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A DISCOURSE ANALYSIS OF HOW CITIZENS, AGENCY MANAGERS AND THE MEDIA FRAME HUMAN CONSUMPTION OF MERCURY IN FISH: WHOSE (WHAT) INTERESTS ARE (NOT) SERVED AND WHY IT MATTERS

presented by

Melanie Lynn Hiltunen Barbier

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of the requirements for the

Doctoral degree in Fisheries and Wildlife

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By

Melanie Lynn Hiltunen Barbier

A DISSERTATION

Submitted to Michigan State University
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Fisheries and Wildlife

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ABSTRACT

A DISCOURSE ANALYSIS OF HOW CITIZENS, AGENCY MANAGERS AND THE MEDIA FRAME HUMAN CONSUMPTION OF MERCURY IN FISH: WHOSE (WHAT) INTERESTS ARE (NOT) SERVED AND WHY IT MATTERS

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The purpose of this study is to understand 1) how different actors (the public, the media, and agency managers) frame mercury and fish consumption, 2) how those frames affect those who are at risk, and 3) how to recognize implications of gender and equality in order to improve agency risk assessment, management and communication. In order to do this, residents from Michigan's Upper Peninsula participated in focus groups, community dinners, informal angler interviews and a public meeting during 2004-2005 (N=244). Interviews with state and federal public health, natural resource, food safety and environmental agencies were held from 2006-2007 (N=16). Articles from the New York Times, Washington Post and the Associated Press (1988-Jan 2008: N=37), in addition to transcripts from network television (CBS, ABC, NBC) and news programs (2001-Jan 2008: N= 25) represent how the media frames the issue. Results show that all three sample populations frame mercury in fish in terms of a human health issue. A few interviewees from federal agencies and many news articles and transcripts also talk about ecological health in terms reducing mercury emissions from coal-fired power plants.

The public frames mercury as a non-issue and focuses on their uncertainty over the risks and benefits of consuming fish. People form their own (often incorrect) ideas about the risks and benefits of consuming fish based on mental-models, trust, and past experience. Government managers and scientists are aware that the current fish

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consumption information is inadequate, but feel they lack the resources, political will, or control over information dissemination to develop better risk characterization and communication. The media use three main frames to discuss mercury and fish consumption: (1) mercury does not pose a threat to human health, (2) mercury does pose a threat to human health, and (3) information about mercury and fish consumption is uncertain. These risk framing processes leave those at-risk unable maximize the benefits and minimize the risks of consuming fish. It also leads to overly risk averse or overly risk accepting behavior. In addition, the fish consumption advisory program does not help people understand why there are contaminants in fish.

Government process of risk identification, management and communication are supposed to serve those at risk, but in reality serve technocratic agency goals, objectives, and funding priorities. The lack of targeted fish communication is unjust to women of childbearing age and others who consume large amounts of fish because it subjects them to increased risks without giving them the proper information to choose, or benefit from fish consumption, nor does it allow for a discussion of limiting or mitigating the chemical content of fish. In order to improve fish consumption benefit and risk information, government agency managers need to develop more reflexive and rigorous processes for public participation, and implement adaptive governance to develop risk communication and risk policy. In addition, there is a need for holistic multi-disciplinary management of contaminants in fish. The process should incorporate working with stakeholder groups to develop risk assessment and management and create appropriate risk communication messages that are conscious of gendered science practices and positionality.

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ACKNOWLEDGMENTS

The completion of this dissertation would not be possible with out the help and support of my major professor Geoffrey Habron; my committee: Tracy Dobson, Craig Harris, Mike Jones, and Linda Kalof; project partners: Michigan State University extension in Gogebic, Chippewa, Marquette and Alger counties (especially Joan Vinette) and Michigan Sea Grant (Ron Kinnunen); collaborating individuals and organizations: Bailey Scholars Program (MSU), Upper Peninsula Children's Museum, VanLanschoots Fish House, Thills Fish House, Wilcox Fisheries, Life of Lake Superior Program, Falling Rock Cafe, Jennifer Binkley-Power, John Hesse and Heather Patt; and last, but certainly not least, my family: Guillaume and Amélie, Bob and Pam (Dad and Mom) and Jean-Claude and Marie-Jo. Thank you all.

This dissertation was made possible by funding from the Gender Justice and Environmental Change Program's Dissertation Completion Scholarship and as part of a larger fish consumption advisory project funded by the Agency for Toxic Substances and Disease Registry in the U.S. Department of Health and Human Services (Grant #H75/ATH573196).

So long, and thanks for all the fish…

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KEY TO ABBREVIATIONS

U.P. Michigan's Upper Peninsula

EPA: United States Environmental Protection Agency

FDA: United States Food and Drug Administration

DCH: Michigan Department of Community Health

DEQ: Michigan Department of Environmental Quality

DNR: Michigan Department of Natural Resources

ATSDR: Agency for Toxic Substances and Disease Registry, United States Department of Health and Human Services

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Chapter One

Introduction

Risks exist. How they are conceptualized, talked about, decided upon, studied and experienced diverges widely and depends on socio-cultural norms and practices (Adam and Van Loon 2000; Beck 2000; Horning-Priest 1995: Rosa 1998) and the physical properties of things we value, including human beings (Adam and Van Loon 2000; Kasperson 1999; Lidskog 2002; Rosa 1998; Wynne 2002). Therefore, the conceptualization of risk is a scientific, technological and social process. However, current environmental policy and natural resource management in the United States rely only on scientific risk assessment and technocratic decision making (Adam and Van Loon 2000; Beck 2000; Dietz, Frey and Rosa 1998; Rosa 1998), and such is the case of fish consumption advisories (Chess et al. 2003; Habron et al. 2008). Feminist scholars note that modern science, and its masculinist and positivistic culture of objectivity and truth, marginalizes certain groups, such as, women, children and ethnic minorities - exactly those at high-risk in the fish consumption issue (Buckingham-Hatfield 2000; Fischer 2000; Harding 2001; Haraway 1989, 1991, and 2001; Merchant 1996).

The purpose of my research is to use a case study of fish consumption advisories in Michigan's Upper Peninsula (U.P.) to understand how risk is constructed by a) environment, natural resource, food safety, and public health agencies at the state and federal levels b) the national media and c) the public [Upper Peninsula Residents]. Understanding these frames enables the identification of 1) the effect that these risk framing processes have on the people who are labeled at-risk (women, children and some minorities l

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minorities), its implications for gender and justice in risk issues, and how this process can be improved to be more democratic, inclusive and proficient at achieving a more effective and sustainable fish advisory program. It also facilitates opening the dialogue to identify the acceptable risks, policy goals and objectives for human and ecological health.

Research Questions

- What is the current institutional context for the fish consumption advisory process (scientific risk identification, assessment, characterization, data collection, and risk communication) at the state and federal level?
- How do individuals, federal and state agencies, and the local media frame the mercury and fish consumption issue?
- Whose interests, both real and/or perceived, are served, or not served, by the ways in which mercury and fish consumption information is framed?
- What are the implications for this in terms of gender and equality?

In order to answer these questions it is necessary to know about mercury in the environment, human mercury exposure from food, and a history of mercury regulation in Michigan and the United States. Therefore, chapter two provides background information about mercury and its danger to humans, the study of human mercury exposure from food sources, the history of mercury regulation by the state of Michigan and the federal government, and an overview of fish consumption advisories, including past and present agency collaboration.

Chapter three covers the theoretical basis for this study and its analysis. Chapter four provides an overview of the methods used in this study in addition to a discussion of methodological theory, potential biases, and (in)advertent omissions/neglect. Chapter five begins with a short summary of research results and continues with a detailed report of those res

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of those results in three different sections: Participants from the Upper Peninsula, Government Agency Staff, and the Media. At the end of the chapter there is an overview of these results.

Chapter six discusses the results in terms of advisory framing activities and provides recommendations to improve risk characterization, management, and communication to protect human and environmental health. It follows two important questions that stem from research results: 1) Why create a fish consumption advisory if it does not reach or help the effected populations at risk; and 2) If mercury contamination affects both human and ecological health, why do government agencies treat them separately? The answers to these questions provide the jumping off point for recommendations to improve the advisory and policy process.

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Chapter 2

Mercury: Human Exposure, Regulation, & Advisories

I. Mercury in the Environment

Mercury (Hg) is a major global environmental pollutant (Flaherty et al. 2003). It comes from a variety of sources, both natural (30%), such as, volcanic eruptions, geysers, and forest fires; and anthropogenic (70%), such as, coal-fired power plants (which make up 41% of atmospheric Hg) (Carrington and Bolger 2002; Foulke 1995; Trasande et al. 2005; USEPA 2000; Weiss 1995). Certain microorganisms present in water and sediments can convert elemental mercury into its most toxic and bio-available form, methylmercury (MeHg) (Hesse, 2005). Over 90% of total mercury present in fish tissue is in the form of methylmercury (USEPA 2000; Foulke 1995; Great Lakes Consortium 2007). At least some level of methylmercury can be found in every fish in the world (Carrington and Bolger 2002).

Unlike persistent organic pollutants (POPs)[1] (such as PCBs) mercury and methylmercury bind to proteins in all fish tissue (Carrington and Bolger 2002; Flaherty et al. 2003; Foulke 1995; Mahaffey et al. 2003). Therefore, in contrast to POPs, which bind to fatty tissues that can be removed or reduced through special fish preparation (trimming off the fat, skin and head, removing major organs) or cooking methods (broiling, baking or grilling, instead of frying or smoking), high levels of mercury remain in fish no matter how it is prepared (Flaherty et al 2003; Hesse 2003; Mahaffey et al. 2003; MDCH 2003,

[1] "Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment around the world. Because they can be transported by wind and water, most POPs generated in one country can affect people and wildlife far from where they are used and released. They persist for long periods of time in the environment and can accumulate and pass from one species to the next through the food chain." http://www.epa.gov/international/toxics/pop.pdf

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2007). Fish consumption is the major source of mercury (in the form of methylmercury) exposure to humans (Carrington and Bolger 2002; Flaherty et al. 2003; Hall et al. 1997) because methylmercury easily bioaccumulates and biomagnifies up the food chain (Anderson et al. 2004; Carrington and Bolger 2002; EPA 2000; Flaherty et al. 2003; Foulke 1995; Hesse 1997).

II. The Study of Human Exposure to Mercury through Food

A. High-Dose Exposures: Minamata and Iraq

The first studies of human mercury poisoning due to the consumption of highly contaminated fish occurred in Minamata Japan in the 1960's (Carrington and Bolger 2002; Hesse 2003; Foulke 1995; Marsh et al. 1995; Weiss 1995). For decades mercury-contaminated effluent from an acetaldehyde plant (used for making plastics) spilled mercury into the bay, heavily polluting the local fish that the people of Minamata relied upon as their primary source of protein (Weiss 1995). Minamata disease, as it is now called, was first observed in humans in 1956. Before that time it was seen in cats exhibiting strange behavior, "dancing" in the streets, and then collapsing and dying (Weiss 1995).

Symptoms of methylmercury poisoning in humans include loss of hearing, peripheral vision and coordination, memory problems, impaired speech, mental disturbances, paresthesia, and behavioral changes (Foulke 1995; Hesse 2003; Weiss 1995). In extreme cases mercury poisoning can cause death (Hesse 2003; Weiss 1995). These often dire consequences are due to mercury's effect on vital bodily functions such as the central nervous system, brain and kidneys. For fetuses, babies and small children, mercury poisoning even in small doses may cause brain damage and other developmental birth defects (

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The negative effect mercury has on fetal and child development is the primary threat of mercury poisoning to humans (Budtz-Jorgensen 2004; Foulke 1995; Marsh et al. 1995; Myers et al. 1995; Rice 2004; Trasande et al. 2005; USEPA 2000; 2004; Weiss 1995). The correlation between maternal mercury levels and infant developmental problems was first suspected in Minamata when mothers exhibiting no negative effects from mercury poisoning gave birth to children with cerebral palsy and other developmental difficulties (Marsh et al. 1995; Trasande et al. 2005).

The connection between maternal mercury consumption and infant poisoning was specifically studied and scientifically confirmed in the 1970s when a community in Iraq was accidentally poisoned with methylmercury (Bakier et al. 1973; Carrington and Bolger 2002; Foulke 1995; Marsh et al. 1995; Meyers et al. 2003; Trasande et al. 2005). The range of maternal hair mercury level in Iraq was extremely high, between 10 and 15ppm, much higher than typical mercury levels in North American fish consumers (Marsh et al. 1995). Until recently many U.S. state and federal agencies used extrapolations of these data to develop methylmercury exposure standards for fish (NRC 2000).

B. Small-Dose Contamination: Faroe Islands, New Zealand and Seychelles Islands

The first peer-reviewed study of low-dose maternal methylmercury exposure and its effects on child development took place in the Faroe Islands, off the coast of Denmark, in the 1980s (NRC 2000; Rice 2004). A large sample size of 900 mother-infant pairs were studied to understand the correlation between methylmercury content in umbilical

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umbilical cord-blood and maternal hair with later child development (at age 7 and later at age 14) (NRC 2000, Rice 2004). Mothers in the Faroe Islands study reported eating approximately three fish meals per week with once monthly meals of pilot whale that contain 10-20 times the amount of methylmercury found in fish normally consumed (NRC 2000). The results showed exposure-related effects in children on a range of specific neuropsychological endpoints as a result of higher maternal methylmercury exposure due to consuming fish (NRC 2000; Rice 2004).

At about the same time as the Faroe study, a study in New Zealand also found exposure related effects of maternal methylmercury content on the child's neuropsychological development (NRC 2000; Rice 2004). In this study 38 mother-infant pairs with high (over 6ppm) maternal mercury levels were matched with mother-infant pairs with low mercury levels (NRC 2000; Rice 2004). Hair samples were used to calculate maternal mercury levels (NRC 2000; Rice 2004). The children were assessed at the age of 6 on a number of global neuropsychological scales (NRC 2000; Rice 2004). The results show that children born to mothers with higher mercury levels perform more poorly than those with lower maternal mercury levels (NRC 2000). Scientists and governments rarely use the New Zealand study because it has a small sample size and until recently did not undergo peer review (NRC 2000).

The Faroe Islands and New Zealand studies detected negative developmental effects with relatively low-dose methylmercury exposure (NRC 2000). Conversely, a 1995 study of low-dose methylmercury contamination from fish consumption in the Seychelles Islands (Indian Ocean) found no negative effects of maternal methylmercury exposure (

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In the Seychelles study 779 mother-child pairs were followed from birth to the age of five and half (Davidson et al. 1995; Myers et al. 1995; NRC 2000; Rice 2004). Researchers used maternal hair samples to calculate maternal mercury concentrations throughout the entire pregnancy (NRC 2000). Unlike the Faroe Islands or New Zealand studies, mothers in the Seychelles ate primarily low to moderate-mercury containing fish species in absence of any PCBs. However, they ate many more fish meals per week (~12) (Davidson et al. 1995; Myers et al. 1995; NRC 2000; Rice 2004). And the results demonstrated that there were no developmental differences between children with high maternal mercury exposure and those with low.

In the year 2000, the Faroe, Seychelles Islands, and New Zealand studies were critically reviewed by the National Research Council (NRC) (NRC 2000). The NRC report attributed the differences in results between the Faroe and Seychelles studies to a number of experimental parameters. For example, each study used different study design and biomarkers for measuring mercury. In addition, the study populations consumed different types of fish species and had different ranges of maternal mercury exposure and different levels of other contaminants like PCBs. One important difference among the studies was that the Seychelles study did not control for the test administrator. Therefore, test performance may be a result of the quality of test administer and not the level of mercury in the blood.

In addition, the NRC report speculates that the large amount of fish that mothers in the Seychelles ate may have contributed to a "buffering effect". High levels of

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Omega-3 fatty acids found in the species of fish eaten by mothers in the Seychelles aid infant neuropsychological development and may have attenuated the negative developmental effects of mercury exposure. However, according to the report this hypothesis has not been tested empirically (NRC 2000).

Another potentially confounding factor is the different types of seafood people in the Faroe and Seychelles Islands eat. Mothers in the Faroe Islands eat pilot whale, which in addition to high doses of mercury, also have large amounts of Persistent Organic Pollutants such as PCBs. A series of studies conducted in Michigan tested the effects of intrauterine PCB exposure on childhood development. These studies found a correlation between higher maternal PCB levels and later developmental difficulties for their children (Jacobson et al. 1985; Jacobson et al. 1997). They associate maternal PCB exposure with a number of developmental deficits in children, such as lower birth weight, poorer autonomic and reflex functions, and poorer visual recognition memory (Jacobson et al. 1985:854; Jacobson et al. 1997). Therefore, the presence of other contaminants, such as PCBs, may affect the results of the developmental tests. The authors of the Faroe Islands study deny this claim (NRC 2000).

The NRC report (2000) suggests that the New Zealand study is similar enough to the Seychelles study that any differences between the Faroe and Seychelles Islands study designs are not sufficiently significant to explain the differing results. The exact reason for the difference between the Seychelles and Faroe Islands studies is unknown and more research is needed. Nonetheless, the three studies are important to the fish consumption advisory issues because the low-dose mercury exposure data are more relevant to risk assessment in the United States than either the Japan or Iraq studies with very high-dose of merc

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of mercury exposure (NRC 2000). They also highlight the complex nature of risk assessment, scientific uncertainty, and balancing fish consumption benefits with the risks (Neumann et al. 1997).

C. Human Health, Mercury, and Fish Consumption

Since the Seychelles study no new overarching research has been done to study the neurological/developmental effects of low-dose mercury exposure in mothers and infants. However, more recent studies suggest consuming too much mercury can also lead to cardiovascular health (Stern 2005) or male reproductive (Chou et al. 2002) problems. Also, in 2002 Dr. Jane Hightower, a San Francisco internist, published a study of her wealthy health-conscious patients who ate a lot of seafood, and, as a result had high levels of mercury. Many of Dr. Hightower's patients suffered from symptoms of mercury poisoning including memory loss and heavy fatigue (Hightower and Moore 2003). Not one of these later (Chou et al 2002; Hightower and Moor 2003; Stern 2005) studies figures into state or federal agency risk assessment and decision making processes that, in some cases, solely emphasize the risks of human mercury exposure to women of childbearing age and children (USDHHS 2004; MDCH 2003, 2007).

III. Regulating Methylmercury in Fish

Table 2.1 Mercury and Fish Contamination Advisory Timeline 1950-1980

- 1956: First observed case of Minamata disease, mercury poisoning due to fish consumption [Japan had second case of poisoning a few years later in Niiagata]
- 1960s: First studies of fish consumption and mercury poisoning in Minimata
- 1970s: First studies of the correlation between maternal mercury consumption and fetal mercury poisoning in Iraq
- Late 1960-early 1970: FDA first regulates mercury content in United States food supply (.5ppm limit for safe human consumption)
- 1970: High levels of mercury are found in Michigan fish (Lake St. Clair) due to pollution from a chlor-alkali facility
- 1970: Michigan becomes the first state to develop a fish consumption advisory
- 1975-76: PCBs are banned in Michigan
- 1977: Michigan first includes annual advisory updates to the state fishing guides that accompany a fishing license
- 1977: Clean Water Act- EPA establishes reference dose for methylmercury in water (.3 ug/kg/day)
- 1979: FDA is legally bound to increase their action level for methylmercury contamination in fish from .5ppm to 1ppm
- 1979: EPA bans PCB use under the Toxic Substances Control Act (TSCA)

Table 2.2 Fish Contamination Advisory Timeline Continued: 1980-1996

- 1985: Lake Michigan States develop a common fish consumption advisory protocol for PCBs in Lake Michigan
- 1986: Great Lakes governors call for common Great Lakes fish advisory protocols for PCBs by 1987, thereby establishing the Great Lakes Fish Consumption Advisory Task Force to look for common methodology among Great Lakes state health officials, FDA and EPA
- 1987: Faroe Islands study finds maternal consumption of fish with low level mercury contamination has negative effects on child development
- 1989: Paper Reduction Act in Michigan puts an end to a mandated fish consumption advisory program
- 1994: Most of the Great Lakes states implement a common Great Lakes PCB protocol- Michigan among those that did not [New York did not use the protocol but had a unique methodology that the EPA did not challenge]
- 1994: Michigan governor Engler established a "blue ribbon" panel of scientists who ultimately recommend adopting the Great Lakes PCB protocol for women and children only
- 1994: FDA consumer magazine features its first article on mercury and fish, "Mercury in Fish: Cause for concern?"
- 1995: Seychelles Islands study finds no negative effects on child development from low level mercury contamination and maternal fish consumption
- 1995: EPA changed their reference dose for mercury in fish (.1ug/body weight/day)
- 1996: Michigan relaxes salmon advisory and comes under fire by the National Wildlife Federation, EPA, and the International Joint Commission

Table 2.3 Mercury and Fish Contamination Advisory Timeline Continued: 1997-2007

- 1999: Congressional appropriations for the EPA arrange for a study of methylmercury toxicity in humans to resolve the differences between EPA, FDA, and ATSDR scientific protocols.
- 2000: The National Academy of Science conducts this research and reports findings on methylmercury toxicity
- 2000: EPA Starr Report on mercury
- 2000: FDA comes under fire for no longer testing fish for mercury
- 2001: FDA creates their first official fish consumption advisory
- 2002: FDA calls upon an independent scientific panel of advisors to look at the fish consumption and mercury issue
- 2002: Hightower study of mercury poisoning in patients who consume a lot of fish reported by media
- 2002: Michigan stops printing fish consumption advisory for distribution with fishing licenses but makes it available to WIC clinics, local health departments, and persons requesting copies. Since then, it has also been made available on-line.
- 2004: Joint EPA/FDA mercury fish consumption advisory for women of childbearing age and children
- 2007: Common Great Lakes Protocol for mercury (Michigan has not yet adopted this protocol)
- 2009: FDA discusses a revision of the 2004 joint mercury advisory to promote increasing fish consumption

A. Federal Agencies: Food and Drug

A. Food and Drug Administration and Environmental Protection Agency

Since 2004, on a national level the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) warn women of childbearing age and children against eating large ocean predators such as shark, swordfish, king mackerel, and tilefish because of their high mercury content (EPA/FDA 2004). Some argue that tuna should also be on the do not eat list due to the large amounts of tuna consumed in the United States. So far, the FDA and EPA have decided to advise women to eat only one meal of albacore tuna per week or eat only chunked light tuna that is much lower in methylmercury (USDHHS 2006).

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The Federal Food and Drug Administration (FDA) first regulated mercury (as methylmercury) in fish in the late 1960's (Foulke 1995, Hesse 2003). Mercury was regulated as methylmercury because regulation is based on human health risks (instead of ecological health risks) and methylmercury is the most bioavailable form of mercury and therefore most harmful to humans. The FDA set their action level for methylmercury in fish at 0.5 parts per million. The FDA action level "represents the limits at or above which the FDA will take legal action to remove products from the market" (Foulke 1995). The removal of products from the market obviously poses major consequences for the commercial fishing industry and is, therefore, not taken lightly by the FDA.

In 1979 the FDA was mandated by the courts to increase their action level for methylmercury from .5ppm to 1ppm due to the probable negative impacts of such a low action level on ocean fish markets (Hesse 1997). When the FDA determines an action level they are not required to make human health their primary focus; in fact, they are legally mandated to consider economic impacts to industry (Hesse 1997; US FDA 2000). Therefore, the FDA action level for methylmercury remains the same, although new epidemiological methods have prompted other state and federal regulatory agencies to use lower action levels for methylmercury from 0.5ppm and lower (Hesse 1997; Rice 2004).

The EPA has a slightly different way of scientifically representing the risk of mercury in fish. They use a reference dose, which is more conservative than the FDA's action level, but used for a completely different purpose. The EPA defines a reference dose as "numeric values we believe will protect human health from pollutant concentrations in aquatic media, such as ambient waters and edible tissue" (Borum et al.

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2001). In the late 1970's the Environmental Protection Agency (EPA), as part of the requirements of the Clean Water Act, developed a reference dose for methylmercury in aquatic media. Unlike the FDA, the EPA more cautiously set their reference dose for human methylmercury exposure at 0.3 micrograms/kilogram of body weight/day. Since 1995 the EPA uses a reference dose of 0.1 micrograms/kilogram of body weight/day for women of childbearing age and children (Great Lakes Consortium 2007).

In 1997, as a requirement of the Clean Air Act amendments of 1990, the EPA presented a report to Congress (often called the *Mercury Report)* about the risks and effects of mercury in the environment (EPA 1997). As a result of this report and the release of data from the Faroe and Seychelles Islands studies, mercury in fish gained interest in the news in the mid to late 1990s. In addition, in 1999 the Center for Disease Control's Agency for Toxic Substances and Disease Registry (CDC/ATSDR) relaxed their minimum risk level for methylmercury in response to data from the Seychelles Islands study. This change was highly criticized by some in Congress.[2]

For example, Senator Patrick Leahy of Vermont who was seen and quoted in many newspapers and television news programs at the time,[3] felt that the ATSDR should have waited for the National Academy of Science's review of the toxicological effects of methylmercury on human and the environment. In 1998 congressional appropriations[4] to the EPA funded the National Academy of Science's National Research Council for a comprehensive study methylmercury. As a result the National Research Council's (NRC) Board of Environmental Science and Toxicology created a special committee on

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[2] http://leahy.senate.gov/issues/environment/mercury/index.html#efforts Accessed 2/2/09

[3] http://leahy.senate.gov/issues/environment/mercury/index.html#efforts Accessed 2/2/09

[4] VA-HUD appropriations bill of 1999:HR 4194; EPA grant #X 827238-01

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the toxicological effects of methylmercury (NRC 2000). In 2000, the NRC published their report designating guidelines for methylmercury risk assessment and risk characterization.

In the months and years that followed, the FDA, EPA and CDC/ATSDR reevaluated their reference doses, guidelines and risk assessment methodology for methylmercury. In 2001 the FDA developed their first fish consumption advisory. Before publishing, the FDA submitted it to an independent science advisory committee for review. The committee recommended that the FDA collaborate with the EPA, give more specific and targeted risk communication information for women of childbearing age and children, and include tuna as a restricted fish due to its popularity among American households.

The FDA heeded the advice of the committee and collaborated with the EPA to develop a common mercury advisory for women of childbearing age. The joint advisory came out in 2004. In the advisory, tuna is not included on the list of fish in the "do not eat" category. The joint FDA/EPA advisory does, however, include information about albacore tuna having higher mercury levels than chunked light tuna (USDHHS 2004).

B. Michigan Advisories

In Michigan high mercury levels are more a cause for concern in inland lakes and reservoirs than in the Great Lakes (MDCH 2003; DEQ interviewee 2006). This is of great importance since Michigan has more than 11,000 lakes in which people enjoy sport fishing (MDCH 2007). In the Great Lakes the contaminants of concern are PCBs, chlordane, dioxin, toxaphene, and then mercury. However, the threat of mercury is increasing in the Great Lakes due to its continual atmospheric deposition into the lakes from coal-fired power plants and other industrial effluents. Conversely, the levels of certain persistent organic pollutants, such as PCBs, decrease over time as they are detected and banned (Groetsch 2005). Fish caught in Michigan's rivers and streams are less worrisome as their moving waters tend to flush contaminants into lakes, except on highly polluted rivers such as the Kalamazoo and the Saginaw/Tittabawassee (MDCH 2007) where fish are contaminated.

Mercury contamination in Michigan was first discovered in 1970 by a graduate student studying fish in Lake St. Clair downstream from a chlor-alkali facility (Hesse 1997). Following this discovery, Michigan became the first state to issue a fish consumption advisory. This advisory, unlike the current advisory, was mandated by state law. However, it included only methylmercury in the contaminated fish of Lake St. Clair and connecting waters. With the discovery of more contamination in Michigan's waters, a sport-caught fish consumption advisory was developed by the Department of Community Health (DCH) and published in 1971 as part of the Department of Natural Resources' (DNR) Michigan Fishing Guide distributed with sport fishing licenses. This non-mandated advisory covered methylmercury in addition to other pollutants such as PCBs.

By 1980 widespread distribution of mercury in inland lakes and reservoirs was found throughout the state of Michigan. Initially, Michigan used the same action levels for sport caught fish as the FDA used for commercial fish (0.5ppm) (Interviewee DCH 2006). In the late 1980s this level changed to the levels still used today. For women of childbearing age and children, the DCH recommends consuming fish with levels higher than 0.5ppm not more than once per month (Interviewee DCH 2007). For the general populati

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population the DCH recommends consuming fish with levels higher than 0.5ppm not more than one meal a week. Fish with levels higher than 1.5ppm are on the "do not eat" list for all populations (Interviewee DCH, 2007).

In 1989 the DCH issued a generic statewide advisory for mercury in inland lakes and reservoirs (Great Lakes Consortium 2007). The generic statewide advisory followed an intensive sampling of inland lakes between 1980 and 1988 (Interviewee DCH 2006). The inland lake advisory which still exits today suggests that women of childbearing age and children under the age of 15 limit themselves to no more than once a month consumption of crappie, rock bass or perch over 9 inches in length, and any size largemouth bass, smallmouth bass, walleye, northern pike, or muskie. It also recommends that the general population not eat these fish more than once a week (MDCH 2007).

The first printed version of the Michigan fish consumption advisory was incorporated into the DNR's fishing license packets. Once the advisory became too large to be printed in the fishing guide, a separate advisory document was distributed with the fishing guide to license vendors. In 2001, the two booklets were distributed in a common envelope provided with fishing licenses. Since 2003 the fish consumption advisory is no longer printed due to lack of funding for fish consumption advisories and is only available online from the Department of Community Health's website.

Today the Michigan fish consumption advisory program is based on project-specific grants from the Agency for Toxic Substances and Disease Registry (ATSDR). As a result of one such project, Michigan now has a brochure for store bought fish, in addition to their sport fish advisory which was finally updated in 2007 (MDCH 2007).

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The previous fish consumption advisory is from 2003 and was not updated due to lack of resources, even though the DEQ makes recommendations to do so each year.

IV. Advisory Collaboration and Consistency

A. Federal Agencies

The EPA, and to a lesser extent the FDA, sometimes collaborates with (and sometimes pressures) the states on state-level advisory procedures. In addition, the EPA develops guidance for state-level managers on fish sampling, analysis and risk assessment related to fish consumption. They also hold national technical conferences dealing with advisory issues (Farland in Hesse 1997; Interviewee EPA). Although the EPA is not legally responsible for fish consumption advisories, consistency among state advisories is in their best interest since it contributes to the implementation and consistency of other EPA programs, notably Superfund (Hesse 1997:152).

B. Michigan

1. Past Collaboration: Common Great Lakes Fish Consumption Advisory Protocol for PCBs

In 1983 the EPA (Region V) facilitated a state-based initiative to establish a uniform health advisory for sport fish caught in Lake Michigan. Each of the Lake Michigan states (Michigan, Illinois, Indiana, and Wisconsin) participated in this process (Hesse 1997). At the end of this process, the Lake Michigan states "agreed on common advisories for PCBs in Lake Michigan, (mercury was not considered) except where there were distinct regional differences, developed advisory information for particular fish species, and dedicated themselves to greater data sharing and better coordination of monitoring

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monitoring plans" (Hesse 1997:158). In 1985, the Lake Michigan states created the first uniform fish consumption advisory for PCBs in sport caught fish in Lake Michigan.

In an effort to expand collaboration and consistency among all the Great Lakes states, in 1986 the Great Lakes Governors met and adopted the "Governors' Great Lakes Toxic Substance Agreement" (Hesse 1997). As part of this agreement the Great Lakes states called for common fish advisories and advisory protocols across all the Great Lakes on a lake by lake basis. The Province of Ontario and other Canadian and tribal organizations also joined the call for common fish advisories and advisory methodology. The Great Lakes Fish Consumption Advisory Task Force (the Task Force) was formed to complete the task. The task force was made up of as many as three representatives from each state, the FDA, EPA, the Province of Ontario and other Canadian and Tribal organizations.

The product of the task force deliberations was a new "Health Protection Value" for PCBs as an alternative to previous action levels or reference doses (Hesse 1997). This level was based on the reproductive and developmental effects of PCBs on children as well as its cancer risk. The task force felt it was important to deviate from the FDA action levels because: one, the FDA action levels may not be sufficiently health-based to protect human heath; two, FDA levels are based on the idea that market-bought fish comes from a variety of sources; and lastly, FDA levels are developed to protect the general population on a national level.

It was assumed that anglers probably visit the same lakes over and over, and, if those lakes are contaminated, anglers will be consistently exposed to the same levels of the same contaminant. However, they did not consider local or regional fish eating habits, nor did th

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nor did they take into consideration the fact that anglers most likely eat more fish than the average population. The current advisory program still uses these assumptions for making fish consumption recommendations (Hesse 1997).

In 1996 the task force met and submitted final recommendations to the Great Lakes Governors' Council. It was then up to each state's governor to make the ultimate decision whether to adopt the protocol (Hesse 1997). Most of the Great Lakes states implemented the Great Lakes protocol in some form, except Michigan and New York. Governor John Engler of Michigan chose not to adopt the new "science-based" criteria because some people in the administration felt changing the action level from the FDA's to this new, more restrictive level might have had negative impacts on Michigan's economy (Interviewee MDCH).

In the following years, Michigan was heavily criticized by the EPA and environmental groups for not adequately protecting human health by failing to adopt the new risk-based common protocol. The EPA threatened to issue a separate fish consumption advisory for Michigan if the state did not comply. The EPA and the National Wildlife Federation effectively used the media to criticize the Engler administration. As a result, Governor Engler created another "blue ribbon" scientific advisory committee to review the proposed common protocol for PCBs (Hesse 1997:155). The scientific advisory committee recommended to keep FDA levels for the general population, and use more restrictive criteria for "sensitive populations" (women of childbearing age and children). Michigan then adopted the Great Lakes common fish consumption advisory protocol for sensitive populations only.

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2. Current Collaboration: 2007 Common Mercury Protocol

In May of 2007 the Great Lakes Consortium created an addendum to the 1993 "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (the PBC protocol described in the pervious section) called, "A Protocol for Mercury-based Fish Consumption Advice" (Great Lakes Consortium 2007). The Great Lakes Consortium replaced the Great Lakes Taskforce created during the joint PCB protocol process. It is made up of state, federal, and tribal public health and environmental agency staff from around the Great Lakes including Canadian provincial government and First Nation representatives.

Like the common protocol for PCBs, the Consortium agreed upon a methylmercury "Human Protection Value" for women of childbearing age and children. The value they chose is the EPA's reference dose for women of childbearing age and children, 0.1 micrograms per kilogram of bodyweight per day. The common mercury protocol also advises public health managers to consider more strict advisories when fish tissue tested has both mercury and PCBs. In addition to advice about the risks of mercury contamination in fish, the common mercury protocol also calls for fish consumption advice that includes the benefits of eating fish. The addendum (Great Lakes Consortium 2007, p. 18-19) says this about Michigan's potential for implementing the common protocol:

> *In Michigan the Protocol will be used to stimulate discussion on fish consumption advice that is developed using health-based mercury fish tissue concentrations. The Protocol will act as a starting point for trying to develop a process to update Michigan's Fish Consumption Advisory. The impediment is uncertainty regarding the implications of this change compared to the need for the change. The Department of Community Health currently does not provide explicit funding for updating or maintaining the fish consumption advisory program.*

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V. Overview

With decreasing funds and increasing responsibilities for state agency managers Michigan's fish consumption advisory program is not as active as it once was. The current advisory is only available on the DCH's website. However, at the federal level the mercury in fish issue seems to be growing in importance since the 2004 joint FDA/EPA mercury advisory for women of childbearing age and children. These two advisory processes are very different, one is for mercury in commercial fish on a national level for women of childbearing age and children only and the other is for a variety of chemicals found in sport-caught fish from inland lakes for women of childbearing age and the general population. This study looks at how different actors, the public (N=244), agency managers (N=16), and the media (N= 62 articles and transcripts) frame the issue to understand how they talk about and react to fish consumption advisory information in the face of political, social, and scientific limitations and uncertainty. The results will help to improve risk assessment, management and communication through social science research and by including the public in decisions about environmental and health policy.

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Chapter Three

Theoretical Frameworks and Literature Review: Risk, Feminist Critiques of Science and Framing

I. Introduction

Three main theoretical bases serve as the framework for this dissertation: sociological risk theory, feminist critiques of science, and theories of framing processes. These theoretical frameworks best enlighten the data analysis in order to answer the research questions put forth in the first chapter of the dissertation. Feminist critiques of sciences and sociological risk theory serve in tandem to analyze a) the types of frames the public, agency managers, and the media have about the safety of eating fish, b) the fish consumption advisory policy process, and c) whose interests these processes serve.

This chapter starts by asking the question: "what is risk?" The response will lead to a discussion of competing conceptions of risk within and among scientific and social analyses of risk. I defend the thesis put forth by Rosa (1998) that risk is ontologically real, but epistemologically vast. When risk is uncertain and there are high human stakes, such as the case of fish consumption risk, Rosa (1998) calls this post-normal risk.

However, identifying fish consumption advisories as fulfilling conditions of post-normal risk does not provide an explanation for how and why we talk about risks. It is pertinent then to study and understand how things "get done" in a scientific agency setting to tease out agenda setting processes. A discussion of risk theory in terms of risk communication and risk perception is necessary to identify the ways in which risk is discussed and understood by "experts" and "non-experts". In addition, to fully develop the discussion of risk identification, evaluation and communication I use feminist critiques of positivistic, patriarchal science to unmask hidden and underdeveloped understandings of prejudices embedded in scientific risk process.

Scientists in government agencies and agency managers, albeit at times begrudgingly, use reductionist scientific risk analyses to make decisions and policies about risk management and communication. The methodologies used by this type of risk analysis fail to account for the subtle (and not so subtle) ways in which government science underscores gender and ethnic differences with regard to risk characterization, management, and communication. In the case of fish consumption advisories this is highly important given that the most at-risk populations are the same ones traditionally left out by the patriarchal culture of modern science: women, children and minorities. In addition, the current government risk processes treat human and environmental risks as separate and do not approach risk and risk management holistically.

The final theoretical framework, social frames, describes the way people (experts and non-experts) formalize their points of view into structured frames that they use to act and react to information. Framing is the process of constructing one's reality to fit within some boundary based on experience, interests, beliefs, trust, knowledge, and socio-cultural belonging (Benford and Snow 2000). The literature on framing is often portrayed in terms of conflicting frames that develop as tactics for advancing social movements. In the fish consumption advisory issue, framing is less about how people develop opposing frames, but more about how and why people frame a risk issue in the face of multiple inputs and decision vectors and how individuals can occupy multiple frames at the same time, even conflicting ones (Benford and Snow 2000; Kurtz 2003; Hoffman 2001).

II. What is Risk?

A. Introduction

In the traditional scientific paradigm, risk is defined through probabilistic risk assessments that quantitatively identify risks and scientifically estimate the probability and consequences of their occurrence (Dietz et al. 1998). These risk assessments are often articulated in the form of risk ratios. Agency managers and decision makers integrate these risk ratios into policy and communicate them to the public through risk communication and agency outreach. Once scientists determine an acceptable level of risk, government agencies mobilize to avoid, reduce, mitigate, and control unacceptable risks (Dietz et al. 1998). However, determining how much risk is too much, and to what extent adverse effects will be observable, measurable, and discrete is ambiguous at best (Adam and van Loon 2000; Beck 2000; Horning-Priest 1995; Kasperson 1991; Lidskog 2000; Rosa 1998). This process is by and large a solely scientific, technological, or engineering practice and does not include stakeholder participation (Dietz et al 1998).

Over the past twenty years the limited conceptualization of risk that probabilistic risk assessment offers has been critiqued and deconstructed by social science scholars (Beck 2000; Dietz et al. 1998; Douglas and Wildavsky 1982; Freudenberg 1989; Rosa 1998; Slovic 1992; Wynne 2002). These scholars propose that risk is a social phenomenon in addition (or as opposed) to a scientific one. Many authors note the limitations of a technological and scientific process to fully articulate risks in a reliable, value-free, and nonbiased way (Adam and van Loon 2000; Beck 2000; Rosa 1998;

Verchick 2000; Wynne 2002). Adam and van Loon (2000:1-2) argue that "even the most restrained and moderate-objectivist account of risk implications involves a hidden politics, ethics and morality." They go on to say that "risks are manufactured [socially constructed] not only through the application of technologies, but also in the making sense and by the technological sensibility of potential harm, danger or threat." In other words, even if the scientific process of risk analysis is technologically and methodologically consistent among all research studies, the results would continue to be ambiguous because different scientists study and interpret risks differently due to a number of socio-cultural factors.

Social theorist Ulrich Beck puts forth the idea that there are societies in which the integral component of modern life is risk, and that risk should be treated as such. Beck and other scholars (Slovic 1992; Douglas and Wildavsky 1982; Freudenburg 1989: Wynne 2002) theorize that what we actually call risk is only a human perception (through the interpretation of scientific and technological output) of that risk. The state of risk cannot be separated from the way it is perceived by humans. Taking this idea further, some like Slovic (1992) say that a risk exists only if human beings perceive the risk. These scholars do not believe that risk is an ontologically real state of the world because when we talk about risk we are not talking about something that *is*; we are talking about something that *will probably happen* if we do not change in some way (Adam and van Loon 2000; Beck 2000).

