Local Understanding of Fish Consumption Advisory Risks in Michigan’s Upper Peninsula: The Role of Structure, Culture, and Agency*

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

Fish Consumption Advisories

Upper Peninsula Advisories

The Agency for Toxic Substances and Disease Registry identifies the Upper Peninsula (U.P.) of Michigan as a particular region of concern

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regarding the uncertain effectiveness of fish consumption advisories due to the vast rural and isolated nature of the area as well as the relatively large presence of Native American populations who may consume larger amount of fish (ATSDR 2003). Fish advisories exist in the Upper Peninsula that apply to Great Lakes waters of Lake Huron, Lake Michigan, Lake Superior, and St. Mary’s River as well as to inland lakes, reservoirs, and streams (MDCH 2003). In the Michigan Great Lakes, PCBs comprise the predominant contaminant of concern, followed by chlordane, dioxin, and mercury. For inland lakes, fish advisories address mercury, PCBs, chlordane and dioxin in decreasing order of frequency. The counties with the highest number of specific inland lake and stream advisories include Marquette (9), Gogebic (6), Iron (5), Alger (3), and Houghton (3). In addition, a general advisory applies to all inland lakes in the U.P., as well as the rest of Michigan.

No published studies exist of angler awareness about advisories specifically in the Upper Peninsula of Michigan. However, evidence suggests that at least 40–50% of sport fish consumers express no knowledge of the fish advisory for PCBs in the Great Lakes (Imm, Knobelech, and Anderson 2005; Tilden et al. 1997). Women, minority groups, and persons lacking a high school degree express the least levels of awareness (Imm et al. 2005). Advisory awareness varies among the Great Lakes states with highest awareness occurring in Wisconsin (65.3 percent) and Michigan (60.3 percent), with the lowest rate occurring in Minnesota (37.5 percent) and Ohio (37.9 percent) (Tilden et al. 1997). Advisory awareness among women 18–45 years old in Minnesota and Wisconsin reached no higher than 26 percent (Knobeloch et al. 2005). In most studies, anglers demonstrate higher levels of awareness than the general public achieving almost 83 percent awareness among anglers who fished the Great Lakes within the past 5 years (Connelly and Knuth 1993). Yet, up to 95 percent of anglers who ate fish from the Fox River in Wisconsin lacked knowledge of Wisconsin’s fish advisory pamphlet (EPA 2002; Steenport et al. 2000).

Communication about fish consumption seeks to provide information about the potential benefits and risks of eating different kinds of fish from different bodies of water. However, evidence indicates that advisories often fail to fully achieve the goals of information delivery or behavioral change (Burger, Sanchez, and Gochfeld 1998; Connelly and Knuth 1993: EPA 2001, 2002; Flaherty, Sass, and Stiles 2003; Jardine 2003; Knuth et al. 2003; Tilden et al. 1997). Further the failures apply differentially to segments of the most potentially affected groups such as pregnant or nursing women, women of childbearing age, low-income, elderly, limited literacy, limited English proficiency, migrants,
youth, subsistence fishing, ethnic and cultural groups as well as urban and rural groups (Beehler, McGuinness, and Vena 2001; EPA 2002; Knobeloch et al. 2005; Steenport et al. 2000).

Traditional approaches to risk viewed risk as an objective and discrete function of the probability of an event multiplied by the consequences of that event. The field of risk has since developed beyond that notion to incorporate both objective and subjective dimensions (Pidgeon, Kasperson and Slovic 2003a,b; Rosa 1998, 2003). In order to effectively communicate risk, one must understand and utilize the role of the culture of the at-risk population in the communication and response process (Kasperson 1992; Lidskog 2000). Risk identification and response is subject to cultural filtering processes and mental models (Pidgeon et al. 2003a,b) that explain how people “select, order and explain signals from the physical world” (Kasperson 1992:158) in ways that can amplify or attenuate the understanding and response to objective risks. As such, “social amplification of risk refers to the cultural, social and individual structures and processes that shape the societal experience with risk” (Kasperson 1992:161). Thus, our pilot study sought to determine how select populations in Michigan’s Upper Peninsula come to understand the nature of risk in terms of consuming local fish.

**Theory**

**Agency, Culture, and Structure**

Because risk is socially constructed it is important to understand those factors that contribute to the development of risk. Those factors exist across the domains of agency, culture and structure. Emirbayer and Mische (1998) define agency as, “the temporally constructed engagement by actors of different structural environments—the temporal-relational contexts of action which, through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in iterative response to the problems posed by changing historical situations” (970). In particular, agency consists of temporal dimensions of the past, present, and future that influence the capacity of actors to respond and act to their situations. Agency brings together structure and culture in terms of their effect on individual behavior. Agency suggests that actors are neither structural nor cultural “dopes”, but are able to negotiate their own meaning in light of opportunities and culture (Giddens 1984; Rubinstein 2001).

