7 Using and Communicating the Comparative Dietary Risk Framework

This framework and approach could be used by state, tribal, and local risk managers who set fish advisories to provide additional information on possible health benefits to those who fish and eat fish. Because of the data intense process and results of the FCI, a solid risk communication program is necessary to insure successful usage of the information generated. The risk communication process associated with fish consumption health advisories has been described in depth in U.S. EPA's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 4* (U.S. EPA 1995). This chapter summarizes key elements of that process applied to the comparative dietary risk framework, emphasizing that risk communication is a process of information exchange between the target audience and the risk communicator.

Two cautions about communicating information from the framework should be reiterated. First, instituting a risk communication program assumes the existence of quality information to communicate. Developing a risk communication approach at this stage of evolution in the Comparative Dietary Risk Framework is appropriate; however, implementing a risk communication program is not appropriate until the data are available for calculating the actual values that would be used in the framework and the FCI.

Second, although the framework provides a mechanism for comparing risks and benefits associated with fish consumption, it is not a justification for accepting fish consumption risks as long as there is a net benefit. Decisions about acceptable risks and distribution of risks and benefits throughout society is a social decision, to be made collectively by the communities affected (Shrader-Frechette, 1990; Knuth, 1995). That the FCI may demonstrate cases in which fish consumption benefits appear to outweigh the risks is not a license to pollute. Rather, society must determine policy about long-term goals for minimizing environmental pollution based on a range of ethical, economic, and social criteria. Further, environmental justice and equity issues are raised when certain communities are forced to assume more health risks than others. For example, some communities consuming large amounts of fish may score high on the “benefits” side of the equation. If those fish are chemically contaminated, however, the same communities also score high on the “risks” side. Use of the framework and FCI does not imply the proper choice is simply achieving a situation in which the net risks and benefits are zero. Rather, the framework helps make the tradeoffs between risks and benefits transparent, and should be used to foster discussion on environmental equity and justice issues, and questions of who should bear the costs of pollution vs. derive the benefits from the fisheries resource.

7.1 Overview of Risk Communication as a Process

Risk communication includes several stages: problem analysis; audience needs assessment; communication strategy design; communication strategy implementation, and evaluation (Fig. 7-1). Problem analysis includes examination of both external and internal factors that may or should influence the risk communication program. This first phase also involves identifying the specific objectives to be achieved through the risk communication process.

The second phase, audience identification and needs assessment, begins with target audience identification. The risk communication objectives established in the problem analysis phase

provide insights about potential types of target audiences. In this phase, those audiences are characterized in terms of demographics; awareness and knowledge about advisories, contaminants, and fish consumption; beliefs and attitudes about related topics; and behaviors related to fishing and fish consumption. Based on this information about target audiences, health advisory information needs are identified.

Strategy design and implementation, phase three, reflects the communication objectives and the target audience information needs identified earlier. Strategy design includes considerations about the style of communication (e.g., format, tone, text vs. graphics, reading level), the content (e.g., comparisons of sites, health effects, health benefits), and means for disseminating the information (e.g., mass media, interpersonal contacts, specialized media). Strategy implementation includes pre-testing the message, modifying the design as needed, creating a timetable, and finalizing and disseminating the message(s).

Evaluation as a component of the risk communication process occurs at three stages of the process. Formative evaluation occurs during problem analysis, audience needs assessment, and the initial stage of communication strategy design. Process evaluation occurs during the communication strategy implementation period. Summative evaluation occurs after the communication strategy has been implemented, but refers back to information identified in the problem analysis and audience needs assessment phases.