Therefore risk is not an actual state of the world, it is only the epistemological knowledge of risk interpreted through the perception of risk (Beck 2000; Slovic 1992; Freudenburg 1989) and technological output (Carolan 2004). This position poses several problems

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problems. First, some risks are undeniably real and not just an outcome of our cultural judgment about them (Rosa 1998). That is, until the outcome of risk (death, natural disaster, mercury poisoning) becomes a reality, the risk of these outcomes are only perceived (or not). The failure to distinguish an ontological reality of the consequences of risk and the epistemological perception of risk forces these theorists to adhere to a realist view of risk, and at the same time the constructivist assertion that risk identification can only occur from the perception of that risk. This logic is cumbersome at best (Rosa 1998). On the other hand, if what they are really saying is that "risks are entirely subjective phenomena, then the result is a conceptualization that fuses ontology with epistemology" and "introduces a constructivist bias" (Rosa 1998:33).

B. Post-Normal Risk

Contrary to the theories of risk described above, Rosa (1998) asserts risks exist as a state of the world somewhere "out there," that risk is ontologically real. Therefore, Rosa defines risks as a "situation or event where something of human value, including themselves, has been put at stake and where the outcome is uncertain (Rosa 1998:28)" regardless of one's level of perception. This is the definition of risk used in this dissertation.

Rosa (1998) calls "ontological realism" the reality of risk as a state of the world However, Rosa points out that "human limitation precludes isomorphism between the world and our understandings of it, thus, all claims to knowledge about the world are fallible (1998:41)." He goes on to say that not all claims to knowledge are equally fallible. This is what he calls epistemological hierarchy.

Rosa says:

> *"Human perpetual and cognitive capabilities are inherently limited. As a consequence we can neither generate perfect knowledge about the world, nor can we create a 'true' understanding of our physical and social environments- risky ones or otherwise. Facts seldom speak for themselves and considerable ambiguity surrounds even the most basic facts. The world 'out there' and our understanding of it can never be isomorphic: human understanding can only approximate the world we seek to explain. Thus, our claims to knowledge about our worlds are always subjective- and always fallible."*

Rosa constructs his theory of epistemological hierarchy by relying on the realist/positivist constructs of ostensibility and repeatability. This is where I critique Rosa. Although it seems that his descriptions of ostensibility and repeatability are more encompassing of non-scientific epistemologies than what is traditionally valued in the sciences. For example, he uses gravity as an event that is of high ostensibility and repeatability. Everyone understands that there is something keeping us from floating away into space, no matter what cultural lens we look through. He bases his call for a democratization of risks on business-as-usual constructs of the scientific method.

In contrast to Rosa, it may be more useful to think in terms of levels of uncertainty rather than ostensibility and repeatability. In practice this shift from high ostensibility and repeatability to differing levels of uncertainty would make it difficult to articulate (however loosely) what post-normal risk is. Ravetz and Funtowicz (1998) suggest the use of the term "epistemological complementaries" in the place of "epistemological hierarchy" to accommodate a greater spectrum of types of valued knowledge and eliminate the connotation that ostensible and repeatable knowledge is somehow superior to knowledge lacking those properties (Ravetz and Funtowicz 1998:45,48).

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In the event of post-normal risk "risk assessment and management should be epistemologically inclusionary, embracing an extended range of paradigms, perspectives, and stakeholders with alternative claims to knowledge (Rosa 1998:41)." The goal of post-normal science (risk) is not to turn research labs over to unqualified laypeople, but to democratize sciences so that it is a part of the public debate along with all the other issues affecting our society (Funtowicz and Ravetz 1992:254). I believe that agency risk characterization, management, and communication processes could greatly benefit from this type of practice.

For Rosa, the objective of post-normal risk is to move the debate from "what is risk?" to "what is our knowledge about risk?" and "how could we best use our various systems of knowledge to improve our democratic decision making over risk choices" (1998:40). Unfortunately this shift does not necessarily elaborate questions about why certain risks are discussed over others or how knowledge is created. In governmental agencies, knowledge gathering and decision making about risk take place as a result of learning based on piecing together information and combining it with previous knowledge, beliefs and values to create something new. Freeman (2007) calls this process epistemological bricolage.

III. Risk Construction

A. Epistemological Bricolage

Epistemological bricolage is the process by which scientists in government agencies create knowledge through learning, a processes of "successive crafting, assembling and literally making sense of different bits of information and experience, often creating something new from what they have acquired secondhand" (Freeman

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2007:476)." Uncertainty creates space for learning, but this uncertainty is rarely resolved by the varied disciplinary perspectives upon which public administration might draw (Freeman 2007:477). Inevitably, "these disciplines tend to talk past each other" and although learning remains a policy "good" the amount of which learning occurs in practices remains unknown (Freeman 2007:477). Epistemological bricolage is a type of learning that lacks evaluation, careful reflection and institutional memory, or knowledge that is systematically passed on and remains even though individuals occupying certain posts move on and change (Coffey and Hoffman 2003; Freeman 2007).

There are three strains of theory about learning in policy setting (Freeman 2007). The first is rationalist theory. It privileges the scientific method. The second strain, institutionalist, states that different organizations show different capacities for learning depending on types and sources of information processed, and, what policy makers learn is a function of what they believe and the way they think. Policy makers learn from others like them or people who "speak their language" both literally and figuratively (Freeman 2007). The third theory, the constructionist approach, states that problems and solutions are defined by what they are conceived and agreed upon to be, and that learning is a collective and interactive process.

Freeman found that individuals in public health agencies simultaneously learn in ways supported by all three theories. Learning, then, "consists of 'piecing together' what is known from different sources in different ways" (Freeman 2007: 484). This process is both subtle and complex. Freeman (2007:486) says that the agency manager takes on the role of the "bricoleur" (tinkerer) which is to navigate between research and practice, ways of knowing, and sometimes different kinds of learning. This process can sometimes bring about conflicts about how to use and share information. Knowledge is "negotiated not only between actors and interests, but between ways of thinking; more precisely, because it is debated between differently situated actors, with different interests and traditions, it is also built form the respective styles of thought" (Freeman 2007: 491).

> *"The bricoleur acquires and assembles tools and materials as he or she goes, keeping them until they might be used. Each is shaped in part by its previous application but remains inevitably undetermined, imperfectly understood, open to manipulation for whatever purpose is at hand. Not only are the tools selected according to the bricoleur's purpose, but that purpose itself is shaped in part by the tools and material available. The properties of each-tools, materials, and project- are uncovered in the process." (Freeman 2007:486)*

How government managers learn and therefore what they act upon is less systematic or rigorous than modernist visions of the scientific method put forth. The "doing" of science adheres to technocratic science policy, however, the "why" of agency action depends on the "crafting and assembling" of information and experience more than systematic planning and learning in a holistic way. Due to the relative ambiguity of scientific understanding, knowledge, and risk communication, it becomes necessary to understand risk not only in terms of probabilistic risk assessments, but also by how it is socially constructed and perceived by both the lay-public and experts.

B. Risk Perception

1. Introduction

Risk construction depends on how people get information, what they do about it, and whom they trust, in addition to their past experiences with an issue or other actors in the process (Beamish 2001; Lidskog 2000). Risk is constructed through the "cultural and social experience [including the impacts of the media, agency outreach, social networks, class, gend

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class, gender, etc.] that determines rules of how to select, order, and explain signals form the physical world" (Kasperson 1991:158). When people make decisions about risk they use scientific risk information infused with and based on social networks, trust, experience, knowledge, access to information, mental models, gender, class, etc (Beamish 2001; Bickerstaff and Walker 2001; Fischer 2000; Goldman et al 2004; Jakus and Shaw 2003; Kasperson 1992; Lidskog 2000; Marshall 2004).

2. Ethnic and Gender Differences in Risk Perception

In general women and minorities, especially African-American women, tend to perceive environmental risks as more serious than white males (Davidson and Freudenberg 1996; Finucane et al. 2000; Fisher 2000; Flynn et al 1994; Marshall 2004). However, context matters. Marshall (2004) found that a small percentage of white males are so completely risk accepting that it skews the results for all white males when grouped together in statistical analysis. When data from this small overly risk accepting group is taken out, white males are statistically almost as risk averse as women and minorities. However, a disparity among risk acceptance between white males and minority females remains statistically significant (Marshall 2004).

Some white males may be extremely accepting of risks because of their higher social positions, which allow them to benefit from the sources of pollution without being exposed to the risks. While African American women, especially those living in highly polluted areas, are thought to be so extremely risk averse because they do not reap the benefits from these sources of pollution but are overly exposed to their harm. Marshall (2004) also found that men and women are risk averse about different risk issues. Women tend to be more risk averse about issues concerning threats to their family, especially

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especially heath risks to children. Also, people who live in polluted areas are more risk averse than those who live elsewhere, regardless of gender or ethnicity.

3. Expert versus Lay Perceptions of Risk

In general experts tend to perceive industrial risks as less of a threat than the public (Beamish 2001; Carolan 2006; Rose 2000; Sjoberg 1999). This phenomenon is thought to result from the lack of trust among the public and experts. The public tend to believe that experts are hiding the real dangers of risk for political or financial gain (Beamish 2001; Sjoberg 1999). Also, people are wary of the influence that big business has on the government (Beamish 2001).

Interestingly, for activities that people partake in voluntarily like fishing or smoking, the public tends to accept more risk than government public health scientists. People who partake in a risky activity are less likely to see that activity as risky (Beehler et al 2003; Burger 2000; Jakus and Shaw 2003). This causes individuals to de-amplify those risks, and treat them as non-risks. Risk deamplification makes it even harder for public health managers/scientists to communicate risk, especially when there are uncertainties surrounding whether the risk exists (Burger 2000; Kasperson 1992).

4. Risk Perception: Risk (de)amplification

When ambiguous actual risks and psychological, social, institutional, and cultural processes act on risk perception, it often leads to the amplification or attenuation of perceived risk (Kasperson 1992). This can cause people to be overly risk averse, or engage in overly risky behaviors (Burger 2000; Kasperson 1992). For example, many people (both women and men) ignore fish consumption advisory information because they do not know what to do or whom to trust, therefore putting themselves at risk

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(Beehler 2001, 2003; Burger et al 2003; Connelly and Knuth 1998; Jardine 2003). Conversely, many people might choose to avoid fish because "all they hear" about mercury, even those who are not at risk and who have the most to gain from heart healthy omega- 3 fatty acids provided by some fish species (Burger 2008; Knuth et al 2003). To combat risk amplification/attenuation, government public health officials need to effectively target different publics (especially at-risk populations) with appropriate risk communication messages (Anderson et al 2004; Beehler 2001, 2003; Burger 2000, 2008; Burger et al 2001; Burger et al 2003; Burger and Gochfeld 2006; Chess et al 2005; Connelly and Knuth 1998; Imm et al 2007; Jardine 2003; Johnson et al 2003; Knuth et al. 2003; Shimsack 2007; Tilden et al. 1997).

5. Risk Perception: Trust

Even the best risk communication outreach will lack efficacy if people do not trust the information or information sources (Carolan 2006; Rose 2000; Sjoberg 1999). Greater truth is found in statements of risk when they come from trusted sources (Carolan 2006). Who or what people trust often relies on cultural beliefs, past experiences and mental models of health and safety. In the face of scientific uncertainty, non-experts and experts (to varying degrees) "fall back on their social relations to help them make sense of and therefore evaluate statements of risk" (Carolan 2006:250). This lack of trust, often due to past experiences, creates disagreeing public and expert assessments of risk (Sjoberg 1999; Rose 2000). This creates policy problems not because differing expert and lay perceptions present a knowledge gap, but because it is a gap in trust (Rose 2000).

6. Risk perception: Fish Consumption Advisories

Studies of risk perception and fish consumption advisories reveal the same types of findings as studies of other risks. For example, one study of fish consumption from freshwater lakes found that people who engage in risky behavior are more likely to accept risks; white males perceived fewer risks compared to minorities, and that women and anglers use prior experiences to develop their beliefs about the risks of eating fish from polluted waters (Jakus and Shaw 2003). Beehler et al (2003) found that most anglers have no concerns about the fish they eat and use mental models, rather than an official advisory to judge fish safety. Just as in a study of air pollution, (Bickerstaff and Walker 2001) several studies of fish consumption advisories (Beehler et al. 2003; Beehler et al. 2001; Burger 2001; Burger et al. 2003; Jakus and Shaw 2003), found that people use sensory cues, location and past experiences to make decisions about how polluted the air or a fish is.

Connelly and Knuth (1998) found that both personal (past experience, risk attenuation or acceptance) and institutional factors (credibility, format in which the information is presented, multiple and sometimes conflicting responsibilities of agencies) influence how people respond to fish advisory information. Overall, studies of fish consumption advisory risk perception show that the public is not well informed and has difficulty making safe decisions about fish consumption benefits and risks (Beehler et al. 2003; Burger 2008; Connelly and Knuth 1998; Imm et al. 2007; Jardine 2003; Tilden et al. 1997). The ability of governmental risk processes to adequately establish, manage, and communicate risk, has serious limitations in its current state. However, even if government risk processes were perfectly democratic, they may still be unable to effectively reach those who are at risk because of the ways in which risk is socially constructed. For example, people create mental models about the cleanliness and health of the fish they eat instead of following explicit fish consumption advisory advice. Individuals create internal mental models of themselves, their environment, others, and artifacts of technology in order to understand and deal with their interactions with these things (Norman 1983). Mental models are incomplete, unstable, do not have firm boundaries, and are "unscientific" and parsimonious (Norman 1983).

C. Mandated Science

In addition, agency officials are often confined to mandated science. Mandated science refers to "the activities of scientists in situations where they have been given a mandate by government to make recommendations or decisions that have a large scientific component" (Levy 2001, p. 726). Often in these situations, regulatory authorities impose strong "experimental rigor" of uniform and rigorous measurement standards and statistics (Levy 2001, p. 726). In these circumstances, thinking holistically on a systems level becomes difficult or even discouraged because of pressure to emphasize mandated projects and activities. Although many scientists are leery of quantitative statistical tests and measurement instruments to develop concrete recommendations or specific decisions regarding risk, they are often pressured to do so through agency mandate and policy objectives (Levy 2001).

The types of questions governments pose can rarely be answered by the practices and procedures of science (Levy 2001:732) That is, "there is a mismatch between questions posed by government and answers offered by science" (Levy 2001:732). This mismatch is due to issues of fact vs. value, scientific uncertainty, and the limits of science and technology. The statistical and quantitative approach to the sciences mandated by government only increases the amount of judgment that goes into establishment, interpretation, and implementation of data as it is translated from scientific theory and experimentation into scientific fact through risk communication and agency outreach (Levy 2001).

Given the ambiguity surrounding many issues of risk, including fish contamination and fish consumption, the process of quantifying and articulating risks in a way that undoubtedly protects human health requires scientists and policy makers to make assumptions about the people exposed to the risk as well as its consequences (Verichich 2000). For example, when toxicologists develop statistical measures and limits of what is safe they are fully aware of the uncertainty to which they appertain. However, when these levels are translated into fish consumption advisories they become "set in stone" or "set in ink" limits that a certain type of person cannot eat a certain type of fish over a certain size.

D. Adaptive Management

An alternative to these rigid scientific and technocratic processes may be adaptive management (AM). AM offers a way to use science and experimentation, in addition to stakeholder participation, to systematically and rigorously plan policy actions and learn from the process for the benefit of future initiatives. Adaptive management is a theory of natural resource management designed to help managers make decisions despite complexity and high scientific uncertainty (Holling 1978; Henriksen and Barlebo 2008; Lee 1993; Schreiber et al. 2004). It adds the democratic notions of lay knowledge to scientific process and treats management decisions as experiments that exist outside the control of laboratory settings (Holling 1978; Henriksen and Barlebo 2008; Lee 1993; Schreiber et al. 2004). This type of management strategy may provide a guide for agency managers beyond mandates and epistemological bricolage.

The purpose of adaptive management is to learn from management action and use that knowledge, along with stakeholder input, to improve future management decisions. Policies and management become experiments monitored before, during and after the intervention (Henriksen and Barlebo 2008). According to Schreiber et al. (2004) the process of adaptive management is to:

> (1) define objectives with stakeholders
> (2) model existing knowledge, promoting consensus and finding gaps
> (3) identify goals relating to objectives and identify criteria for assessment
> (4) model alternate management options and formulate expectations (using steps one and three)
> (5) identify decision structure
> (6) implement on single or multiple sites and
> (7) draw inference by monitoring and evaluation. (*Schreiber et al. 2004)*

In terms of fish consumption advisory information managers could use adaptive management to gather information about risk perception and create more fitting risk communication. In addition, the process of adaptive management allows citizens and managers to incorporate human and environmental health issues to holistically solve contaminant problems. However the use of adaptive management in policy and decision making must be altered to accommodate the differences between policy and management and the ethical considerations of research on human subjects. Folke et al. (2005) use the term "adaptive governance of social-ecological systems". This will be developed in the discussion chapter, chapter 6.

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management (Feldman 2008; Folke 2005; Gunderson 1999; Walters 1997). One of the major barriers to overcome to successfully implement adaptive management is overcoming the challenges the principles of adaptive management pose to existing management systems and the political basis for these systems (Feldman 2008; Gunderson 1999; Pinkerton 1999). For example, government resource management is guided by short-term objectives, single-issue optimum policy outcomes, and engineering/technocratic dominated approaches to problem solving (Feldman 2008; Gunderson 1999; Pinkerton 1999).

In contrast, adaptive management requires long-term learning that incorporates multi-disciplinary approaches to complex resource issues with the inclusion of human and biophysical components of ecosystems (Gunderson 1999). In addition, to develop science and policy that support sustainability environmental and public health agencies need to include the human dimensions of ecosystem management, an expertise rarely found in these agencies (Folke et al. 2005). Adaptive management also requires that stakeholders are included in the policy and decision making process. This necessitates a great deal of social capital involving an investment in the social relationships and networks that provide relations of trust, reciprocity and common rules, norms, sanctions, and connectedness (Folke et al. 2005).

E. Risk and Stakeholder (Public) Participation

Like with adaptive management involving stakeholders in environmental risk management and decision making is seen by many scholars as a policy good (Fischer 2000; Folke et al 2005; Rabe 1999; Rosa 1998; Rose 2000). However, when scientists interact with the public, it most often involves a one-way monologue about scientific facts (Thomas 1995; Rabe 1999; Rose 2000). Scientists rarely, if ever, ask the public what it thinks about science and what direction science should go. They often confound public understanding with the number of scientific facts the public knows (Rose 2000). As a solution, Sjoberg (1999) recommends the use of an ombudsman that works in the public's interest on risk issues, increasing agency accountability. Others (Carolan 2004; Judd et al. 2005; NRC 2000; Rose 2000), like Rosa (1998) propose a democratization of risk policy where the scientist is not replaced by lay-people, but occupies a smaller and more modest role of expert which has equal weight as any other perspective.

IV. Risk Communication and Fish Consumption Advisories

The Environmental Protection Agency defines risk communication of fish consumption as "a process of sharing information about perceived and potential dangers and benefits associated with fish consumption" (EPA 2001: I-4). The steps of effective risk communication should be: know your audience, do formative research, know the risk- know what it is and what can be done about it, test your messages empirically (evaluation), iterate, and involve those concerned (Bostron and Lofstedt 2003). Unfortunately risk communication in government agencies is more of an art than a science, relying on "intuition" rather than well-researched principles (Bostron and Lofstedt 2003). The success of risk management and communication relies on "formalizing these intuitions and testing them systematically" (Bostron and Lofstedt 2003:246), which is what adaptive management does.

The existing scientific knowledge of risk communication and fish consumption advisories is relatively vast. Many studies concern the communication of fish consumption risks (Anderson et al 2004; Connelly and Knuth 1998; Beehler et al. 2001;

Beehler et al. 2003; Bienenfeld et al. 2003; Burger 2000, 2008; Burger et al. 2001; Burger et al. 2003; Burger and Gochfeld 2006; Dellinger 2004; Imm et al. 2007; Jardine 2003; Jakus et al. 1998; Johnson et al 2003; Knuth et al. 2003; Shimsack 2007; Steenport et al. 2000; Tilden et al. 1997). Much of this research has shown that the public needs better risk communication to understand how to balance the benefits and risks of consuming fish. But, this cannot occur without a more concentrated effort on the part of risk managers to understand, target, and involve audiences of concern (Anderson et al 2004; Connelly and Knuth 1998; Burger 2000, 2008; Burger et al. 2001; Burger et al. 2003; Burger and Gochfeld 2006; Imm et al. 2007; Jardine 2003; Johnson et al 2003; Knuth et al. 2003; Shimsack 2007; Tilden et al. 1997).

For example, Beehler (2001, 2003) found that anglers have little information and do not know if they are making safe decisions about consuming fish. Therefore, the exposure to risk information is not enough. Fish eaters need targeted risk communication, especially for those who are labeled at risk (Anderson et al. 2004; Connelly and Knuth 1998; Bienenfeld et al. 2003; Burger 2000; Burger et al. 2001; Burger et al. 2003; Burger and Gochfeld 2006; Steenport et al. 2000; Tilden et al. 1997). Clearly, relying solely on sport-caught fish consumption advisories is not enough because it often does not represent the types of fish eaten by the at-risk population (Imm et al. 2007).

A single type of risk communication strategy that is adequate for all target audiences does not exist (Connelly and Knuth 1998). Defining anglers as the target audience, as the Michigan fish consumption advisory does, is insufficient to reach the populations most at-risk (Connelly and Knuth 1998). In addition, the public often gets fish consumption information from sources other than the official fish consumption advisory such as, people they trust like fish purveyors, family, and medical professionals (Bostron and Lofstedt 2003; Burger 2000, 2008; Johnson et al. 2003).

Researchers have developed different, but similar, solutions to more effectively communicate fish consumption risks. Most have called for more targeted, audience-centered risk communication (Beehler et al. 2001; Beehler et al. 2003; Bienenfeld et al. 2003; Burger 2000; Burger et al. 2001; Burger and Gochfeld 2006; Connelly and Knuth 1998; Shimsack 2007). Others recommend targeting risk communication to information gatekeepers such as medical professionals, schools, charter boat captains, women's centers and health clinics (Imm et al 2007; Jardine 2003; Johnson et al. 2003; Burger et al. 2003). Tilden et al. (1997) and Anderson et al. (2004), who come from more public health backgrounds, specifically talk about the need for increased collaboration among the states and recommend that they work with trained risk communication specialists (i.e. experts) to create targeted risk communication for at-risk groups.

Finally, Knuth et al. (2003) propose that risk communication should use risk-risk and risk-benefit comparisons in fish consumption outreach materials. They also say that agency managers need to make a better effort to clarify who is at risk and who accrues the most benefits from fish consumption. In addition, they emphasize balancing benefit and risk information in risk communication.

Several studies indicate that people are aware of fish consumption advisories, but they do not have enough information to make healthy decisions about consuming fish (Beehler et al. 2001; Beehler et al. 2003; Burger and Gochfeld 2006; Jakus et al. 1998; Jardine 2003; Habron et al. 2008). For example, most anglers understand that chemicals can be removed by certain fish preparation techniques (Beehler et al. 2001; Habron et al.

2008; Tilden et al. 1997). However, mercury is the leading fish contaminant in freshwater inland lakes, but cannot be removed by special preparation or cooking techniques. In addition, conflicting messages about fish consumption risks in the media and in government risk communication add to the confusion.

Even in the event of vastly targeted risk communication, different people react differently to risk communication. What can evoke fear in some may evoke anger in others (Bostron and Lofstedt 2003). Past research has also found a lack of public interest in fish consumption advisories (Burger 2000). Many people feel as though it does not pertain to them, and therefore they ignore the advisory (Burger 2000).

Those at-risk such as women, children and minorities may not receive the risk message due to bias in the message structure and framework that targets the general public. This also creates a spillover effect so that those who are not at risk reduce beneficial fish consumption (Burger 2008; Mozaffarian et al. 2006; Shimsack 2007). In addition, fish consumption messages are rife with what Chess et al (2005) call "government-speak".

Government-speak is the bland, generic style commonly used by government agencies to communicate risk (Chess et al. 2005). Government business-as-usual risk communication involves generalizing local knowledge as a means to impose order. Standardized reports, templates, and memos create an "official" language of government that neglects linguistic and cultural factors that affect the usefulness or acceptability of risk communication messages in different communities (Chess et al. 2005). Lack of resources in state agencies cannot be the only reason for poor risk communication.

Instead, Chess et al. (2005) attribute poor risk communication to a lack of expertise and management commitment as well as interagency conflict. In order to rend fish consumption advisories more accessible to minority populations, government agencies need to change their current risk communication strategy away from using this "government speak". As the authors point out, in terms of agency mandates, it is risk assessment, not communication, which has the most power and legitimacy in management agencies (Chess et al. 2005).

V. Feminist Critiques of Science

While risks associated with fish consumption and mercury are real (Rosa 1998), scientific risk assessment is only able to assess these risks through the application of technology and methodologies that are developed under the paradigm of paternal western science. In addition, scientists and therefore "science" is often limited by fiscal concerns, political and cultural pressures, environmental factors (such as mobility of resources), and incongruous interpretations of results by different interests (Adam and van Loon 2000; Buckingham-Hatfield 2000; Rosa 1998). For example, the type of reference studies agencies use to develop their mercury action levels will greatly affect how risks are articulated to the public. The choice to use one study over another may not always be an objective decision. As Verchick (2000, pg 70) asserts:

> *"Much of the risk assessment data are manipulable and could easily be used by "captured" agencies to satisfy corporate or political goals. The acceptability standards applied to such findings are often inconsistent among safety and environmental laws and serve to protect some groups more than others. Further, many agency programs fail to collect or consider data on potentially exposed people and instead rely on more generalized findings"* [as is the case with the fish consumption advisories].

How science is conceptualized, conducted, interpreted and communicated can greatly affect people's perception of, and ultimately exposure to, risks. Therefore, in order to (at least partially) understand risk and risk perception, we must understand the science by which it is created (Horning-Priest 1995). The current dominant scientific pedagogy is based on modernist metaphysical and epistemological premises including atomism, mechanism, universalism, objectivism, and monism (La Blond Hanks 1996; Haraway 2001; Merchant 1996; Norgaard 1994).

Modern science emphasizes an epistemology based on observation and the ability of the observer to be removed from what he is observing, in other words, that observations are unbiased and value-free (Buckingham-Hatfield 2000; Haraway 2001; Harding 2001). It seeks to understand the world in terms of unchanging maxims and the strengths of fixed relationships through mathematical language and logic, technology and organization (Haraway 2001; Harding 2001). Feminists have critiqued this process by presenting the ways in which scientists cannot distance themselves from their preconceptions, stereotypes, backgrounds, knowledge, education, and culture, thus creating inequalities in risk prevention and communication (Buckingham-Hatfield 2000; LaBlond-Hanks 1996; Merchant 1996). In addition, feminist scholars also critique the very ideas of scientific objectivity and relativism that promise a "vision from everywhere and no where equally and fully" which Haraway (2001:176) calls one of the "common myths in rhetorics surrounding Science".

Buckingham-Hatfield (2000: 11) states, "a society which is stratified by economic wealth, race or gender will seek to understand the environment in a way that reflects this. The questions asked, the methods used in seeking the answers, and the answers themselves are likely to reinforce and justify the way in which that society is organized." For example, the majority of research on the cause and treatment of heart attacks is based on studies of white-males. Then, the results of these studies are applied to all other populations of people (LaBlond-Hanks 1996). However, the causes of heart attacks for white males may differ from those of white women or minorities.

In the past, women and minorities have been scientifically marginalized by scientific research that sought to prove their inferiority to white males both physically and intellectually, as exemplified by measuring skulls to prove brain size is correlated to intellect and that white males have the largest brains (LaBlond-Hanks 1996). In addition, minorities and sensitive populations are victims of racist research goals such as the Tuskegee syphilis study in which African American men were not treated for syphilis long after a cure was developed. Not only are women and minorities the object of prejudiced research, they traditionally have been kept away from scientific practice through formalized education systems that encourage men to excel and women to stay behind. Elite scientific clubs, such as the French Academy of Sciences and the English Royal Scientific Society excluded women until well into the twentieth century (Buckingham-Hatfield 2000). According to many feminists, this exclusion of women and minorities results in a scientific and cultural paradigm that is dominated by a western middle-class male perspective (Buckingham-Hatfield 2000; LaBlond-Hanks 1996; Merchant 1996).

From its very foundations of Aristotle and Descartes, western science creates a gendered space where some types of knowledge are valued over others (Buckingham-Hatfield 2000). Feminist critiques of science assert that modern science cannot make "universal claims about knowledge, bodies, emotions, female "nature," and transcended reality—claims that reinforce domination" (Merchant 1996:61). They reveal the ways in which scientific language, imagery, and methods a) enforce the duality of women and men, men as objective observers and women as emotional feelers; b) support racial differences; and c) preserve inequalities (Buckingham-Hatfield 2000; Merchant 1996). They say that scientific objectivity cannot truly be objective without "contestation, deconstruction, passionate construction, webbed connections and hope for transformation of systems of knowledge and ways of seeing" (Haraway 2001:179).

According to Merchant (1996:71) feminist approaches to the history of science have:

> *(1) destabilized the assumption that science can know nature; (2) linked power and knowledge at the levels of both epistemology and practice, so that what counts as scientific knowledge necessarily reflects the relations of domination; (3) questioned the possibility of a scientific knowledge system independent of the culture-bound influences of sex, race, and ethnocentrism and (4) challenged the assumption that the nature behind human representations changed only through its own evolutionary and physical laws, asserting instead that human practices give rise to new objects, such as chemically-induced or genetically-engineered mutants."*

Cartesian duality and the Aristotelian identification of the female as passive (through the passivity of her sex organs) along with the feminization of nature has, according to some feminists, set the stage for masculine domination over nature and women (Buckingham-Hatfield 2000; Merchant 1996; Shiva 1989). The lack of a traditionally feminine presence in policy making, science and the academy has given way to a masculine dominated world-view of objectivity and domination in western science and culture. This does not mean that all men prescribe to this dominant world view, or that women do not. Masculine positivist science, which looks to the scientific method as the only way to acquire true knowledge, underlies the production of sciences in western society so th

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society so that the type of scientific questions asked, the interpretation of the answers, and the methods of analysis become gendered to the point of fostering inequality (Buckingham-Hatfield 2000; Haraway 2001). Assumptions made about people exposed to risk can have major consequences for women, minorities and the poor due to the dominance of white middle-class masculine culture in scientific pedagogy and policy making.

Not all people can be expected to interact with their bodies and environment in the same way, given all of the different factors that impact their health and lifestyle, like, poverty, geography, history of illness, and occupation (Haraway 1989, 2001; Lober 1998; Rocheleau et al. 1996; Ward 1999). In addition, the body is an agent and not just a "resource politics of the body" (Haraway 2001:181). Therefore we cannot expect all people to have the same actual and perceived risks. If most scientists are educated according to the dominant masculine world-view, risk assessment and communication and agency outreach may fail to consider differences among people, leading to inappropriate messages about the risk and benefits of certain behaviors that either confuse people or fail to reach them altogether (Haraway 2001; Rocheleau et al. 1996; Verchick 2004). In addition, in public forum and policy settings the style of communication is dominated by this masculine world-view, which may intimidate others from participating or speaking up and becoming involved in these processes (Ward 1999).

For these reasons it is important to understand the gendered implications of scientific exploration and public-science discourse through a feminist lens to capture the explicit and implicit gendered inequalities of risk calculation and communication. The lens used in this dissertation is Haraway's (2001) theory of situated knowledge. Haraway

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(2001:176) says that “objectivity is not about disengagement, but about mutual and usually unequal structuring about taking risks in a world where ‘we’ are permanently mortal, that is, not in ‘final’ control”. The translation of science is always interpretative, critical and partial; therefore an epistemology and politics of engaged accountable positioning is needed (Haraway 2001:179). Engaged accountable positioning is the process of being aware of and reflexive about why we do the things we do and the biases inherent in the creation of our knowledge.

Feminist objectivity makes room for “surprises and ironies” of knowledge production (Haraway 2001:179). It recognizes that “we are not in charge of the world; we just live here and try to strike up non-innocent conversations [interpretations of science] by means of our prosthetic devices [technology]” (Haraway 2001:179). This melds nicely with the objectives of adaptive management which also claim to make room for the surprises of knowledge creation and the ability to use these surprises to inform future policy/decisions.

This theory does not privilege the “view from below” that some other types of feminist theory advocate, and recognizes that 1) there is a danger in romanticizing and/or appropriating the vision of the less powerful, and 2) that these positions are not “innocent”. The object of knowledge is pictured as an actor and agent, but not as objective knowledge. Situated knowledge promotes politics and epistemologies of location, positioning, and situating, where partiality, and not universality, is the condition of being heard to make rational knowledge claims. Science “becomes the paradigmatic model not of closure, but of that which is contestable and contested” (Haraway 2001:179).

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Governmental agencies, like those that develop contaminant action levels and fish consumption advisories, have long been working under the assumptions and pedagogy of the dominant Western masculine scientific and cultural world-view (Saidel and Loscocco 2005). Partial understandings of risk are turned into universal maxims of what is safe. However, the sociological agency of individuals within institutions to work against the dominant paradigm can be an important factor in the discourse of risk (McLaughlin 2001). In addition, because risk really exists, science can provide helpful tools to sort out safe and unsafe behaviors.

VI. Framing

Frames are defined slightly differently by different scholars. Overall, framing is understood to be a phenomenon by which people interpret, respond to, understand, and construct reality (Benford and Snow 2000; Johnston 2002; Kurtz 2003; Kaufmann and Smith 1999). Frames organize knowledge in ways that affect individuals' interpretation of a situation and their choices regarding it (Kaufmann and Smith 1999). They are "a schemata of interpretation that enable individuals to locate, perceive, identify and label occurrences within their life space and the world at large" (Benford and Snow 2001:614). People use frames to render events or occurrences meaningful, organize experiences and guide action (Benford and Snow 2001; Johnston 2002).

The process of framing is most often studied in terms of collective action frames in social movements (Benford and Snow 2001; Johnston 2002). Although the fish consumption issue is not a well defined social movement per se, collective action framing is pertinent for fish consumption risk because of the utility of core framing tasks to explain and study risk frames, including those about fish consumption risk. These core framing tasks a

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framing tasks are, 1) diagnostic framing- to create a shared understanding of some problematic condition or situation that is need of change, 2) prognostic framing- to ascribe blame, present alternatives, and 3) motivational framing- to impel others to act to affect change (Benford and Snow 2000: 615-17). These framing tasks reflect the fish consumption advisory risk communication process.

In addition to the three core framing tasks of collective action frames, three overlapping categories affect framing processes: discursive, strategic, and contested. Discursive process are the "speech acts and written communications of movement members that occur primarily in the context of, or in relation to, movement activities" (Benford and Snow 2000: 622). This includes frame articulation and frame amplification or punctuation. Strategic processes are the "frames developed and deployed to achieve a specific purpose" (Benford and Snow 2000: 624). And finally, contested processes include "counter-framing by movement opponents, bystanders, and the media; frame disputes within movements, and the dialectic between frames and events" (Benford and Snow 2000: 625).

Three main factors affect the credibility of any frame, these factors are: frame consistency, empirical credibility, and credibility of the frame articulators or claims makers (Benford and Snow 2000: 620). Inconsistency results from either (1) contradictions among beliefs or claims or (2) perceived contradictions between discursive framing and real life situations or the actions of claims makers. Frames must be salient to be effective. They must be essential to the lives of the targets of mobilization, culturally resonant (narrative fidelity), and coalesce with everyday experience (experimental commensura

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commensurability) (Benford and Snow 2000: 621-22). Frames with greater status and/or perceived expertise are more plausible and resonant (Benford and Snow 2000).

Framing contests are the back and forth of framing and counter-framing and occur within complex, multi-organizational and sometimes multi-institutional arenas (Benford and Snow 2000; Johnston 2002). Frames are not static or reified; they are continuously evolving, contested, reproduced, replaced and transformed (Benford and Snow 2000: 628). Political opportunity and the media both constrain and facilitate framing processes by opening up or denying access to wider audiences and greater resources. The target audience for a certain message can also affect the form and content of that message (Benford and Snow 2000: 629). In addition, frame makers are both cultural actors and individual agents, and influence the framing process and the credibility of the frame.

For example, frames developed during past experiences with an occurrence or event can shape the way people frame new events and occurrences (Kaufman and Smith 1999). Credibility lost and won in past framing exercises influences the salience of new framing activities when the same actors are involved (Johnston 2002; Kaufman and Smith 1999). In addition, people will look to past frames to create new ones if an event or occurrence is similar to an event or occurrence in the past (Kaufman and Smith 1999). Kaufman and Smith (1999:166) say that "past experiences, prevalent societal perspectives, media images or other readily available processed information can all serve as frames for new incidents." For example, salient events in the media, even if reported on in the past, are "lodged in memories" and resurface to replace real details when a similar event occurs locally (Kaufman and Smith 1999:165).

When frames are transferred from one set of circumstances to another "an imperfect match may prompt solutions that do not respond to actual needs and conditions" (Kaufman and Smith 1999: 164). As the complexity of a frame increases it is difficult to assess how well past frames match current situations. This increases the likelihood that choices about the current situation are "unsound" because they are based on a "poor simile of reality" (Kaufmann and Smith 1999: 165). Kaufman and Smith (1999:164) say that it is important for managers who "want to promote processes and outcomes rooted in actual, rather than distorted specifics of each situation" to understand the importance of framing processes. They propose that frames can be altered by a process of re-framing. Reframing is the "deliberate attempt to alter someone else's frame" and "occurs during negotiations, usually to facilitate communication, but also to promote the re-framers preferred outcome" (Kaufman and Smith 1999:166).

Framing is a dynamic, ongoing process, but this process does not occur in a structural or cultural vacuum (Benford and Snow 2000; Hoffman 2001). Rather, framing processes are affected by a number of elements of the socio-cultural context in which they are embedded- political opportunity structure, cultural opportunities and constraints, and audience effects. For example, scale frames can occur in which geographic scale is not ontologically defined, but epistemologically used as a way of understanding the world. In this case, scale is socially constructed and social actors create geographic boundaries filtered though culture, values and beliefs rather than actual physical geographical boundaries (Kurtz 2003). This is seen with fish consumption advisories when anglers report that their favorite fishing locations have little pollution, but point out other areas where they would never fish because it is too polluted when in fact the risk may be similar or the sa…

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VII. Overview

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VII. Overview

The risks of mercury contamination in fish are real, but how people make decisions about those risks as well as how those risks are studied and communicated depends on a number of social factors including positionality, trust, politics, norms, values and beliefs. Thus, different epistemological methods are needed to understand and gather information about how to deal with risk. As Rosa proposes, the conversation needs to shift from "what is risk" to "what is our knowledge about risk" and "how could we best use our various systems of knowledge to improve our democratic decision making over risk choices" (Rosa 1998:40). However, this may be easier said than done.

If government agencies make policy and risk communication using epistemological bricolage then risk management is more of a hodg-podge of knowledge practices put into action, lacking evaluation, systematic learning, and institutional memory. These processes lack rigor and are unaware of how differing perceptions of risk affect risk management and risk communication. In addition, mandated science binds managers to technocratic decision making that lacks engaged and accountable positioning.

As an alternative to these government processes adaptive management coupled with situated knowledge may be able to bring differing epistemologies together to work towards more effective and democratic risk process and risk communication. In addition, how individuals with differing positionalities frame issues within and outside of the institutions that develop scientific risk assessments and risk communication and outreach can have a major im ict

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can have a major impact on individual behavior, agency outreach, message framing, and risk perception. Therefore, understanding how different groups frame the risk issue can help to inform and organize collaborative processes of learning.

Frames are created as a way for people to interpret, respond to, understand and construct reality (Benford and Snow 2000; Johnston 2002; Kurtz 2003; Kaufmann and Smith 1999). They help people organize experiences and guide action. How frames act on individuals depends on a number of parameters such as cultural resonance, consistency, empirical credibility and the credibility of the frame articulators (Benford and Snow 2000). In addition, counter-framing affects how frames are formed and changed over time by providing alternatives to framing processes. Different people frame risks in different ways according to their role and positionality. In some cases, the same person can frame an issue in differing ways depending on how they position themselves when they create or communicate the frame. How risk is framed affects the ways in which people receive, understand and believe in risk messages.

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Chapter Four

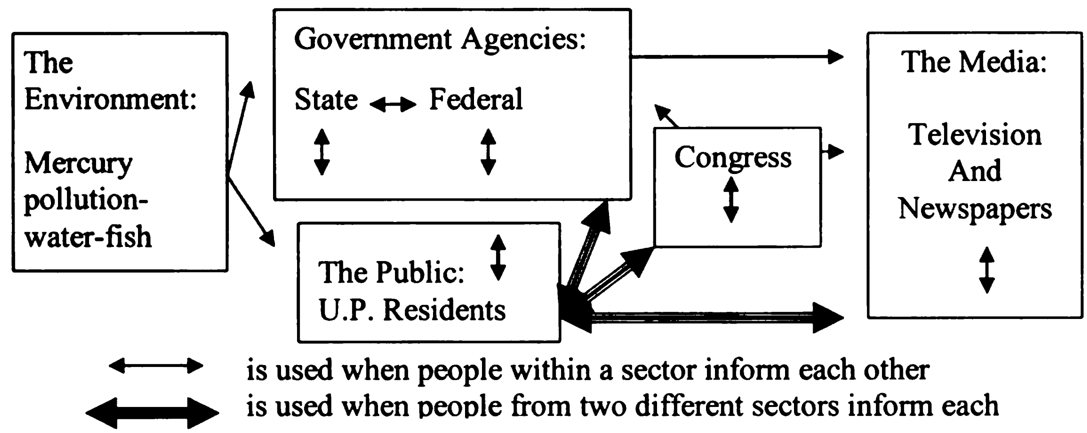
Methodology

I. Introduction

A. Unit of Analysis and Sample

The units of analysis for this study are individuals and written text. To understand how different actors frame mercury pollution and fish contamination and how those framing processes affect public policy, agency science and the public understanding of mercury pollution and fish contamination, this study's sample populations include 1) the institutions that develop, analyze and communicate scientific results and risk information 2) the people who are affected by these risks, and 3) the media, which filters information from different types of sources and presents it to the public (Figure 4.1). The sample population is operationalized as: 1) U.P. residents from Alger, Chippewa, Gogebic and Marquette counties (N=244), 2) staff from state and federal public health and/or environmental agencies (MDCH, MDNR, MDEQ and FDA and EPA) (N=16), and 3) articles and transcripts from *The New York Times*, *The Washington Post*, the *Associated Press (N=37)*, and network television (ABC, CBS, and NBC) news programs (N=25).

