflect a social desirability bias among respondents who may think that because a university sent out the questionnaire the "right" answer is the example with the higher reading level. Differences also existed by age and gender. In terms of understanding the message being presented, most respondents chose the eleventh-grade materials.

These results should be interpreted with some caution. We sampled licensed anglers, the majority of whom had at least a high school education, and all of whom were literate (we presume) as evidenced by their ability to complete and return a written questionnaire. These results demonstrate some variability in reading level choice among this (skilled) group of respondents, and indicate the need to consider the appropriate reading level and literacy skills of target audiences when designing communication programs.

4.1.2. Graphics Versus Text Only

Several types of graphics can be included in health advisories, such as maps of locations relatively safer or riskier for fish consumption, graphs of contaminant concentration patterns over time, and diagrams of risk-reducing fish preparation techniques. We compared a graphical presentation of a fish trimming procedure accompanied by very little text with a longer text-only description. In general, we found respondents felt the diagram plus text example was the clearest and easiest to understand. This preference might have been stronger had the diagram been larger or in color, but because space and color in most health advisories are limited, the example used in this study was realistic. Our results are consistent with past research with children which indicated that illustrations enhance the transfer of learning when the text depends on the illustration.⁽²⁹⁾ Also, researchers have found that young adults are more successful at completing instructions when illustrations are provided.⁽³⁰⁾ For our adult audience we have some in-

dication that the diagram plus text format was seen as easier to understand as education and income increased.

4.1.3. Command Versus Cajole Tone

In a study of how risk information affects individual risk perceptions, Smith *et al.*⁽³¹⁾ analyzed the effects on risk perception and behavioral responses associated with the tone of presentation of risk-related information. In that study, the differences in tone focused on the extent of the direction given to the individual interpreting the risk information: the directive or commanding tone directed the reader to follow a government-issued radon guideline; the evaluative or cajoling tone encouraged the reader to make his/her own individual judgment regarding how to respond to the potential of radon contamination in the home. However, Smith *et al.*⁽³¹⁾ were unable to determine if the differences in learning they found between the two tones were due to the tone or to the respondents' evaluation of the personal risk they faced.

For many licensed anglers, consumption of sport-caught fish is a voluntary activity, but an important component of their lifestyle. Individuals often respond differently and seek different types of information for risks that are voluntary versus involuntary.⁽³⁾ It was hypothesized that the tone of presentation would be an important factor influencing anglers' perceptions about advisories. Most respondents felt the cajoling tone best provided them with the information they needed to make their own decision about eating Great Lakes fish, reflecting one of the primary objectives of many health advisory programs.⁽¹⁴⁾ The majority felt that the cajoling tone would make them want to keep their consumption within the recommended limits, which is another primary objective of health advisory programs.⁽¹⁴⁾ Important for risk management purposes, respondents indicated the cajoling tone was also more likely than the commanding tone to prompt them to continue their Great Lakes fishing involvement. One reason fish consumption advisory programs were selected as the preferred risk management option by states (as opposed to fishing bans) was that advisories would still allow anglers and local communities to reap the many benefits of fishing, especially those unrelated to fish harvest or consumption. Angler expenditures associated with trips to the Great Lakes were estimated at \$870 million in 1991.⁽³²⁾ Continuing the economic contributions of the fishery is an important consideration for the states. Thus, risk communication designed to be cajoling rather than commanding seems more appropriate to help attain several primary, but po-

tentially conflicting, objectives for health advisory programs.

4.1.4. Qualitative Versus Quantitative Risk Ladder

Smith *et al.*⁽³¹⁾ suggested the relative emphasis on quantitative vs. qualitative information could influence the effectiveness of the presentation. We believed the effects of this variation would be important to understand for Great Lakes health advisories. A variety of risk assessment results are available that could lead to a quantifiable presentation of potential risks (e.g., chances in 1000 of an additional cancer death due to fish consumption) versus a qualitative description of those risks (e.g., moderate risk). A quantitative description of risks allows the reader to interpret the level of "acceptable" risk to a greater degree than does a qualitative description that already has labels of acceptability attached.⁽¹⁾ Anglers from this study indicated that the quantitative risk ladder helped them to best understand the health risks from eating Great Lakes fish. Those with an identified need for this type of information (i.e., respondents who were uncertain when asked if the health risks from eating contaminated fish were minor compared with other risks to which they were exposed) were more likely to choose the quantitative chart as a way to provide them with information to make their own decision about risks. Many respondents, however, reported that both charts gave them the impression that most activities involve some risk. Items lower on a risk ladder (as used by Moschandreas and Chang)⁽³³⁾ may leave the impression of lower risk and reduce respondents' willingness to pay to reduce risks. Other researchers⁽¹¹⁾ have demonstrated a locational effect of risk ladders. In our test, both the quantitative and qualitative risk levels were located at the same relative position on the risk ladder (near the middle). Future research might analyze the combined effects of location and quantitative vs. qualitative formats. Smith *et al.*⁽²¹⁾ concluded quantitative risk information should be included in communication programs to help people form realistic risk perceptions.