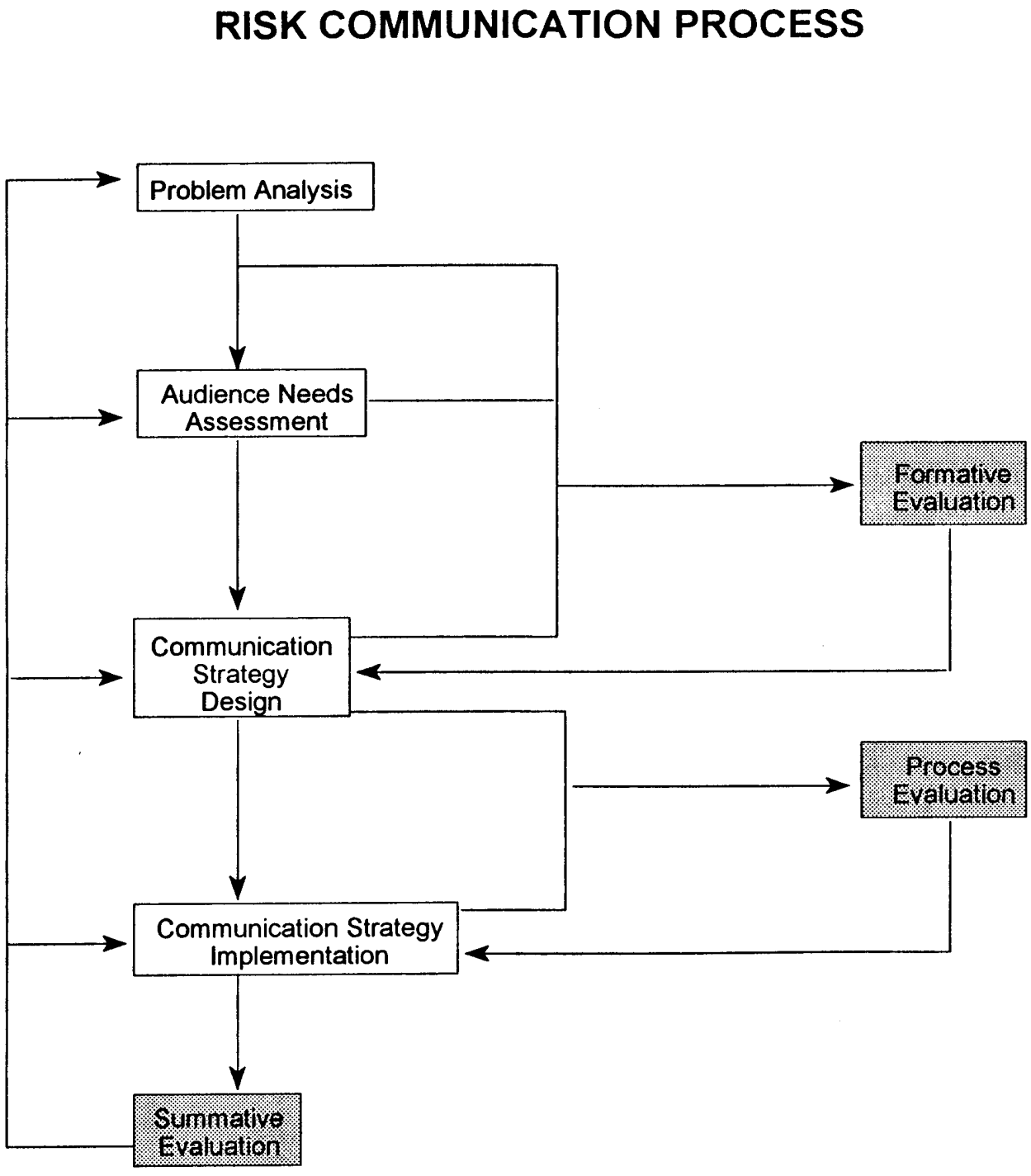
7.2 Designing, Implementing, and Evaluating a Communication Program for the Comparative Dietary Risk Framework

This section examines each stage of the risk communication process in relation to using the Comparative Dietary Risk Framework, indicating both strengths and challenges. The Comparative Dietary Risk Framework responds to several risk communication needs identified for fish consumption health advisory programs. Recent studies of angler and fish consumer response to advisory communications suggest that potential fish consumers desire particular types of information, although these information needs may differ among target audiences.