Figure 4.1 The Flow of Information about Mercury in Fish



B. Methodological Theory

To understand how the different sample populations frame mercury pollution and fish contamination I used a composite of qualitative social science research methods (interviews, focus groups, and content analysis). Qualitative research methods allowed me to gain more subtle and in-depth understanding of the mercury and fish consumption issue, as they allow for responses and observations that go beyond ascribed survey answers. As a result I gained increased insight and an improved understanding of informant responses. However, qualitative research results are not easily generalizable (Creswell 1994; Kempton et al. 1995).

1. Community-Based Research Methods

The first phase of data collection with residents from the Upper Peninsula was designed using community-based research methods. This portion of data collection was apart of another study funded by the Agency for Toxic Substances and Disease Registry (ATSDR) (Grant #H 75/ATH573196-01) to improve fish consumption advisories in

Michigan's Upper Peninsula (U.P.). The data collected during this phase was preformed by two different researchers using community-based research methods.

Community-based research methods (CBRM) give research participants an active role in the research study as researchers and informants (Arcury and Quandt 1999;Carr and Halvorsen 2001; Halvorsen 2001, 2003). It places value on local knowledge and the ability of informants to understand local conditions and develop solutions to problems of policy and management (Carr and Halvorsen 2001). CBRM focuses on representativeness, community-wide common good, and the incorporation of values and beliefs into the discussion of policy and resource management (Carr and Halvorsen 2001 pp. 108-09). There are no specific methodological tools associated with community-based research methods, for example, the use of community dinners over formal interviews or surveys.

The way in which this study used CBRM was to collaborate with local partners specifically from the local Michigan State University Extension and Michigan SeaGrant offices. Focus group participants were recruited in the local areas where our focus groups took place by our project partners (Michigan State University Extension and Michigan SeaGrant) in addition to local health department breastfeeding and prenatal classes, Michigan Women Infants and Children program and the Upper Peninsula Children's Museum.

The first type of focus groups were called "advisory groups" comprised of a least one of each specifically selected stakeholder group, including, women of childbearing age, fish harvesters, medical professionals, and youth. The second type of focus group was comprised entirely of one stakeholder group. It was important to hold focus groups with single s

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with single stakeholder groups in order to make people as comfortable as possible among their peers and colleagues. However, it was also important for us to discuss these issues with people of different backgrounds so they could hear and understand each others' perspective in a facilitated and respectful environment. Participants received a twenty dollar gift card to a local grocery store for their participation.

There are several problems with conducting community-based research. For example, CBRM are not representative of the population as a whole (Arcury and Quandt 1999; Carr and Halvorsen 2001). Methods are limited by time and the size of the study area so that simple approaches to sampling are not possible (Arcury and Quandt 1999). This greatly affects the validity of the research results because participants are not necessarily representative of the study population. In addition, when researchers engage to make participants equal partners in the research endeavor, participants are not always willing or able to do so (Acker et al. 1991). I found that it was difficult to engage citizens to participate when they are not concerned with or feel affected by the issue, such as the case in the U.P.

2. Feminist Research Methods

Like CBRM feminist research methods do not require researchers to use any one type of method over another. Instead the researcher uses methods that are most appropriate to the research questions and purpose, and executes those methodologies with competence and reflexivity (Epstein-Jayaratne and Stewart 1991, pp. 100). Reflexivity is the crux of feminist research methodology. It requires researchers to "reflect upon, examine critically and explore analytically the nature of the research process to gain insight into th

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In addition to reflexivity, feminist research methods emphasize "conscious raising" and political action (Fonow and Cook 1991; Kirsch 1999). It seeks to find the hidden implications of research findings that can lead to inequality and injustice. It denies essentialization and strict definitions of objectivity where the researcher is removed from the research process (Fonow and Cook 1991; Kirsch 1999). These tenets of feminist research methodology guide my understanding of the research process and informed my research questions.

3. Methodological Tools

a. Focus Groups

The purpose of a focus group is "to listen and gather information" and "better understand how people feel or think about an issue (Kruger and Casey 2000)." Participants are selected by the researcher because they have some set desired characteristics that relate to the topic of the focus group. In a focus group participant conversation is led by a facilitator whose role is to engage conversation without dominating the discussion. Focus group participants are encouraged to share their opinions and point of view.

b. Public Meetings

Like focus groups, public meetings and community dinners are used to solicit the participant's values, beliefs and point of view. Unlike focus groups they are expected to appeal to a wide variety of community members. Public meetings are most often used to facilitate citizen participation in policy and management decisions (Adams 1991). The protocol for a public meeting is, "an open meeting is scheduled, the date and time are advertised to the public and the issue is discussed at the meeting" (Thomas 1995: 12).

c. Community Dinners

Community dinners are thought to be satisfying and deliberative in that they focus upon small group discussion among members at each dinner table (Carr and Halvorsen 2001; Halvorsen 2001, 2003). Community dinners are used because they resemble a social event that people are familiar and comfortable with, dinning at a local restaurant (Carr and Halvorsen 2001). At a Community dinner, dinner is served and people are encouraged to interact over the dinner table to discuss the issue at hand (Carr and Halvorsen 2001; Halvorsen 2001, 2003). They are usually held at local restaurants and are open to all community residents. Participants either pay a small fee for their meal, or, as in the case of this study, the meal is paid for with research funds.

d. Participant Observation

In addition to informal conversations and formal interviews we used participant observation in the U.P. to gain a sense of context. Although data gained from this process is not directly included in the results, participant observation provided insight to the lives of U.P. residents. In participant observation the researcher takes part in the daily activities, rituals, interaction and events of a group of people to learn "the explicit and tacit aspects of their life routines and their culture (Dewalt and Dewalt 2002). Participant observation, in addition to informal conversations with community residents and anglers, led me to think differently about my research questions and allowed me to better assess and situate informant responses during interviews, community dinners, the public meeting and focus groups. In addition it aided the development of new hypothesis and research questions.

e. Formal and Informal Interviews

To understand how U.P. residents and agency managers interpret, respond to, understand and construct reality we used informal and formal interviews (Kempton et al. 1995; Fonow and Cook 1991; Dewalt and Dewalt 2002). These types of ethnographic methods "reduce the distance between the researcher and the researched and accord the respondent a more active role in the research processes" (Kempton et al 1995 pp. 18). For example, questions asked using ethnographic interview methods elicit paragraph instead of word length answers and allow respondents to bring up new topics and carry on the discussion in ways that suit them (Kempton et al 1995).

In my research I used both formal interviews and informal conversations. Both of these ethnographic techniques involve using open ended questions that allow informants to reveal how they construct and interpret the world. Ethnographic interview methods also allowed me to be sure of the informant's intent (Kempton et al 1995). For example, during the second phase of data collection when I formally interviewed agency managers I often paraphrased informant's responses to be sure that I understood them correctly. This allowed for greater accuracy in data analysis. In addition, the types of questions asked using ethnographic interviewing methods permit the informant to bring up new topics and allowed me to probe further to explore unfamiliar or unexpected concepts (Kempton et al. 1995; Fonow and Cook 1991; Dewalt and Dewalt 2002).

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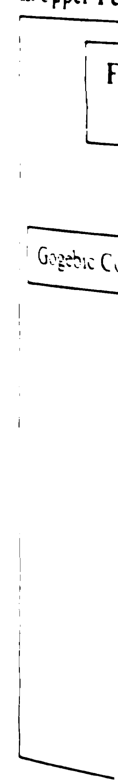

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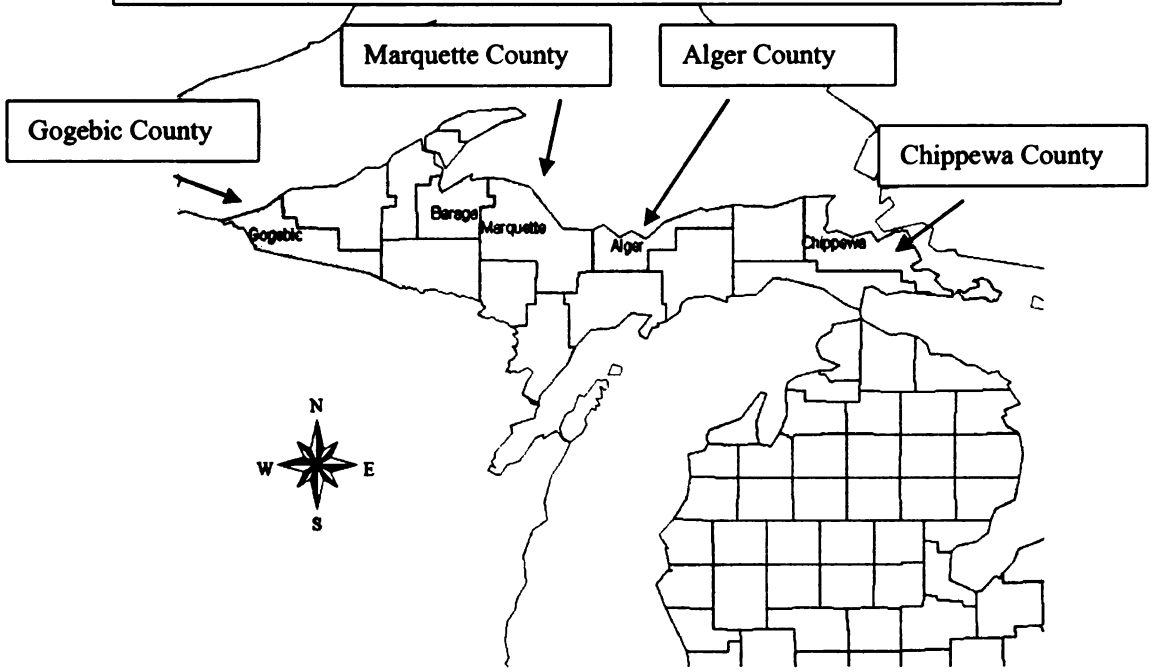
4. Summary

Each of these methodological tools influenced the way in which I developed my research questions and implemented research methods. In order to answer my research questions and adhere to feminist research ethics, each of the three sample populations necessitated the implementation of different methodological strategies. The following sections include a detailed account of that data collection.

II. Upper Peninsula Residents

Figure 4.2 Counties in Michigan's Upper Peninsula Chosen as Research Sites: Gogebic, Marquette, Alger and Chippewa



As mentioned before, this phase of data collection was a part of a different study funded by the ATSDR to improve fish consumption advisories in the U.P. Two different researchers facilitated the data collection events. A multi-method approach to data collection was used to maximize participant diversity and comfort. This study is informed by th

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informed by the work of others who use community-based research and/or study fish consumption advisories.

Data collection in the Upper Peninsula took place at or around three different lake sites within four counties: Alger County, Chippewa County, Gogebic County and Marquette County (Figure 4.2). The types of lake-sites identified in each county include a Lake Superior site, an inland lake site, and an impaired site (as identified in the advisory). Data were collected from both the general public and individuals who were specifically recruited to attend focus groups due to their membership in a particular group with stake in the fish consumption advisory issue, such as, women of childbearing age, youth, anglers, medical professionals, and commercial fishermen. (Table 4.1). Since community based research methods were used the sample population does not represent a randomized sample applicable across the general population of the Upper Peninsula.

From June 2004 to August 2005 focus groups were held with women of childbearing age, expecting parents, commercial fish producers, recreational anglers, youth and a watershed-based environmental group. In addition to these focus groups one public meeting (Alger County) and three community dinners (Alger, Marquette, and Gogebic Counties) took place. The public meeting and community dinners targeted a wide range of community residents as people were recruited through an announcement in the local newspaper, by our on-site partners or by word of mouth. In addition, we worked through the Women, Infant and Children (WIC)[5] programs at local health departments to recruit low-income women of childbearing age. Individuals present at

[5] WIC provides Federal grants to States for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk. http://www.fns.usda.gov/wic/ Accessed 5/5/09

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focus groups and the public meeting received a twenty dollar gift certificate to a local grocery store for their time and participation. At the community dinners, people were compensated with a free fish dinner.

Table 4.1. Distribution of Data Collection Activities			
Event	**County**	**Demographic**	**Participants**
Angler interviews	Alger	Anglers	27
	Chippewa	Anglers	16
	Marquette	Anglers	21
Community Dinner	Alger	Community	20
	Gogebic	Community	22
	Marquette	Community	7
Focus Group	Alger	Community, Youth	7
		Women	4
		Youth	34 (4 subgroups)
	Chippewa	Anglers	12
		Anglers	13
		Commercial fishermen	2
		Community	12
	Gogebic	Community	10
		Women	5
	Marquette	Community	7
		Anglers	9
	Upper Peninsula	Commercial fishermen	9
Public meeting	Alger	Community	7
Total			n=244

In addition to focus groups, community dinners and a public meeting, onsite informal interviews with recreational anglers (n=64) were performed at 16 different water bodies throughout the five counties (see Table 4.2). These anglers did not receive any incentive for their participation. At the beginning of every interview with anglers an oral consent script was read informing the interviewees of the purpose of the study and their rights as a study participant. Anglers gave oral consent to use their responses in our study (see Appendix A 1.5). At focus groups, community dinners, and the public meeting individuals signed MSU University Committee on Research Involving Human Subjects (UCRIHS – now the Institutional Review Board) approved consent forms before data collection began (see Appendix A 1.1-1.4). In addition, UCRIHS approved permission slips were signed by a parent of all minors participating in the study (see Appendix A 1.2 and 1.4). At the end of data collections participants were given a copy of the official Michigan fish consumption advisory. For Optionfinder (Option technologies Interactive LLC n. d.) questions see Appendix B 1.1.

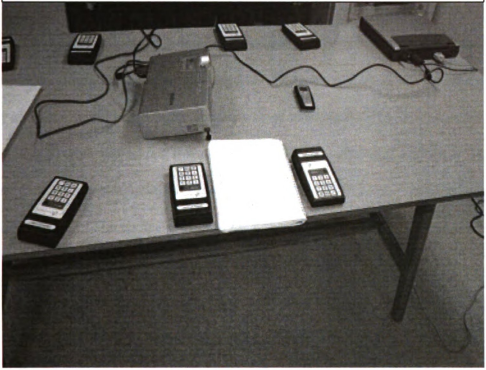
Table 4.2 Site Design

County	Lake Superior	Impaired	Inland
Alger	Munising Bay	West Branch lakes (SW of Grand Marais)	Grand Sable Lake
Chippewa	Tahquamenon	St. Mary's River (Sault Ste. Marie)	Caribou Lake (Detour Village)
Gogebic	Black River harbor	Langford and Pomeroy= Duck lakes (Watersmeet)	Cisco Lake (Watersmeet)
Marquette	City of Marquette	Deer Lake	Lake Independence

A. Focus Groups

Focus group data were collected using the computer-aided data collection tool Optionfinder (Option technologies Interactive LLC n. d.) (Figure 4.3). Participants sat around a table facing a screen upon which the questions were projected to select from a series of mutually exclusive answers. Each participant was given a key pad with buttons numbered 0-9. When a question appeared on the screen, people chose their answer by pressing the corresponding button on their individual key pad. After all the questions were answered, summary graphs showing the participants' responses were shown on the screen allowing participants to view the anonymous choices of their peers.

Figure 4.3 OptionFinder (Option technologies Interactive LLC n. d.) focus group set up with projector



Focus group participants were asked why they chose the answers they did, if they felt the questions and available answers were useful, what might have been left out, and if they had any other questions. Digital voice recorders were placed on the table to record this discussion, which was facilitated by one of two different researchers. The recordings of focus groups were later typed verbatim for coding in Atlas.ti 5.5 (GmbH, Berlin) computer-aided qualitative data analysis software (for U. P. resident codes and code definitions see Appendix C 1.1). The triangulation of participant observation, the quantitative Optionfinder (Option technologies Interactive LLC n.d.) results and the qualitative data from the discussion sections allowed for a deeper understanding of people's knowledge, awareness, and understanding of the fish consumption advisories.

B. Community Dinners

Three community dinners were held; one in Alger County at a popular, relatively small, locally owned restaurant located on the highway between (~ 10 miles from) the two largest communities in the county (N=21). The second took place in Marquette County at a very small, but popular, locally owned restaurant that was located on a lake quite a distance from the nearest town (~15 miles) (N=7). The third and final dinner in Gogebic County was at a national chain restaurant located directly in the largest town in the county (N=22). The choice of restaurant was made by 1) the availability of a place to hold a meeting and 2) the presence of a Friday fish fry (or fish special), and 3) recommendations from our on-site partners (Michigan State University Extension).

At each of these community dinners people sat in tables of 5-7 people facing each other with a screen set up in front. This type of set up was not optimal since some participants had to turn around in their chair to see the screen. Some participants commented that this arrangement conflicted with conversation and eating. In Marquette and Gogebic Counties the dinner was held in a separate room from the main dining room. In the case of Alger County the meeting took over the restaurant's main dining room.

The same data collection format was used for focus groups and the community dinners, beginning with the signing of consent forms, moving on to quantitative data collection using OptionFinder (Option technologies Interactive LLC n. d.) and finishing with a group discussion of the results. However, at the community dinners people discussed the results less with the facilitator and more among themselves at their respective tables. A digital voice recorder was placed on each table to record that table's discussion. The recordings from the community dinners were later typed verbatim for coding in Atlas.ti 5.5 (GmbH, Berlin) computer aided qualitative data analysis software (for U. P. resident codes and code definitions see Appendix C 1.1).

Each of the three community dinners was held during the traditional Friday night fish fry at each of the restaurants. Participants were recruited through an announcement in the local newspaper, word of mouth and by our Michigan State Extension and community partners. For their involvement in our study participants were given a meal of fish and unlike those of the focus groups and public meeting were not compensated with the twenty dollar gift certificate,

C. Public Meeting

Only one public meeting took place in Alger County (N=7). The meeting was held in a conference room of a local bank located in downtown Munising, the largest town in the county. The data collection format and setting (seven people sitting around a projector screen; consent forms, quantitative data collection with Optionfinder (Option technologies Interactive LLC n. d.), and finally qualitative data collection during a discussion period in which the results were shown anonymously) was similar to the focus groups, except people were not specifically recruited by stakeholder group. Instead, participants were recruited through an announcement in the local newspaper and flyers posted throughout the community. Digital voice recorders placed on each table recorded any discussion and dialogue among participants. The recording of the public meeting was later typed in verbatim for coding in Atlas.ti 5.5 (GmbH, Berlin) computer aided qualitative data analysis software (for U. P. resident codes and code definitions see

Appendix C 1.1). Participants were given a twenty dollar gift card to a local grocery store.

D. Informal Angler Interviews

Informal angler interviews took place at 12 different lake sites (see table 4.2) Researchers spent from 4 to 8 hours at each lake site during a range of hours on a range of days, both weekdays and weekends. Each angler that was seen at the lake site was asked to be interviewed as they went out or came back from fishing on the lake. Anglers gave oral consent to be interviewed after the consent script was read to them (see Appendix A 1.5). The researcher took notes as participants responded to their questions (see Appendix B 1.1) Angler interviews were not recorded. The interviews lasted from five to fifteen minutes and participants were not compensated for their involvement.

E. Participant Observation

Along with formal data collection activities participant observation offered a different look into the fish culture of the Upper Peninsula. Researchers interacted with customers and employees of grocery store fish departments, commercial (fresh) fish retailers, and restaurants during Friday fish fry, anglers at boat access sites and fish cleaning stations, and participated in a local youth-oriented environmental education program called Life of Lake Superior. In addition, numerous photos were taken to document the presence of fish consumption culture in the daily lives of Upper Peninsula residents.

III. Agency Managers

After the first phase of data collection with U.P. residents I wanted to enlarge the scope of my study to include an understanding of the official fish consumption advisory process in addition to how agency managers and the media (the two major sources of advisory information as reported by U.P. residents) frame fish consumption advisory information. To study agency managers I conducted 16 interviews with state and federal environmental and public health agency managers. One-on-one interviews, either in person or over the phone, were conducted with agency staff associated with fish consumption advisories and/or fish contamination: research directors, program coordinators, and individuals charged with data collection, testing, or analysis (see Appendix B 1.2 for interview protocol). However, interviewees often had multiple responsibilities. For example, program coordinators were often also the individuals charged with data collection, testing or analysis (Table 4.3). I was therefore unable to correlate a manager's role in their agency with the reason they hold a particular frame about mercury in fish

Although there are other state and federal agencies peripherally involved with fish contamination such as the ATSDR and Michigan Department of Agriculture, the Michigan Department of Community Health (2 interviews), the Michigan Department of Environmental Quality (3 interviews), the Michigan Department of Natural Resources (5 interviews), the United States Food and Drug Administration (3 interviews) and the United States Environmental Protection Agency (4 interviews) were chosen for their direct role in policy making, permitting, and communicating information about toxic substances and fish consumption to the public and among each other (Table 2.2). In total

I interviewed 8 women (5 from federal agencies and 3 from state agencies) and 8 men (1 from federal agencies and 7 from state agencies). Other demographic information such as ethnicity and age is unknown since many interviews were done by telephone.

Table 4.3 Agency Interviews		
Agency	**Number of Interviews**	**Role in Agency**
Michigan Department of Community Health	2 (face-to-face)	-2 program coordinators/individuals charged with data analysis
Michigan Department of Environmental Quality	3 (face-to-face)	-1 research director -1 program coordinator -1 program coordinator/ individual charged with data analysis
Michigan Department of Natural Resources	1 (face-to-face) 4 (telephone)	-2 research directors -1 program coordinator -2 program coordinator/ individual charged with data collection and analysis
United States Food and Drug Administration	2 (telephone)	-1 research director/program coordinator -1 program coordinator/individual charged with data collection and analysis
United States Environmental Protection Agency	4 (telephone)	-1 research director -2 program coordinator -1 individual charged with data collection and analysis

Names and phone numbers of potential interviewees were found on agency websites and from the list of participants from the 2005 EPA National Forum on Contaminants in Fish. A referral method was used thereafter. At the end of each interview the interviewee was asked who else they felt should be interviewed. Even though the DNR has only a small role in the fish consumption advisory issue, managers from the DNR were interviewed in this study because the DNR was cited as a popular source of fish consumption advisory information by residents in the Upper Peninsula. Interviewees were chosen based on their role within the agency and their role with the fish consumption advisory.

Each interview lasted approximately an hour and a half to two hours and all were conducted by the author. The face-to-face interviews (N=10) took place with agency managers in Michigan agencies with offices in East Lansing. The interviews were held either in the interviewee's office or in an agency conference room. The interview was recorded and later transcribed verbatim for coding.

Telephone interviews (N=6) were held with agency staff with whom it was not possible to interview face-to-face because travel to their office was not possible. Telephone interviews were carried out using handless speaker phone function which allowed the interviewer to type interviewee responses directly into an electronic document. The interview was transcribed as close to verbatim as possible. The interviewer reviewed the text directly after the interview took place to fix misspellings and assure quality control. All agency interviews were coded using Atlas.ti 5.5 (GmbH, Berlin) computer aided qualitative data analysis software. The list of codes and their definitions can be found in Appendix C 1.2.

Agency interviews took place between April 2006 and June 2007. There are a larger number of interviewees from the DNR simply because more people in the DNR were willing to be interviewed. Many people from the Michigan Department of Community Health and the Food and Drug Administration declined to be interviewed because, according to them, if I had talked with X or Z person they felt they had nothing else to add.

IV. Media Analysis

In addition to government agencies many U.P. informants reported getting information about fish contamination the media. I therefore decided to conduct a media analysis of mercury in fish. The analysis was conducted using a Lexus Nexus article search from 1970- January 2008 using key words "mercury AND fish". I choose to search for articles since 1970 because that was the year when mercury was first regulated in fish in the United States.

Thirty-seven newspaper articles (33 national, 4 from Michigan) from the *Associated Press*, eighteen from the *New York Times*, and ten from the *Washington Post* and twenty-five television news transcripts from major network (6 from ABC, 8 from NBC and 11 from CBS) news programs were used for analysis (n=65). Newspaper articles span a time frame from January 1988-January 2008. Televisions transcripts are found from 2001- January 2008.

Articles chosen for analysis discussed mercury pollution and fish contamination nationally or in Michigan. Unfortunately, local newspapers from the U.P. could not used for analysis because they lack a systematic and easily searchable archive. They are only available on microfiche at local libraries and do not have a searchable index. Articles from the *New York Times* and *Washington Post* were chosen because of their status as two major American newspaper sources, one known to be more liberal (New York Times) and the other more conservative (Washington Post). The *Associated Press* was chosen for its breadth of news coverage, picking up on issues other major news magazines might pass over; and because many local newspapers in the Upper Peninsula use Associated Press articles as an inexpensive and easy way to report state and national news. Television transcripts from major networks (ABC, NBC, and CBS) are used because people from the U.P. cited print and television news as sources of fish consumption information.

Each article was coded using Atlas.ti 5.5 (GmbH, Berlin) computer aided qualitative software. The list of codes and their definitions are listed in Appendix C 3.1. The articles are grouped by source (i.e. New York Times, Washington Post, and Associated Press) and sorted by date and article content. The data include one editorial. Letters to the editor were excluded. In addition, some journalists for the Associated Press wrote two or more articles on the same topic over a span of two days or less. When this occurs, only one article is used for analysis.

Chapter Five

Results

I. Introduction

Results show that the processes of risk identification, management, and communication are piecemeal collections of different agency projects. The fish consumption advisory program lacks a rigorous scientific protocol in terms of how it is put together and carried out. Decision/policy making is highly technocratic, but rife with uncertainty. Agency managers do not know fish consumption patterns in the United States (or Michigan in the case of state government), and therefore do not know who is eating too much or not enough fish. In Michigan it is uncertain what lakes have the most contaminated fish due to the lack of rigorous sampling by government agencies. And, uncertainty still exists whether mercury in low doses causes health problems, even for developing fetuses and children.

In the Upper Peninsula with its almost unlimited access to natural resources, people are aware that fish consumption advisories exist but lack familiarity with the specific fish consumption advisory guidelines. U.P. residents say that they do not know how to simultaneously reduce risks and increase the benefits of consuming fish. This increased awareness of fish contamination coupled with the lack of an effective and targeted official fish consumption advisory message, especially for women and children, leads people to form their own (often incorrect) ideas about risk through mental models, trust, and past experience. Trust is important to people in the Upper Peninsula. If they do not trust the source of fish advisory information, they will be less likely to follow that advice. In addition, people more likely trust others in their community than government agencies. During focus groups and community dinners many people said they feel like they don't know what to believe or whom to trust.

People express confusion about what fish are (un)safe to eat due to lack of familiarity with the official fish consumption advisory information. Fish consumption information rarely lists what kinds of fish are low in mercury, but high in omega-3, a comparative benefit-risk communication message that may prove more effective informing consumers. However, agency managers and scientists do not know the utility of various kinds of messages because they lack: a) evaluation of risk characterization, communication or management, b) reflexive or rigorous advisory procedures, and c) public involvement.

Government agency managers and scientists frame mercury and fish consumption as a human health issue. All interviewees said that people should eat fish, but should also follow the advisory. Agency managers acknowledge the current lack of adequate information readily available to the public about the benefits and risks of eating fish. At the federal level, agency managers also frame the fish consumption advisory issue in terms of ecosystem health and reducing mercury emissions. They say that fish consumption advisory information helps to fosters public awareness and political will to regulate mercury emissions from coal-fired power plants. However, this message is not explicitly available to the public.

Interviewees from the FDA are clear about their role, or lack thereof, in the advisory process. They prioritize regulation of mercury in fish sold in interstate commerce. FDA interviewees adhere to the claim that their sole role in fish contamination issue is regulating methylmercury in interstate commerce, however they also spend time developing advisories. A possible reason for this may be that it is easier for the FDA, financially and politically, to develop a fish consumption advisory rather than go through the process of testing fish and taking those with elevated mercury levels off the market.

Interviewees from the EPA see the fish consumption advisory issue as a state's responsibility. They see a sort of paternalistic role for the EPA, to help the states consolidate advisory information, identify new fish consumption risks, and promote collaboration and consistency among the states and with the FDA. In addition, the EPA is a regulatory agency that regulates mercury emissions. The existence of fish consumption advisories helps support reducing and regulating emissions.

At the state level, managers and scientists see the advisory process as doing the best they can with the resources they have. The lack of funding and resources available to Michigan agencies is a real obstacle to effective risk assessment, characterization, management and communication. State fish consumption advisories (at the time of data collection) were geared toward anglers and sport-caught fish only and only available online. The official Michigan fish consumption advisory includes not only mercury, but other contaminants such as dioxin, PCBs, and PBDEs.

Recently, the Michigan Department of Community Health (DCH) developed a new fish consumption brochure and a shopping and restaurant guide for mercury in commercial fish. Unlike previous advisory information geared toward anglers, these outreach materials are geared toward families. However, they are still only available online. State agency managers who do not directly work with the fish consumption advisory all say that the advisory is not their responsibility, so they will not or cannot do anything to fix it.

The media frames mercury and fish consumption in terms of issue-based news events. Articles and broadcasts rarely tell a complex or complete story. The three ways the media frames the fish consumption advisory issue are (1) mercury poses a threat to human health, (2) mercury does not pose a threat to human health, or (3) the mercury and fish consumption issue is uncertain. Sometimes all three frames occur in the same article or transcript. Due to journalistic obligations to objectivity, articles and transcripts often include complex or even conflicting messages about the risks and benefits associated with fish consumption. The ways that the media frames the mercury and fish consumption issue change with time. For example, before the year 2000 all risks are framed in terms of sport-caught fish. After 2000 commercial fish are the topic of risk in the majority of articles and transcripts, especially the fish on the FDA/EPA do not eat list (shark, tilefish, swordfish, and king mackerel) and tuna fish.

The quagmire for current fish consumption advisory programs is balancing fish consumption risks with the consumption benefits of heart-healthy omega-3 fatty acids, low fat and caloric content and high protein. Omega-3 fatty acids contribute to healthy heart functioning and aid child neuropsychological development (Kris-Etherton et al. 2002). Adding to the complexity, not all fish are created equal. Some fish, such as shark and swordfish, have extremely high levels of mercury contamination, but provide relatively little omega-3 amino acids. However, fish like herring and salmon contain very low mercury levels and provide a larger amount of Omega amino acids, but may contain more Persistent Organic Pollutants like PCBs and dioxin (American Heart

Association 2008). The message prevails that fish is both good for you, and, at the same time, risky for some.

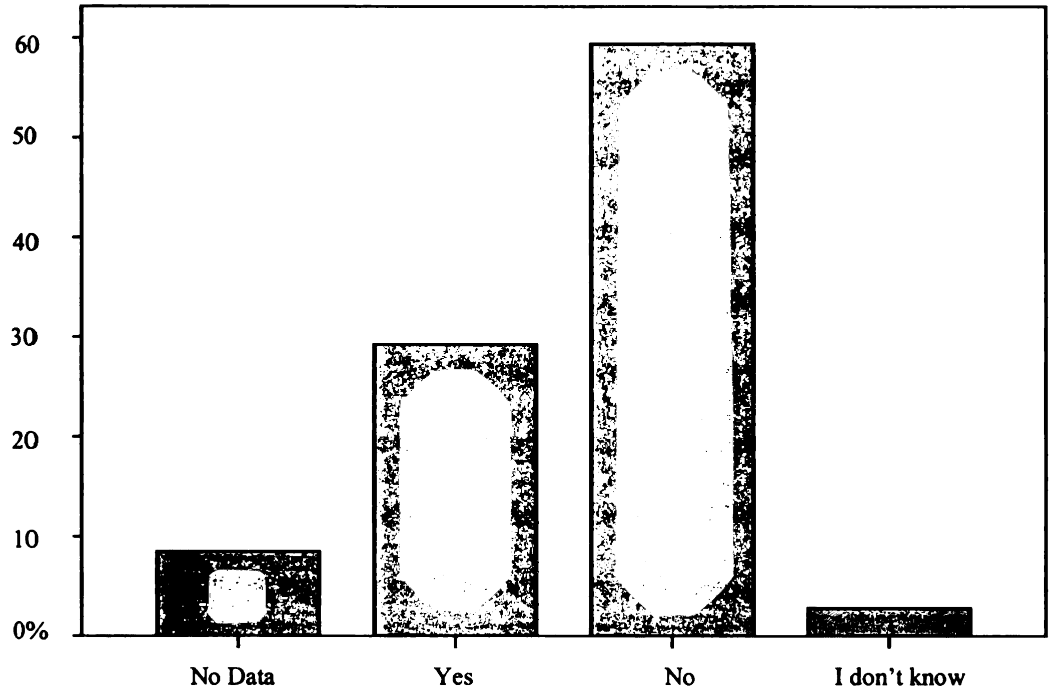
II. Upper Peninsula Residents

A. Guidelines: Nescient Awareness

Participants were generally aware that a fish consumption advisory exists. Of all data collection events (n=180 participants) only one adult commented to not even know an advisory exists (Marquette Community Diner). Although most people have heard of contamination in fish, relatively few people have actually read Michigan's fish consumption advisory. The majority of respondents (59%) said they had not read the advisory (50% males and 66% females) (See Figure 5.1). This is consistent with angler interviews (n=62) in which 89% of females and 38% males said they had not read the advisory.

Furthermore comments made during the discussion period of focus groups and community dinners suggest that many people who reported having read the advisory during the Optionfinder (Option technologies Interactive LLC n. d.) session may not had actually read the official advisory. Therefore, it can be presumed that even fewer people have read the advisory than reported in the data. For example, some people who said they read the advisory later recanted when given a copy of the Michigan's official fish consumption advisory. One male angler who reported to have read the advisory, when given a copy of the official advisory said, "I've never seen this booklet".

Figure 5.1 Advisory Awareness among Focus Group Participants



Others made comments about the fish consumption advisory that they would not have if they had read the official advisory. For example one Marquette County woman said, "[I] read it a couple of years ago and felt like, now what am I supposed to do. It seemed too vague." Likewise, one Alger County man said, "advisories aren't specific enough, makes people more fearful, it's too generalized." Others made comments that the advisory does not give information about contamination or that it does not include the names of lakes or species of fish. However, the official advisory provides specific and detailed information about fish preparation, contamination in fish and bioaccumulation. It also lists the species of contaminated fish on a lake-to-lake basis and gives the name and map coordinates of each lake with contaminated fish, or fish less contaminated than the criteria for the general advisory.

B. What Is the Advisory?

Many people seemed confused about what the fish consumption advisory actually is. One Alger County woman who reported reading the advisory said that she gets her advisory information from the fish market because they have instructions on how to cook fish. This type of reflection was common among focus group participants. People often failed to differentiate information about fish consumption or contamination with the official fish consumption advisory. For example several anglers assumed that if they had read the DNR's fishing guide, then they had also read the official fish consumption advisory. However, the DNR fishing guide deals mostly with the regulations for fishing in Michigan, and in 2004, the year of data collection, included only a small paragraph on the last page providing very general information about the fish consumption advisory (Figure 5.2).

Figure 5.2 Fish Consumption Advisory in Michigan Sport Fishing Guide 2004

Fish Consumption Advisory

The Michigan Department of Community Health advises women of childbearing age and children under 15 to use caution when eating certain kinds and sizes of fish from the Great Lakes and from some inland and streams. Fish in these waters contain levels of toxic chemicals that may be harmful if those fish are eaten too often. The 2004 Michigan Fish Advisory shows you which fish are okay to eat and how often they can be eaten. To get a copy call 800-454-8041, or go to the MDCH Web site at: www.michigan.gov

Among anglers, especially male anglers, the number of people who had read the official advisory is higher than among the general public. Anglers commonly explained that in the past the advisory came with their fishing license. However, many mentioned that they have not seen it in a while and no longer know where to find it. In effect, the advisory was last distributed with the fishing licenses in 2002. New updated versions of the fish consumption advisory are only available online through the Department of

Community Health's (DCH) website. This is problematic since many people assume that the Department of Natural Resources (DNR) is the agency responsible for distributing the fish consumption advisory.

C. Fish Consumption Advisory Knowledge

Not only did people confuse what the fish consumption advisory is, in every focus group people made incorrect statements about contamination in fish that revealed misinformation or a misunderstanding about contamination and fish consumption. People often confused environmental processes like acid rain, sewage seepage and bacteria with contaminants in the fish consumption advisory such as mercury, PCBs, and dioxin. Participants seldom differentiated mercury contamination from that of persistent organic pollutants such as PCBs or dioxin. For example, they often mistakenly said that mercury, like some persistent organic pollutants, can be reduced by trimming fat, organs and skin.

D. Contaminants of Concern

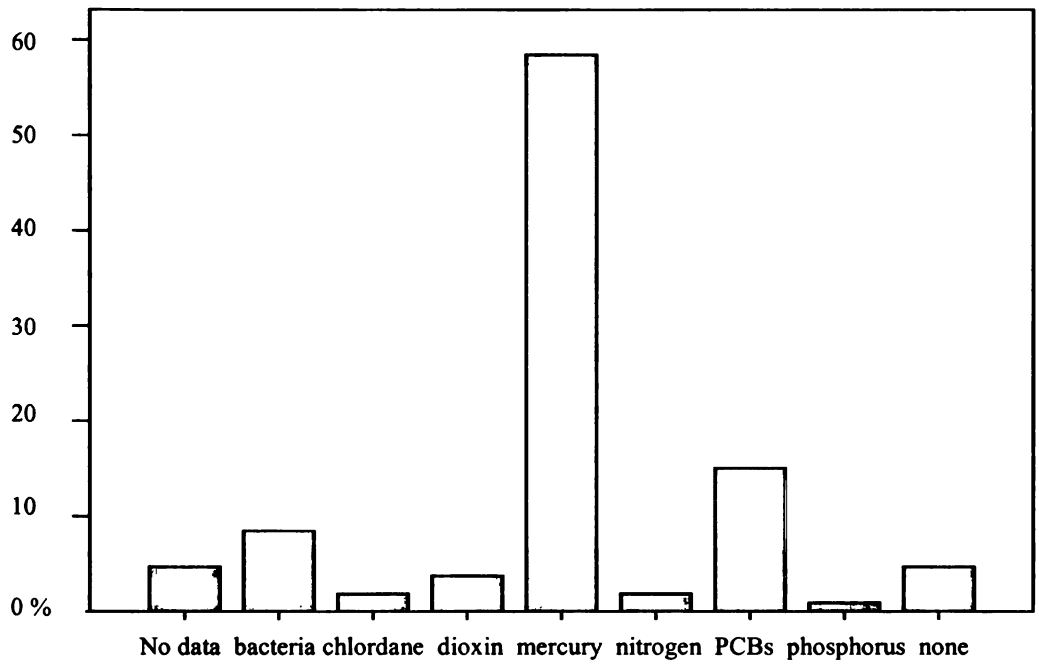
During data collection events 58% of respondents identified mercury and only 15% PCBs as the main contaminant of concern in Upper Peninsula fish (see Figure 5.4). Angler interviewees also identified mercury (75%) more often than PCBs (24%) as a contaminant of concern. However in the Great Lakes, where the majority of participants said they get their fish, the contaminant of concern is PCBs. Participants specifically mentioned being concerned about mercury more than any other contaminant. For example, one fisherman from Chippewa County said, "[I'm concerned about] Lake Superior mercury."

In Marquette County participants commented:

> *M: Mercury is the main contaminant [of concern]*
> *W: In our watershed mercury is the biggest [contaminant of concern]*
> *M2: PCBs and Dioxin are larger Downstate [the Lower Peninsula of Michigan]*

For inland watersheds mercury is the contaminant of concern, however, PCBs and Dioxin are concerns in Lake Superior which is a major part of the Marquette County watershed.

Figure 5.3 Knowledge of Contaminant of Concern



E. Fish Risk- Fatty Fish and Bottom Feeders

A majority of participants correctly identified older (58%) or fatty (53%) fish as presenting greater risk. However, people often said they chose older fish over shorter-lived fish out of common sense instead of advisory knowledge; citing that older fish are in the water longer so they would have more time to pick up contaminants. More people, especially anglers, commented on the importance of avoiding fatty fish in order to avoid contaminants. For example, one male angler said:

> *"[My] daughter bought 50lbs of lake trout for a family event but I wouldn't even clean them b/c they are too fat and are contaminated, so I went and replaced the fish with 50lbs of whitefish [a leaner fish]."*

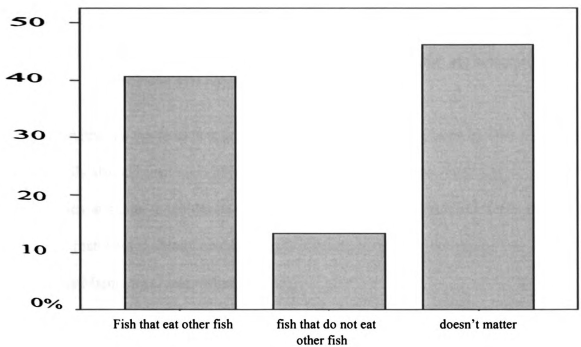
Many other anglers explained that they cut out the fat when filleting fish in order to reduce contamination. However, certain species of fatty fish contain the most health beneficial omega-3 fatty acids, but do not pose greater mercury risks (American Heart Association 2008; Mahaffey et al. 2008).