4.2. Likely Effects of Certain Presentation Formats on Target Audiences

Data from this study show that no one communication strategy is likely to have similar effects on all target audiences. To facilitate design and implementation of communication strategies for the diverse community

of potential Great Lakes fish consumers, several specific target audiences can be identified. Target audiences are portions of the larger human population. Greater similarity in information needs exists within each target audience than between audiences. This study included a sufficient sample size to examine several target audiences of concern to health professionals and fishery managers. The three audiences emphasized in this study were groups at special risk due to their fish consumption patterns or the nature of the specific health effect: Hispanic anglers (the sample size was not sufficient to examine other non-White racial groups), female anglers of childbearing age or households with children under 15, and anglers who ate the most highly contaminated species listed in the advisories (exceeding the consumption limits recommended in the advisories).

Based on data collected during this study (but reported elsewhere),⁽³⁴⁾ Hispanic respondents relied on Great Lakes fish for food for themselves and their families to a slightly greater extent than other anglers, although this reliance was low. Because this group may have a greater dependence on Great Lakes fish as a food source, Hispanic individuals may also have a greater need for health advisory information. Hispanic's choices of sources of information and presentation formats were generally similar to other respondents, but even more Hispanics felt the cajoling tone rather than the commanding tone of presentation of health advisory information provided them with the information they needed to make a decision about fish consumption.

Women of childbearing age and households with children under 15 were examined as a special group because of the potentially increased health risks associated with contaminated fish consumption for this group. Most Great Lakes fish consumption advisories have included special consumption recommendations for these individuals. Health risks associated with Great Lakes contaminants include carcinogenic, reproductive, and developmental effects.⁽³⁵⁾ A presentation format of diagram plus text was chosen more often by this group than by other respondents for its clarity and understandability. This group also was more likely to choose the cajoling tone vs. the commanding tone as a way of providing information so individuals could make their own decision.

Twenty-five percent of all respondents who fished the Great Lakes in the past 5 years ate at least one fish in 1990-1991 which the health advisories recommended against eating. This group did not differ from other respondents in their selection of presentation formats or sources of information. For this group, it may be more useful to evaluate the effect of attitudes and beliefs on

response to advisories rather than focus on information presentation formats.

4.3. Recommendations

Designing audience-oriented communication programs will likely demand a diversity of approaches including communication methods other than the written word discussed here, such as videotapes, interpersonal contacts, and signs or maps with symbols.⁽⁶⁾

Results from the comparisons of specific communication formats in this study indicated that one specific format does not meet the needs of a significant percent of anglers, except for the strong preference shown for a cajoling rather than a commanding message as a way of providing information so anglers could make their own decision. In addition, various formats differed in their abilities to address the other multiple objectives associated with health advisory programs, such as enabling individuals to make their own decisions, reducing public health risks, and maintaining a viable fishery.⁽¹⁴⁾ Risk communicators may need to prioritize their objectives to help decide which communication approach is likely to be most effective. If the goal of an advisory program is to reach most or all people, a variety of approaches will be necessary. 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. Segmenting audiences specifically regarding information needs and communication formats may help clarify which approaches to take with each audience.

We assessed four specific communication techniques, but did not have the opportunity to construct a complete advisory using any set of the techniques. Future research performed in conjunction with Great Lakes agencies should involve developing and testing complete "prototype" advisory communication programs with selected audiences of most concern to the agencies (e.g., women of childbearing age, low-income anglers). Variations in these complete prototype advisories should include reading level, use of quantitative and qualitative information, use of text and diagrams, inclusion of health benefits and negative health effects information, and a description of a suite of risk-reducing behaviors.

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