Information about how risks change with different levels of fish consumption has been identified by anglers, fishery experts, and health care experts as very important for health advisory communication programs (Velicer and Knuth, 1994). Studies of licensed anglers have indicated the perceived importance of health advisory information about topics such as potential health benefits and risks associated with fish consumption, how risks change as more or less fish is eaten, and comparing the health risks of eating fish with the risks from other protein sources (e.g., Connelly *et al*., 1992; Connelly and Knuth, 1993).

Other studies have demonstrated that anglers do respond to health risk information by changing their fishing-related behavior. Changes include eating less sport-caught fish, changing fish-cleaning methods, changing fishing locations, changing species eaten, changing the size of fish eaten, and changing cooking methods (Connelly *et al*. 1992). Connelly *et al*. (1996) provided

Figure 7-1. The risk communication process, adapted from Velicer and Knuth (1994).



evidence that fish consumption suppression (anglers eating less fish than they would in the absence of health advisories) was prevalent among Lake Ontario anglers. Montgomery and Needelman (1997) outlined a method to quantify the economic impacts of fishing behavior related to chemical contamination of fisheries.

Key among information needs identified is the desire of many potential fish consumers to understand the impacts of the advisory, and of fish consumption, for them individually. The framework enables risk communicators to facilitate this understanding, providing a mechanism to better meet many risk communication goals.

The FCI is the key communication element of the framework. The FCI may be conveyed graphically across a range of fish consumption rates (see Figure 6-5 Health Scale as a Function of Fish Consumption Rate), or as a single value. The latter approach is similar to many current health advisory communication programs, in which a determined level of fish consumption is recommended for a particular group (e.g., eat no more than 1 fish meal a month). The graphical presentation of FCI, however, conveys a greater degree of information than does a single fish consumption rate. The reader is able to visualize how benefits and risks, and hence net benefits, change with changes in the fish consumption rate. Ideally, it would be possible to convey this comparative information for different species of fish, because many fish consumers face the question of "substitution" rather than "abstinence;" i.e., changing species, sizes, or locations of fish caught and eaten, rather than reducing or eliminating overall fish consumption.

In theory, this graphical presentation increases the information available to the decision-maker (a government agency or the potential fish consumer) and is thus more individualized. Used in this way, however, the framework focuses on individual diets, increasing the risk communication challenge particularly for agencies used to developing and disseminating a "one size fits all" type of health advisory. Limited resources for health advisory and associated communication programs, coupled with a mandate to address large, diverse groups in society, constrain the abilities of agencies to target very specific audiences.

From a risk communication standpoint, the framework's greatest strengths (i.e., use of the FCI across varying fish consumption rates to estimate changes in net benefits) lie in application to local areas, to situations in which individual consumer concerns can be identified, and to internally homogenous groups with particular cultural or dietary concerns. On larger (e.g., statewide, region wide) scales, using a single FCI value on which to base fish consumption recommendations may be the best option. Statewide, portraying all the possible combinations of exposure and benefits would be infeasible, but presenting summary information would be possible to help anglers decide on appropriate "substitutions" – i.e., switching species, sizes, or fishing locations to target those that have, on balance, greater benefits than risks. In local or special audience cases, however, it may be feasible to present a range of figures (FCI graphs) demonstrating a limited number of exposure and benefit scenarios to enhance local understanding of the options and tradeoffs available.

7.2.1 Problem Analysis

The first stage in risk communication is problem analysis, a careful consideration of external and internal factors that influence the selection of risk communication objectives and the likelihood of meeting those objectives. Objectives indicate the outcomes that reflect the mandate of the agency and the impact to be achieved through the risk communication program.

Analyzing external and internal factors improves understanding of the context in which the health advisory risk communication program will occur. Without an understanding of the context, it is difficult to establish realistic objectives. Contextual factors external to the health advisory program include the characteristics of the community(ies) to be affected by the health advisory, and the degree of certainty and completeness of information used to establish the health advisory. Data needs for calculating the FCI within the framework have been discussed earlier. Internal factors include staff, budget, and other resources available to or required by the health advisory program.