Lake trout emerged as the most frequent species of concern, principally a deep-bodied variety called siscowet that contains a high level of fat. Bottom-feeding fish comprised the second most frequent (28%), though incorrect response. During angler interviews 25% of women correctly identified larger and longer lived fish as posing an increased risk, while 42% of men mentioned large, fatty or predator fish. Women tended to be less knowledgeable about what fish pose greater risks; correctly mentioning a fish species of greater risk only 25% of the time, while men correctly mentioned a species of greater risk 73% of the time.

F. Bioaccumulation

Few informants were aware of the processes of bioaccumulation and biomagnifications whereby contaminants are passed up through the foodweb in greater and greater quantities. Only a minority of informants (36% males and 44% females) correctly identified piscivirous fish over non-piscivirous fish as the greatest risk, with a plurality (45%) stating that it doesn't matter whether a fish is piscivirous. During angler interviews, only 5% of anglers correctly identified the increased risk of eating fish-eating predators. U.P. informants also incorrectly identified the pathways of contamination from the environment to fish to humans. During the discussion period many people said they did not know the origin of mercury in fish and also made comments revealing that they were unaware of water and contaminant cycles.

Figure 5.4 Knowledge of Consumption of Predatory Fish Risk



G. Risk for Women and Children

The most widely known fish consumption advisory fact was that women and children are the most at risk populations. Most people were aware that certain types of fish consumption should be restricted during pregnancy. The majority of focus group participants (77%) correctly identified a greater risk for women and children, even if they could not say why. During angler interviews, a majority of women (74%) and men (64%) indicated that more fish consumption guidelines apply to pregnant women or women of child-bearing age than other groups. Many women and some men commented on reducing fish consumption during pregnancy, for women of childbearing age, or children. For example, one Alger County woman said:

> *"[I am not concerned about mercury now], only when I was pregnant because of all you hear with mercury."*

Two men in Marquette County said:

> *M: [I'm] not really concerned now because of my age, but I would be more concerned if I had a young family.*
> *M2: If [I was] living alone I would eat more [fish], but because [I] have a wife and kids we don't eat as much.*

Although the fetus is at greatest risk from contaminants, heart healthy Omega-3 fatty acids also aid fetal neuropsychological development and are beneficial throughout pregnancy and later in childhood (Mahaffey et al 2008). Unfortunately, many people thought that women should avoid eating fish during pregnancy. A typical case was one angler in Marquette County when he said:

> *"When my wife was pregnant we stayed away from fish because it says in the fish advisory to reduce consumption while pregnant."*

Likewise, a Gogebic County woman said:

> *"I stopped eating fish when [I was] pregnant. My kids used to eat tuna two to three times a week, but now [I] switched to peanut butter and jelly."*

In Alger County some women said that their doctors told them to stop eating Great Lakes fish while pregnant. The message of healthy fish consumption as an important part of fetal and child development is either unknown or is trumped by the message of fish consumption risks.

H. Fish Safety

Many participants claimed ignorance when asked "how do you know if the fish you eat is safe for you and your family?" The majority of respondents including 100% of anglers said they did not know whether their fish was safe to eat. Most people relied on different combinations of mental models, trust and past experience to answer this question. For example, a group of Marquette County fishermen said:

> *M: I grew up eating fish. My Grandma is 90 years old and healthy, there's no one who eats more fish than my Grandparents.*
> *M1: I don't know anyone that has died from eating fish.*
> *M2: Certain lakes are not safe, they'll have fish with sores or tumors.*
> *M3: I caught a pike out of Deer Lake (a lake heavily contaminated with mercury from a mining operation), I ate it anyway.*
> *M2: We know it's safe from experience- going out, knowing about industrial drainage.*

These comments are typical of the different types of models used to decide if fish is safe to eat. Some participants compared their ignorance of fish consumption risks to their ignorance of the risks other foods pose. For example one angler from Marquette County said, "I don't [know if the fish I eat is safe], but I also don't know about the safety of the beef, chicken or pork I eat either." Others were more fatalistic; as many anglers stated "you are going to die of something." Or, as one Gogebic County man summed up the situation, "[You] can have high cholesterol or glow in the dark."

I. Trust

Many participants, especially women, used trust to judge if a fish is safe to eat. A typical response is like this Marquette County woman:

Facilitator: How do you know if the fish you eat is safe for you and your family?
W: unknown, do I know everything there is to know? I may read the fish advisory once in awhile, I've read it in the past, but I don't remember what's in there. If I go to the store and buy salmon or whitefish, I can't be certain that it is safe, I assume that it is.

Also, in Gogebic County one woman answered the same question saying:

"What you buy in the store... [I] trust that the federal government is regulating what kind of fish they sell. If it has a stamp of approval then it should be safe."

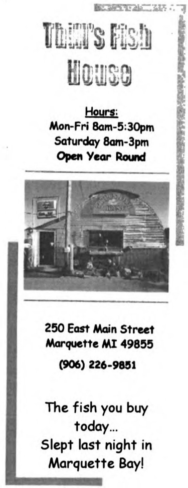
However, one Alger County angler said, "I don't like anything in grocery stores, can't assume FDA or seller cares."

The notion of trusting the fish purveyor was even stronger in the three counties (Marquette, Alger, and Chippewa) with access to locally caught fish, either from commercial fishermen, restaurants, or both. This is reinforced by slogans used by commercial fishermen (and reiterated by focus group participants) such as "the fish you eat today, slept last night in Munising Bay (Marquette Bay) [Lake Superior] (Figure 5.5)" In Marquette County participants discussed purchasing fish from a local fisherman; they said:

W: Don't think folks would sell something that is dangerous, because they are local family people versus the grocery stores.
M: Local people, everyone knows everyone, so [we] can trust each other
W: Don't know where food comes from in the grocery store, some will label that the fish is from [the local commercial fisherman]

Similarly, one Alger County woman commented, "why go to the store and buy fish when you can go down to the docks and buy fish from the angler and ask where it came from?" In Chippewa County participants discussed trusting local restaurants to serve locally caught fish. However, one commercial fisherman among the group told them that while it says local, it may not always be true.

Figure 5.5 BROCHURE FROM THILLS FISH HOUSE, MARQUETTE, MI



Likewise a Marquette Fishermen said:

> *"[I] don't know what to believe; don't know what the truth is…the way they test. Don't know how they do it? You hear different stuff….most people trim fat and cut the mud line out."*

In Chippewa County participants said,

> *W: [I'm] leery of what contaminants, but don't have anybody to tell you specifically.*

M: No one really knows where contaminants are coming from. [I] read information but [I] don't know who to believe

J. Lack Knowledge and Awareness

During the discussion period it was common for participants to talk about reading or hearing about mercury or fish contamination. However, they often followed by saying that they do not know whom to trust or what to believe. A typical response was like this Alger County woman, "I often hear about fish advisories, but I don't know much about it." In Gogebic County one woman said, "Each group comes up their own opinion [about fish consumption], [I] don't know who to believe."

The response "I don't know" was prevalent throughout all data collection events. For example, in Alger County when the focus group facilitator asked:

> *Facilitator: For those who said no, is it because you think there are no contaminants or because you don't know what it is?*
> *Man1: Don't know what it means.*
> *Woman: No clue, I don't know.*

Given the small number of participants who had actually read the official fish consumption advisory, it may not be surprising that people lack specific knowledge about fish consumption advisory information.

However, even those participants who reported reading the official advisory often rely on mental models, trust and past experience to decide if fish is safe to eat. Confusion guided people's ideas about what the advisory is and where to get advisory information. People may know less about fish consumption advisories than reported during the quantitative Optionfinder (Option technologies Interactive LLC n. d.) sessions. This may relate to the prevalence of contamination and fish consumption in the news or with the lack of a strong state fish consumption advisory risk communication process. In any case, it is indicative of the lack of an effective risk communication message for fish consumption advisory information. As a result, people lack the proper tools to make safe decisions about consuming fish.

K. Fish Consumption Attitudes

Qualitative Optionfinder (Option technologies Interactive LLC n. d.) results show that the majority of people have little concern (59%) about eating fish; however, very few people in the discussions talked about having no concerns at all. Most people who reported having no concerns about fish contamination are most often those who do not eat fish. However, a few fishermen did respond with quips such as "I'm not dead yet".

During the discussion time people talked about in order of greatest occurrence: contamination in general without mentioning a specific chemical or species of fish, mercury contamination, and concerns for the sensitive population. PCBs, bottom-feeders, site-specific concerns, eating fatty fish, eating farm raised fish and eating large fish are other topics of concern, but were mentioned with much less frequency than those listed above. A few people made comments about having concerns other than risks from contaminants, including three comments about concerns that people do not eat enough fish. Other types of non-contamination concerns included choking on bones and eating spoiled fish or fish that is not fresh.

L. Risk Deamplification Models

1. Fresh Fish

In the Upper Peninsula participants used a number of risk deamplification models to talk about fish consumption. One of these models was the ability to consume local fish that is fresh and therefore better than ocean fish or fish bought in a grocery store. As one man from Chippewa County said:

> *"I buy the freshest fish that I can find. I don't want indigestion from eating older fish."*

However, what is 'fresh' differs from person to person. For some, fresh meant "from lake to plate" and for others fresh was eating locally caught fish in a restaurant even if it has been frozen beforehand. This preference for local fish may cause people to ignore fish consumption advisory information, especially information that comes from the national government or state public health agencies from "down state" (the state's capital in the Lower Peninsula) as they may feel that it doesn't apply to them in the "pristine wilderness" of the Upper Peninsula.

2. Local Goodness

Among participants there was an overwhelming preference for local fish, along with the belief that local fish is safer to eat than non-local fish. Many participants explained that Lake Superior is clean and that fish from Lake Superior are healthier than fish from other places.

During a focus group in Alger County a woman and a man discussing local fish consumption said:

> *W: [We] eat fish here because the water is clean*
> *M: [It] tastes good, healthier here than elsewhere*

In Gogebic County one man said:

> *M: I remember going to nice restaurants in Detroit or Chicago, you would be served Lake Trout with ¼ inch of fat and skin on it. It didn't taste good and you know it wasn't from Lake Superior.*

A group of Marquette County fishermen said:

> *M: Lake Superior fish are healthier than Lake Michigan. [Lake Superior is] colder and cleaner.*
> *M1: It just feels cleaner, it's psychological.*
> *M2: There is less bacteria and slime.*
> *M: There is 10% of the industrial development on Lake Superior than there is on Lake Michigan.*

And, in Chippewa County one man simply said, "Lake Superior fish are perceived to [be] better." Likewise, one Alger County woman said:

> *"[I] grew up in Detroit where the water is filthy and wouldn't eat anything out of Lake St. Clair, but [I] would eat fish from the Lake Superior [Upper Peninsula] even when pregnant."*

3. Experience

In addition to being fresh and healthier, local fish were described as good because anglers can use experience and historical knowledge of different fishing locations to decide whether fish is safe. Many focus group participants talked about using experience and local knowledge to choose safe fishing locations. For example, when asked how he knows fish is safe to eat one Chippewa County man said, "Location, some areas are just known to be contaminated." In the same focus group another man seconded this by saying, "if you know the history of the area then you have an idea of places to fish." In Alger County a male angler said:

> *"In the past, [I] wouldn't get fish near the paper company because of the chemicals, but now the fish don't bother me. I like salmon because they are only*

in there for a month so they won't be so contaminated as compared to a bottom fish."

Likewise in Marquette several anglers mentioned staying away from Deer Lake, a lake with particularly high mercury contamination from industrial pollution. One man said, "if you take fish out of the reservoir or Deer Lake, you know you're going to die, otherwise [you're fine]."

4. Fish Consumption is Good for You

Another way people framed fish consumption risks is to say that fish is healthy or "brain food". People often down played the risk of contamination with respect to the benefits of consuming fish. For example, one Gogebic County man said:

> *"People eat fish because of cholesterol, so advisory scares people from eating fish. The book [the advisory] is a good tool but people will more likely die of a heart attack than mercury poisoning."*

Several people commented on the advisory being "scary" or "going overboard" to warn people about risks in fish. In Alger County focus group participants said:

> *W: Some people have gone overboard with worrying about warning so they don't eat any fish.*
> *M: I remember when we used to play with mercury in school.*

There were differing opinions when people talk about fish consumption advisory information. Some people were outraged that advisory information is not made easily available to the public, even for those who do not eat sport-caught fish. Others claimed that government science is biased and the advisories only serve to scare people away from eating fish. For example, one Gogebic County man said, "If you read advisory- it's negative and makes people think they are gong to die if they eat fish, they give fish a bad name." Anglers, both male and female, who regularly eat fish, were more likely to see the advisories as overprotective.

M. Information Source

Even though some participants were leery of fish consumption advisory information in the news, a plurality of informants reported obtaining their fish consumption information from media sources (38%). Many people also talked about reading or hearing in the news about heart healthy omega-3's found in fish. However, in relation to fish consumption advisories, participants said that there are too many conflicting messages about consuming fish in the media. In their minds, one day they would read about all of the benefits of eating fish, and the next day they would read about how fish posed a health risk due to contamination. This inconsistency often led to doubt and apathy. For example an Alger County man said:

> "*[It's the] boy who cried wolf, if we listen to the press we'd all walk around in space suits, need to draw parallels to what is actually said in the media.*"

In Gogebic County a woman described the situation like this:

> "*[there are] conflicting reports, some say don't eat [fish], other reports say its only a concern if you ate so much fish, but reality is you would never eat that much.*"

Anglers at access sites most frequently identified the DNR or the fish license guide (49%) and media (47%) as information sources. Male anglers most frequently stated they obtained their information about fish consumption issues from the fishing license guide (58%), media (42%) and other people (13%). Female anglers identified the media (64%), other people (29%), and the DNR or fishing guide (21%). Interestingly, the Department of Natural Resources (16%) was the next most popular source of information during focus groups, community dinners and the public meeting. This is striking since the Department of Natural Resources is no longer responsible for any part of the fish consumption advisory.

Both informants (40%) and angler interviewees (47%) most often identified the DNR as the most reliable source of information. The DNR served as the most reliable source for both male and female focus group participants. For female anglers the media (29%) and the DNR (21%) served as the most reliable sources; whereas, male anglers identified the DNR (56%) and media (13%). However several male participants only reluctantly selected the DNR as the most reliable source, because they could not identify an alternative. They expressed disappointment with the DNR's performance with managing natural resources, but believed that the DNR should have the most expertise available. When asked for a reliable source of information a male angler from Marquette county said, "none, the DNR plays around with the numbers."

One Marquette county angler expressed more extreme distrust, suspicion and disappointment with the DNR. This angler continued to eat fish from the one lake [Deer Lake] in the study area with a regulatory ban on fish consumption due to high mercury levels. The angler pointed to the sign at the boat ramp explaining the fishing ban as he explained that he did not believe eating the fish posed a health risk. He believed the sign and regulation provided another example of how the DNR wanted to prevent people from enjoying the natural resources in the area. The angler used his belief that the DNR also excessively and needlessly restricted deer hunter harvest as support for his doubt in the sincerity of the regulations.

Figure 5.6 Sources of Fish Consumption Advisory Information

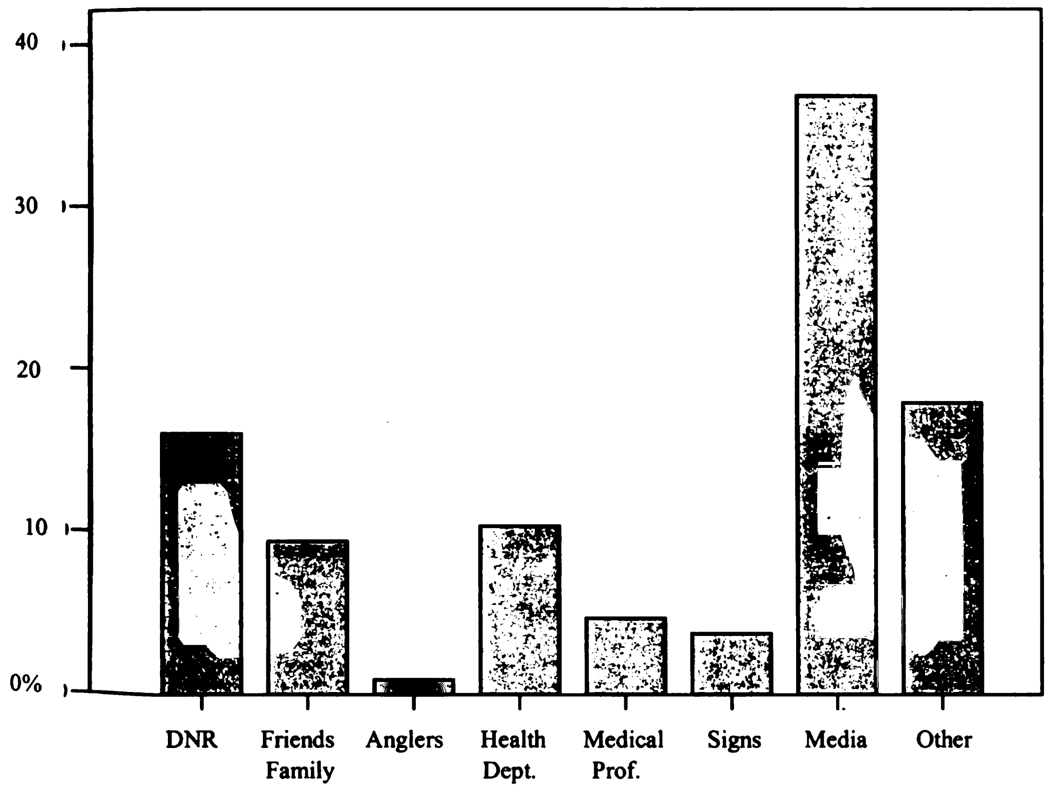
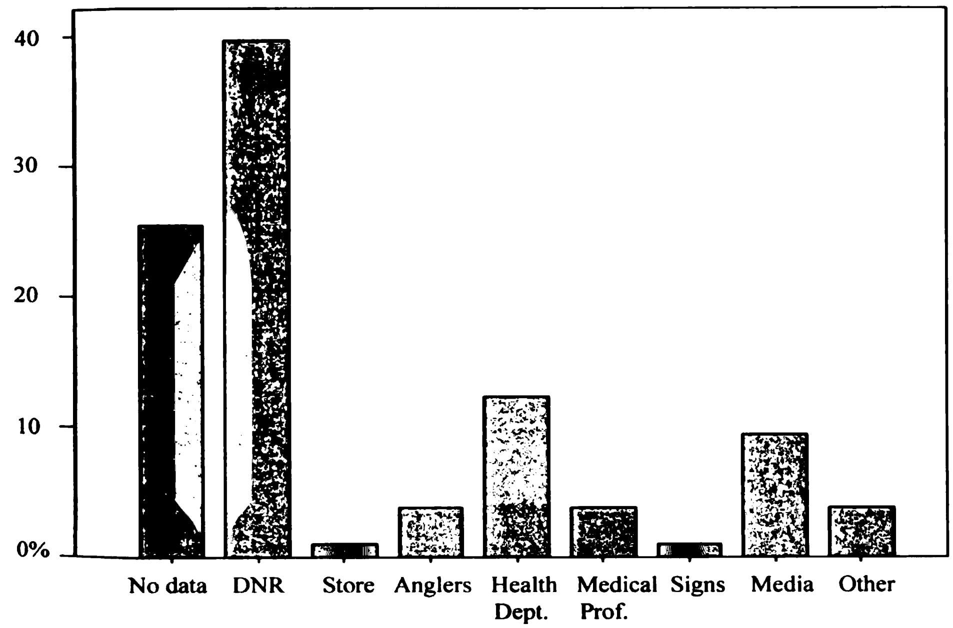


Figure 5.7 Most Reliable Source of Information

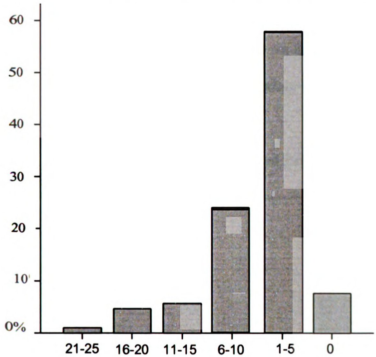


N. Fish Consumption Behaviors

Fish consumption traditions were expressed in all meetings. In study locations with access to fish bought directly from commercial fishermen (Marquette, Alger, and Chippewa Counties) a strong fish eating tradition is tied with the ability to eat 'fresh' and therefore better fish. In Gogebic County where there are no commercial fishermen, there is still a strong cultural tradition of fish consumption at Friday night fish fries. The importance of fish fries was seen throughout the U.P., but was especially important to community identity in Gogebic County. However, unlike fish purchased from commercial fishermen, the species of fish eaten at Gogebic County fish fries tend to be non-local freshwater or ocean fish. In addition, fish fry consumption is only once a week.

On average people reported eating between 1-5 meals per month with more frequent consumption during the summer.

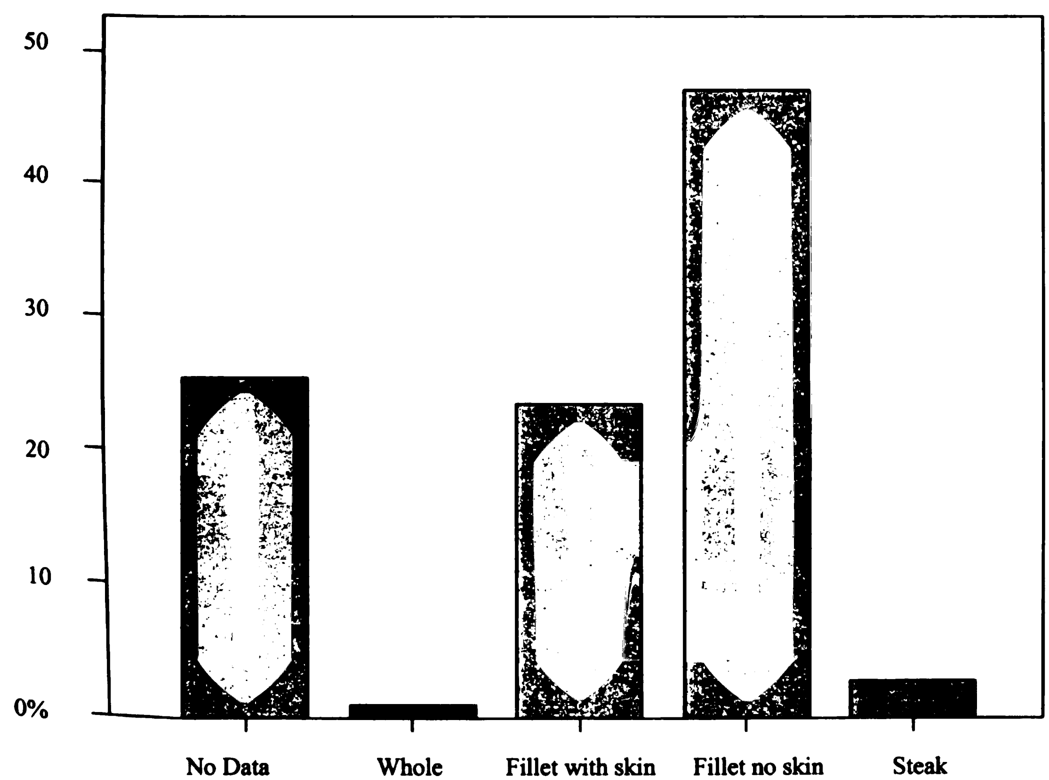
Figure 5.8 Meals of Fish Eaten Per Month



A plurality of focus group participants prepared their fish as fillets without the skin or bones (47%) and most frequently ate fried fish (43%). Anglers most frequently prepared fish by filleting (88%) and frying (71%). In terms of risk reduction measures, the most frequent method comprised of trimming fat or skin (38%) while others (23%) identified no risk reduction method. More men (42%) than women (29%) identified trimming the fat and other portions of fish as a suitable method of reducing contaminants. Likewise, during angler interviews more males (85%) than females (50%) identified methods for risk reduction.

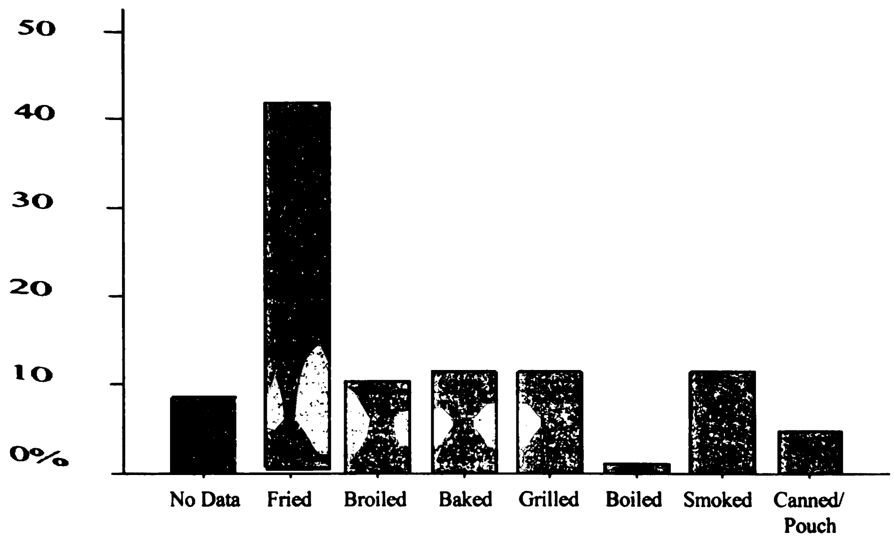
Across all data collection efforts, fried fish emerged as the most popular way to cook fish. Participants emphasized the role of taste in choosing to eat fried fish fillets. A focus group in Chippewa County generated a lot of laughter when several of the participants noted the irony of stating the greatest benefit of eating fish are the health benefits, despite the fact that everyone preferred to eat fish in the least healthful way: deep-fried. Consumers removed the skin and fat mainly because of taste, and secondarily to reduce contaminants.

Figure 5.9 How Fish is Prepared Prior to Cooking



However, people noted that grilling fish required cooking the fish with the skin, although they did not eat the skin. During a Marquette County focus group a male bragged about how his family grilled fish regularly even through the deep snows of winter, though most people limited the grilling of fish to the better weather during summer and fall. Fish consumption guidelines recommend grilling fish as the best way to reduce contaminants, because contaminants such as PCBs, but not mercury, can drip away with the fat.

Figure 5.10 How Fish is Cooked



O. Overview

Residents of Michigan's Upper Peninsula who participated in our study were aware that fish consumption advisories exist but lack specific knowledge about advisory and other complementary environmental information, such as bioaccumulation, the origins and pathways of contamination, and the types of fish that pose greater risks to human health. In the absences of a clear fish consumption message, people use mental models, trust and past experience to make decisions about whether a fish is safe to eat. Almost everyone was aware that women and children are the populations most at-risk. However, many people believed that these populations should avoid eating fish. This is not necessarily the healthiest behavior since fish provides essential nutrients and fatty acids that aid fetal development.

The majority of participants said that they do not know if the fish they eat is safe for themselves and their family. However, people generally had few concerns about the fish they eat. Buying local fish and attending Friday night fish fries are important cultural traditions in the Upper Peninsula, but people eat few fish meals per month (1-5). In addition, the species consumed are most often those with relatively low contaminant levels such as whitefish. Participants trust fish purveyors and restaurants to provide fish that is safe to eat. The main source of advisory information for the majority of participants was the media, and the DNR was often mentioned as the most reliable source of fish consumption advisory information.

III. State and Federal Agency Managers

A. Introduction

Five state and federal agencies represent the institutional and organizational field (Dimaggio and Powell 1983; Hoffman 2001) of the fish consumption advisory process in this study. These agencies are the United States Environmental Protection Agency (EPA), United States Food and Drug Administration (FDA), Michigan Department of Natural Resources (DNR), Michigan Department of Environmental Quality (DEQ), and Michigan Department of Community Health (DCH). Each agency has different processes and procedures related to how tasks (from science, to policy, to inter and intra-agency communication) are done. In order to understand the differences among the agencies it is pertinent to look to their differing missions (Tables 5.1 and 5.2).

Although most agencies have a mission to protect human and/or environmental health, the DCH differs from the paternalistic protector roles of these other agencies by also committing to "promoting access to the broadest possible range of quality services and supports" in lieu of only offering its protection. The DCH mission provides a more diverse range of agency goals and programs. In addition, the DCH mission statement differs from the others as it explicitly mentions fiscal responsibility as a part of agency mission. Although no other state or federal agency includes fiscal or budgetary maters directly into their mission statement, it seems as though budgetary constraints are not exclusive to the DCH, especially for state agencies.

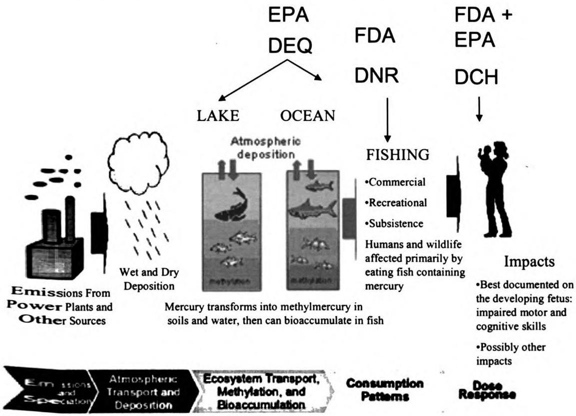
Table 5.1 State Agency Mission Statements and Roles in Fish Consumption Advisory Development and Risk Communication

AGENCY	MISSION STATEMENT	ADVISORY MANDATE	ADVISORY ROLE
MDCH	Michigan's Department of Community Health (MDCH) strives for a healthier Michigan. To that end, the department will: • Promote access to the broadest possible range of quality services and supports • Take steps to prevent disease, promote wellness and improve quality of life • Strive for the delivery of those services and supports in a fiscally prudent manner	No	Responsible for the development and distribution of the official Michigan sport fish consumption advisory.
MDEQ	We, in the Michigan Department of Environmental Quality, protect and enhance Michigan's environment and public health. As stewards of Michigan's environmental heritage, we work on behalf of the people of the Great Lakes state for an improved quality of life and a sustainable future. In service to the public, we administer programs and enforce laws that protect public health and promote the appropriate use of, limit the adverse effects on, and restore the quality of the environment. We encourage voluntary actions to enhance our natural resources and the environment. We preserve biologically diverse, rare, sensitive or endangered plants, animals, and ecosystems through identification, education, management, and public/private partnerships and initiatives. We advance environmental protection through innovation and improvements to regulations and programs.	No	Legally mandated to carry out the state of Michigan's fish contaminant monitoring program Provides technical data and recommendations for the official Michigan fish consumption advisory
MDNR	The Michigan Department of Natural Resources is committed to the conservation, protection, management, use and enjoyment of the State's natural resources for current and future generations.	No	Collects fish to be tested for MI's fish contaminant monitoring program and the fish consumption advisory. Issues fishing regulations guide Has one on one contact with anglers

Table 5.2 Federal Agency Mission Statements and Roles in Fish Consumption Advisory Development and Risk Communication

AGENCY	MISSION STATEMENT	ADVISORY MANDATE	ADVISORY ROLE
USFDA	The FDA is responsible for protecting the public health by assuring the safety, efficacy, and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation. The FDA is also responsible for advancing the public health by helping to speed innovations that make medicines and foods more effective, safer, and more affordable; and helping the public get the accurate, science-based information they need to use medicines and foods to improve their health.	No	Responsible for regulating commercial fish sold in interstate commerce. With the EPA distributed a mercury fish consumption advisory for women of childbearing age and children
USEPA	The mission of the Environmental Protection Agency is to protect human health and the environment. Since 1970, EPA has been working for a cleaner, healthier environment for the American people	No	Responsible for the national fish contaminant monitoring program. With the FDA distributed a mercury fish consumption advisory for women of childbearing age and children

Figure 5.11 Agency Context of Mercury Contamination and Fish Consumption



B. Advisory Context- State of Michigan

In Michigan, three state agencies work differentially with the fish consumption advisory and the fish contaminant monitoring programs (Figure 5.11). These agencies are the Department of Natural Resources (DNR), Department of Environmental Quality (DEQ) and the Department of Community Health (DCH). The DCH as is a public health agency charged with diverse public health issues from disease prevention and promoting wellness to fish consumption and lead paint advisories. The DEQ is a regulatory agency charged with protection of the environment and public health through the regulation and reduction of harmful substances in the environment. And finally, the DNR is a natural resource management organization that emphasizes the use and enjoyment of the State's natural resources.

The fish consumption advisory program is not mandated by any state agency, but is carried out by the Department of Community Health. It provides information about contaminants found in sport-caught fish in Michigan waters, including the Great Lakes. A fish contaminant monitoring program is legally mandated within the Department of Environmental Quality to monitor water quality in Michigan by testing contaminants in fish. The DEQ uses the data from the fish contaminant monitoring program to, among other things, make recommendations to the DCH to update the fish consumption advisory. The DNR collects fish used for testing in these programs.

One interviewee from the DCH (N=2) best described the way the sport fish consumption advisory process operates in Michigan:

> *"[It is] best to think of it in how the state runs the advisory, starts with DNR who collects the fish, they provide fish to DEQ, DEQ picks out what water bodies need to be looked at, DEQ oversees the processing and chemical analysis and data summary, which gets sent to DCH with recommendations. [The DCH] reviews [the data] and makes new changes to update the advisory. DCH is responsible for setting comparison values or trigger levels and information dissemination."*

These three agencies, in addition to the Michigan Department of Agriculture, have worked together on contaminant issues through the Fish and Wildlife Consumption Advisory Committee (FAWCAC). FAWCAC meetings were originally designed as manager meetings to inform all Michigan agencies of developments with the fish consumption advisory. This was deemed important because the fish consumption advisory was likely to spark large public attention and each agency was likely to be contacted by members of the public with questions. FAWCAC meetings were also used to work on environmental and public health contaminant issues and as a means of sharing technical and policy knowledge among the different agencies. However, one interviewee on the committee mentioned that the group may dissolve since no mandate to set advisories exists and there are few resources (time and money) available to bring them together. Currently the members of FAWCAC meet very infrequently as they struggle to meet the goals and objectives set within their own agency with, according to interviewees, fewer and fewer resources.

In the past, collaboration among Michigan's environmental and public health agencies on fish contaminant issues was more prevalent (see Chapter 2 for full description). The DNR even published the first fish consumption advisories in their fishing regulations guidebook. As the fish consumption advisory grew, it became a separate booklet handed out to anglers along with the fishing regulations guide. In 2002 the DCH halted widespread publication and distribution of the fish consumption advisory to reduce expenses. That year copies of the advisory went exclusively to high priority groups such as medical professionals and the Women, Infants, and Children program or people who requested a copy directly from DCH. Since 2002 the advisory is only available online or by request to the DCH.

1. Michigan Department of Community Health

The Michigan Department of Community Health is responsible for preventing diseases, promoting wellness, and improving the quality of life for Michigan's residents in a fiscally responsible manner (DCH mission, Table 5.1). Over the last few years within the DCH a concerted effort attempts to keep the fish consumption advisory program alive despite steadily increasing agency responsibilities and decreasing funds. As a result, the role of the fish contamination program within DCH is weaker than in the past. At one time it was even mandated and specifically funded by the state government. In 1989 with the Michigan Paperwork Reduction Act, the state decided to eliminate the mandated fish consumption advisory.

This seemed reasonable at the time since the mandate was for a mercury advisory only. In addition, the non-mandated fish advisory program was strong and more than adequate to protect human health and address more pressing multiple contaminant problems such as PCBs, dioxin and mercury. Currently, all funding by the state for maintenance and upkeep of the fish consumption advisory has been eliminated.

The fish consumption advisory program relies on cooperative agreements from the federal Agency for Toxic Substances and Disease Registry (ATSDR) as its main source of funding. These agreements are in a sense grants for site-specific work with definite outcomes and objectives. With lack of funding for an overall advisory program, the DCH, to the best of its abilities, takes responsibility for toxicological data analysis and risk communication for the fish consumption advisory.

The fish consumption advisory is not any one person's responsibility, but DCH toxicologists take on fish consumption advisory issues because, according to one DCH staff member, "it is the right thing to do." DCH toxicologists evaluate human health risks from exposure to chemicals found in the home and in the environment, from radon in basements to the fish consumption advisory. According to DCH interviewees, few of the projects they work on are specifically mandated by state or federal law.

The DCH does not develop scientific protocols for conducting risk analysis. They use EPA and ATSDR guidelines for developing risk assessment and EPA guidelines for risk communication. According to DCH staff the EPA regulations are the most standard in the field. The Department of Environmental Quality also produces risk assessment guidelines which are used to inform the fish consumption advisory process. The DCH, like the National Academy of Sciences and the EPA, uses the Faroe Islands study as the standard for setting fish consumption advisory advice. They collect few actual data because they lack field staff and other resources.

The DCH uses contaminant trigger levels established by the FDA and EPA to develop the advisory. For PCBs they use a human health protection value that was developed as a result of the common Great Lakes protocol of the Great Lakes Task Force (described in Chapter 2). There are two different target audiences in Michigan's fish consumption advisory: one for women of childbearing age and children under 15, and another for everyone else called "general population." When 10% of fish sampled exceeds FDA limits, a "do not eat" advisory is given for women of childbearing age and children. When 50% of the fish sampled are above the FDA limit a "do not eat" advisory is given for the general population.

Besides the common protocol that was developed for PCBs in the 1990s, there is progress being made to create a joint protocol for mercury (described in Chapter 2). At present there is consensus among the eight Great Lakes states that the current advisory methodologies for mercury are suitable for women of child-bearing age and children. However, there debate continues over the specifics of the risk analysis for the general population. According to interviewees, state health professionals still debate the number of significant digits to include in the risk analysis. Others believe that a consistent joint mercury advisory for the Great Lakes States may be too political.

According to interviewees, the DCH gets on average five to ten phone calls a month concerning fish consumption advisories. The fish consumption advisory website receives approximately 300-800 hits a month (more in the summer months). The amount and quality of risk communication the DCH can perform is thought to be inhibited by the project-specific, objective-driven funding mechanism. In addition, DCH staff members often talk about the importance of a consistent, targeted and quality risk communication message, but admit struggling to attain this goal due to lack of funding and expertise. At the time of data collection from the public (2004-2006), the fish consumption advisory had not been updated using current scientific analysis since 2001.

2. Department of Environmental Quality

The DEQ is responsible for the fish contaminant monitoring program, which is used to inform fish consumption advisory decisions. The fish contaminant monitoring program is mandated and funded by the state of Michigan, through the Clean Michigan Act. As one DEQ manager explained, it is often cheaper to test fish for contaminants than to test the water itself. The fish contaminant monitoring program has no field staff and does not collect the fish that are tested. Fish are collected through collaborations primarily with the DNR, but also with tribal organizations, commercial fishermen and charter boat fishermen.

Once the fish are collected, the DEQ coordinates the processing and testing. Before testing, fish are filleted, except the samples used for trend analysis which are left whole. As a part of the fish contaminant monitoring program the DEQ tests mercury in top predators and PCBs in Carp from inland lakes. In the Great Lakes they test a variety of contaminants, mostly in trout and whitefish. In addition to testing wild fish, the DEQ studies long-term contamination in caged fish. They place caged fish in a specific water body for twenty-eight days and then test those fish for a variety of contaminants including PCBs and mercury.

Fish testing is contracted out to different labs in the state, including labs at the Department of Community Health. After testing, the data are sent to the DEQ where scientists review the data for quality control. From that data analysis DEQ managers prepare an annual report and make recommendations to the DCH for the fish consumption advisory. The DCH makes the final decisions about any changes or updates to the fish consumption advisory. Data from the fish contaminant monitoring program are also used to study contaminant trends over time and may aid in the listing or delisting of Areas of Concern[6]. The results of the fish contaminant monitoring program show that persistent organic pollutants are decreasing in the Great Lakes, but mercury is on the rise. For inland lakes, the opposite phenomenon occurs.

Interviewees from the DEQ (N=3) all felt that the DEQ does over and above EPA/FDA levels and testing protocols. They also said that fish contaminant information, although controversial, is of interest to the public and government agencies. They felt that there is a real effort to integrate monitoring with decision making, regulation and implementation. They were aware of the different interests (sportspersons groups, environmental groups, industry lobbies, etc) that may influence priority-setting, but they

[6] "Geographic areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life." U.S.-Canada Great Lakes Water Quality Agreement (Annex 2 of the 1987 Protocol)

try to look at "what actual risks are and what's most important". As one interviewee put it, "Ecologically you never make everyone happy." Meaning that if you follow what the science says for the health of the environment, at least one of these "unscientific" interest groups will be unhappy.

3. Department of Natural Resources

The Department of Natural Resources is responsible for the management of Michigan's natural resources. According to an interviewee from the DNR, their fish division traditionally had a "big and lots of them" fish management strategy geared towards accommodating recreational anglers. In recent years their focus has shifted to a more ecosystem-based approach to management, and management strategies that accommodate all resources users, even those who "leave no trace". Also, there is a new focus on trying to understand what people want out of natural resources, natural resource management and what people value, to more accurately target resource management to meet the needs and desires of the public.