A variety of objectives are often associated with health advisory programs. The involvement of more than one agency in the development and dissemination of health advisories (Reinert *et al*. 1991) often complicate such programs. For example, environmental quality agencies may conduct the chemical and fish tissue monitoring programs. Health agencies may conduct the risk assessment (or calculate the FCI). Health agencies in cooperation with fishery management agencies may be charged with communicating the health advice. Because these agencies have differing mandates, they may have differing objectives they hope to accomplish through health advisory programs.

In a study of Great Lakes agencies involved in health advisory programs, one of the most frequently cited objectives (by all types of agencies) for health advisory communication programs was to enable consumers to “make their own, informed decision” about fish consumption (Knuth and Connelly 1991). Other objectives focused on reducing human health risks, educating people about risk-reducing fish preparation methods, encouraging public support for fisheries and facilitating positive fishery resource use, and following agency mandates.

Value-based risk management judgments are inherent in risk communication, particularly using the FCI-based approach. Because the framework (through the graphic presentation of FCI) compares potential health risks and benefits of eating fish affected by contaminants, risk communicators have an increased ability to help individual fish consumers be informed in their decision making, addressing the first objective noted above. Including a graph such as Fig. 4 in health advisory communication programs would improve a potential fish consumer’s ability to make an informed decision based on his or her own choice about balancing fish consumption benefits with risks. However, objectives focused on reducing human health risks might prompt agencies to choose the FCI represented by zero or near-zero risk, the FCI represented by maximum net benefits, or some other value. Objectives focused on encouraging public support for and use of fishery resources might support choosing the FCI represented by zero net benefits (i.e., that level at which net risks are offset by net benefits so that maximum fish consumption opportunities at zero net risk are promoted) or some other value.

Thus, the communication resources available to an agency, the context in which the communication will occur, and the objectives inherent in the health advisory program will influence the way in which the framework and FCI are implemented. As noted, the FCI may be communicated graphically as a range of values across differing fish consumption levels, or as a point value recommending one set fish consumption rate as a maximum allowable level. The single point value selected would differ depending on the program objectives, reflecting an agency's decision about the appropriate manner in which to balance risks and benefits associated with fish consumption.

7.2.2 Audience Identification and Needs Assessment

The second stage in the risk communication process is audience identification and needs assessment. A combination of "expert" input from those within the health advisory agency(ies) and those knowledgeable about the potential target audiences, and direct input from the potential audiences is usually required. "Expert" viewpoints about target audience information needs may not agree with needs identified by the target audiences themselves (Velicer and Knuth 1994). Judgments about factors such as the relative importance of risks and benefits to community members, and about cultural importance of fish consumption in the diet or as part of local tradition, are needed. Risk communication experts may not be informed enough or aware enough to make such judgments without considerable local input.

Identifying potential target audiences is the first step in this phase. Ideally, selection of target audiences would have been completed during development of the FCI. Calculations within the framework require a variety of data about health status and impacts, dietary tradeoffs, etc., which should be collected for the target audiences of concern. From a communication standpoint, target audience segmentation should be based on identifying groups that are relatively homogenous from the perspective of information content needs, and who can be reached through similar information dissemination mechanisms.

Characterizing the information needs of target audiences includes assessing a variety of factors, such as audience demographics (age, gender, education, language ability, income, residence, race, family status); typical information sources used; fishing and fish consumption experience; and prior awareness, knowledge, beliefs, and behaviors related to fishing and fish consumption, including cultural forces. These information needs are similar to those in the risk communication components of existing health advisory programs. Using the framework, however, these information needs are relevant not only to the risk communication process, but also to the preceding process of developing the basic health advisory recommendations.

The information requirements for an audience needs assessment using the framework occur earlier in the health advisory development process than in traditional health advisory approaches. The framework can consider different subgroups (e.g., adults, children, breast-feeding mothers and infants), health benefits, cancer and non-cancer health endpoints, biological and perceived severity of health endpoints, and cultural values. Because of this, more information about target audience characteristics, behaviors, values, and information needs is required at the time the fish consumption recommendations are generated – not just at the risk communication stage.

Emphasis must be placed on incorporating information about target audiences early in the process of developing data to insert in the framework.

Applying the framework to a particular audience requires knowledge of how the target community (or individuals within the community) perceives the severity associated with different health outcomes, what health outcomes are most important in the community given its demographics, and the cultural values the community assigns to fish consumption. Other important information includes understanding how dietary behavior changes in response to reduced fish consumption (e.g., what alternative food sources would replace fish) so the appropriate comparisons of health risks/benefits between current and modified (less fish consumption) dietary patterns can be factored into the framework.

Early and in-depth assessment of target audience information needs is particularly important for applications of the framework in which cultural risk factors will be incorporated. Rarely (if ever) will a group of risk-management or risk-assessment experts be able to characterize adequately the cultural risks associated with fish consumption and/or potential loss of fish consumption. If fish consumption and associated activities are a key element of the local culture (e.g., see Chapter 5 *Socio-cultural Considerations of Fish Consumption)* decision-making methods are needed that will allow the local community to help quantify or characterize the perceived severity and cultural risk factors that will be incorporated into the calculations of the framework.

Techniques for determining target audience information needs, based on input from both audience members and experts, are detailed in U.S. EPA (1995). These include personal interviews and group discussions, mail and telephone surveys, and document review.

7.2.3 Communication Program Strategy Design and Implementation

The flexibility of the framework for designing and implementing risk communication programs is both appealing and challenging. Because of the types of information used in operating the framework, very specific risk communication messages can be developed that are responsive to the special concerns of a given subpopulation, community, or individual. The converse, however, is the challenge of providing all of the information needed for the framework to be applied to its fullest – detailed descriptions of perceptions, cultural values, and behaviors within the community of concern. Thus, this approach can be particularly cost-intensive in terms of information and the staff resources needed to acquire it.

In many cases, decisions will have to be made about which set of perceptions and values to apply, treating a known heterogeneous community as if it was homogenous, to simplify calculation and communication of the FCI. In large, heterogeneous communities, therefore, the full benefits of the framework may not be realized because of the number of assumptions (of homogeneity) that will be necessary. However, in small communities that are homogeneous on several parameters important in the framework (e.g., perceived severity of health outcomes, cultural importance of fish in the diet), the FCI should improve the ability of individuals to make their own “informed decisions” about an appropriate fish consumption rate, particularly if the FCI is presented graphically relative to differing fish consumption levels and species or locations.

The framework provides a range of fish consumption rates that will result in a net health benefit score. A risk communication approach aimed at enabling fish consumers to make their own, informed, decision might convey this net health benefit score graphically (e.g., Fig. 6-5 Health Scale as a Function of Fish Consumption Rate). The magnitude of risk or benefit the consumer may incur can be compared for different levels of fish consumption, allowing a consumer to "locate" her/himself along the spectrum of consumption values compared to current consumption vs. some changed rate of consumption. Changes in consumption might result from changing species or size of fish eaten, or location where fish are caught. For example, eating smaller fish of the same species may likely reduce the risks due to chemical contamination while maintaining the benefits because these smaller fish are generally younger, and correspondingly less contaminated.

With this ability to compare the net health impacts of different consumption levels, risk communication programs may enable individuals to choose a "risk/benefit" level appropriate for themselves. A side benefit of this approach is that it may stimulate greater public awareness that the concepts of "safety" and "risk" are continuous, not dichotomous. Communicating the FCI graphically, therefore, can make a contribution to the general need in our society for science education and greater public understanding of the concepts of uncertainty and variability.