The DNR is only peripherally involved in the fish consumption advisory process. The DNR collects the fish that get tested by the DCH and DEQ. They receive lists from the DEQ and DCH of what size and species of fish to collect. However, according to interviewees, they are often unable to collect the specific species and sizes of fish the DEQ and DCH request. Along with fish collection, the DNR fishing regulations guidebook distributed with fishing licenses includes a small paragraph that references the official fish consumption advisory (Figure 5.2). In addition, DNR's website has a link to the DCH's official fish consumption advisory.

One DNR interviewee (N=5) described their involvement with fish consumption advisories by saying:

> *[Our role at the DNR] is to know where to find [fish consumption advisory information] when people ask, so we know where to send them. I try to be aware of the regulations, I don't' memorize them because they change or I can have them in front of me. We help the DEQ get their sample [of fish]. They tell us the bodies of water that they need assistance with. They pick the list of lakes and they call the basin coordinator at the DNR. They also look at the DNR sampling list. This is totally voluntary and cooperative in nature. The DNR doesn't have to do it, but it's the right thing to do. It saves the DEQ money from having to pay a contractor.*

All interviewees at the DNR made it clear that the fish consumption advisory is not their responsibility. A second interviewee at the DNR (N=5) said, "[The fish consumption advisory] is important but it's the job of DCH." The third DNR interviewee said:

> *"[The fish consumption advisory] is in the most recent draft of our strategic plan. It has not come up in the last couple of years in research themes. I think that historically it was really separated and fisheries division didn't touch it. DCH toxicology people do that. We help sample, but we don't study it."*

A fourth DNR interviewee (N=5) described their role more informally saying:

> *"We have occasional conversations with anglers [about fish consumption advisories]. That is not our role. Don't want a whole bunch of fish dudes explaining that to the public. [We have] no credibility, we don't know what we're talking about."*

When the public asks DNR staff about fish consumption advisories, interviewees said they tend to give their personal view of contamination risk and refer people to the official DCH advisory. Although there is a small paragraph about the existence of a fish consumption advisory on the last page of the DNR's fish regulations guidebook, the DNR has little to do with the fish consumption advisory. However as the Upper Peninsula citizen data illustrate, a large number of people believe that the DNR is responsible for the advisory.

The rhetoric of public stewardship was much stronger among employees of the DNR than those interviewed in the other state agencies. The idea that the "public is the customer" and has a say in agency decisions was important to interviewees at the DNR. As the fifth interviewee said (N=5):

> *"That's the point of the management agency, to be there for the public... In an agency you are a steward. We do things that are scientific, but the trump card is what people want. People run natural resources management. The best you can do is to marry science with the public understanding. There's always an aspect of, what can you do."*

However, how DNR interviewees define "the public" is unsure. Many interviewees from the DNR cited a lack of experience or expertise with "human dimensions" type work. As the third DNR interviewee put it:

> *"Human dimensions used to be a small closet on the side. Now it is seen as a central piece of what we do...but we lack expertise."*

All interviewees from the DNR mentioned the lack of funding as a major constraint to what, why and how things get done. As the third interviewee said:

> *"There are probably 100 problems and we only have enough money to work on five. If we don't have someone pushing us, then we won't do it."*

In addition, the second interviewee said:

> *"[The] public expects the DNR to give the information on catching fish. People think that the Department of Transportation pick up deer on the side of the road, but it's the DNR. So, the public might expect it, but it is not a reasonable expectation due to funding and programming. Outreach and education, we don't have the money to do it and it is not one of those things we are required to do by law. Every time a new law gets passed it gets passed without additional funding. [For example] the ground water bill that was passed didn't come with any money for additional fisheries management. By law they have to do that, [therefore] something else has to come off the plate. Good legislation gets passed, but it doesn't take into*

account that the fisheries division [funding depends] 100% on license sales, and license sales are going down and our revenue is dropping."

All state agencies claimed that they lack the funding necessary to effectively provide fish consumption advisory information to the public. In federal agencies, funding did not seem to be such a problem. However, they felt they only have a say in fish consumption advisories for commercial fish. They said that it is the states' responsibility to develop sport fish advisories. According to one federal agency interviewee, "the states do not like when we step on their toes." With the states working on advisories for sport-caught fish and the federal agencies working on commercial fish there are two different approaches to two different fish consumption advisories. This leads to a lack of consistency in advisory information and perhaps confusion among the public.

C. Advisory Context- Federal Agencies

Two main federal agencies work with fish consumption advisories, the Food and Drug Administration (FDA) and the Environmental Protection Agency (Figure 5.11). As their mission states (Table 5.2), the FDA, among other things, is responsible for the safety of the American food supply. They also emphasize a commitment to "science-based" risk communication to improve human health (FDA mission statement, Table 5.2). Likewise, the EPA's mission is to protect human health as well as the environment. The creation of a joint FDA-EPA mercury advisory for women of childbearing age and children (2004) marked a new era of collaboration among the FDA and EPA, organizations that do not traditionally work together in matters of policy.

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1. U.S. Food and Drug Administration

The Food and Drug Administration is responsible for hazard exposure analysis and safety and risk assessments of industrial contaminants and natural toxins that occur in the human food supply (Figure 5.11). According to interviewees at the FDA, they use the most up-to-date science, origins of toxicity and dose response to develop exposure analyses. In addition, they said that the FDA relies solely on quantitative risk assessment. The FDA is responsible for regulating contaminants in fish sold nationally in the United States. It first regulated mercury in fish in 1970.

Although fish represents only a small part of the overall American diet, the mercury and fish issue has been a national priority at the FDA for many years due to the extreme neurological effects of mercury especially on developing fetuses and children (Foulke 1995). In a 1995 article the FDA Consumer Magazine for the first time described the risks of mercury in fish to the public (Folke 1995). But as one FDA interviewee mentioned, the FDA Consumer Magazine is not a high-impact publication. More recently, the mercury and fish issue was brought into the national spotlight when the National Academy of Science (NAS) developed their report on methylmercury (NAS 2000).

When interviewees at the FDA talked about contaminants in fish they emphasize its role as a regulatory agency addressing interstate commerce. They quickly identified the many differences between state and federal regulation of mercury and fish consumption advisories. For example, one interviewee explained that the FDA mostly regulates ocean fish, whereas sport advisories are geared towards freshwater sport-caught fish. The FDA regulates commercial fish that most likely come from a variety of sources, and thus

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sources, and thus have different levels of different contaminants. Therefore, when people eat commercial fish they are not exposed to the same contaminant every time. However, it is thought that anglers more often catch fish that come from the same locations, and have the same contaminants at the same levels. Therefore, people who eat sport-caught fish are exposed to greater risks because they are consistently exposed to the same chemicals. Consequently increased protection is needed when performing risk analysis for sport-caught fish.

As one FDA interviewee said (N=2):

> *"FDA is in charge of interstate commerce. [In sport fishing regulations] species are specific to the area, local traditions specific to local consumption of fish. Many species that [the FDA] deal with are marine species, not fresh water...States are working with wild catfish rather than farm raised catfish. There are different considerations to take into account. The public has a hard time understanding that a catfish is not a catfish."*

According to interviewees at the FDA (N=2), the action level for mercury adequately keeps fish with unsafe levels of mercury from entering the American food supply. The outcome of violating FDA regulation is hefty, as it requires seizing whole shipments of fish. There are significant financial repercussions of removing products from commerce. For this reason in 1979 the FDA was forced to increase its tolerance level for mercury in fish meaning that the FDA considers the economic impacts of regulating fish over the human heath effects (Hesse 1997). According to FDA interviewees very few foods have FDA action levels.

Interviewees at the FDA (N=2) see no inconsistencies among their action level, the EPA's reference dose and state trigger levels for methylmercury in fish. The interviewee quoted above also expressed frustration at the press' attempt to exaggerate the differences between the numbers used by the different agencies to distinguish fish safety. The interviewee said that everybody followed the standard practices. The different terms and different numbers reflect different purposes; in reality, all agencies use the same science and standard operating procedures. Interviewees from both the FDA (n=2) and EPA (N=4) felt that the joint mercury advisory for women of childbearing age and young children sends a clear message to the public that the FDA and EPA use the same tolerance levels, at least for women and children.

In addition to fish consumption advisories and regulating mercury in fish, the FDA also conducts a total diet study to monitor contaminants in commonly consumed foods. According to interviewees, if contaminant levels in foods are higher than expected; more studies seek to find out why. These data are primarily used for trend analysis and do not have any regulatory component to take food off the shelves in case of contamination. However, one FDA interviewee said that it is rare to see levels of contaminants in food higher than expected. In addition, the results show that foods have lower and lower levels of pesticides as a result of past regulation.

In terms of risk communication, the FDA has a whole consumer advice unit that conducts outreach and risk communication. They work on programs such as microbiological hazards like *E. coli*, and to get people to wash their hands and cook their food properly. They also conduct focus groups and test risk and other types of outreach messages. As one interviewee said, "mercury is just another part of what they do".

2. U.S. Environmental Protection Agency

The EPA works with fish consumption advisories at many different levels although there is no mandate for it (Figure 5.11). The EPA creates protocols for risk analysis and risk communication used by the states to develop their sport fish consumption advisories. Along with the FDA, the EPA also puts out a mercury advisory for women of childbearing age and children. However, all EPA interviewees clearly state that fish consumption advisories are a state's responsibility. One interviewee even said that the EPA delegated the fish consumption advisories to the states.

Because of their long-time involvement in the state fish consumption advisory issue, the EPA keeps track of what the states are doing and tries to keep them informed of emerging contaminants like PBDEs[7], a persistent organic pollutant found in fire retardants. Unlike the FDA, the EPA has strong working relationships with the states. For example, in the Great Lakes region a group works to keep public and environmental health managers connected throughout the states. It is called the Great Lakes Human Health Network and is only available to resource managers.

Through the network, managers from the eight Great Lakes states can send their ideas out over email and share new research and technical methodologies. In addition they gather at the EPA's National Forum for Contaminants in Fish (often called Fish Forum). This network helps states to work together to create common protocols and increase collaboration and consistency among the states. At the moment they are working to develop a common protocol for mercury advisories. They also work on other

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[7] "Polybrominated diphenylethers (PBDEs) are members of a broader class of brominated chemicals used as flame retardants; these are called brominated flame retardants, or BFRs. There are dozens of congeners, or varieties of the basic chemical type, of PBDEs. These chemicals are major components of commercial formulations often used as flame retardants in furniture foam (pentaBDE), plastics for TV cabinets, consumer electronics, wire insulation, back coatings for draperies and upholstery (decaBDE), and plastics for personal computers and small appliances (octaBDE). The benefit of these chemicals is their ability to slow ignition and rate of fire growth, and as a result increase available escape time in the event of a fire." (The United States Environmental Protection Agency. http://www.epa.gov/oppt/pbde/#pbdes. 10/1/08)

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Great Lakes health issues such as invasive species like the Asian Carp, issues of persistent toxics, and report writing.

Many interviewees at the EPA (N=3) recognized that states struggle with increasing responsibilities and decreasing funding. As one interviewee said:

> *"Funding is the biggest stumbling block for the states. Programs run on small budgets, so the EPA along with the Agency for Toxic Substances and Disease Registry try to help them fund important projects such as evaluation of risk communication programs."*

Another interviewee said:

> *"The Great Lakes Network has a bottom up strategy. Anyone with a little bit of passion, if we can find the money in the budget [we'll fund them]."*

At times, EPA interviewees described their relationship with the states in very paternalistic ways. For example, one interviewee said,

> *"The Great Lakes governors look to find successes and one of the things they see is uniform advice for mercury protocol. That is one way things improve. We hand it to them on a plate and say, look at how well you did in your state."*

In addition to their work with the states, the EPA is responsible for a mandated fish contaminant monitoring program much like the Michigan DEQ's fish contaminant monitoring program, except that it is national (Figure 5.11). These fish are tested with the skin on, whole and filleted. Results still show high levels of what one interviewee called "dead chemicals", those that have been banned such as PCBs, but found in fish today. According to the interviewee, even if mercury is heavily regulated today, it is likely to be a problem well into the future.

The EPA also works on the bi-national toxics strategy in collaboration with Canadian environmental agencies to eliminate and decrease contamination in bi-national waters. The fish contaminant monitoring program helps to inform the bi-national toxics strategy. The E

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strategy. The EPA also works with the United States Geological Survey to monitor chemicals that might wind up in fish. In addition the EPA regulates the use of new pesticides and their distribution in commerce (Figure 5.11).

D. Agency Managers- Purpose of Fish Consumption Advisory

Each interviewee was asked what they believed to be the purpose of the fish consumption advisory. Responses varied from detailed explanations of how and why the advisory was created to simple straightforward answers, like, "the purpose [of the advisory] is to let the public know what things [they] ought to be concerned about, particular contaminants and kinds of fish." All interviewees mentioned in some way or another that the purpose of the advisory is to inform the public about the potential risks of consuming contaminated fish. For example one DEQ interviewee (N=3) said:

> *"The reason [for the advisory] is to protect human health; people need to be knowledgeable about what they are eating, whether it comes wild from the lakes or from the grocery store. They should be protected. We can't assume everything we eat is safe. We need to test it and let people know about it. I think advisories, to date, are the only way to get things across."*

Some interviewees include reflections about the advisory and whether they find it effective. For example, one interviewee from the EPA (N=4) said:

> *"The purpose of the advisory is... they tend to be very focused on inland lakes and fish species. Most people can't translate it. People think, so you can go to one lake and you can't go to the other one. A lot of fish [eaten] in the U.S. is marine fish. [Therefore] a local freshwater strategy is myopic; treating mercury like PCBs. Fish consumption is not dominated with local fish, and without a commercial fish advisory, people are not getting the message. Figuring out who the populations are that are at risk. People that consume local fish don't think it's effective. Another thing that gets mixed up is that mercury levels are in high trophic levels fish[for example, shark, swordfish, and certain species of tuna] and people don't have the equipment [to catch those species of fish].."*

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1. Choice

One theme throughout many responses is the idea that people should have a choice; that the purpose of the advisory is to inform people of their risks and enable them to make good decisions, but the decision is ultimately theirs. For example, one interviewee from the EPA (N=4) said:

> *"The purpose is to let the public know what things they ought to be concerned about particular contaminants and kinds of [contaminated] fish. Affect behavior and affect what choices people are making. Risk reduction through public right to know and the choices they make."*

Likewise, an interviewee from the DCH (N=2) said, "We want to do prevention and allow people to choose."

2. Comparative Risk

All interviewees from the DNR, who work less with the fish consumption advisories, talked about risk ranking or balancing the fish consumption risks with its benefits. Some interviewees made comparisons to knowing about contaminants in other foods or lifestyle choices like smoking or drinking alcohol. One interviewee from the DNR said (N=5):

> *"[The purpose of the advisory is] to make people aware of chemical contamination of fish. We don't know the chemical contamination of our milk and our meat. I think it's appropriate for a public health program that deals with this, but it has the tendency to increase the awareness or fear in fish, but not in milk. I've never read anything about milk. You know there are chemical contaminants in food supply."*

Another interviewee from the DNR (N=5) talked about balancing benefits and risks:

> *"[The purpose of the advisory is to], I guess, just to educate [the public], at least to the point that they are comfortable with the knowledge, especially the people who have the responsibility- who have kids. [The message should be] somewhat balanced by the fact that fish are good for you. [The purpose of the advisory should be] to educate and alert the public of the potential dangers as well as the benefits of eating fish."*

It is not surprising that the interviewees from the DNR were more inclined to use comparative risk statements. No other interviewees made these kinds of comments. The DNR has the most to lose (reduced fishing license sales) if people stop fishing. In addition, they are environment and natural resources experts; they have the least amount of public health or toxicology expertise. They are perhaps more likely to use mental models to situate fish consumption risk rather than toxicological studies or public health information.

3. Pollution Reduction

Two interviewees from the federal agencies that have worked with fish consumption advisories for quite some time both commented that the ultimate purpose of the advisory is to reduce mercury pollution by informing the public of its existence with the hope that they will pressure the government to enact policies and regulations to reduce emissions. One EPA interviewee said (N=4):

> *"Letting the public know that there are fish that have concentrations of contaminants at certain levels can encourage public pressure on the causes and sources of pollution. [This can lead to] public pressure to push for changes in pollution regulation. The more people are exposed to this information and how widespread it is the more likely it is the public will ask questions about what can be done to reduce these levels."*

The interviewee from the FDA said (N=2):

> *"[The purpose of the advisory is to produce] a simple message that people will act on that doesn't have unintended consequences. We in the field think we do a really nice job and pat ourselves on the back... Environmental remediation, reducing mercury from the stack will help us battle this problem. The advisory will not solve this problem, but it's something to present to public. Like global warming, it is hard to get public focused on it. You talk about mercury emissions and people don't worry about it in their daily lives. People want electricity at a price they can afford. [Making the public aware is] easy to do in advisory, especially if [it is] alarmist. Media love alarmist things...and the journalists have to come up with a story..."*

In the opinion of this FDA interviewee, the 2000 National Academy of Science report on methylmercury was driven by an effort to eliminate coal-fired power plants, the number one source of anthropogenic mercury emissions. The interviewee also said:

> *"Several new studies in the Faroe Islands and Seychelles- those reports that started coming out prompted the NAS at the behest of the EPA...what was really driving it, what EPA was driving at was coal-fired power plants. EPA looked at contaminants coming out of stacks. The only one that passed the threshold of concern is mercury. Mercury in fish is not about mercury in fish it's about coal-fired power plant. Clean Air Act- you can imagine what's at stake here. It's huge. Sport, recreational fishing or subsistence is peanuts compared to the whole energy issue. [The report] had big implications for fish consumption advisories, but it was not that, it was regulating emissions from coal fired power plants."*

E. Risk Communication- Most Important Fish Consumption Message

Each interviewee was asked to identify the most important message about consuming fish for the public. All interviewees responded with some variant of, fish is healthy and/or good for you, but people should follow fish consumption advisories in order to balance the benefits with the risks. Exact answers differed slightly depending on level of expertise.

1. Balancing Benefits and Risks of Consuming Fish

For example one interviewee from the DNR (N=5) with little fish consumption advisory role said:

> *"Level of knowledge, understanding risk and understand what kind of choices you have. I didn't feed my daughters Great Lakes salmon, but I would eat one. Understanding what the contaminants are, where they are, and who they affect. What sort of processes are affected, like reproduction...getting all the best info out on the table. But you don't want to...there's some fine line there about frightening people. I would stand on the place of transparency."*

Another interviewee from the DNR said (N=5):

> *"Communication to the public. All depends on how you identify success. Maybe people understand all of the risk. National Wildlife Federation or Sierra Club get people to not eat fish to get strict environmental regulations. This is not necessarily the best. To me, success is communication of the risks to people so they are working from an informed point of view and not an ignorant point of view. [I] wouldn't like to see people not buying a fishing license, but also don't want to see people catching predator fish and feeding it to their wife."*

An interviewee from the EPA who has spent more time working with fish contamination and the fish consumption advisory had a more detailed response commenting on the benefits of heart healthy omega-3 fatty acids[8] found abundantly in fish versus the risk of mercury. The interviewee said (N=4):

> *"[People] can get omega-3s without high dose of contaminants. Delivering this message may be a risk communication message that we may not be able to complete. Public has a hard time identifying species of fish. Fresh fish, filleted fish, people often don't know what to buy. Peer review on study from France- more access to fresh fish than we do in the*

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[8] "Omega-3 fatty acids have been shown in epidemiological and clinical trials to reduce the incidence of [cardiovascular disease]. Large-scale epidemiological studies suggest that individuals at risk for CHD benefit from the consumption of plant- and marine-derived omega-3 fatty acids. Evidence from prospective secondary prevention studies suggests that EPA [eicosapentaenoic acid] +DHA [docosahexaenoic acid] supplementation ranging from 0.5 to 1.8 g/d (either as fatty fish or supplements) significantly reduces subsequent cardiac and all-cause mortality." (Kris-Etherton et al 2002, p. 2754).

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United States, they couldn't get the women to remember which fish were high or low in mercury and omega-3s. Tell people what to eat instead of telling them what not to eat. It is far better off for messages to say, 'this is what is good to eat' instead of 'this is what's bad'."

2. Right Message, Right Audience

Much like the responses to the advisory purpose, many interviewees stressed the importance of choice; gearing risk communication so that "proper" audiences receive "proper" information or "education" and are able to make their own decisions. For example, none of the interviewees from any agency suggested regulating the amount of fish people could catch recreationally or purchase commercially to reduce their exposure to contamination. Many interviewees said they strive to get the right message to the right people (sensitive populations), without spillover to populations not at-risk, such as middle-aged men with heart disease.

As one interviewee from the EPA said (N=4):

> *"[The] most important message is that the public has choices and there are certain types of fish and species that have more and less contaminants with different benefits. [People] can achieve the balance of health benefits and [risks of] contaminants. Not an issue of people avoiding contaminants in fish, but making good choices."*

An interviewee from the DCH also talked about the importance of getting the right message to the right people (N=2):

> *"There is a health risk, but it is also important to publicize the health benefits. People must be given enough information. Issue advice in ways that people can understand it. A past downfall of the advisory program came from not speaking to the audience. Proposals [for fish consumption advisories targeting] low-income and minority populations have been [funded in the past] [sic]. Also [there was to be] a media blitz [about] issuing [fish consumption] advice at [recreational fishing] sites and to church groups. [That was] cut from the budget and we did not get to implement it. [We need to] let people know what the negative effects are...The most risk is for mothers and children. They need to know that*

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it's not just what they feed their baby; it's their [older] children and the fetus [too]."

Likewise an interviewee from the FDA said (N=2):

> *"Crafting the message is one thing, then getting it out. Once it goes out the front door, you lose control. Once in media, you try to direct that in an appropriate way. Then you have to worry about spillover to the rest of the population. People hear a negative message, [and think] maybe I should stop eating fish. For middle aged men- No! They should be eating fish, especially those with cardiovascular disease."*

Also, another interviewee from the DNR said (N=5):

> *"Fishermen ask about [fish consumption advisory] stuff frequently. Some are worried that they are eating too much fish. I would ask what their age is and how much they are eating. I would always explain the benefits of eating fish over the risks. Especially to those that are not in the high risk groups. Trade off with heart disease...those in the high risk group; they are the ones who know the least. Older guys are the ones more worried, but not the young moms or kids. They are not the people to ask as much."*

3. Variety and Moderation

In addition to stressing choice and creating a targeted risk message, many interviewees emphasized eating fish in moderation or eating a variety of fish species to minimize fish consumption risks. However, this messages is not available (state advisory) or gets lost (federal advisory) in official advisory information and risk communication

At the FDA one interviewee said (N=2):

> *"Fish is an important part of a healthy diet and you should just eat a variety of foods and fish. From nutritional standpoint fish is a good food. Eating it in moderation and a variety of fish [is best]. Not eating the same type of seafood."*

An interviewee from the DEQ said (N=3):

> *"Fish consumption is a good part of a healthy diet when consumed in moderation. [It's] important not to scare people away."*

F. Risk Communication-What People Know

Interviewees were asked what they think the public knows about fish consumption advisory information. In addition to their responses to this question, interviewees made comments throughout other components of the interviews about how they think people believe and how they behave when it comes to consuming fish. Almost everyone said that the public is probably aware that an advisory exists, but they are unfamiliar with the specific information found in the advisory. This is interesting because it shows that agency managers are aware that current advisory information is ineffective to help people make safe decisions about consuming fish, and does not fulfill its intended purpose.

One interviewee from the EPA mentioned the results from a focus group put together by the FDA and EPA to test the fish consumption advisory message (N=4):

> *"We've done a little bit of work with the FDA and additional work in Mississippi [with minority fishing populations]. We did some follow up surveys after the 2004 mercury advisory. We were interested in understanding how much information was internalized and how accurately. It was a lot better than I feared. We weren't talking about 80-90% accurate internalizing. Of all focus groups and survey responses, there were five to ten people who expressed knowledge about mercury in fish...and people understood that it was for women of childbearing age and children. There is a general knowledge that different kinds of fish have different levels [of contaminants]."*

An interviewee from the FDA (N=2) also commented on testing the fish consumption advisory message. The person said:

> *"On one hand, there are risks of mercury and then you turn around and say fish are good to eat. We tested this message with consumers and they basically rejected that message. All they hear is neurotoxin. Their response is, I don't need to eat fish; I don't need this risk"*

At the state level one interviewee from the DCH said (N=2):

> *"The fish advisory came out in the 1970's with the [fishing] license. It expanded and became its own book, but was distributed together [with the fishing license]. Later they were no longer distributed together, so people think they have read it, but have only read the blurb on the license. There should be a broad group of folks who know that an advisory exist, but don't know the depth at which they understand the advisory, other section of people who know the advisory exist, but they don't care."*

At the DEQ one interviewee said (N=3):

> *"Fish is good for you; people think that if they eat fish they will die, people think one way or another. The public doesn't know enough, it either scares them off or they don't worry about it."*

Another DEQ interviewee (N=3) said, "People know that there is an advisory, but they don't know what's in it." Likewise an interviewee from the DNR said (N=5):

> *"I don't know how much attention people pay to [the advisory] or how much they understand it. I don't have hard data to back this up, but my opinion is that people probably know that there is a problem with fish. [They probably] get more information from the newspaper or T.V. rather than the advisory. May have a general idea that there are some chemicals in fish that are bad for people...and I think they probably know that they have more of an effect on kids and young women. [It's one] of those things...because there are no [immediate or easily observable negative] effects, people will go on doing what they're doing as a part of their lives. Don't know how many people are following the recommendations of how to clean or cook the fish?"*

G. Obstacles to Effective Risk Communication

All interviewees commented on the inefficacy of the current fish consumption advisory risk communication. As shown above, most interviewees were aware that people may not be receiving the advisory message in an efficient and useful way. However, they were often hard pressed to find solutions to this problem. Every interviewee described obstacles to a quality and effective fish consumption advisory program.

1. Tough Message to Convey

One major difficulty discussed by many managers is that a message with both risks and benefits is a hard message to convey. As one interviewee from the DCH put it (N=2):

> *"How do you balance risk and benefits if the risk is to the brain, but the benefits are to the heart? Putting a fine point on sciences misses the practicality of the health education side, which is providing people with knowledge and letting them make choices"*

An interviewee from the EPA said (N=4):

> *"There is a concerted effort of the fishing industry to overestimate the Omega 3s. They work very hard to undermine [the fish advisory] message. [The fish advisory message] is difficult enough if you didn't have to fight all of the other food messaging. Spin-[It's like the movie] Thank You for Smoking. It's a hard message to get out, and then you have people diss-ing the message. People become confused. People in focus groups say that they don't want to read the whole [fish consumption advisory]. I was surprised to see how poorly people retain [fish consumption advisory] information."*

Another interviewee from the EPA (N=4) commented on the Native American population and said:

> *"Tribes are extremely important. Consuming fish is a cultural, religious experience. When you talk about risk, is the risk of diabetes or heart disease better or worse than fish contamination risks? Tough, it's hard to measure that. How to give them advice to help them rather [than hurt them]."*

At the FDA an interviewee said (N=2):

> *[We] try to stress that there are benefits. Tough one, because you have to be careful how you convey that message. Fish is a part of balanced diet. You have to be careful about that. If someone doesn't eat fish are you implying that they would not have a healthy pregnancy? A lot of pregnant*

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women never eat fish and have healthy babies. There are some good science about what we know is in fish. Omega 3s, I hate to focus on that because fish is more than omega-3s, but there is very good science about including omega-3s in your diet. Have a lot of data that show what species have a low level [of contaminants]. If you are pregnant or thinking of becoming pregnant eat species low in mercury... [It is a] very complicated story that is tailored to the group that you're concerned about, that will be acted upon, one without spillover. We had to go through several versions [of the joint FDA/EPA mercury advisory for women of childbearing age and young children]. Really tough. Never going to get everybody. [It needs to be] a message that is direct and pretty simple, and it's understood and people will act on it."

2. Agency Collaboration and Consistency

Another major issue that interviewees described as an obstacle to effective advisory outreach is the lack of collaboration and consistency of advisory information among agencies. Three different interviewees at the EPA commented on the importance of collaboration and consistency.

As one interviewee said (N=4):

> *"Working together is the biggest thing...not sweating the small details. Accept that people are going to do things their own way, so it is better to stay together- a pull strategy [rather] than push. Giving the states the opportunity to work together and set guidelines uniformly, giving them money to do outreach in the way they want to do it".*

Another interviewee from the EPA (N=4) said:

> *"I'm not saying that the EPA/FDA advice is perfect, but the fact that they continue to work together is really good. It's a huge step for our agencies. More uniform advice instead of more conflicting advice as in the past. The [Agency for Toxic Substances and Disease Registry (ATSDR)] is in there too...we all look at things in a different way. We work with ATSDR very closely. We often agree to disagree, they have their own models for working with risk, and their scope is different. They are funded through Superfund so, it's a little different.*
> *[The] EPA is more conservative in protecting human health. There are always going to be exceptions to that. Consistency is the hardest thing that is lacking with risk. [In some states there are] four different advice for the same species in the same lake. An advisory that is not too full of*

> *jargon, easy to follow... but the advice is not always the same as doctors. People are going to ask their doctors. [They are] not going to call public health hotline."*

The third interviewee at the EPA (N=4) said this of the joint EPA and FDA advisory:

> *"The EPA worked with the FDA to create the [joint mercury] advisory that applies the EPA exposure limits for women. That is a huge step forward."*

The lack of collaboration was also discussed at the state level. One interviewee from the DNR said (N=5):

> *"All of the news [about contamination] and even the state does not lend a straight forward message on fish consumption [which confuses the fish consumer]."*

At the DCH one interviewee commented (N=2):

> *"[The fish consumption advisory is] designed for consistency, built on science, being conservative to protect public health. But know that it won't be perfect. Monitor it and build from it. To show a consistent message to the public it needs to be simple and easy to use. Unfortunately, there is no one managing the DCH component for the last 6-7 years, updates are being made, but the science hasn't really been updated. Lose credibility when there isn't consistency between years and changing science."*

Later in the same interview the interviewee said:

> *"There have been people who try to get together. Wisconsin did a good job with the grant they were given. There has to be money to get people together, most people don't have the time built within their jobs to contribute to a uniform protocol. [And] some think changing the advisory to meet uniform standards would mess with politics."*

3. Funding

This comment touches on another large obstacle to effective fish consumption advisory information at the state level, funding. All interviewees from state agencies and those from federal agencies that work closely with the states, all talked about the lack of funding as a

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funding as a major stumbling block towards effective fish consumption advisory risk communication. As one interviewee from DCH said (N=2):

> *"[Risk communication is difficult] with decreasing staff and increasing responsibilities for individuals within the DCH...the Engler administration set risk communication in Michigan back."*

Likewise an interviewee from the DEQ said (N=3):

> *"Budget constraints don't allow [the DCH] to publicize the advisories, in the past it used to be in fishing license guide but got to be too much so they published a separate book, and that got to be too expensive, so they put it on a website, which hasn't been updated since 2004...[The DCH] shouldn't rely on website because the people who need it most, or eat the most fish probably don't even have a computer."*

H. Agency Science and Expertise

All, state and federal agencies described the policy and scientific process as "using what they know" in terms of method and expertise. As one interviewee from the EPA (N=4) said:

> *"For us, we are aware of some research, but we would like to know more. It would be helpful in our office to know [more]...what I can take to headquarters, if they know about it they will use it."*

In addition one DNR interviewee (N=5) said:

> *"We have a lot of in-house expertise on a number of studies to develop methodologies. Do tend to fall back on what we know."*

Another DNR interviewee (N=4) said:

> *"Toxic sampling is opportunistic. We only look for a problem if we are aware of it. Why are the moose not doing well in the U.P.? It could be a contaminant problem, but scientists are not systematically looking for it."*

An interviewee from the DEQ (N=3) talked about this in terms of training. They said:

> *"Staff need to be really effective at communicating risk. On a daily basis they do a good job, sure there's room for improvement. A scientist is trained to do science and not trained to communicate. Training on risk*

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communication, public involvement. A big issue for the Department [of Environmental Quality] is interest groups and mass meetings. Trying to give staff tools to do that. I had to take a class in Natural Resource Policy in college and I didn't realize how important it was. Things turn out better when you involve the public."

I. Overview

Data collection with residents in Michigan's Upper Peninsula shows the ineffectiveness of the current fish consumption program. This inefficacy is known to agency managers. However, they felt powerless to do anything about it for lack of funds, lack of responsibility (as in the case of the DNR and DEQ), lack of political will, or for the sheer difficulty of communicating both the benefits and risks of fish consumption. The current fish consumption advisory program in agencies is a mostly scientific endeavor, but this science is rampant with uncertainties and gaps in knowledge.

The complexity of the risk/benefit communication message, funding limitations, the lack of social science/human dimensions expertise, and the reliance on technocratic policy making in these agencies makes developing and providing the public with effective information difficult at best. The advisory process does not allow for public involvement and there is little understanding, scientific or otherwise, of how to improve upon risk characterization, management and communication. With the lack of public engagement, involvement, or outreach on the part of governmental agencies, the public often get fish contaminant information from the media. In addition the fish contaminants issue is separated into human and ecosystem health projects. There is no room for holistic solutions to contaminant problems.

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IV. Newspaper and Television Media

A. Introduction

To understand how the media reports the mercury and fish consumption issue, articles (N=65) from the New York Times (NYT) (18 articles), Washington Post (WP) (10 articles) and the Associated Press (AP) (37 articles) from January 1988 to January 2008, comprise the data set for analysis. Transcripts from network television news programs (n= 25) (NBC-8 transcripts, CBS-11 transcripts, and ABC- 6 transcripts) dating from January 2001 to January 2008 were also analyzed using the same coding scheme as the newspaper analysis. Articles were found by searching "mercury AND fish" in Lexus Nexus. Each article/transcript is about mercury contamination and fish consumption.

Figure 5.13 Network Television News per Year

Figure 5.13 Network Television News per Year

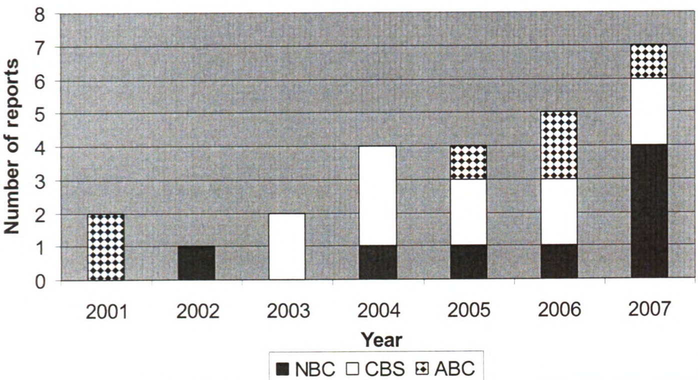

Figure 5.14 Morning vs Evening news per Year

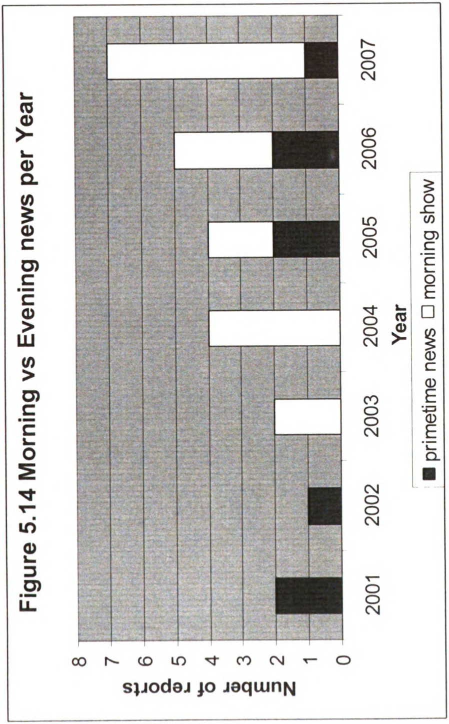

Figure 5.14 Morning vs Evening news per Year

Figure 5.12 Number of articles per year

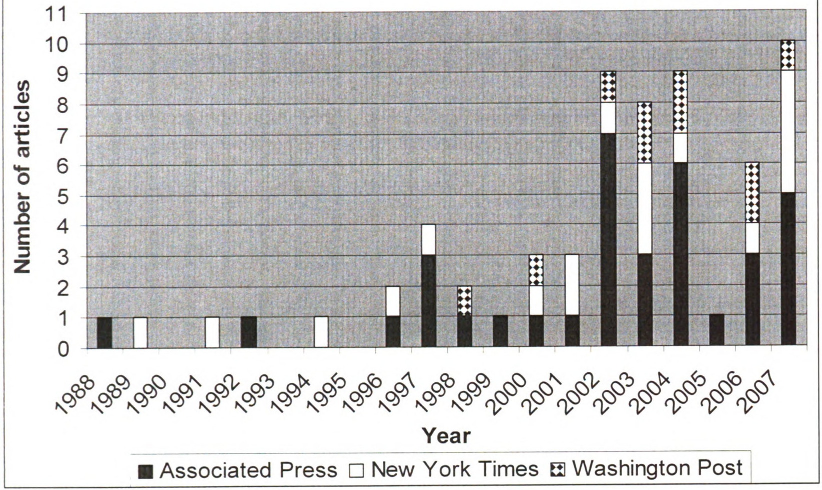

Figure 5.12 Number of articles per year

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1. Event Based Reporting

Of all newspaper articles (N=65) only four (2 NYT: 2003, 1991; 1 WP 2007; and 1 AP 2002) gave a complex view of the mercury and fish consumption issue. None of the television news transcripts (N=25) provided a complex story of the mercury and fish issue. Articles that report a complex story described the issue holistically, without overt bias, and include: (1) the origin of mercury contamination- where it comes from, both natural and man-man sources; (2) past research about mercury poisoning in humans, from Minimata and Iraq to Faroe Islands, Seychelles, and National Academy of Science report on the human health effects of methylmercury; (3) lists the benefits of eating fish low in mercury and high in omega-3; (4) discusses the impacts of reducing mercury emissions; and (5) describes who is at risk and who has the most to gain from consuming fish.

All other articles and transcripts were event-based, meaning that the information presented in the article revolves around some news event, be it a new academic study, governmental report, or a report from an environmental group. The tone of each article was often set by the source of information. For example, if the information source was an independent study that showed elevated mercury levels (like the Associated Press September 15, 2005 article) found in store bought tuna, the article would most likely accentuate the risks of eating contaminated fish. However, if the source was a study that found no negative affects of maternal mercury levels on fetal and childhood development (AP February 17, 1996), the article would most likely focus on the benefits of eating fish or accentuate that consuming fish is not a human health threat.

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Until 2002 few articles about mercury contamination in fish appeared in the three newspapers used for analysis (1-3/year) (figure 5.12). The most articles about fish and mercury contamination appeared between 2002 and 2004 (~9/year). The majority of these articles (46%) talked about the federal fish consumption advisory process and/or the resulting joint FDA/EPA mercury fish consumption advisory for women of childbearing age and young children. After 2004 the mercury and fish consumption "buzz" quieted. However, in 2007 (Jan 2008) the mercury and fish issue became a more popular news story (N=10), but, the tone of the articles changed from accentuating the risks of eating fish to accentuating the benefits over the risks, even for at-risk populations.

The number of television transcripts concerning mercury and fish consumption steadily increased from 2001 to 2007 (Fig. 5.13). Interestingly, during the years of the joint FDA/EPA advisory process (2003-2004) no nightly news programs reported on fish consumption and mercury contamination issue (Fig. 5.14). The information appeared only on morning news programs such as Good Morning America and The Early Show. Unlike the written press, television news programs predominantly focused on mercury risks in commercial fish. Sport-caught fish was rarely mentioned, except to say that individuals should consult their state's fish consumption advisory.

Unlike the nightly news programs where a reporter interviewed several different people and used journalistic reporting to tell a story, the morning news programs were most often arranged as an interview between the journalist and some sort of expert (most often a medical doctor or nutritionist) who worked for the show. The journalist asked the expert questions about a certain study, report, or government action. However, three morning news programs (CBS's Sunday Morning, The Osgood File [November 2005], Good Morn

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Good Morning America [March 2006], and the Today Show [January 2008]) used reporting styles similar to nightly news programs.

Before the year 2000, information about mercury and fish consumption accentuated the risks of eating fish. However, since 2000 most articles and transcripts included information about the benefits, along with risks, of consuming fish. After October 2006, with the exception of the New York Times and some television news transcripts, there was a definite shift from accentuating the risks of mercury and fish to promoting the benefits of consuming fish, and in some cases over the risks, even for at-risk populations. In general, articles from the New York Times had a more risk averse tone than those from the other news sources, including television news.

2. Frames over Time: Newspapers

The mercury and fish consumption issue was framed over time in several different ways (see Box 5.2). In the years before the joint FDA/EPA (1988-2003) advisory the media frames focused on sport-caught fish from inland lakes, reducing mercury emissions, and the uncertainty surrounding mercury and fish consumption. The years after the joint FDA/EPA advisory (2004-2008) articles framed mercury in distinctly different ways. Some articles framed mercury in fish in terms of commercial fish (57%), some sport-caught fish (50%), some both. Some emphasized that mercury in fish pose a threat to human health (46%), others said that mercury in fish does not pose a threat to human health (23%), and sometimes these frames were found in the same article (30%). Some advised people to balance the benefits and risks of eating fish (34%). In addition a majority of all articles (51%) framed mercury in fish in terms of reducing mercury emissions.

Table 5.3 Newspaper Frames Over Time

Frames: 1988-1994
- Risk is from mercury in freshwater sport-caught fish
- Reduce Mercury Emissions

Frames: 1996-1998
- Uncertainty: does fish pose a threat to human health?
- Risks are for some women and children
- Reduce mercury emissions

Frames: 1999-2001
- Uncertainty: differing government regulation of mercury in fish
- Government not doing enough to protect human health
- Risk are for some women and children only

Frames: 2002-2003
- Uncertainty: How much is too much mercury? What is safe to eat?
- There are benefits and risks associated with eating fish
- Risks are from eating commercial fish
- Risks are for some women and children, all fish consumers, heart attack victims

Frames: 2004-2008
- Mercury poses a threat to human health
- Mercury does not pose a threat to human health
- Reduce mercury emissions
- Risk is from freshwater fish from inland lakes and commercial fish
- Risk is from fish on the do not eat list (shark, swordfish, tilefish and king mackerel) and tuna
- Government is not doing enough to protect human health
- The public is unaware of fish consumption advisory information
- Risk is for women of childbearing age and children, fish consumers, the wealthy, and Native and Asian Americans

a. 1988-2003 pre-joint FDA/EPA advisory frames

From 1988-1994 100% (N=5) of the articles talked about mercury in sport caught fish. No article discusses commercial fish. Sixty percent of these articles (N=3) framed mercury in fish in terms of reducing mercury emissions from coal-fired power plants and incinerators. From 1996-1998 (100% N=9) articles focused more on the uncertainty over whether mercury in fish at the levels found in a North American diet pose a threat to human health.

This is highlighted as a result of the Seychelles Islands study (1995) (55% N=5) and articles that questioned the utility of EPA reference dose for mercury in fish (45% N=4). Articles from this time period also framed mercury in fish in terms of reducing mercury emissions from coal-fired power plants (78% N=7). The majority of articles (78% N=7) said that risks are for some women and children only. During this time period articles also talked about the benefits of eating fish (22% N=2).

Between 1999 and 2001 articles (N=7) focused on the uncertainty of mercury in fish due to the different government action levels for regulating mercury in fish (71% N=5). In addition, these articles said that the government is not doing enough to protect human health (71% N=5). All articles framed risks for some women (pregnant and nursing) and children. Also, each article framed mercury in fish in terms of reducing mercury emissions. Only two articles during this time (29%) talked about sport-caught fish, the rest framed risks in terms of commercial fish. The year 2000 was the first year in which every newspaper source printed an article about mercury in fish.

From 2002-2003 (N=17) the majority of newspaper articles (82% N=14) framed the mercury and fish issue by highlighting the uncertainty surrounding how much mercury is too much, and who should avoid or eat what species of fish. Risk was still framed for some women and children (94% N=16), but four articles (5%) (two that list people who eat a lot of fish and two that mention heart attack victims as possible at risk groups) questioned if women and children are the only at-risk populations. Again, commercial fish was the focus of risk (88% N=15). There was only one article about sport-caught fish. Also during this time period, the majority of articles said that there are benefits and risks associated with consuming fish (88% N=15), and 41% (N=7) talked about balancing the benefits and risks of fish consumption. One article was different from all others in that it reports about a study that found the form of methylmercury found in fish may be less toxic than previously thought.

b. 2004-January 2008 post-joint FDA/EPA advisory frames

Newspaper articles from 2004- January 2008 framed mercury and fish consumption in terms of the risks and benefits associated with eating fish. Some (46% N=12) said that mercury in fish pose a threat to human health. Others (23%) said that mercury does not pose a threat to human health, and others (30% N=8) include both of these frames. Thirty-three percent of articles (N=9) said to balance the benefits and risk of consuming fish.

The majority of articles (61% N=16) framed risks in terms of the need to reduce mercury emissions. Also, risks were framed as commercial fish (58% N=15), sport-caught fish (50% N=13), the fish on the FDA/EPA's do not eat list (50% N=13), and tuna (38% N=10). Risks are framed for women of childbearing age and children (88% N=23), the wealthy (15% N=4), Native and Asian Americans (15% N=4), and people who eat a lot of fish (7% N=2). A majority of articles (54% N=14) also said that the government is not doing enough to protect human health. Uncertainty over mercury and fish consumption is framed in terms of the public's uncertainty over what fish is safe to eat (27% N=7).

3. Frames over Time: Television

Table 5.4 Television Frames Over Time

Frames: 2001-2003

- Uncertainty: How much is too much mercury? What fish is safe to eat?
- Risk is from mercury in commercial fish, tuna, swordfish, shark, king mackerel
- Reduce mercury emissions
- The public is unaware of fish consumption advisory information
- Risks are for some women and children, people who eat a lot of fish, heart attack victims
- Government is not doing enough to protect human health
- Balance the benefits and risks of consuming fish
- Risk is from mercury in commercial fish
- Eat fish low in mercury

Frames: 2004-2008

- People should eat fish low in mercury
- Risk are commercial fish, fish on the FDA/EPA do not eat list (shark, swordfish, tilefish and king mackerel)
- Uncertainty: what are the risks and to what extent are different fish risky for different populations?
- The public is unaware of fish consumption advisory information
- Balance the benefits and risks of consuming fish
- Risk is for women of childbearing age and children, people who eat a lot of fish
- Risks are only the four fish on the FDA/EPA do not eat list for women of childbearing age and children.

Like newspaper articles, television transcripts had changing frames over time. Transcripts shifted from framing the issue in terms of risks only (12% of all transcripts), to balancing the benefits and risks of consuming fish (48% of all transcripts) to accentuating the benefits over the risks of eating fish (24% of all transcripts). Some frames did not change over time. For example, throughout the articles (2001-January 2008, N=25) the television media framed mercury and fish consumption in terms of the confusion and lack of advisory awareness among the public (68% of all transcripts). In addition, the television media framed mercury and fish consumption in terms of commercial fish (96% of all transcripts).

a. 2001-2003 pre-joint FDA/EPA advisory

Between 2001 and 2003 the television media framed the mercury and fish consumption advisory issue in terms of the uncertainty surrounding the risk of eating fish (100% N=5). All transcripts from this time period (N=5) said that the public is unaware or confused about mercury in fish. All transcripts framed the risks of mercury in fish as commercial fish, shark, swordfish, king mackerel and tuna. Women and children were listed as the at risk population in all transcripts from this time period, 60% (N=3) articles listed other populations such as those who eat a lot of fish and heart attack victims as possible at risk groups. In addition, 60% of transcripts during this time period said that the government is not doing enough to protect human health. Eighty percent said that the benefits of eating fish should be balanced with the risks and 60% say that people should eat fish low in mercury.

b. 2004-January 2008 post-joint FDA/EPA advisory

From 2004 to January 2008 risks were framed in terms of commercial fish (95% N=19), fish on the FDA/EPA do not eat list (75% N=15), tuna (65% N=13), and much less so sport-caught fish (1% N=2). Risks were framed as for women of childbearing age and children (85% N=17) and people who eat a lot of fish (3% N=6). Twenty-five percent of transcripts (N=5) said risks are for women of childbearing age and children only and only for the fish on the FDA/EPA do not eat list. Sixty percent (N=12) of transcripts said that the risks of eating fish should be balanced with the benefits fish provide, such as omega-3 fatty acids (50% N=10), (30% N=6) said that the benefits of eating fish outweigh the risks. Seventy-five percent of transcripts (N=15) said that people should eat fish low in mercury.

Twenty-five percent (N=5) of transcripts said that mercury does not pose a threat to human health, however, twenty-five percent (N=5) of transcripts also said that mercury does indeed pose a threat to human health. Forty-five percent (N=9) of transcripts included both frames. The majority of transcripts between 2004 and January 2008 (80% N=16) framed the mercury and fish issue in terms of the uncertainty surrounding what are the risks and to what extent are different fish risky for different populations. In addition a majority of articles focused on the confusion and lack of awareness the public has about consuming fish (60% N=12).

C. Overview

Before the year 2000 mercury and fish consumption risks were framed only in terms of sport-caught fish. After the National Academy of Sciences report in 2000, the FDA's first advisory for pregnant women, nursing mothers and young children in 2001, and the joint FDA/EPA advisory in 2004 the frames changed from sport-caught fish to commercial fish. All television news transcripts focused on commercial fish. Both newspaper articles and television transcripts emphasized the "forbidden fish" (shark, swordfish, tilefish, and king mackerel), the risks to women (either pregnant or of childbearing age) and children, and the risks of eating tuna fish. Regardless of whether articles discussed sport-caught fish or commercial fish, many framed the mercury and fish issue in terms of reducing mercury emissions often specifically by regulating emissions from coal-fired power plants.

Many television news transcripts and some newspaper articles focused on the confusion or lack of knowledge the public has about mercury in fish. Newspaper media focused on the ways in which the government is not doing enough to protect human health or reduce mercury emissions. Both television and print media reported on the mercury and fish consumption issue in ways that may send mixed messages to the public. In many cases one article or transcript would come out in the beginning of the year touting the benefits of consuming fish and a few months later another would come out saying that too many children have potentially dangerous levels of mercury. In addition, this often occurred within the same article.

The way the media framed mercury and fish consumption changed through time. When focus groups and community dinners were held in 2004 most of the media information framed the issue in a risk adverse manner. If we were to go back and ask the same questions now, given that in the last few years the media frame has shifted to reflect a more benefit-oriented risk message, maybe people would have different models. However since 2002, both television and newspaper media focused on the benefits and risks of eating fish. In addition, even prior to 2004 the media focused on tuna and the four fish on the FDA/EPA's "do not eat" list. None of these fish were mentioned by focus group participants. While the process of bioaccumulation is mentioned in 35% of newspaper articles and 25% of television transcripts, Upper Peninsula participants lacked sufficient awareness of this process.

In general, television news gave a less complex story of mercury and fish consumption than the print media. In addition, the television news reported on the 2002 Hightower study of mercury poisoning in people who eat a lot of fish much more than the print media.

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print media. The print media was more likely to include information about past studies of mercury and childhood development from Minamata and Iraq to the Faroe and Seychelles Islands. All media articles and transcripts (since 1998) seem to support eating fish, but advise people to choose wisely. Both the television and newspaper media stressed coal-fired power plants most often as the source of mercury that eventually winds up in fish.

IV. Overview

Research participants in Michigan's Upper Peninsula were aware that fish consumption advisories exist, but did not have the information necessary to make informed decisions about the benefits and risks of eating fish. Government agencies were aware of the inefficacy of current fish consumption advisories, but felt they lacked the resources or political will to do much about it. In addition, the science behind agency fish consumption advisory information is uncertain. One study in the Faroe Islands shows negative affects of low-level fetal and childhood methylmercury exposure, while a different study in the Seychelles Islands shows the opposite (Marsh 1995; NRC 2000; Rice 2004).

In Michigan, agency managers do not know who is eating enough fish to cause concern. Even at the federal level where ostensibility is higher uncertainty still exists regarding the negative affects, if any, that occur as a result of North American fish consumption, or to what extent eating fish is beneficial. In addition, agency managers in state and federal government agencies do not know how at risk populations understand and interpret information about the benefits and risks of eating fish. It is difficult to prioritize policy objectives with incomplete information, especially when there are both health benefits and health risks of a certain behavior.

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In the absence of strong risk communication programs the public forms its own, often incorrect, ideas about the risks and benefits of consuming fish based on mental-models, trust, and past-experience. The public's main source of fish consumption advisory information was the media. However, when the media reported on mercury contamination in fish, the articles rarely told a complete story about the benefits and risks of fish consumption, instead they focused on specific news events, and did not lend coherent frames throughout time. One day people could read in a newspaper that eating fish provides no risks and the next day find a list of negative health effects due to mercury exposure from consuming fish.

Chapter Six

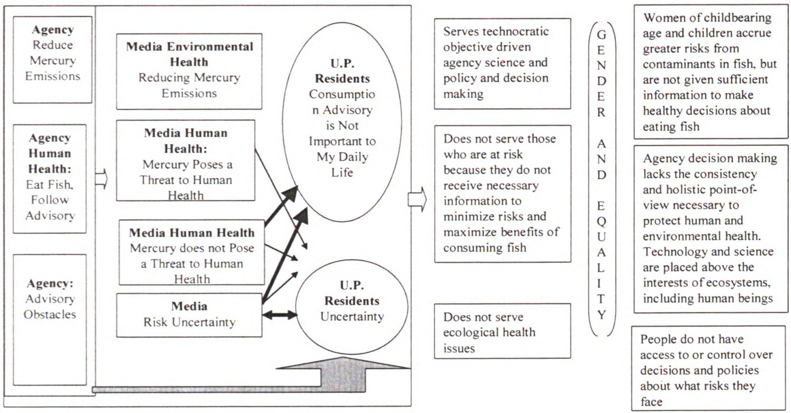
Discussion

I. Introduction

Government agencies focus on technocratic science to make decisions and policy about mercury in fish. Their lack of collaboration and consistency generate multiple levels of governance over mercury in fish (e.g. trigger levels vs. response doses) that are covered and framed in the media upon which the public (especially women) relies for information. Articles and transcripts focus on uncertainty over fish consumption advisory science, the lack of public knowledge about safe and beneficial fish consumption, and report on both the benefits and risks of fish consumption. This may confuse the public thereby affecting risk behavior in terms of falsely amplifying or deamplifying risk (Burger 2000; Kasperson 1992). As a result, the targets of the concern may ignore warnings and continue to eat risky fish, or to choose not to eat fish at all and fail to get the benefits from fish that they enjoy.

In the absence of purposeful risk communication government managers can not learn about what risk communication methods are more successful than others. With the separation of human and ecosystem/ecological health the fish contamination issue lacks consistency and a holistic point of view necessary for ground policy and decision making. What is the point of making recommendations for the fish consumption advisory if the necessary populations do not receive the information or nothing is done to reduce or eliminate those risks?

Figure 6.1 An Overview of the Interactions and Outcomes of Framing Practices



In light of these questions, this chapter discusses: 1) How Upper Peninsula (U.P.) residents, state and federal agency managers, and the media frame the mercury and fish consumption issue; 2) Whose interests are (not) served by these frames; 3) What are the implications of these framing acts in terms of gender and justice and; 4) how can the fish consumption advisory process improve to be more participative, epistemologically inclusive, proficient at achieving an effective and sustainable information and outreach (Figure 6.1).

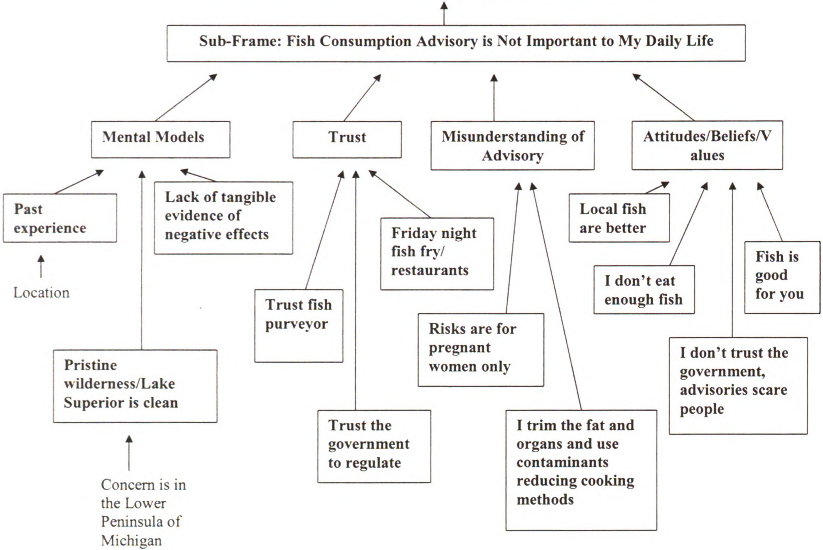
II. Framing the Mercury and Fish Consumption Issue

A. Upper Peninsula Residents

1. Fish Consumption Advisories are not Important to My Daily Life

U.P. informants frame the fish consumption issue solely in terms of human health risks, and they frame those risks as a non-issue. They use diagnostic framing tasks to create a shared understanding of the non-risks of eating fish. In support of past research I found that instead of using the official fish consumption advisory to make decisions about eating fish, U.P. participants used mental models, beliefs, attitudes and values, trust and incorrect understanding of the fish consumption advisory (Figure 6.2) (Beamish 2001; Bickerstaff and Walker 2001; Fischer 2000; Goldman et al 2004; Jakus and Shaw 2003; Kasperson 1992; Lidskog 2000; Marshall 2004). Participants used these psychological, social and cultural practices to make decisions about fish safety, which led to the de-amplification of fish consumption risks (Kasperson 1992; Burger 2000). As a result, they had little concerns about their fish consumption behavior.

Figure 6.2 U.P. Residents Master Frame 1: Human Health Issue



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Many informants from the U.P. also misunderstood or lacked knowledge about what the advisory actually says and therefore have fewer concerns about eating fish. For example, people believed that advisory information is pertinent only to pregnant women. As long as women avoid fish while pregnant, mercury in fish is not a health problem. This type of logic may lead people who are not in the at-risk group to underestimate their risks and cause pregnant women to overestimate their risks. The deamplification of risk for individuals other than pregnant women may be dangerous because the state fish consumption advisory lists fish to avoid or reduce consumption of even for the general population. Conversely, this fame may cause pregnant women to be overly risk averse, to the point that they stop eating fish and miss out on the health benefits of consuming fish, especially the benefits to the developing fetus.

U.P. informants were also unaware of where contaminants ori

that contaminants in fish come from past industrial dumping. They seemed unaware that current air pollution also contaminates the lakes, and therefore the fish. In addition, they believed that the fish preparation techniques described in the fish consumption advisory reduce all contaminants, but they do not. For example, using these techniques does not reduce mercury content in fish. Therefore, people may have few concerns about the fish they eat because they think that by trimming off the fat, internal organs and head they are reducing all contaminants, when in fact they are not. People may be unknowingly putting themselves or their families at risk because they believe they are reducing or eliminating the amount of contaminants in fish when they use these techniques. However, they are not at all reducing their risks for mercury the main contaminant of concern in inland lakes.

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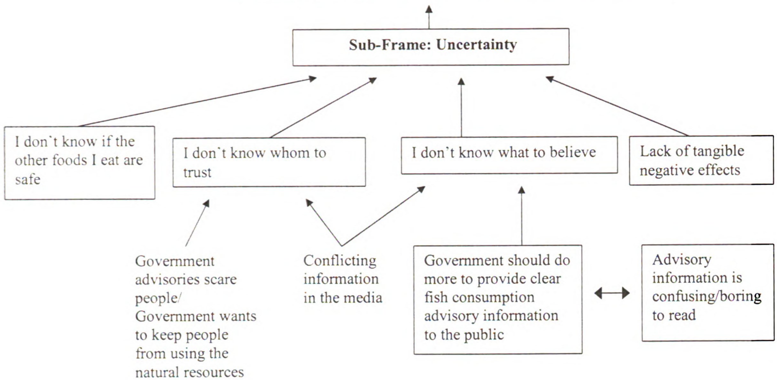
Even if U.P. residents had a more accurate understanding of the official advisory information they may not take heed because of their strong attachment to eating local fish. The superiority of local fish was strong among anglers and participants. For example, people believed that the wilderness of the Upper Peninsula is pristine and therefore believe that Lake Superior is clean (i.e. lacks contaminants). People also created scale frames (Kurtz 2003) to they make distinctions between fish caught in the U.P. or Lake Superior and fish from elsewhere, especially from "downstate" in the Lower Peninsula of Michigan. This type of scale framing allows people to acknowledge the existence of contaminants in fish, while creating a barrier between that pollution and their own fish consumption.

Pollution and contamination is seen as a problem to be dealt with elsewhere in the state, not in the U.P. Many women mentioned that they would eat Lake Superior fish even when pregnant. Local fish are also perceived as better because people can use past experience to judge the safety of fish. People used past experience to "just know" which lakes are polluted and which lakes are clean. In addition, many people cited the lack of tangible evidence of negative effects of contamination in fish. Commonly people would talk about the large amount of fish their grandparents eat as evidence that fish does not pose health risks.

2. Uncertainty

Another way the fish consumption advisory and contamination message fails to reach the public, especially those at-risk, is the lack of agency consistency among the federal and state advisories and a clear risk message that is relevant to people in the U.P. Informants frame the mercury and fish consumption issue in terms of uncertainty

Figure 6.3 U.P. Residents Master Frame 2: Human Health Issue



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over fish consumption/contamination information because they feel unaware and unknowledgeable about mercury and fish contamination (Figure 6.3). Participants used both diagnostic and prognostic framing tasks to discuss uncertainty about the risks of eating fish. Diagnostic frames created a shared vision of the uncertainty. For example, participants said that there is uncertainty regarding comparative risk of the safety of fish versus other foods such as beef or chicken and uncertainty due to the lack of tangible evidence of the negative consequences of eating fish. Interestingly, research suggests government fish consumption advisories should provide the type of risk-risk information U.P. residents describe (Knuth et al 2003). However, few fish consumption advisories make such risk-risk comparisons (Scherer et al. 2008).

U.P. residents used prognostic framing tasks when they said they do not know whom to trust or what to believe. The prognostic framing tasks ascribed blame for the uncertainty. For example, the majority of participants said they get information about fish consumption from the media, but then said that information is conflicting or confusing. U.P. residents also feel that the government should do more to provide clear fish consumption advisory information to the public. However, not everyone trusts the government to this. Some informants distrust the government and may be unlikely to except any type of risk information about fish.

3. Summary

Residents in the Upper Peninsula frame risks of mercury in fish in ways conform to their preferred behaviors and world view. U.P. residents demonstrated how risk is constructed through the "cultural and social experience that determines rules of how to select, order, and explain signals from the physical world" (Kaperson 1991:158). The ways U.P

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ways U.P. informants create or acquire knowledge about contaminants in fish is situated in a cultural context of local goodness and excellent environmental quality and is filtered through their uncertainty pertaining to what are good sources of information.

When actual risks are uncertain or ambiguous and psychological, social, institutional, and cultural processes act on risk perception, it often leads to the amplification or attenuation of perceived risk (Kasperson 1992). This causes people to be overly risk averse, or engage in overly risky behaviors (Burger 2000; Kasperson 1992). This is seen in the behaviors of the U.P. participants. The social construction of risk in addition to conflicting media frames and the lack of trust in the media cause U.P. residents to de-amplify the risks of consuming fish and leave people feeling confused and/or uncertain about the safety of the fish they eat. It also leads to the amplification of risks for women of childbearing age (pregnant and nursing) and children because the media frames women and children as the at-risk population, U.P. residents avoid fish while pregnant.

Government agencies stress techno-science policy solutions to mercury in fish that neglect understanding the types of cultural processes and learning that occurs among the public (Haraway 1989; Lober 1998; Rocheleau et al. 1996; Ward 1999). The lack of a strong fish consumption advisory program supports U.P. resident's frame of mercury as a non-risk except for pregnant women. In addition, U.P. residents trust the government to regulate contaminants in their environment and food. The absence of a strong fish consumption advisory program may suggest to the public that there is nothing to be worried about. However, people are not "cultural dupes", they have agency to chose the sources of information to formulate their opinion and to frame the issue the ways that fit their worl

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their world view and beliefs about the state of the environment and the safety of eating fish, especially local fish.

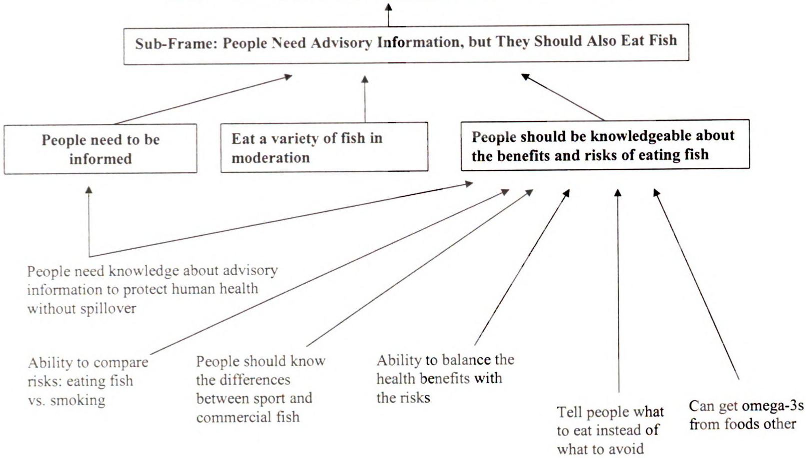
B. Agency Staff Managers

1. People Need Advisory Information, but They Also Should Eat Fish

All agency managers frame fish consumption advisories as a human health issue (Figure 6.3). They use diagnostic framing when they say that people need information to make proper decisions about eating fish without causing alarm for populations not affected by the advisory. Some interviewees feel that an informed public means that people a) are able to situate the risks of eating fish among other risks, like that of smoking, b) know the difference between contamination in sport-caught freshwater fish and commercial fish, or c) know that they can get omega-3 fatty acids from foods other than fish.

Agency managers also use prognostic framing to present alternatives to current advisory information. Agency managers say that individuals should be able to properly balance the health benefits with the risks of consuming fish; something they feel the public is currently unable to do. Some say a better way to do this is to tell people what types of fish to eat, instead of what to avoid. Many managers said that people should eat a variety of fish species and to eat them in moderation, a useful risk communication message. This is not made explicit in the bland government speak (Chess et al. 2005) typical of agency risk communication.

Figure 6.4 Agency Managers Master Frame 1: Human Health Issue

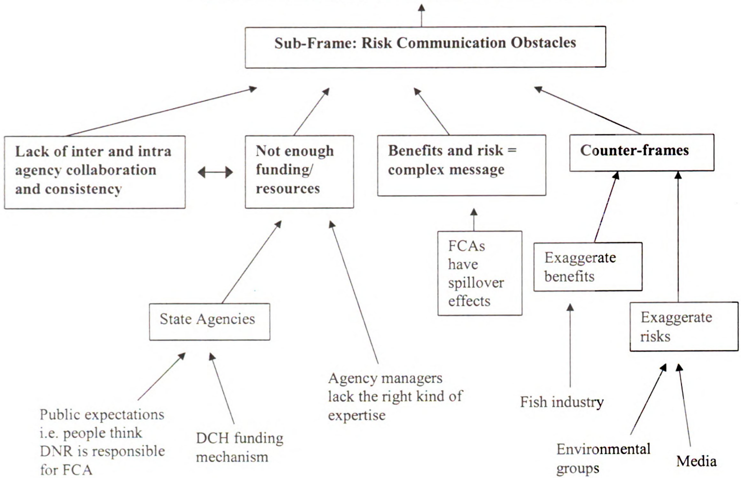


2. Risk Communication Obstacles

Agency managers say that the purpose of a fish consumption advisory is to inform individuals so that they are able to make safe choices about eating fish and reap the benefits of fish consumption while avoiding the risk, without spillover to populations who are not at risk. However the current policy/decision making environment in government agencies creates substantial barriers to quality risk communication (Figure 6.5). Agency managers all use prognostic frames to ascribe blame for these obstacles. Agency managers blame the lack of a successful fish consumption advisory as a) the lack of inter and intra agency collaboration and consistency, b) the lack of funding and resources, including expertise, c) spillover to populations not at risk, d) the complexity of a benefit-risk message, and e) the presence of counterframes (Kauffman and Smith 1999), especially in the media.

The Environmental Protection Agency defines risk communication of fish consumption advisory as "a process of sharing information about perceived and potential dangers and benefits associated with fish consumption" (EPA 2001: I-4). Agency mangers say this message is too complex because it needs to include information about both the benefits and risks of eating fish. The differences between mercury and persistent organic pollutants also complicate the message. Many interviewees say that the lack of collaboration and consistency among agency regulations and fish consumption advisory advice at both the state and federal level is an obstacle to effective advisory outreach. In addition, they say this lack of consistency decreases credibility of the advisory message.

Figure 6.5 Agency Managers Master Frame 2: Human Health



This was seen in the U.P. when informants from Gogebic County, which borders Wisconsin, made comments about the differences between Wisconsin's and Michigan's fish consumption advice. They would ask questions like, "how come in the Michigan advisory it says X, but in the Wisconsin advisory it says Y?" Fish consumption advisories lack consistency when people fish on lakes that border different states (any of the Great Lakes for example) and see that the different states have different advisories for the same lake (Burger and Gochfeld 2006). In the Upper Peninsula, people see that the Wisconsin DNR and the Great Lakes Fish and Wildlife Commission distribute more information about mercury than Michigan, including color coded maps that show which lakes have higher levels of mercury. As a result, government public health and environment agencies in Michigan lose credibility.

Government agencies also lose credibility when the media reports on the lack of agency consistency. For example, in 1999 the Associated Press (April 19) reported that the Agency for Toxic Substances and Disease Registry (ATSDR) increased their tolerance dose in humans to .03 micrograms/kilogram body weight/day from that of the EPA's, .01 micrograms/ kilogram body weight/day. This article frames the mercury and consumption fish issue in terms of the uncertainty surrounding government regulation of mercury and the extent to which mercury poses a threat to human health. In a few cases, such as with agency reference dose, this uncertainty is confounded by journalists who do not understand the specific purposes for the different government science and regulation.

Another major obstacle for state agency mangers is funding. However, when given the opportunity the Michigan Department of Community Health did make progress on their fish consumption advisory. With a grant to make fish consumption advisories for Saginaw Bay watershed in the Lower Peninsula of Michigan heavily polluted with dioxin, the DCH was able to survey people to get a sense of how much fish people eat in the area. The DCH was also able to develop and distribute, although not widely, a brochure about choosing commercial fish low in mercury. Increased funding seems to allow government agencies to learn more effectively instead of the bricolage-type learning that currently takes place.

Also at the state level, agency managers say that the public's expectations of what agency duties are often do not match up with funding priorities, legal mandates, and policy goals of the agency. For example, the DNR may have credibility among the public, but the DNR is in no way responsible for fish consumption advisory information. As a natural resource agency, the DNR is not concerned with public health issues. Therefore, what they invest in as an agency is guided by the type of training and expertise they have within the agency. Since public health, contamination/pollution and risk communication are not expertise found at the DNR it is unlikely that they would take part in the fish consumption advisory.

Regardless of expertise many agency interviewees see helping people balance the benefits with the risks of consuming fish as a tough risk communication message to convey. Some interviewees even question if good benefit-risk communication is possible. They worry that people will only hear that there are risks and ignore the benefits, creating a spillover affect to populations that are not at risk and who are situated to benefit the most from eating fish, such as, middle aged men with heart disease. However, fish consumption advisory risk communication may be better understood if people have more knowledge about the processes of contamination and the differences between, for example, persistent organic pollutants and heavy metals.

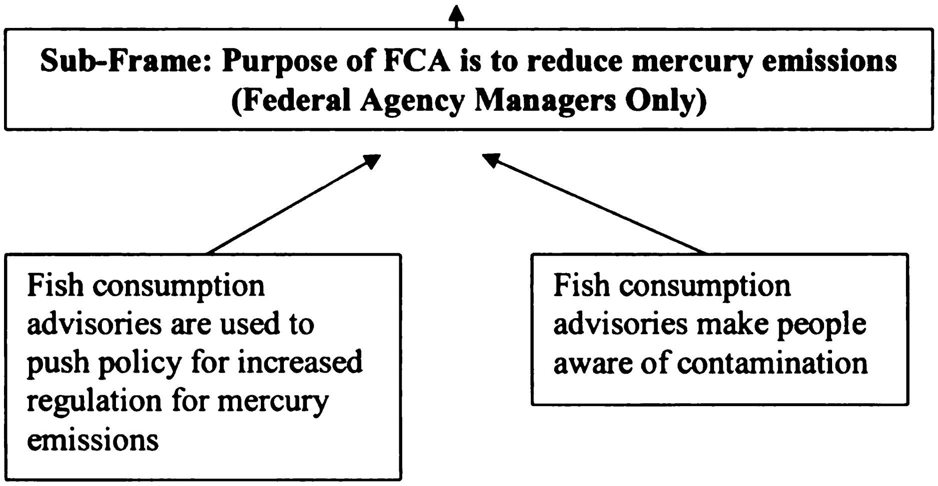
Some agency managers said that no matter how many resources or how good a particular risk communication message is there will still be obstacles to an effective risk communication message because of counterframes (Kaufmann and Smith 1999). Agency managers described two types of counterframes, ones that exaggerate the benefits of eating fish (like, according to interviewees, those of the fish industry) and those that exaggerate the risks of eating fish (like, according to interviewees, those of environmental groups and the media). However, since 2002 the majority of media articles focus on both the benefits and risks of eating fish. Recently (since 2006) newspaper articles and transcripts talk about placing the benefits of eating fish over the risks, even for women of childbearing age and children.

3. Ecological/ecosystem Health

In addition to framing mercury in fish as a human health issue a few federal agency managers (N=3) and many media articles and transcripts (53% articles and 44% transcripts) also frame it as an environmental health issue (Figure 6.5). Federal agency managers used motivational framing tasks to reduce mercury emissions from coal-fired power through frames about fish consumption and contamination. As one agency manager from the EPA (N=4) commented, the reason fish consumption advisories receive so much attention is to raise awareness about environmental contaminants or to push for policies that reduce mercury emissions. This message is also found in the media, in articles and transcripts about both sport-caught and commercially bought fish.

Reducing mercury emissions was not a theme raised by U.P. residents. Giving the public information about contaminants and water cycles may help the public understand the complexity of fish consumption advisories. However, the separation of human and ecological/ecosystem health issues does not encourage this type of risk communication.

Figure 6.6 Agency Manager Frame 3: Environmental Health Issue



There are different goals when the main priority is protecting human health or protecting environmental health. In some cases, as one FDA interviewee (N=2) said, "mercury in fish is not about mercury in fish". It is about reducing mercury emissions from coal-fired power plants, to call the public's attention to contamination in fish, or to help set priorities for environmental remediation (such as in cases of Areas of Concern or Superfund sites). Likewise for the EPA, the fish consumption advisory program is important to substantiate the need for mercury regulations. However, this message is not explicitly available to the public and in the U.P. has not incited change or movement among the public. In order to talk democratically about risk an explicit discussion of ecosystem health issues must be incorporated into fish consumption advisory policy and decision making.

4. Summary

Agency managers say they can only act on what they know, and what kind of in-house expertise they have. However, many government managers say they lack the right kind of expertise, like social science or human dimensions of natural resources, to achieve effective risk communication. Science is done in a way that reflects social stratification and lacks engaged accountable positioning to be aware of and reflexive about why things are done in the way they are (Haraway 1989, 2001; Lober 1998; Rocheleau et al. 1996; Ward 1999). In addition, many state managers have ideas for improving fish consumption advisory information and creating targeted risk communication, but feel they cannot implement these measures due to lack of resources such as time and money.

Because fish consumption advisories are not mandated there is a greater effort to work with the technical data produced from the mandated fish contaminant monitoring programs than to prioritize risk communication and outreach or link the fish advisory program with contaminant reduction efforts. The agencies responsible for fish consumption advisories rarely have specific goals or rigorous methodology for risk communication and lack the expertise necessary to undertake social science research. In addition, the separation of human and ecological/ecosystem health creates fish consumption advisory programs that are inconsistent among state and federal agencies and emphasize human health over providing information about science and the nature of different contaminants.

Getting the right message to the right audience is also theme throughout the media articles and transcripts. However, once again the public does not receive this message. For example, since 2002 the media highlights the fish on the joint FDA/EPA "do not eat" lists, however, not one person mentioned these fish during data collection events. This may be because the species of fish included in the federal advisory are commercial marine fish and people in the Upper Peninsula mostly eat fish from the Great Lakes or inland freshwater lakes, both sport-caught and commercial. This difference may cause U.P. residents to believe that the fish they eat are not contaminated with mercury because neither the media, nor the federal government talks about the species of fish they eat the most.

C. Media Frames

The media does not provide a consistent message about the benefits and risks of eating fish. This may cause confusion among the public since a majority of U.P. residents report that the media is their number one source of information about contaminants in fish (Figure 5.7). Although it is true that all media sources quote more people who accentuate the risks of consuming fish over the benefits (55% of all quotes), this does change over time from more risk-averse comments (1989-2004) to comments that place the benefits of fish consumption over the risks even for at-risk populations such as women of childbearing age and children (2004-2008).

The media frames contamination risk most often in terms of making claims that mercury does or does not pose a threat to human health (Figures 6.7,6.9). The media also focuses on the uncertainty surrounding the fish consumption advisory issue and the need to reduce mercury emissions from coal-fired power plants (Figures 6.10, 6.8). The frames presented in the media are not static; they change over time (see Boxes 6.1 and 6.2). However, they hardly help the public understand contamination or the benefits and risks of fish consumption. Articles and transcripts are event-based and almost never give a complete explanation of mercury contamination and fish consumption. One day an article can say that fish is dangerous for human consumption and a few days, weeks, months later an article will be published that says people should eat more fish.

Table 6.1 Newspaper Frames Over Time

Frames: 1988-1994

- Risk is from mercury in freshwater sport-caught fish
- Reduce Mercury Emissions

Frames: 1996-1998

- Uncertainty: does fish pose a threat to human health?
- Risks are for some women and children
- Reduce mercury emissions

Frames: 1999-2001

- Uncertainty: differing government regulation of mercury in fish
- Government not doing enough to protect human health
- Risk are for some women and children only

Frames: 2002-2003

- Uncertainty: How much is too much mercury? What is safe to eat?
- There are benefits and risks associated with eating fish
- Risks are from eating commercial fish
- Risks are for some women and children, all fish consumers, heart attack victims

Frames: 2004-2008

- Mercury poses a threat to human health
- Mercury does not pose a threat to human health
- Reduce mercury emissions
- Risk is from freshwater fish from inland lakes and commercial fish
- Risks is from fish on the do not eat list (shark, swordfish, tilefish and king mackerel) and tuna
- Government is not doing enough to protect human health
- The public is unaware of fish consumption advisory information
- Risk is for women of childbearing age and children, fish consumers, the wealthy, and Native and Asian Americans

Table 6.2 Television Frames Over Time

Frames: 2001-2003

- Uncertainty: How much is too much mercury? What fish is safe to eat?
- Risk is from mercury in commercial fish, tuna, swordfish, shark, king mackerel
- Reduce Mercury Emissions
- The public is unaware of fish consumption advisory information
- Risks are for some women and children, people who eat a lot of fish, heart attack victims
- Government is not doing enough to protect human health
- Balance the benefits and risks of consuming fish
- Risk is from mercury in commercial fish
- Eat fish low in mercury

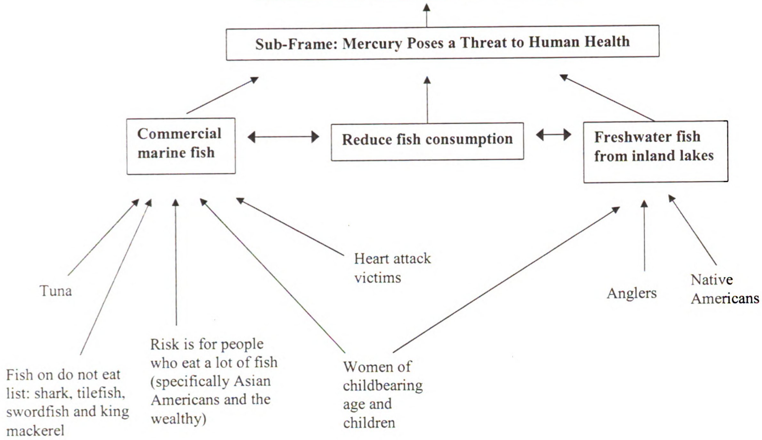
Frames: 2004-2008

- People should eat fish low in mercury
- Risk are commercial fish, fish on the FDA/EPA do not eat list (shark, swordfish, tilefish and king mackerel)
- Uncertainty: what are the risks and to what extent are different fish risky for different populations?
- The public is unaware of fish consumption advisory information
- Balance the benefits and risks of consuming fish
- Risk is for women of childbearing age and children, people who eat a lot of fish
- Risks are only the four fish on the FDA/EPA do not eat list for women of childbearing age and children.

1. Mercury Poses a Threat to Human Health

The media uses diagnostic framing tasks to establish who is at risk and what fish are contaminated. Mercury is framed as a threat to human health initially from freshwater sport-caught fish from inland lakes and increasingly from the consumption of commercial marine fish (Figure 6.7). Eating sport-caught fish is framed as a risk for anglers, and women of childbearing age (pregnant and nursing women), children, and

Figure 6.7 Media Frame 1: Human Health Issue

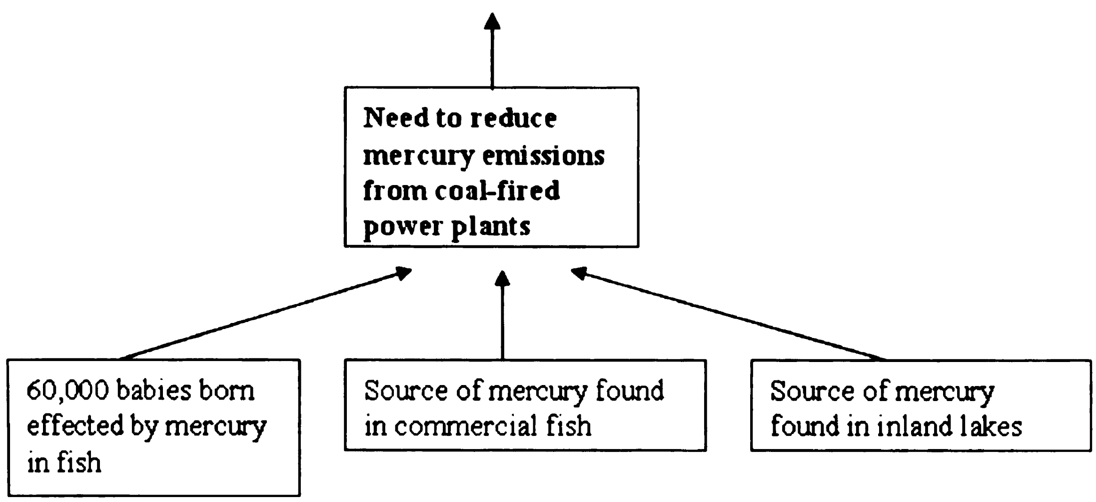


Native Americans. Eating commercial marine fish is framed as a risk for women of childbearing age, children, people who eat a lot of fish (male and female) and possibly heart attack victims.