A less-individualized approach using the framework is also possible. The risk manager could select a particular point on the FCI graph, such as the fish consumption rate at which the benefits are impacted by the risks by a certain percentage (e.g., 10%), reflecting the risk communication objectives described earlier. In this case, the range of net benefit/risk ratios is not communicated to target audiences who then select the appropriate ratio. Rather, the risk manager selects the appropriate ratio and uses this to communicate health advice regarding an appropriate level of fish consumption that considers both health risks and health benefits. Calculating an FCI for different subgroups (e.g., infant, adult) as described earlier is also possible, increasing the specificity of the fish consumption advice to target audiences. Many existing health advisory programs issue different advice for women of childbearing age and children compared to men and older women. Thus, use of the framework in this way does not represent a major conceptual shift.

As noted earlier, the framework produces the FCI, which is a measure of the net health risk and benefit of eating fish. In addition, if cultural concerns or personal perceptions of severity of risk and magnitude of benefits are included, based on the target audience needs assessment, the FCI becomes a measure of more than just health endpoints. This feature is not available in most current health advisory approaches.

Factors such as perceived severity and cultural importance reflect individual and community values. Because the framework allows these values to be incorporated into developing the FCI, and therefore identifying an appropriate or recommended fish consumption rate, it is quite possible that different social groups would receive different fish consumption recommendations. Different recommendations for different types of groups are now common in health advisory communication programs, in which advice for children or women of childbearing age is often much more restrictive than advice for other demographic groups. Good risk communication

programs explain the basis for these differing fish consumption recommendations, and explain the basic assumptions used in risk assessment and risk management decisions (U.S. EPA 1995). Explaining the assumptions on which health advisory recommendations are based is essential for any health advisory program. For example, advisory programs that assume a particular type of fish preparation (e.g., skin-off fillets) may produce fish consumption advice that is not protective enough of fish consumers who do not use the assumed approach. Connelly *et al*. (1996) discussed the importance of explaining the assumptions underlying the calculations of health risk in advisory programs.

Risk communication programs based on the framework would need to include an explanation of the basis for differences among target audiences in fish consumption advice, characterizing, for example, the greater cultural importance of fish and fish-eating to certain communities. The demand for, and benefits from, this audience-specific consumption advice may be countered by questions and criticisms about the appropriateness of providing different advice for subpopulations within the community. Involvement of the target audience and subpopulation in identifying and quantifying cultural importance will help address some concerns, as will careful communication of the components of the FCI. Risk communicators should anticipate these concerns and develop a response explaining the importance of this approach (e.g., focusing on the risks associated with a loss of culture). The information in Chapter 5 *Socio-cultural Considerations of Fish Consumption* may be helpful.

It is important in both local and statewide applications to indicate clearly the assumptions underlying calculation of the FCI. For example, is the FCI is based on risks specific to women of childbearing age, then the risk communication information must be geared to explaining why this advice pertains to women of childbearing age, and how it should be interpreted by other types of audiences.

Depending on which approach is chosen, conveying the FCI in terms of a single recommended fish consumption rate or representing the range of the FCI relative to differing fish consumption levels, different formats will be appropriate for representing the health advisory information. A primary consideration is ensuring that the material communicated is appropriate to the language abilities and reading level of the intended audience. For many audiences, a combination of diagrams (graphs) and text may be most effective (Connelly and Knuth, in press). Text-only presentation of advisory information is likely less effective than text coupled with graphs or tables (Krieger and Hoehn, 1998). If the FCI is conveyed as a range, the illustration should be accompanied by text explaining how to interpret the graph. In addition, a combination of qualitative and quantitative information appears to be effective for many types of audiences, and a cajoling rather than a commanding tone better meets many target audiences needs (Connelly and Knuth, in press). The presentation of the FCI as a range of values rather than a single unit of "maximum allowable fish consumption" better addresses the intent of cajoling vs. commanding health advisory information. In cases in which FCI is presented as a single value, however, the information can be provided as a recommendation supported by clear explanations and explicit assumptions to give it a greater "cajoling" appearance rather than an authoritative command devoid of explanation.

A variety of dissemination approaches are detailed in U.S. EPA's Risk Communication guidance (U.S. EPA 1995). These include mass media such as television, radio, newspapers, magazines, billboards (appropriate for small subpopulations as well as general public audiences); specialized media such as guides, brochures, newsletters, fact sheets, videotapes, posters, and comic strips; and interpersonal contacts. Pre-testing both the potential content and the dissemination method with the intended target audience(s) is recommended. Messages delivered in the preferred style of the target audience have higher potential for success than messages constructed in the preferred style of the communicator (Johnson and Petcovic, 1987).

7.2.4 Evaluation

Evaluation should occur throughout the design and implementation of the health advisory communication program. Evaluation includes three types: formative, process, and summative.

Formative evaluation addresses the match between health advisory program objectives, including communication objectives, and the intended content and dissemination plans for the health advisory information. It occurs during problem analysis, audience needs assessment, and communication strategy design phases. A key focus in decisions relative to the Framework is the extent to which health advisory program objectives mesh with the data used as input for calculations leading up to the FCI (e.g., appropriate choice of audience-specific data; inclusion of cultural concerns as appropriate). This focus may also help with the decision to present fish consumption recommendations as a single value or as a range (FCI graphic).

Process evaluation assesses the correspondence between activities planned and activities implemented. Typical questions focus on the extent to which communication activities are being conducted on the intended time schedule, with the intended staff and budget resources, and using the intended dissemination mechanisms.

Summative evaluation assesses the outcomes produced through the health advisory risk communication program. Thus, a key element of this type of evaluation is assessing the extent to which objectives identified during the "Problem Analysis" phase of the risk communication process have been met. This also includes assessing the extent to which the objectives of the target audience have been met.

The evaluation process is detailed in the risk communication guidance (U.S. EPA 1995). Evaluation considerations for health advisory programs using the Comparative Dietary Risk Framework do not differ considerably from those of existing health advisory programs. Evaluation efforts, however, should be increased when programs switch from a more traditional approach to using the Framework, to help identify additional or different information needs, problems, or concerns that arise during the transition.

7.3 Research Needs and Further Work

Key to the approach proposed in this document is research-based evaluation, alluded to in the preceding section. A major concern voiced at recent Federal-State-Tribal forums on fish consumption health advisories is the challenge of helping potential fish consumers balance the

tradeoffs between health risks from exposure to chemical contaminants and the health benefits from eating fish. The approach described herein is an attempt at providing states and tribes the ability to describe and analyze such tradeoffs between benefits and risks. Ultimately, however, no approach will be successful if it cannot be understood and applied by the audiences for which it is intended. Both formative and summative evaluation research efforts are therefore needed.

Formative evaluation research would include working with the target audiences, including particularly at-risk populations (e.g., tribes with potentially heavy fish consumption, women of childbearing age, fish-eating families with children), to identify their information needs. Ideally, formative evaluation begins with in-depth, qualitative analysis of information needs and the range of potential responses to and concerns about various types of information (e.g., the FCI graphics and text). Focus groups and other interactive forums often provide the best mechanism for this stage of research. Formative evaluation continues with iterative development of communication approaches and content, with communicators and target audiences working in partnership.

Summative evaluation, an empirical assessment of the impact of the communication process, is a critical research need to assess the efficacy of the FCI approach. Summative evaluation is often hypothesis-based. For example, possible hypotheses related to use of the FCI include:

H_1: Availability of health benefit/risk comparison information via the FCI will be related to increased confidence of fish consumers that they are making an informed decision about fish consumption;

H_2: Increased information provided to fish consumers through the FCI will lead to improved compliance with health advisory recommendations.

Summative evaluation assesses the extent to which program objectives were achieved. Thus, achievement of the objectives of health advisory programs using the FCI should be evaluated systematically, both before implementing FCI, and after. Collecting baseline data is critical to evaluating the impact of new risk management and communication programs.

7.4 References

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