The fact that women (pregnant or of childbearing age) and children are the at-risk group is also acknowledged by U.P. residents and agency managers. However, U.P. residents and agency managers, unlike the media, do not talk about fish consumption risks to people other than women and children. This is interesting since the state fish consumption advisory includes fish on the do not eat list for the general population as well as women of childbearing age and children under 15.

2. Mercury in Fish as an Environmental Health Issue

Figure 6.8 Media Frame 2: Environmental Health Issue



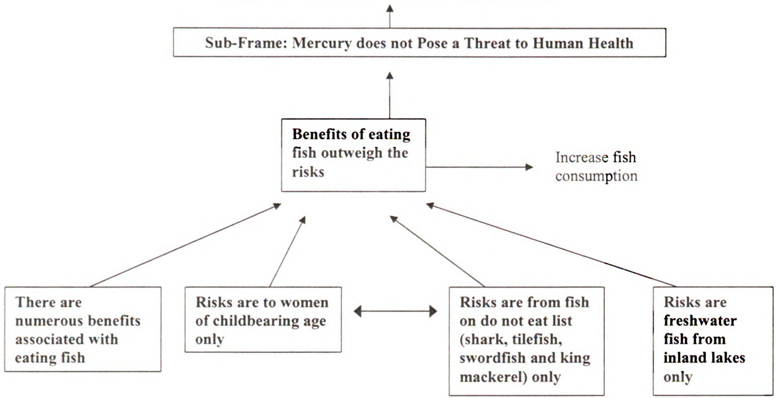
When the media talks about risk to human health they also often discuss the need to reduce mercury emissions from coal-fired power plants. The media talks about environmental health by accentuating the need to reduce mercury emissions from coal fired power plants. Many articles explain that the cause of mercury in both commercial and sport-caught fish is the mercury emissions from waste incineration and especially coal-fired power plants. Unlike federal risk communication the media often linked human and ecological/ecosystem health issues in terms of environmental (human) health. In fact, in several media articles and transcripts the explicit message was that mercury from coal-fired power plants needs to be regulated because mercury in fish harms babies.

3. Mercury Does Not Pose a Threat to Human Health

Many articles and transcripts use diagnostic frames to establish that benefits outweigh the risks of eating fish; prognostic frames to say that risks are only for certain populations or from certain fish; and motivational frames to encourage people to eat more fish. The majority of articles and transcripts mention the benefits of consuming fish (55% of articles (from 1988-Jan 2008) and 92% of transcripts (from 2001-Jan 2008)), such as, fish is heart healthy, good source of protein and a good source of omega-3 fatty acids. Some list species of fish that are low in mercury and/or high in omega-3 fatty acids. Some articles and transcripts say that mercury in fish is only a risk for women of childbearing age and children or from eating fish on the do not eat list. Others say that the risk is only for pregnant and nursing women and children in general. Some also say that the risk of mercury in fish is only from eating freshwater fish from inland lakes. Some of these articles and transcripts go as far to say that the benefits of eating fish outweigh the risks.

When the media discusses the benefits of eating fish they mostly use diagnostic framing to inform people that there are benefits of eating fish. However, motivational

Figure 6.9 Media Frame 3: Human Health Issue



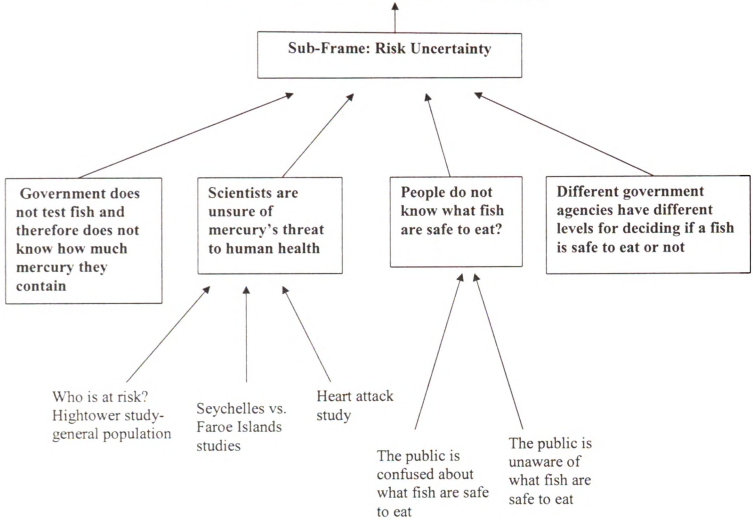
frames are also used to get people eat fish, while balancing the benefits with the risks of that behavior. Most articles and transcripts recommend that people eat fish, and in some cases, increase fish consumption to at least two or three fish meals per week. When articles and transcripts say that the benefits outweigh the risks of eating fish they still stress that women of childbearing age and children should avoid the fish on the FDA/EPA join mercury advisory do not eat list.

3. Uncertainty

The media also frames the mercury and fish consumption issue in terms of uncertainty. It uses diagnostic frames to establish that there is scientific uncertainty and that the public is unaware of the risks. It also uses prognostic framing to ascribe blame for and present solutions to this uncertainty. Many articles focus on the uncertainties of government regulation or the government's ability to know who is at risk or which fish are risky. Some articles focus on the fact that the FDA does not test for fish and therefore does not know which fish are the most contaminated. Other articles focus on the fact that different governmental agencies have different levels at which they tolerate mercury in fish for human consumption. However, the journalists often confuse the FDA's action levels for regulating fish in interstate commerce and the EPA's reference dose that the EPA believes will protect human health from pollutant concentrations in aquatic media, such as ambient waters and edible tissue (Borum et al. 2001).

Many articles (53%) and transcripts (44%) focus on the scientific uncertainty surrounding whether mercury in small doses poses a threat to human health and to whom more specifically it poses risks. The scientific uncertainty surrounding the issue is described in articles and

Figure 6.10 Media Frame 4: Human Health Issue



transcripts about the conflicting findings of the Seychelles and Faroe Island studies, two studies of the effects of mercury on heart attacks that have differing results, and the Hightower study that suggests the risks are not just for women and children, but that at high enough levels mercury in fish affects the population at large.

Three main factors affect the credibility of any frame. These factors are: consistency, empirical credibility and credibility of the frame articulators or claims makers (Benford and Snow 2000). The media emphasizes the lack of consistency and empirical certainty with which agency managers make decisions about fish consumption advisory information. The media also focuses on the lack of advisory knowledge and understanding among the public. The media also frames risk uncertainty in terms of the public's confusion about fish consumption messages. In this way media reporting may discredit the framing tasks of government agencies and support the frames of U.P. residents by reporting on the scientific uncertainty surrounding the issue, and focusing on the fact that people are confused or uncertain about advisory information.

3. Summary

The media frames the mercury and fish consumption issue in order to tell a story and inform people of the latest news in a way that is fair and balanced. This leads to confusing or mixed messages in the media. For example in one article a government agency manager can be quoted saying that fish is good to eat and people should eat more, while a few lines later people can read that 60,000 babies are born each year with harmful levels of mercury. Although agency managers all recognize that fish consumption has risks they all say that people should eat fish. However, the kinds of risk-benefits messages found in the media may serve to confuse the public more than they help sort out how to balance the benefits and the risks of eating fish. For example, one article can say that fish should be avoided while a few weeks later another article comes out saying that people should eat more fish.

III. Interactions of Framing Processes

A. Types of Framing Processes

All three study populations used the same types of framing processes (diagnostic, prognostic, and motivational) to frame mercury in fish, except the media (Table 6.3). Unlike U.P. residents and agency managers, when the media framed the human health risks of mercury in fish they also used motivational frames to incite people to change their fish consumption behaviors, to either eat less or more fish. Also, when the media frames the environmental health issues of mercury in fish, unlike agency managers, they use prognostic frames to ascribe blame for the problem. They most often blamed government agencies for not regulating mercury emissions from coal-fired power plants more strictly.

Since U.P. participants said that they receive the majority of their information from the media one can see how they may be confused about the safety of eating fish. One day the media tells people to eat more fish and then another day they say to eat less. The way agencies deal with fish consumption advisories adds to the confusion because there are two different types of fish consumption advisories. One at the state level that is geared towards anglers and focuses on sport-caught fish, and another at the federal level made for women of childbearing age that focuses on mercury in marine fish. And there is little to no collaboration or consistency between the state and federal advisories. Also, uncertainty is emphasized by U.P. residents (figure 6.3) and the media (figure 6.10), but not agency mangers.

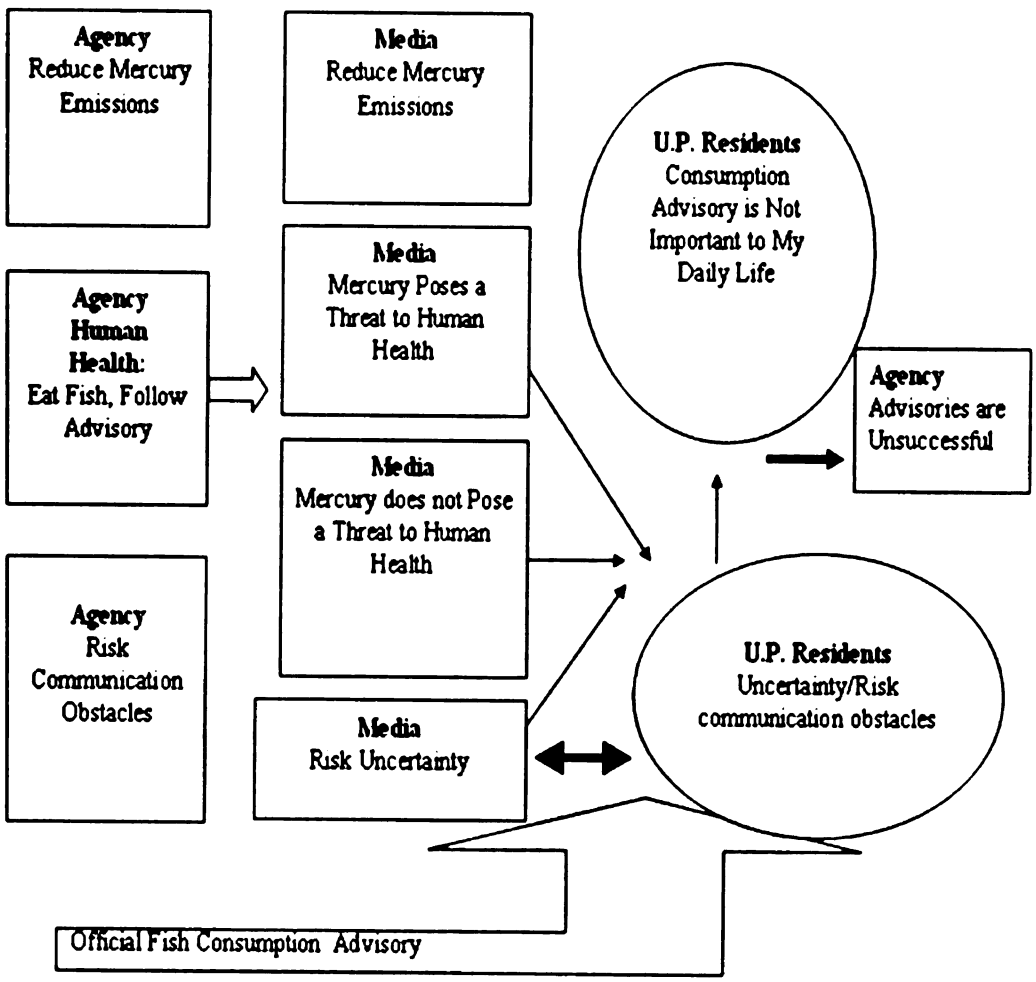
Table 6.3 Types of Framing Processes

	U.P. Residents	Agency Managers	Media
Human Health	Fish consumption is not important to my daily life Diagnostic Prognostic	Eat fish, follow advisory Diagnostic Prognostic	Mercury does not pose a threat to human health Diagnostic Prognostic Motivational Mercury poses a threat to human health Diagnostic Motivational
Ecosystem Health	Not discussed	Reduce mercury emissions Motivational	Reduce mercury emissions Motivational Prognostic
Risk Communication	Uncertainty about the risks of consuming fish Prognostic	Obstacles to Risk Communication Prognostic	Uncertainty about the risks of consuming fish Prognostic

B. Interactions of Information Gathering Framing Processes

The way fish consumption and contamination information is transmitted and framed by citizens, agency managers and the media results in unsuccessful advisory information outreach (Figure 6.11). Media information does not provide a clear view of safe fish consumption behavior. Agency managers focus on technocratic project driven agency science to make decisions and policy on contaminants in fish. As a result, citizens do not receive the information necessary to minimize risks and maximize benefits of

Figure 6.11 Information Gathering and Framing Processes



consuming fish. Women of childbearing age and children accrue great risks from contaminants in fish, but are not given sufficient information to make healthy decisions about eating fish. In addition, people do not have access to or control over the decisions and polices about what risks they face.

According to Bostron and Lofstedt (2003) effective risk communication includes: (1) knowing your audience and knowing the risk; (2) knowing what is and what can be done about it; and (3) testing your messages empirically, iterating the message and involving those concerned. No agency advisory risk communication strategy in this study includes these steps to address fish consumption advisories. The public cannot understand the benefits and risks of consuming fish if risk managers do not make more of an effort to a) understand who is actually at risk, b) understand how the public receives, interprets, and acts upon risk information; c) target audiences of concern in ways that are relevant to them; and d) involve audiences of concern in at least the risk communication process (Anderson et al 2004; Connelly and Knuth 1998; Burger 2000 2001, 2003, 2006, 2008; Imm et al. 2007; Jardine 2003; Johnson et al 2003; Knuth et al. 2003; Shimsack 2007; Tilden 1997).

IV. Whose Interests are (not) Served by these Frames?

A. Ineffective Advisories

The interests that are not served are those of the people for whom mercury in fish poses a real risk. The lack of quality fish consumption advisory information leads people in the Upper Peninsula feeling uncertain about their ability to make safe decisions about consuming fish (Figure 6.3). In addition, the interests women of childbearing age are not served by the way fish consumption advisory information is framed because they may miss out on the beneficial nutrients and Omega-3 fatty acids found in fish if they stop eating it.

In the U.P. informants feel that the risks of fish consumption and mercury contamination do not pertain to them. Therefore, government frames of eating fish, but following the advisory and reducing mercury emissions lack relevancy to the very people who they are trying to reach. As a result those at-risk are less likely to adopt this frame. In addition, the media reports on the uncertainty and confusion among the public, the lack of consistency among government regulations, and the uncertainty of government information; leading to an ever doubtful and confused public.

For example, the majority of participants from the Upper Peninsula (40%) chose the DNR as the most reliable source of information about fish consumption advisories. However, it is the MDCH that is responsible for the advisory. Interviewees at the DNR do not see fish consumption advisories or contaminants in fish as a part of their jobs.

When the public asks DNR personnel about fish consumption advisories, DNR staff members give the public their personal opinions about the risks of eating fish without giving official advisory information or talking about environmental health issues. The following article (Barta 2006) from a newspaper in Lower Michigan articulates this well. Also, even though the author knows the DCH is responsible for the advisory, he goes to a known source at the DNR.

To try and grasp a better understanding about safe fish consumption, I started by reading the 2005 Michigan fish advisory, which was put out by the Department of Community Health. To get a better understanding of what's stated in the book, I decided to call [DNR biologist], a well-respected fisheries biologist and supervisor working out of the DNR office in [Yourtown]. I know [DNR biologist], well and knew that I could rely on any information that he would give me. According to [DNR biologist], approximately 80 percent of the PCB chemicals found in fish are found in fatty tissue. Proper cleaning and cooking methods will definitely lower contaminates well below an acceptable level," said [DNR biologist]...If the majority of fat is removed when the fish is cleaned and the rest is allowed to drip away during cooking, such as it does during baking or broiling, there should be very little to worry about when eating most fish. So there you have it. If the fish is properly cleaned and cooked, you can eat enough to start developing the same roll over your belt that I'm working on.

Asking the DNR for fish consumption advisory information may lead to risky fish consumption behavior because, as this article shows, not all DNR employees give sound fish consumption advice. While persistent organic pollutants can be reduced by trimming and certain cooking methods, heavy metals like mercury cannot. Since many people believe that the DNR is responsible for the fish consumption advisory, they may interpret the lack of official advisory and contaminant information in the fishing regulations and from DNR employees as a lack of importance of the advisory and pollution reduction (deamplification of risk), even though all DNR interviewees said it is important that people follow the advisory.

In addition, the current fish consumption advisory does not appeal to the very audiences it is trying to inform. U.P. informants said that the official fish consumption advisory booklet is cumbersome and boring to read. People did not want to take the time to look up all of the different fish. They wanted a message that is more streamlined and easy to remember. They also asked for information about where contaminants originate and how they affect humans and the environment. This is difficult because government agencies currently use “government-speak” to create risk communication including fish consumption advisories (Chess et al. 2005).

Government-speak is a bland, generic style of writing that neglects linguistic and cultural factors that affect the usefulness or acceptability of risk communication messages in different communities (Chess et al. 2005). The following passage from the Michigan Fish Consumption Advisory (2007), which is entirely printed and shown on the website in black and white with single spaced text, is an example of such government speak.

- **No one should eat** more than one meal a week of rock bass, yellow perch or crappie over 9 inches in length from inland lakes, reservoirs or impoundments in Michigan.
- **No one should eat** more that one meal a week of largemouth bass, small mouth bass, walleye, northern pike or muskellunge of any size from inland lakes, reservoirs or impoundments in Michigan
- **Women who are pregnant or may become pregnant in the future and children under 15 years old should not eat** more than one meal per month of rock bass, yellow perch or crappie over 9 inches in length from inland lakes, reservoirs or impoundments in Michigan
- **Women who are pregnant or may become pregnant in the future and children under 15 years of age should not eat** more than one meal per month of largemouth bass, smallmouth bass, walleye, northern pike or muskellunge of any size from inland lakes, reservoirs or impoundments in Michigan.

Although the majority of participants do not eat enough of the particular kinds of fish to presumably cause alarm (1-5 fish meals per month) they are unaware of good fish consumption choices, including which fish contain the least contaminants and which fish provide the most abundant beneficial nutrients. Given that agency managers see the purpose of the advisories as an informed public able to make safe choices to balance the benefits and risks of consuming fish (figure 6.3), this is a major policy gap.

In addition, the process of government science and fish consumption advisory information creation and dissemination lacks rigor and evaluation. The process of government science resembles what Freeman (2007) calls epistemological bricolage. It is a hodge-podge of learning practices that lacks reflexivity and evaluation. The different models, missions, and rationales used by each agency to develop fish consumption advisory information does not allow a lot of space for collaboration and consistency. What is accomplished is done so out of political will more than as an attempt at scientific rigor, or quality risk communication.

The uncertainty surrounding fish consumption risks (e.g. Faroe Island vs. Seychelles Islands) and the heavy risk of childhood developmental problems makes fish consumption advisories a case of post-normal risk. In order to improve the relevancy and ease of information about contaminants in fish, the focus needs to be shifted from what is the risk, to what is our knowledge about risks, and, how we can best use our various systems of knowledge to improve democratic decision making over risk choices (Rosa 1998). Therefore, agency managers need to be aware of the cultural context within which people understand and make decisions about risk.

Risk assessment and management in post-normal risk should be epistemologically inclusionary, embracing an extended range of paradigms, perspectives, and stakeholders with alternative claims to knowledge (1998:41). However, risk assessment and management for contamination in fish is done in a purely technocratic agency setting with little public involvement, except, at times, ad-hoc focus groups. Agency managers believe they know who is really at risk, but make little effort to reach out to who they call "sensitive populations" to understand the ways in which they receive and interpret information, and lack the expertise to carry out a successful fish consumption advisory program. State and Federal advisories fail to adequately help people choose among the benefits and risks of consuming fish and leave out a discussion of solving contamination problems.

There is no shortage of research stressing the importance of targeted risk communication that is appropriate for the intended at-risk audience (Beehler 2001; Burger 2000, 2001; Burger and Gochfeld 2006; Connelly and Knuth 1998; Shimsack 2007). There is even research that sorts out the types of risk-benefit information for which the public is most receptive (Knuth et al 2003). Government managers and scientists should not say that balancing the benefits and risks of consuming fish is a difficult risk communication message without implementing these types of researched benefit-risk messages or any kind of evaluation.

Although Upper Peninsula residents generally eat amounts of fish that are not considered risky, if a woman of childbearing age eats walleye once a week that could generate harm. State and national advisory programs must take into account who is actually at risk and who will receive the most benefits from consuming fish. To communicate the risks and benefits of fish consumption in a just manner, government agency managers and scientists must then develop targeted risk and benefit information in collaboration with other governmental agencies as well as the groups who are at risk.

Also, when agency managers create risk communication, partial understandings of risk become definite levels of what is safe. For example, estimates of fish contamination and body burden become concrete contaminant trigger levels in fish, translated into definite numbers. If agency managers people to make informed decisions, like they said they did, then they need to communicate that fish consumption advisory information is uncertain. Giving the public a choice may mean risk communication states what is known and what is unknown and lets people make decisions from there. Why is it a problem if people stop eating fish? What are the risks of people not eating fish? Agency managers mostly take these questions for granted, or do not feel that they have the resources or political will to find the answers.

V. Implications for Gender and Justice

A. Ineffective Advisories

Gender, along with class, race, culture and ethnicity are critical variables in shaping resource access and control. In addition, knowledge about the environment is stratified among these variables (Haraway 1989, 1992, 2001; Rocheleau et al. 1996). For example, women and child informants in the U.P. were less knowledgeable than adult males about what fish are most contaminated. Contaminants in fish are controlled by government agency managers and the industries that create them. Fish advisory contaminant information fails to inform the public in order to enable them access to or control of regulating contaminants in fish.

Government scientists and managers are responsible for a number of projects competing for resources, especially time (state and federal) and funding (state). Their knowledge is situated within the confines of government techno-science with objective driven project-based goals and outcomes that fail to consider the "body as an agent and not just a resource politics of the body" (Haraway 2001:181). Agency managers are also subject to the political pressures of the policy making environment. As a result fish consumption advisories are not suited to the ways women (especially those of childbearing age) and children receive and understand advisory information, even though they are singled out as the at risk populations.

However, not all women are the same. Agency scientists are trained in certain ways that fail to consider the differences among individuals in meaningful ways (Haraway 1991; Rocheleau et al 1996; Verchick 2004). The types of risk messages agency managers develop are often inappropriate (advisories for sport anglers only) and either confuse people (too long or use language that is boring) or fail to reach them altogether (like in the U.P.) (Haraway 1991; Rocheleau et al 1996; Verchick 2004).

Agency managers are trying to provide people with the best information possible using the best science possible; however, they do not acknowledge what they deem to be the best science possible is a result of their experiences, training, and job responsibilities. As Haraway says (2001, pg. 179) the translation of science is always interpretative, critical and partial; therefore an epistemology and politics of engaged accountable positioning is needed. However, engaged and accountable positioning rarely takes place for a number of reasons that are often not the fault of agency managers.

Only one agency manager specifically mentioned targeting information for women because they are "the gatekeepers of the kitchen". However data show that more men (75%) than women (25%) know about fish preparation techniques that reduce the levels of persistent organic pollutants, such as PCBs, but not mercury. In addition women are less knowledgeable about what fish are the most contaminated.

The joint FDA/EPA advisory specifically designed for women of childbearing age does give a relatively simple message especially compared to the state advisory. However, the species of fish covered by the joint mercury advisory are not the types of species U.P. residents reported consuming the most, therefore, they may likely ignore the advisory or believe that fish consumption advisories do not concern the species of fish they eat. Women in the Upper Peninsula may be more likely to eat lake trout, a fish relatively high in mercury, than any of the fish listed by the joint mercury advisory. Lake trout also serve as the most abundant and popular recreational catch in Lake Superior. However, they may think that lake trout does not have mercury because it is not listed in the joint advisory.

Even without knowing who eats enough fish to be at risk, agency managers believe that the risks to the developing fetus and children are the most important. Therefore, agency managers need to do more to understand how women of childbearing age and parents receive, interpret, and act on risk information. Many participants said that the official state advisory booklet is too long or boring to read in its entirety. In addition, because they do not read through the official advisory, many women simply stop eating fish as a response to hearing about risks. This behavior is not necessarily the best since there are numerous benefits to consuming fish even while pregnant. In addition the majority of women get their information about fish consumption advisories from the media. Therefore they may become confused by the vague or changing risk-benefits messages in the media.

VI. Suggestions for Improving Environmental Policy and Decision Making

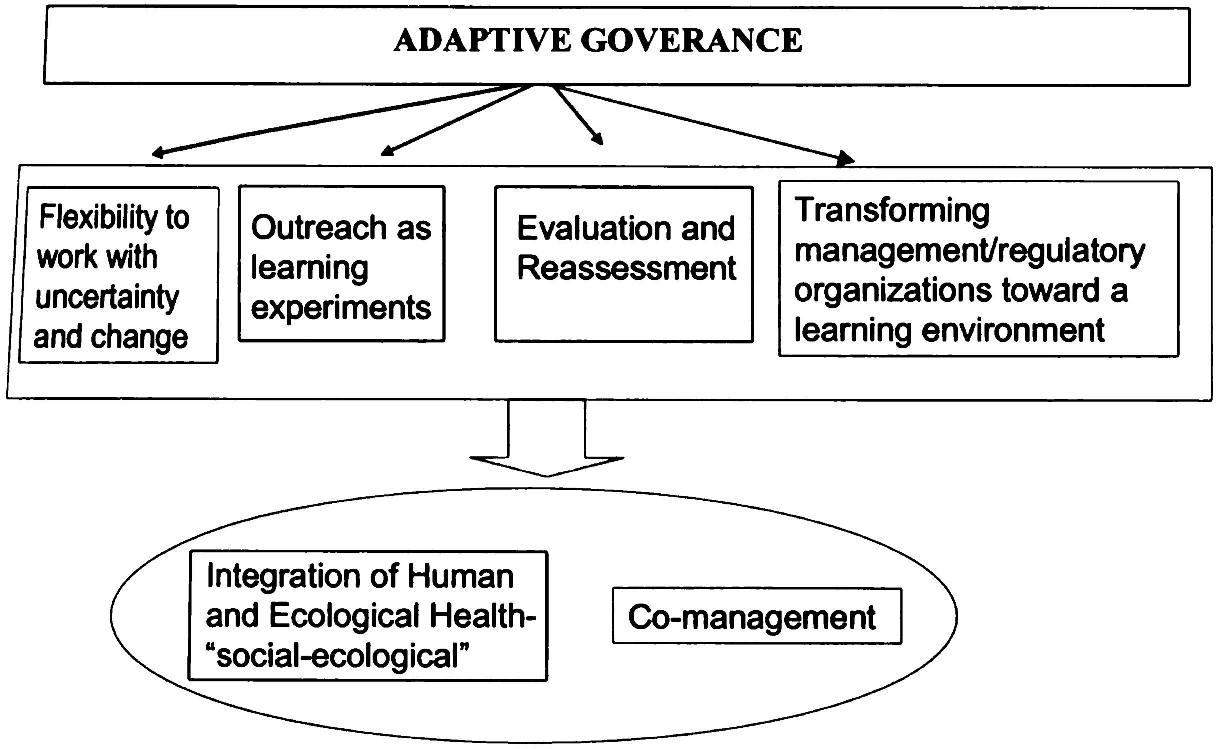
Fish consumption advisories fail to inform people in a way that helps them, especially those at greatest risk (women and minorities), make good decisions about eating and avoiding fish. In addition, people do not have control over the decisions and policies about what risks they face. So, what can be done without resorting to the traditional one-way scientific monologue (from expert agency mangers to the unknowing public) type of public participation? I propose the use of adaptive governance as a means to gather information about "our various systems of knowledge" and "improve democratizing decision making over risk".

A. Long-term Solutions: Adaptive Governance

Normally adaptive management is used in natural resource management when managers must make decisions about best management practices in spite of uncertainty and complexity of the environment (Henriksen and Barlebo 2008; Holling 1978; Lee 1993; Schreiber et al. 2004). It is often described as "learning by doing" as it treats management decisions and practices as experiments that exist outside the control of laboratory settings to reduce uncertainty. It uses modeling to set up different management scenarios and brings stakeholders together to debate, deliberate, and discusses possible management solutions (Henriksen and Barlebo 2008; Holling 1978; Lee 1993; Schreiber et al. 2004).

Adaptive governance incorporates the human dimensions of shaping ecosystem processes into the management equation (Folke et al. 2005) Governance is the process of connecting individuals, organizations, agency and institutions at multiple organizational levels (Folke et al. 2005). This requires social capital to facilitate collaboration, conflict resolution and enable legislation and co-management (idem). Adaptive governance would then organize stakeholders as social networks that draw on different expertise, knowledge and experience to develop common understandings and co-management of environmental problems (Figure 6.12).

Figure 6.12 Process and Outcomes of Adaptive Governance



This type of process could greatly improve the fish consumption advisory and risk communication in general. The goals of these policy experiments would be two fold. The first goal is to inform citizens, especially those at high risk, so they are able to make their own knowledgeable decisions about consuming fish even if that means they choose to make the unhealthy decisions. Some people may choose to eat fish even though they know that it is unsafe. The importance and difference from current fish consumption advisory processes is that the goal of information outreach is to give decision makers all of the information necessary to understand whether or not they are the fish they eat are safe. The second goal of this adaptive governance processes would be to build social capital with diverse stakeholders and learn to work together to solve environmental problems.

Table 6.4 Findings from Past Research

- Need targeted risk communication for different populations
- Risk information about sport-caught fish in not adequate
- Who is at risk?: Asian Americans (Tilden et al 2004), Latinos (Beehler 2003), the wealthy (Tilden et al. 2004), people who eat a lot of fish, women of childbearing age and children.
- Fish consumption advisories for anglers-only is insufficient
- Work with information gatekeepers: medical professionals, schools, charter boat captains, women's centers, health clinics, fish purveyors
- Use risk communication experts
- Use risk-risk and risk-benefit information
- Risk communication should "speak the language" of targeted groups
- People are aware of fish consumption advisories, but do not have specific information
- People have few concerns about eating fish
- People use prior experience to develop beliefs about the risk of eating fish
- People use mental models of cleanliness or fish health
- Personal and institutional factors influence how people respond to advisory information

Using adaptive governance agency managers, together with stakeholders, can call upon the plethora of scholarly work on communicating the benefits and risks of consuming fish (Table 6.4) in addition to information brought to the discussion by stakeholders, to rigorously and thoughtfully develop policy and management options. Agency managers and stakeholders/collaborators would then implement the management options and policy goals chosen at the end of this process as policy experiments.

The process of adaptive management serves as an alternative to epistemological bricolage. Instead of creating knowledge through a processes of "successive crafting, assembling and literally making sense of different bits of information and experience, often creating something new from what they have acquired secondhand (Freeman 2007:476)," adaptive governance would organize and institutionalize these learning practices so that decision makers and stakeholders can act, model, and build upon them in a way that is reflexive, evaluated, and integrated into the institutional (organizational) memory for future use.

In order to be truly effective these processes must be carried out in a space that is mindful of issues of gender and equality. As feminist scholars point out, the dominant scientific world-view that values atomism and objectivity enforces the dualities of women with men and humans with the environment, ignores racial differences, and preserves inequalities (Buckingham-Hatfield 2000; Merchant 1996). These scholars also highlight that not all people interact with their bodies and environment in the same ways, given different factors that impact their health and lifestyle like poverty, geography, history of illness, and occupation (Haraway 2001; Lober 1998; Rocheleau et al 1996; Ward 1999). Current technocratic and scientific government advisory processes do not allow for these variances.

Therefore, it cannot be expected that 1) even with inclusionary epistemologies and stakeholder involvement agency decision making would result in more effective risk communication for disenfranchised populations such as women, children and minorities and those deemed at risk; 2) all at-risk populations respond to advisory information in the same way; and 3) that all people are equally at-risk or equally reap the benefits of eating fish. To overcome the biases of technocratic and scientific practices, agency managers must be aware that the translation of science is always interpretative, critical and partial, and should be reflexive of why they do what they do.

1. Example of Possible Adaptive Governance Outreach Outcome

At the end of the stakeholder process managers may decide to develop age appropriate classroom lessons (K-Middle School) for children 15 and under as a way to target this important at risk group. Managers along with stakeholders would develop the lessons in such a way that fish consumption and contamination knowledge is tested before and after implementation. At the end of the implementation period managers would collect data to see if classroom lessons increase participants' knowledge of environmental pollution and fish consumption advisories. Managers would use these results, along with new scholarly information, to reassess hypotheses and policy goals leading to new management experiments. If the lesson is unsuccessful, it is not a 'policy bad'. It is treated as a learning tool upon which to alter and improve current management strategies.

Ideally management options and policy goals are developed with stakeholders; however in practice often only policy goals are set with stakeholders. Management options are often left to the scientists. I support the vision of adaptive management in which the scientist or agency manager takes the place of stakeholder, instead of running the show as an expert. This requires outside expertise to facilitate the meeting at which management options are developed and policy goals are defined.

B. Short-term: Improving fish consumption advisories state-wide

People want a straightforward message about eating fish that allows them to make safe choices when deciding what fish to eat. Also, if choice is important to agency managers, as they reported it is, the public needs to be aware of the uncertainty surrounding fish consumption information even if that means that some people will stop eating fish. That should be a choice people are allowed to make. However, the quality of risk communication should be such that people fully understand the risks of their behaviors, unlike now, where people feel that they are doing the right thing by avoiding fish while pregnant.

Upper Peninsula residents, especially women, reported that they get the most of their advisory information from the media; the second most common answer was the Department of Natural Resources. Although participants may be wary of what they read in the media or the action of the DNR, these two actors may be good outlets for advisory information. Even though the DNR does not see fish consumption advisories as their responsibility, many U.P. residents believed the DNR develops and distributes advisory information. Collaboration among the Department of Community Health and the DNR may provide an effective way to reach Upper Peninsula residents about contaminants in fish.

C. Short-term: Improving fish consumption advisories in the U.P.

Local newspapers in the Upper Peninsula may be a great way to reach people in the U.P. Given their preference for all things local, U.P. residents may be more likely to trust information read in local newspapers, which are often looking for information to fill their pages. A quick and inexpensive way to better reach women of childbearing age of the U.P. may be for the DCH to write an article to be published in all local newspapers (~ 14), as long as it is not the only method of advisory risk communication. These articles should include that 1) cooking and cleaning methods do not reduce mercury, 2) people should eat a variety of fish in moderation, 3) most risks are to women of childbearing age and children because of fetal and childhood development problems, but these groups should eat some fish because it is also beneficial to fetal and childhood development, and 4) mercury in fish comes mostly from current pollution from coal-fired power plants.

Chapter Seven

Conclusion

I. Conclusion

Currently there is no evaluation of risk communication efforts or public participation included in fish consumption and contamination projects. Government agencies focus on techno-science to make decisions about fish consumption advisories. Media articles and transcripts focus on the uncertainty over fish contamination and fish advisory science. My question is then, why make advisories if those who are at risk do not get the message?

Also, the separation of human and ecological health issues leads to issue-based problem solving (e.g. fish consumption advisory projects are different and separate from fish management and contaminant regulation projects) instead of holistic management of the ecosystem, including human beings. Ecological change, ecologically viable livelihoods and sustainable development depend on the equal access and control of resources (Rocheleau et al. 1996). However, not all areas of policy are treated equally. This is a major stumbling block towards future sustainable environmental policy.

II. Bridges to the Big Picture: Connecting Human and Ecological Health

Another way fish consumption advisories fail to serve the public is by not serving the interests of environmental health. If people were more knowledgeable about the scientific information of contaminants, for example, water and contaminant cycling and processes of bioaccumulation and biomagnification, they might be able to make safe decisions about eating fish without having to explicitly read the advisory. In addition, increased public knowledge of environmental problems such as pollution and fish contamination may cause people to reflect upon their lifestyles and the use of harmful and toxic substances. It may help push for greater pollution/contaminant reduction efforts and a greater application of the precautionary principle in government decision-making and policy.

Fish consumption advisories should be a part of the discussion to find solutions to pollution problems. When we talk about fish consumption advisories we should also talk about, for example, alternative energy or "clean coal" (if such as thing exists) technology to replace the current mercury emitting coal-fired power plants. Since government science and policy does not look at contamination issues holistically we as a society never get to have discussions about what we risks we are willing to accept and what risks we wish to do without; in addition to what the possible solutions to these problems might be.

Instead of a risk society we are an ecological society, where issues of environmental health cannot be separated from issues of human health. To do this is to put certain interests, most notably those of techno-science, before those of the planet and its citizens. Issues of human and environmental health must be integrated together into sectoral policies such as transportation, commerce, and energy. There is a need for increased multi-disciplinary competencies in government agencies and holistic approaches to environmental and human health. As Haraway (1992) says, "we must find another relationship to nature besides reification and possession…it is not a happy ending we need, but a non-ending".

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III. Limitations of this Study

A. Institutions Left Out of the Study

One important institution that has been purposefully left out of this study due to time constraints is academia. Academia is an interesting entity in the mercury story because of its role as expert knowledge provider and educator. Academia trains and educates organization, agency, and industry scientists, decision-makers, and employees. Therefore preexisting institutional philosophies and biases for certain pedagogies, techniques, and technologies will be transferred to these individuals through the way they were educated.

In addition, academic studies can be funded and possibly influenced by government agencies, industry, environmental organizations, and communities. The information or knowledge created as a result of this funded research can then become evidence for social actors to use one frame over another and discredit other actors. In addition, the information created by the academy often becomes channeled through the media and is therefore made available to the general public.

In addition to academia I have also left out environmental groups and the fish industry, both commercial and sport, from my study. While these two groups have stakes in the mercury and fish issue, I feel that they are not the most primary sources of knowledge creation and dissemination, even thought U.P. informants listed fish purveyors as a trusted source of information. Given more time and resources, understanding the framing effects of these groups on the mercury issue would be a worthwhile pursuit and an impetus for future research.

Elected government officials are also neglected by this study since they are not directly involved with the risk characterization and communication of fish contamination/fish consumption advisories. However, understanding the framing practices of state and federal elected officials about contaminants in fish is a worthwhile pursuit for future research. This group is important because they help control the spending and policy practices of government agencies and are directly accountable to the public.

The Agency for Toxic Substance and Disease Registry (ATSDR) and the Michigan Department of Agriculture (MDOA) are other Federal and State agencies respectively, that peripherally work with fish consumption advisory information. However, they do so to a much less extent than the five agencies chosen for this study. Therefore, nobody from the ATSDR or MDA was interviewed for this study. In addition, the ATSDR funding this research and including their agency may bring about conflicts of interest.

B. Methodological Limitations

One limitation of this study is that the focus group/community dinner facilitator was not always the same, nor did the facilitators have the same gender or ethnicity. In addition, one facilitator is more experienced with facilitating focus groups and thus may have run the session more smoothly and procured better information. All of these factors could affect research results. However, there is reason to believe that these factors did not overly influence responses since, in every focus group and community dinner people made similar types of comments and reflections.

Another factor that may influence the quality of the work is the positionality of the author as a young woman who is an environmentalist and feminist critical of government science. Also, my status as a native of the Upper Peninsula may cause me to take certain things for granted or overlook some types of data due to the prejudices and biases that come with being “a local”. My position as a non-biophysical scientist may also cause misinterpretations and misunderstandings of scientific jargon during the interviews with agency scientists and managers. However, I am conscious of the biases I may bring to my analysis and therefore make the best efforts at opening my data and analysis to critique. No data are free of bias. To overcome that we researchers must be aware of our preconceived notions, prejudices, philosophical and theoretical attachments.

APPENDICES

APPENDIX A:

UCRIHS CONSENT PROTOCOLS

APPENDIX A 1.1: CONSENT FORM- FOCUS GROUP

Improving Fish Advisories in Michigan's Upper Peninsula

We are concerned about people eating potentially contaminated fish throughout the state of Michigan. We would like to improve the communication of the benefits and risks of eating fish in Michigan's Upper Peninsula. In order to improve communication we need the ideas, knowledge and opinions of people who consume, produce or distribute fish harvested in the Upper Peninsula. This study led by Dr. Geoffrey Habron at Michigan State University, plans to determine the informational needs of people and to develop a small project to improve communication of benefits and risks. To pay for this project we received money from the Agency for Toxic Substances and Disease Registry within the U.S. Department of Health and Human Services.

We would like you to participate in an activity that will provide ideas for the research that we conduct. We will use focus group discussions where a group of people sits around a table and shares their knowledge and concerns regarding eating fish. We will include up to 12 people in each group. We will have separate groups for sport fishermen, commercial fishermen, women, charter boat captains, youth, health department and medical professionals. Each may have different concerns about eating fish. The focus group interview will last approximately 2 hours. The interview will be audio taped to assist in correcting our notes. Following the focus group we will discuss your experience and share more about the research project. For your participation in our focus group, we will offer you a $20 gift certificate to a local store upon completion of the discussions.

We will make sure that no one outside of the group will know what you shared since your name and identity not be used in any reports. We will use the audio recordings and notes to describe everyone's concerns and provide us suggestions to help our research. You will have the opportunity to look at any of our reports prior to our sharing or using the information. We will report our findings in scientific articles and popular articles such as newspapers. Your privacy will be protected to the maximum extent allowable by law. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or leave the study at any time without any penalty.

If you have any questions about this study, please contact Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have questions or concerns regarding your rights as a study participant, or are unhappy at any time with any aspect of this study, you may contact - without using your name, if you wish - Peter Vasilenko, Ph.D., Director of Human Research Protections, (517)355-2180, fax (517)432-4503, e-mail irb@msu.edu, mail 202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047.

By signing this form, you are agreeing to your voluntary participation in today's focus group and granting your permission for us tape-record you to ensure an accurate description of the discussion.

______________________________	______________________________
(Print Name)	(Sign Name)

____

(Signature of principal investigator or authorized representative)

________________(Date)

APPENDIX A 1.2: CONSENT FORM- FOCUS GROUPS, PARENTAL CONSENT

Improving Fish Advisories in Michigan's Upper Peninsula

Dear Parent or Guardian,

Currently there exist advisories regarding eating potentially contaminated fish throughout the state of Michigan. There is a need to improve the communication of the benefits and risks of eating fish in Michigan's Upper Peninsula. Key to the success of improving communication is obtaining the unique input, knowledge and diverse views of those who consume, produce or distribute fish harvested in the Upper Peninsula. This study led by Dr. Geoffrey Habron at Michigan State University, plans to determine the informational needs of vulnerable populations and to develop a pilot project to improve communication of benefits and risks. Funds for this project originate from the Agency for Toxic Substances and Disease Registry within the U.S. Department of Health and Human Services.

The focus group interview will last approximately 2 hours. The interview will be audio taped to assist in correcting our notes. Following the focus group we will discuss our experience and share more about the research project. For her/his participation in our focus group, we will offer her/him a $20 gift certificate to a local store upon completion of the discussions.

You may be assured that your child's responses will remain completely confidential, as references to her/his identity will be deleted from any reports or transcriptions. We will use the audio recordings and notes to develop a summary of concerns and suggestions to guide our research. You will have the opportunity to review any of our summaries prior to our distribution or use of the information. We will report our findings in research and popular articles. Your child's privacy will be protected to the maximum extent allowable by law. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or withdraw from the study at any time without penalty.

If you have any questions about this study, please contact Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Peter Vasilenko, Ph.D., Director of Human Research Protections, (517)355-2180, fax (517)432-4503, e-mail irb@msu.edu, mail 202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047.

By signing this form, you are acknowledging your child's voluntary participation in our focus group and granting your permission to be tape-recorded to ensure an accurate record of the discussion.

I agree to allow my child, ________________________, to participate in the fish consumption advisory focus group.

Parent/Guardian signature

____Date:

Parent/Guardian name (please print)

____

APPENDIX A 1.3: CONSENT FORM- COMMUNITY DINNER

Improving Fish Advisories in Michigan's Upper Peninsula

Community Dinners

We are concerned about people eating potentially contaminated fish throughout the state of Michigan. We would like to improve the communication of the benefits and risks of eating fish in Michigan's Upper Peninsula. In order to improve communication we need the ideas, knowledge and opinions of people who consume, produce or distribute fish harvested in the Upper Peninsula. This study led by Dr. Geoffrey Habron at Michigan State University, plans to determine the informational needs of people and to develop a small project to improve communication of benefits and risks. To pay for this project we received money from the Agency for Toxic Substances and Disease Registry within the U.S. Department of Health and Human Services.

We would like you to participate in an activity that will provide ideas for the research that we conduct. We will use community dinners where a group of people from your community sits around tables and shares their knowledge and concerns regarding eating fish. Each person may have different concerns about eating fish. The dinner discussion will last approximately 2 hours. We will audio tape the discussion to assist in correcting our notes. Following the dinner we will discuss your experience and share more about the research project. For your participation in our project, we will offer you a $20 gift certificate to a local store upon completion of the discussions.

We will make sure that no one outside of the group will know what you shared since your name and identity not be used in any reports. We will use the audio recordings and notes to describe everyone's concerns and provide us suggestions to help our research. You will have the opportunity to look at any of our reports prior to our sharing or using the information. We will report our findings in scientific articles and popular articles such as newspapers. Your privacy will be protected to the maximum extent allowable by law. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or leave the study at any time without any penalty.

If you have any questions about this study, please contact Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have questions or concerns regarding your rights as a study participant, or are unhappy at any time with any aspect of this study, you may contact - without using your name, if you wish - Peter Vasilenko, Ph.D., Director of Human Research Protections, (517)355-2180, fax (517)432-4503, e-mail irb@msu.edu, mail 202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047.

By signing this form, you are agreeing to your voluntary participation in our project and granting your permission for us to tape-record you to ensure an accurate description of the discussion.

_______________________________ _______________________________

(Print Name) (Sign Name)

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(Signature of principal investigator or authorized representative)

_________________(Date)

APPENDIX A 1.4: CONSENT FORM- LIFE OF LAKE SUPERIOR PROGRAM 2004- PARENTAL CONSENT

Improving Fish Advisories in Michigan's Upper Peninsula
(Life of the Lakes parental consent)

Dear Parent or Guardian,

Currently there exist advisories regarding eating potentially contaminated fish throughout the state of Michigan. There is a need to improve the communication of the benefits and risks of eating fish in Michigan's Upper Peninsula. Key to the success of improving communication is obtaining the unique input, knowledge and diverse views of those who consume, produce or distribute fish harvested in the Upper Peninsula. This study led by Dr. Geoffrey Habron at Michigan State University, plans to determine the informational needs of vulnerable populations and to develop a pilot project to improve communication of benefits and risks. Funds for this project originate from the Agency for Toxic Substances and Disease Registry within the U.S. Department of Health and Human Services.

During the Life of Lake Superior program, we would like your permission to allow your child to participate in a fish consumption advisory activity. The activity teaches kids about how aquatic animals get food and how pollution can get passed along through the food web. We will ask each child about their knowledge of food webs before and after the activity to see how well the activity helps the children understand what they can do to maximize the benefits and reduce the risks of eating fish. They can then share their thoughts on the activity. The activity and questions will last approximately 1 hour. Following the activity we will discuss our experience and share more about the research project.

We think your child will benefit by getting information about the animals in the Great Lakes and learning how to maximize the benefits while minimizing the risks of eating fish. We do not anticipate any risks for participating since these activities are those assembled by educators and designed for use in Michigan schools.

You may be assured that your child's responses will remain completely confidential, as references to her/his identity will be deleted from any reports or transcriptions. You will have the opportunity to review any of our summaries prior to our distribution or use of the information. We will report our findings in research and popular articles. Your child's privacy will be protected to the maximum extent allowable by law. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or withdraw from the study at any time without penalty.

If you have any questions about this study, please contact Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Peter Vasilenko, Ph.D., Director of Human Research Protections, (517)355-2180, fax (517)432-4503, e-mail irb@msu.edu, mail 202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047.

By signing this form, you are acknowledging your child's voluntary participation in our activity.

I agree to allow my child, ________________________, to participate in the fish consumption advisory activity.

Parent/Guardian signature

____Date:

Parent/Guardian name (please print)

____

APPENDIX A 1.5 CONSENT FORM- ANGLER INTERVIEW

Improving Fish Advisories in Michigan's Upper Peninsula
Angler Interviews Oral Consent Script

Hi, I am working with Michigan State University to collect information about what anglers think about the benefits and risks of eating potentially contaminated fish in the Upper Peninsula. We are trying to determine the informational needs of anglers to improve communication of benefits and risks in the future. We would like to know if you would be able to spend 5 minutes answering a few questions about catching and eating fish.

We will report our findings in scientific articles and popular articles such as newspapers. Your privacy will be protected to the maximum extent allowable by law. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or leave before we are finished without penalty.

We will give you this postcard if you have any further questions or issues about our project or the information you provide today.

If you have any questions about this study, please contact Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Peter Vasilenko, Ph.D., Director of the Human Research Protection Program (HRPP) at Michigan State University, by phone: (517) 355-2180, fax: (517) 432-4503, email: irb@msu.edu, or regular mail: 202 Olds Hall, East Lansing, MI 48824.

U.P. Fish Advisory Angler Interview Log

Date	Location	Time	Consent (yes or no)	Comments

APPENDIX A 2.1 CONSENT FORM: GOVERNMENT AGENCY INTERVIEW

Improving Fish Advisories in Michigan's Upper Peninsula
Government Agency Oral Consent Script

First, let me say that what you say here is confidential. Nothing you say will ever be associated with your name. The purpose of this project is to improve the communication of the benefits and risks of eating fish in Michigan's Upper Peninsula. This study, led by Dr. Geoffrey Habron at Michigan State University, is funded by the Agency for Toxic Substances and Disease Registry within the U.S. Department of Health and Human Services. This interview will last approximately one hour and a half. If possible, this interview will be recorded using a digital audio recorder. We will use the audio recording and notes to help with data analysis. We will report our findings in scientific articles and popular articles such as newspapers. You will have the opportunity to review our reports before publication if you so desire. Your privacy will be protected to the maximum extent allowable by law. You will have the opportunity to look at any of our reports prior to our sharing or using the information. Participation is voluntary and you may choose not to participate at all, refuse to answer certain questions or leave the study at any time.

Your participation in this study will help us provide recommendations to improve the fish consumption advisory process which, we believe, is good for the people of Michigan. We may also be able to share data with you in order to help your agency assess the status of the Michigan fish consumption advisory program. This is an opportunity to better inform the public about the fish consumption advisory process. Participating in this study may involve risks to you or your agency due to the lack of anonymity that we are able to provide given the small population involved with the fish consumption advisory program. Please be aware that the public may judge your agency based on the results of our study. We will protect you and your agency to the greatest extent possible.

If you have any questions about this study, please contact Melanie Barbier, barbierm@msu.edu, 517-432-5037 or Geoffrey Habron at 517-432-8086, habrong@msu.edu, Department of Fisheries and Wildlife, 13 Natural Resources, East Lansing, MI 48824-1222. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish – Peter Vasilenko, Ph.D., Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180, fax: (517) 432-4503, e-mail: ucrihs@msu.edu, or regular mail: 202 Olds Hall, East Lansing, MI 48824. By giving verbal consent, you are agreeing to your voluntary participation in our project and granting your permission for us to tape-record you to ensure an accurate description of the discussion.

APPENDIX B:

DATA COLLECTION PROTOCOLS

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APPENDIX B 1.1: QUESTIONS FOR FOCUS GROUPS, PUBLIC MEETINGS, COMMUNITY DINNERS, AND ANGLER INTERVIEWS

Background Information

Age

Gender

- Male
- Female

Primary Demographic descriptor

- Commercial fishing
- Recreational fishing
- Charter fishing
- Youth
- Breastfeeding woman
- Medical professional
- Extension
- Woman of childbearing age (non-breastfeeding)
- Tribal member

County

- Alger
- Baraga
- Chippewa
- Gogebic
- Marquette

Fishing Behavior Questions

1. Do you fish (for work? For food? For pleasure?)
2. What kind of fish do you catch?

Fish Consumption Questions

1. What kind of fish do you eat?
2. How much fish do you eat per month?
3. How do you prepare your fish?

Risk/Benefit Behavior Questions

1. What do you consider the benefits of eating fish from the U.P.?
2. What concerns do you have about eating fish from the Great Lakes or inland waters?

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Advisory Awareness Questions

1. How do you know if the fish you eat is safe for you and your family?
2. Have you read Michigan's fish consumption advisories?

Questions about Advisory Knowledge

1. What are the main contaminants of fish in Michigan?
2. What kinds of fish are the most contaminated in the Great Lakes?
3. How are guidelines different for men, women, and children?

Information Questions

1. Where do you get your information about the benefits and risks of eating fish?
2. What do you feel is the most reliable source of fish advisory consumption information?

F. Questions about Barriers

1. Do you feel that the fish advisory guidelines provide enough information for you to make informed decisions about safe fish consumption for you and your family?
2. Are there cautions/issues that we need to consider, such as religious beliefs or cultural traditions?

H. Research Data Collection Possibilities

1. What would be the most effective way to determine how much people know about fish consumption advisories?
2. How can we involve the community in developing better fish consumption advisories?

APPENDIX B 2.1: INTERVIEW PROTOCOL FOR AGENCY AND ORGANIZATION STAFF

Questions about Personal Involvement with Fish Consumption Advisories and Background

1. What is your role in the agency: job, duties, responsibilities; goals and outcomes

2. Tell me about your background.
   a. How has your background influenced your work?

3. How are you involved with the fish consumption advisories or advisory awareness?

4. What do you think is the most important message to get out to the public about consuming fish? Why?

Questions about Fish Consumption Advisories

5. What do you know about advisories? What is the purpose of fish consumption advisories?
   a. What affects the success of the advisory program? How do you know that the advisory program is working?-

6. What do you think the public knows/thinks about advisory information? How do they get their information?
   a. Why do you think that is?
   b. What should/can be done about this?

7. Can you tell me who sets the action levels for chemicals in fish? Why do different agencies have different action levels?

Questions about Agency/Organization in Advisory Information Creation/Dissemination

8. How is your agency/organization involved with the fish consumption advisories? In what ways does your agency/organization communicate the risks and/or benefits of consuming fish?
   a. What exactly do they do?
   b. Do you think the agency's role is sufficient? What else should/could they do?

9. How does your agency/organization decide what risks and benefits to study and/or communicate?
    a. What kinds of considerations are taken into account in making those decisions (scientific, political, economic, etc)?

10. Is your agency or organization involvement with fish consumption mandated by the state or federal government?
    a. In what ways does that affect how you communicate information to the public?

APPENDIX C:

CODES AND CODE DEFINITIONS

APPENDIX C 1.1: CODE LISTS AND DEFINITIONS- UPPER PENINSULA RESIDENTS

Awareness

A-Guidelines – Statements made by participants that correctly identify the source (MDCH and/or EPA and FDA) and/or content of fish consumption advisory guidelines.

Responsible institution- Statements made by participants that correctly identify the responsible agenc(y)ies for developing and distributing the fish consumption advisories, either the MDCH, EPA or FDA.

Guidelines-Participant comments that reflect acknowledgement of the existence of fish consumption advisory guidelines.

A-Don't Know- Participant comments about not knowing or being unsure of fish consumption advisory information.

Contamination- Comments made by participants stating that they are unaware of what contaminants are found in fish or how fish become contaminated.

Hear about/read about advisories- Statements made by participants about "reading about" or "hearing about" contamination in fish or fish consumption advisories, without recall of what they read or heard.

Fish safe for family- Statements made by participants stating that they do not know whether the fish they eat is safe for themselves or their family.

Guidelines- Statements made by participants about being unsure or not knowing the information found in the fish consumption advisory guidelines.

Attitudes and Beliefs

Local Goodness- Statements that reflect participant attitudes and beliefs about the goodness of the local environment and fishing culture.

Local fish better- Statements that reflect participant's attitudes and beliefs about pollution being elsewhere- not locally, or fish from local lakes being better than those from elsewhere

Clean Water- Attitudes and beliefs about local waters being clean, pristine, non polluted or local fish are less polluted

Ease- Attitudes and beliefs about the ease of catching local fish

Fresh- Attitudes and beliefs about the goodness of "fresh" local fish

Healthy- Attitudes and beliefs about the healthiness of eating fish

Inexpensive- Attitudes and beliefs about local sport caught fish being inexpensive

Local- Attitudes and beliefs about the benefits of eating local fish- Great Lakes (read Lake Superior) or fish purchased locally.

Recreation- Attitudes and beliefs about the recreational benefits of sport fishing

Sustainability- Attitudes and beliefs about the goodness of local fish as a sustainable food source.

Taste- Attitudes and beliefs about the importance or benefits of taste in relation to fish consumption behaviors

Tradition- Attitudes and beliefs about the goodness of local fishing and fish-eating traditions

Eating fresh fish- Statements made about local "fresh fish" consumption behaviors.

<u>Information</u>- Participant attitudes and beliefs about fish consumption advisory information creation and dissemination.

Available information- Participant comments about what kind of information should be made available.

Bias information- Statements made by participants about fish consumption advisory information being bias.

Trust- DNR- Statements about trusting the DNR as a source of fish consumption advisory information.

Trust- fish purveyor- Statements about trusting fish purveyors as a source of fish consumption advisory information.

Trust- internet- Statements about trusting the internet as a source of fish consumption advisory information.

Trust- media- Statements about trusting the media as a source of fish consumption advisory information

Trust- science- Statements about trusting science or scientists as a source of fish consumption advisory information.

Concerns

Contamination - Statements referring to concerns about contamination in fish.
Farm-raised fish- Statements referring to specific concerns about contaminants in farm-raised fish.

Fat fish- Statements referring to specific concerns about contaminants in fatty fish.

Contamination- Statements referring to general concerns about contaminants in fish

Fish size- Statements referring to specific concerns about contamination in large fish.

Mercury- Statements referring to specific concerns about mercury contamination in fish

PCBs- Statements referring to specific concerns about PCBs contamination in fish.

Sensitive population- Statements referring to specific concerns about contaminants in fish for sensitive populations.

Site specific- Statements referring to specific concerns about contaminants in fish at certain lake sites.

No concerns

No concerns- Statements that reflect participant's awareness of fish contamination and consumption risk, and ignoring those risks.

Low fish consumption- Statements referring to participant's lack of concern about contaminants in fish due to infrequent fish consumption.

Fish preparation- Statements referring to participant's lack of concern about contaminants in fish due to using contamination reducing fish preparation techniques

Low contamination- Statements referring to participant's lack of concern about contaminants in fish due to perceived low levels of contamination.

Other- Statements made about participant concerns other than fish contamination.

Bones- Statements referring to concerns about choking on fish bones.

Not enough fish- Statements referring to concerns about people not eating enough fish.

Spoiled fish- Statements referring to concerns about eating spoiled or "not fresh" fish.

Knowledge

Correct Information- Statements that reflect knowledge and understanding of fish consumption advisory and contamination information.

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Bioaccumulation- Statements that reflect knowledge and understanding of bioaccumulation

Contamination effects- Statements that reflect knowledge and understanding of the effects of contaminants in fish on humans.

PCBs vs Mercury- Statements that reflect knowledge and understanding of the differences between mercury and persistent organic pollutants like PCBs and Dioxin and fish contamination and fish consumption risk.

<u>Misinformation-</u> Statements that reflect misinformation and misunderstanding of fish consumption advisory and contamination information.

<u>*Contamination-*</u> Statements that reflect misinformation and misunderstanding of fish contamination.

Contamination effects- Statements that reflect misinformation and misunderstanding of the human effects of fish contamination.

Contamination source- Statements that reflect misinformation and misunderstanding of the sources of contamination in fish.

Environmental impacts vs. contamination- Statements that reflect misinformation and misunderstanding of the differences between contamination in fish and other natural or human influenced environmental processes, such as, for example, fish reproduction.

No eat pregnancy- Statements about how women should avoid eating fish while pregnant

PCB vs Mercury- bottom feeders- Statements that reflect misunderstanding or misinformation about the differences between mercury and persistent organic pollutants in bottom dwelling fish

PCB vs Mercury-fat fish- Statements that reflect misunderstanding or misinformation about the differences between mercury and persistent organic pollutants in fatty fish or the fat of fish.

PCB vs Mercury- fish size- Statements that reflect misunderstanding or misinformation about the differences between mercury and persistent organic pollutants relative to fish size.

PCB vs Mercury- Great lakes vs. inland lakes- Statements that reflect misunderstanding or misinformation about the differences between mercury and persistent organic pollutants in the Great Lakes (Lake Superior) and inland lakes.

Guidelines- Statements that reflect misinformation or misunderstanding of the Michigan fish consumption advisory and/or its source.

Guidelines- Statements that reflect misunderstanding or misinformation of the Michigan fish consumption advisory.

Information source- media- Statements saying the official fish consumption advisory is printed in the media.

Information source- DNR- Statements saying the official fish consumption advisory is developed and distributed by the DNR.

Information source- fish purveyor-Statements saying the official fish consumption advisory is distributed by fish purveyors.

Information source- medical professional- Statements saying the official fish consumption advisory is distributed by medial professionals.

Behavior

Contamination avoidance - Statements that reflect using behaviors perceived to reduce fish consumption risk.

Fish species- Statements made referring to behaviors that are purposefully used to reduce exposure to pollution in fish consumed due to the particular fish species consumed.

Experience- Statements made referring to behaviors that are purposefully used to reduce exposure to pollution in fish consumed based on prior experience.

Avoiding fat fish- Statements made referring to behaviors that are purposefully used to reduce exposure to pollution in fish consumed due to avoiding "fat fish" or the fatty parts of fish.

Location- Statements made referring to behaviors that are purposefully used to reduce exposure to pollution in fish consumed due to avoiding certain locations or eating fish from sources with little or no pollution.

Fish consumption/preparation preferences- Statements made about using perceived pollution reduction fish preparation techniques , but admitting to do so because of personal preferences (taste, cooks better, etc) over contamination reduction.

The five senses- Statements made about avoiding pollution in fish by using the senses (taste, feel, look, smell).

Fish Consumption Advisory guidelines- Statements made about avoiding pollution in fish by using the fish consumption advisory guidelines.

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Preparation practices- Statements made about avoiding pollution in fish by using special contaminant-reducing fish preparation practices.

Sensitive population- Statements made about avoiding pollution in fish by reducing fish consumption only for sensitive population.

<u>No Contamination avoidance -</u> Statements that reflect no risk adverse behavior.

Experience- Statements that reflect no purposeful risk aversion due to prior experience

Fish preparation practices- Statements about fish preparation practices that do not reduce fish consumption risk.

Taste preferences- Statements about fish preparation and consumption practices that do not reduce fish consumption risk due to taste preferences.

APPENDIX C 2.1: CODE LISTS AND DEFINITIONS- AGENCY INTERVIEWS

Background

PhD- Interviewee holds a PhD
MS- Interviewee holds a Master of Science Degree
BS- Interviewee holds a Bachelor of Science Degree
Science- Interviewee holds a degree in the bio-physical sciences
Social Sciences/Communication- Interviewee holds a degree in the social sciences, humanities or communication arts

Job Responsibilities

Policy/Administration- Statements which reveal that the majority of the interviewee's job responsibilities involve administrative or policy work
Laboratory Science- Statements which reveal that the majority of the interviewee's job responsibilities involve laboratory science
Outreach- Statements in which interviewees say that outreach is a part of their job responsibilities
Fish Consumption Advisory- Statements in which interviewees report that fish consumption advisory work is a formal part of their job responsibilities
No Fish Consumption Advisory- Statements in which interviewees report that fish consumption advisory work is NOT a formal part of their job responsibilities

Fish Consumption Advisory

Mandated:don't know- Statements in which interviewees report not knowing if his/her agency is mandated to produce fish consumption advisory information
Mandated:yes- Statements in which interviewees report that his/her agency is mandated to produce fish consumption advisory information
Mandated:no- Statements in which interviewees report that his/her agency is not mandated to produce fish consumption advisory information

Fish Consumption Advisory Process

EPA- Statements about fish consumption advisory development, dissemination, and/or evaluation at the EPA
FDA- Statements about fish consumption advisory development, dissemination, and/or evaluation at the FDA
Federal- Statements about fish consumption advisory development, dissemination, and/or evaluation at the federal level
State- Statements about fish consumption advisory development, dissemination, and/or evaluation at the state level
State and Federal- Statements about fish consumption advisory collaboration among state and federal agencies
Fish Analysis- Statements about agency scientific processes for fish analysis for fish consumption advisory
Reference dose- Statements about agency scientific processes for determining reference dose

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Other State-level processes- Statements about scientific/policy/risk communication activities other than the Fish Consumption Advisories at the state level

Advisory Frames

Advisory Outcome

Awareness- Statements in which interviewees talk about increased public awareness and knowledge as an outcome of current fish consumption advisory information and/or dissemination

Awareness with out knowledge- Statements in which interviewees describe the public as aware, but unknowledgeable, of fish consumption advisory information as a result of current advisory information and/or dissemination

Ignore information or stop eating fish- Statements in which interviewees say that as a result of current fish consumption advisory information and/or dissemination people either ignore fish consumption advisories or stop eating fish

Fish preparation behavior- Statements that identify risk-reducing fish preparation techniques as an outcome of current fish consumption advisory information and/or dissemination

Confusion- Statements in which interviewees talk about people being confused as a result of current fish consumption advisory information and/or dissemination

Multi-message- Statements in which interviewees talk about how people receive several different types of messages about contamination and the benefits and risks of consuming fish as a result of fish consumption advisory information and dissemination

Purpose of Advisory

Informed public- Statements in which interviewees talk about the purpose for fish consumption advisories as a more informed citizenry able to make "smart", "healthy", "better" or "proper" choices

Protect human health- Statements in which interviewees talk about the purpose for fish consumption advisories as protecting human health

Sport fish- Statements in which interviewees talk about the purpose for fish consumption advisories as elevated levels of chemicals in sport-caught fish

Frames: Fish Consumption Advisory Process

Advisory responsibility- Statements in which interviewees talk about who and/or what agency is responsible for the fish consumption advisory process

Advisory responsibility: Not Me- Statements in which interviewees renounce responsibility for fish consumption advisories and/or when they refer to another person or agency as being responsible.

Collaboration and consistency- Statements in which interviewees discuss current or past inter/intra-agency collaboration and consistency in scientific protocols, outreach and/or communication messages

Collaboration and consistency: Need- Statements in which interviewees discuss the need for more and/or better inter- and intra-agency collaboration and consistency in scientific protocols, outreach and/or communication messages

Best Job Possible- Statements in which interviewees say their agency is doing the best job possible communicating to the public environmental risks and agency decision making with the resources they have

Could Do Better- Statements in which interviewees say their agency could do a better job communicating environmental risks and agency decision making to the public

Complex- Statements in which interviewees say communicating environmental risk and benefit messages are (perhaps too) complex for agencies

Complex: FCA- Statements in which interviewees say that communicating fish consumption advisory information in an effective way is (perhaps too) complex.

Defer to Science- Statements in which when discussing fish consumption advisories and/or risk communication interviewees defer to scientific studies, "research" and/or scientists as a way to explain or talk about policy decisions and/or communication/outreach strategies.

Best efforts- Statements in which interviewees say that successes in the fish consumption advisory process come organically from a person (people) with a passion or their best efforts to work for success

Public risk perception- Statements in which interviews talk about outreach and communication effectiveness as dependent on individual perceptions of risk held by the public

Advisory Success: Don't know- Statements in which interviews say they do not know what effects fish consumption advisory or risk communication success.

Frame: Personal Risk Message (What interviewees think themselves about fish consumption advisories or consuming fish)

FCA=pollution reduction- Statements in which interviewees link communicating fish consumption advisory information with inciting public pressure for reducing mercury emissions and other pollution.

Follow FCA- Statements in which interviewees say that people should follow state and national fish consumption advisories.

People should eat fish- Statements in which interviewees say that people should eat fish or should not stop eating fish as a result of fish consumption advisory information.

HG vs PCB- Statements in which interviewees discus the differences between mercury and persistent organic pollutants when communicating fish consumption advisory information.

Moderation- Statements in which interviewees stress the importance of consuming fish in moderation

Variety- Statements in which interviewees stress the importance of consuming a variety of fish

Scare- Statements in which interviewees talk about fish consumption advisories scaring people and stress the importance of reducing this fear

Frame: Advisory Risk Message (What interviewees think their agency should say about fish consumption advisories)

Balancing benefits and risks- Statements in which interviewees say that fish consumption advisory information should stress balancing the risks and benefits of fish consumption

Focus on what to eat- Statements in which interviewees say that fish consumption advisory information should focus on what to eat and not what not to eat.

Sport and commercial- Statements in which interviewees say that state and national fish consumption advisory information should include both sport and commercial fish consumption advisory information

Stay as is- Statements in which interviewees say that the fish consumption advisory message should remain as it is.

Frame: What Should be Done

Use Science- Statements in which interviewees say that science should be used to develop fish consumption advisory information

Targeted risk communication- Statements in which interviewees say that risk communication should be specifically targeted to different audiences through multiple outlets

At-risk Population- Statements in which interviewees discuss the need to focus fish consumption advisory information and outreach specifically towards at-risk populations (women, children, and minorities)

DNR/Fish industry- Statements in which interviewees say that the agencies/people responsible for fish consumption advisories should work to achieve natural resource agency and fishing industry buy-in.

Media- Statements in which interviewees say that the media should be used as an outlet for distributing fish consumption advisory information

Medical Community- Statements in which interviewees say that the medical community should be involved in the fish consumption advisory process

Tribal- Statements in which interviewees say that tribal communities should be involved in the fish consumption advisory process

Frame: Obstacles

Environmental Groups- Statements in which interviewees say that environmental groups are an obstacle to successful fish consumption advisory communication/outreach

Media- Statements in which interviewees say that the media is an obstacle to effective fish consumption advisory communication/outreach

Anti-FCA message- Statements in which interviewees say that exaggerated information about the benefits of fish consumption are an obstacle to effective fish consumption advisory communication/outreach

Frame: What's Needed- institutionally

Expertise- Statements in which interviewees say that more expertise, especially in terms of the social sciences, is needed to achieve successful and effective fish consumption advisories, risk communication, and outreach

Funding- Statements in which interviewees say that more funding is needed to achieve successful fish consumption advisories, risk communication, and outreach

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Risk Evaluation- Statements in which interviewees say that more risk evaluation is needed to achieve successful fish consumption advisories, risk communication, and outreach

Frame: What's Needed- access

Available infomation- Statements in which interviewees discuss the need to make fish consumption advisory information more physically (or digitally) available to the public

Easy to understand- Statements in which interviewees discuss the need to make fish consumption advisory information easier to understand for the public

Frame What's Needed- Outcomes

Public understanding- Statements in which interviewees say that public knowledge and understanding is not currently, but needs to be an outcome of fish consumption advisory information and/or any risk communication/outreach effort

No spill-over- Statements in which interviews talk about the need to stop spill-over effects to populations that are not at risk (men over age 15 and women not of childbearing age) as a result of fish consumption advisory information

Frame: Theory

Frame: Science

Top down- Statements in which interviewees describe scientific practices in use which are top down, objectivist, and/or materialist

Good science- Statements in which interviewees describe what is "good science" and when and where it should be used.

Frame: Nature/Human- Statements about connecting or putting barriers around contamination in terms of human and environmental health

Frame: Gender- Statements about gendered differences in attitudes and behaviors

Frame: Policy Process

Policy and Politics- Statements in which interviewees describe policy processes: what gets done, how it gets done and why it gets done

Epistemological Bricolage- Statements in which interviewees describe policy processes in which they assemble and make sense of different bits of information and experiences gained through formal institutional and scientific, as well as, more socially situated epistemological strategies or rationale to create policy and management decisions (Freeman, 2007)

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APPENDIX C 3.1: CODE LIST AND DEFINITIONS- MEDIA ANALYSIS

AP-Michigan: Michigan Associated Press Articles

AP-National: National Associated Press Articles

TV News: Network television news stories

Balancing benefit and risk- fish vs fish: Passages or statements in which the reader/viewer is encouraged to eat certain types of fish over others because they are low in contaminants(specifically Hg)

Balancing benefit and risk-fish vs other food: Passages or statements that discuss the benefits of eating fish over other types of food that may be less healthy

Balancing benefits and risks: Statements that specifically talk about balancing the health benefits and risks of consuming fish

Benefit-cost: A benefit of eating fish is its low cost.

Benefit-fetal brain/development: A benefit of eating fish is improved fetal/childhood brain functioning and development

Benefit-healthy/nutritious: A benefit of eating fish is that they are healthy and nutritious

Benefit-heart healthy: A benefit of eating fish is that it promotes heart health.

Benefit-omega 3: Statements in which the term Omega 3('s) (fatty acids) is mentioned as a benefit of eating fish

Benefits-fatty fish: The benefits of eating fish come from fatty fish

Benefits before risks: Articles/News segments that begin by relaying the benefits of eating fish prior to discussing the risks

Benefit- cultural: Passages or statements that talk about the cultural importance of fish and eating fish

Bioaccumulation: Passages that describe or explain the process of bioaccumulation of mercury in fish in greater or less detail

Conflicting message: Passages or statements in an article that directly contradict each other or when there are two or more conflicting statements/positions reported in an article

Confusing message_: Statements in which the journalist or someone quoted in an article says that fish consumption advisory information is confusing/uncertain/or gives mixed messages

Date: Year of article publication

Decreased consumption= mercury reduction: Passages or statements that say one can reduce blood-mercury content by reducing fish consumption

Do not eat fish: Instances when eating fish is/should be prohibited

Eat small/young fish: Passages that recommend eating small/young fish to avoid mercury pollution

Eat variety: Passages that recommend eating a variety of fish to avoid mercury pollution

Environmental policy/politics: Passages or statements that discuss the policy process and politics of mercury pollution, including fish consumption advisory information development and communication

Fish Consumption Advisory (FCA)-responsible agency: Passages that indicate the agency responsible for creating fish consumption advisories

FCA facts: Passages that describe, reiterate, or summarize official government fish consumption advisory information

FCA facts-fish preparation and mercury: Passages or statements that inform people the way fish is prepared makes no differences in the amount of mercury included in a serving

FCA process: Passages that discuss the history, study, or processes of creating and disseminating fish consumption advisory information and mercury pollution

Fish cook matters: Passages that discuss the how the way a fish dish is prepared (fried, baked, breaded, grilled, etc) affects the healthfulness of eating fish.

Follow advisory:_Passages recommending the reader to follow state and/or federal fish consumption advisories

Gender: Passages or statements that single out gendered behavior or target specific gendered populations with regard to mercury contamination and/or fish consumption

Mercury symptoms: Passages or statements about the symptoms of mercury poisoning

Mercury testimonial: Testimonials from individuals or medical professionals who have experienced mercury poisoning themselves or in their patients

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FCA studies: Passages that reference or talk about scientific studies of mercury poisoning and/or fish consumption

International examples: Passages about fish consumption advisory information in other countries besides the US

Journalist: Author of article

Lay ideas of science: Passages that reflect lay people's or non-expert ideas of the science behind mercury contamination

Low risk fish: Passages that list or discuss types of fish which are low in Mercury

Other advisory chemicals: Passages that talk about fish consumption advisory pollutants other than mercury

Other sources of human mercury: Human sources of mercury other than coal fired power plants or incinerators

Past mercury uses: Past uses of mercury

People should eat fish: Passages or statements that recommend people to eat fish

Pressure on government: Passages that talk about individuals or groups pressuring government to act in some way or another on the mercury and fish issue

Probable solution-technological: Passages that talk about technological solutions to the mercury problem

Reference dose: Passages or statements that talk about the mercury reference dose for different agencies

*The following codes represent the framing of the mercury and fish issue through different organizations as presented by the media

Position- commercial fish: Frame of mercury and fish issue by commercial fish industry

Position-academia: Frame of mercury and fish issue by academics

Position-American Heart Association: Frame of the mercury and fish issue by the American Heart Association

Position-government-Center for Disease Control: Frame of mercury and fish issue by the CDC/ATSDR

Position-government-Chippewa Ottawa Resource Authority: Frame of mercury and fish issue by CORA

Position-government-Department of Community Health: Frame of mercury and fish issue by Michigan Department of Community Health

Position-government-Department of Natural Resources: Frame of mercury and fish issue by Michigan Department of Natural Resources

Position-government-Environmental Protection Agency: Frame of mercury and fish issue by EPA

Position-government-Food and Drug Administration: Frame of mercury and fish issue by FDA

Position-government-legislature: Frame of mercury and fish issue by members of congress

Position-government-food safety administration: Frame of mercury and fish issue by the food safety administration

Position-government-state/local: Frame of mercury and fish issue by state and local governments

Position-government-National Academy of Science: Frame of mercury and fish issue by the National Academy of Science

Position-journalist: Frame of mercury and fish issue by the journalist

Position-Medial Professionals: Frame of mercury and fish issue by medical professionals

Position-NGO-world health organization: Frame of mercury and fish issue by the World Health Organization

Position consumer groups: Frame of mercury and fish issue by consumer groups

Position environmental groups: Frame of mercury and fish issue by environmental groups

Position: energy: Frame of mercury and fish issue by energy providers

Position: Native Americans: Frame of mercury and fish issue by Native Americans

Risk- Upper Peninsula: Passages that talk specifically about mercury risk in the Upper Peninsula

Code: Ris
black/His

Code: Ris
lot of fish

Code: Ri
fetus/you

Code: Ri
FDA/EP

Code: R
as more

Code: ri
governm

Code: R
populat

Code: R
risks m

Code: I
poses t

Code:
to the

Code:
mercu
power

Code:
higher

Code:
Ameri

Code:
gover

Code:
popul

Code: Risk-concern-Blacks/Hispanics: Passages or statements that identify black/Hispanic populations as populations of concern

Code: Risk-concern-eat lots of fish: Passages or statements that identify people who eat a lot of fish as a population of concern

Code: Risk-concern-fetus/young children: Passages or statements that identify fetus/young children as a population of concern

Code: Risk-concern-forbidden fish: Passages that identify the types of fish on the FDA/EPA advisory's do not eat list for women of childbearing age and young children

Code: Risk-concern-freshwater fish: Passages or statements that identify freshwater fish as more contaminated than other fish

Code: risk-concern-government not testing: Passages that talk about the concern for government no longer testing fish for mercury

Code: Risk-concern-health fans: Passages or statements that identify health fanatics as a population of concern

Code: Risk-concern-hg effects-brain/development: Passages about the developmental risks mercury poses to a fetus/child's brain and/or mental/physical development

Code: Risk-concern-Hg effects-heart: Passages about the elevated risks that mercury poses to heart health

Code: Risk-concern-Hg effects-kidneys: Passages about the elevated risks mercury poses to the kidney health

Code: Risk-concern-hg emissions: Passages and statements that associate the risks of mercury contamination in humans to man-made mercury emissions through coal-fired power plants and incinerators.

Code: Risk-concern-large fish: Passages or statements that identify large fish as having a higher mercury contamination risk

Code: Risk-concern-Native Americans: Passages or statements that identify Native Americans as population of concern

Code: risk-concern-reducing hg standard: Passages that talk about concerns of government agencies elevating their mercury reference dose.

Code: Risk-concern-subsistence: Passages that identify subsistence fisherpeople as a population of concern

Code: Risk-concern-wealthy: Passages that identify the wealthy as a population of concern

Code: Risk-concern-women: Passages that identify women as a population of concern

Code: Risk-concern-women of childbearing age and children: Passages that specifically identify women of childbearing age and children as a population of concern

Code: Risk-concerns-changing lifestyle: A risk of fish contamination is to be forced change ones habits or lifestyle

Code: Risk-concerns-elevated hg levels-environment: Passages or statements about elevated levels of mercury found in the environment, including fish

Code: Risk-concerns-elevated hg levels-humans: Passages or statements about elevated levels of mercury in human beings

Code: Risk-concerns-hg poisoning: Passages that talk about the risks and/or concerns of mercury poisoning through fish consumption

Code: Risk-concerns-human and environment: Passages that make a direct link between human and environmental health

Code: Risk-concerns-tuna: Passages that talk about mercury contamination in tuna fish and the risk that poses to human health

Code: Risk-Great Lakes States: Passages about mercury contamination in the Great Lakes

Code: Risk-hg effects-nervous system: Passages that talk about the negative effects of mercury poisoning on the nervous system

Code: Risk-hg=toxic/poison: Statements that specifically describe mercury as toxic, fatal, or poison

Code: risk amplification: Passages that describe mercury contamination and fish consumption in a way that accentuates risks, or appeals to emotive feelings of fear or pity

Code: risk deamplification: Passages and statements that down play the risks of mercury poisoning and/or contamination or accentuate the benefits of consuming fish or the products of polluting industries

Code: Risk communication: Passages that talk about risk communication

Code: risks before benefits: These articles begin by talking about the risks of mercury contamination prior to the benefits of fish consumption

Code: romantic outdoorsmen/tribe: Passages that romanticize the image of outdoors- or tribesmen

Code: scare: Passages or statements that talk about fish consumption advisory or mercury contamination information "scaring" people.

Code: science/scientists: Passages or statements that talk about science, scientists, research or studies

Code: scientific uncertainty: Statements that say there is scientific uncertainty concerning mercury contamination and/or mercury poisoning

Code: site specific: Passages or statements that attribute mercury contamination to site specific pollution

Code: source- natural: Passages or statements that say mercury come from natural sources

Code: source-coal-fired power and natural: Passages and statements that attribute mercury contamination to both natural and man-made sources

Code: source: coal-fired power: Passages or statements that attribute mercury contamination to coal-fired power plants.

Code: sport vs commercial: Passages or statements that talk about the differences in mercury contamination found in sport caught and commercial fish

Code: supplements: Passages or statements about taking fish oil supplements to get heart healthy omega 3 fatty acids

Code: Title: The title of the article

Code: vague information: Vague information about mercury contamination, mercury poisoning, and/or fish consumption advisories. Vague is defined as information that relates the existence of something without explaining what it is.

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