Culture is defined as systems of belief-norms and values, attitudes and worldviews in terms of how people engage in meaning making that
explain behavior (Rubinstein 2001). Rubinstein invokes Bourdieu’s concept of habitus as the mental categories through which actors engage the world” (Rubinstein 2001:13). Work appearing in anthropological literature reaffirms such cultural dimensions of folk models that affect meaning making and behavior (Beehler et al. 2001; Paolisso and Maloney 2000). “Culture is read in light of opportunities, opportunities are read through the lens of culture” (Rubinstein 2001:13).

The need for integrating instrumental/materialist and normative/idealistic approaches to understanding behavior (McLaughlin 2001; Rosa 1998, 2003) is reflected in notions of risk in a way that articulates “how social structures are constituted through culture and how culture is, in turn, structurally constituted” (Rubinstein 2001:11). Structure consists of the rules and resources (Emirbayer and Mische 1998) such as the objective, external, supra-individual constraints and opportunities that affect social behavior and understanding in terms of “the costs and benefits they provide to actors” (Rubeinstein 2001:5) The interaction of structure and agency forms the basis of structuration (Giddens 1979, 1984, 1990) “which relates to the fundamentally recursive character of social life, and expresses the mutual dependence of structure and agency” (Giddens 1979:69). Actors, therefore can be viewed as readers of, but also subject to, culture, structure and agency (Rubinstein 2001).

Methods

Design

Our project seeks to determine how people get information on risk, how they make meaning about the risk, and what they do about it. The project incorporates a community-based approach to: 1) identify the barriers (including specific cultural practices) to following current fish consumption advisories and fish preparation guidelines among vulnerable populations; and 2) engage vulnerable community members and relevant community institutions in identifying more effective communication channels for fish advisories that recognize and work within existing cultural practices. Therefore we developed a data collection regime to describe fish advisory: a) awareness, b) knowledge, c) understanding, d) information sources, and e) behavior.

Data Collection

In 2004–2005, we collected data in four Michigan counties utilizing a mixed-method approach informed by the work of others who work with community-based research or fish consumption advisories, though we
did not seek to replicate any specific study. Our methods included photographs of access areas, face-to-face interviews (Burger et al. 1998; Burger et al. 2003b; Flaherty et al. 2003; Jardine 2003; Steenport et al. 2000), onsite angler surveys (Flaherty et al. 2003; Steenport et al. 2000), focus groups (Beehler et al. 2001; Jardine 2003), and community gatherings (Carr and Halvorsen 2001). For angler interviews we selected Great Lakes access sites, inland lake access sites, and access sites with restrictions on fish consumption. The incorporation of a wide variety of data collection methods provides different opportunities to incorporate a wide variety of cultural groups (EPA 2002; McAvoy et al. 2000). In each county we developed an advisory committee composed of a representative of each group of vulnerable partners. Each method utilized a set of structured questions about 1) fish advisory awareness, 2) knowledge, 3) understanding, 4) information sources and 5) behavior (see appendix).

The project team utilized the networks of Upper Peninsula-based Michigan Sea Grant and county-based Michigan State University Extension staff to recruit participants for focus groups (16 events, range = 4–13 participants, mean = 8.25 participants), community dinners (3 events, range = 7–22 participants, mean = 16.3 participants) and community meetings (1 event, 7 participants) in Alger, Chippewa, Gogebic and Marquette counties (see Table 1 for distribution of data collection efforts as suggested by Morgan 1996). Visits to boat access sites during summer weekends enabled angler interviews in Alger, Chippewa and Marquette counties (n = 62). Groups were selected based on the potentially relevant risk exposure demographics such as youth, anglers, women, commercial fishermen and coastal place-based communities. Therefore, our data do not represent randomized sampling applicable across the general population of the counties in which we sampled. Adults signed written consent forms and parents signed consent forms for children during focus groups, community dinners and community meetings. Anglers provided oral consent for interviews.

During focus groups, public meetings and community dinners, participants utilized interactive hand-held digital keypads to respond to close-ended questions projected from a computer to a screen (Option Technologies Interactive, LLC n.d.). Upon completion of all the answers, participants immediately viewed bar graphs of the frequency distribution of the results on the screen. The survey results then stimulated participant discussion of the results, the question, and the meaning of the responses. Digital audio recorders captured the entire focus group process. Written notes by the research team comprised the
final data recording method. Therefore, the computer response provided a quantitative record of close-ended participant responses, but also served as a visual elicitation device to foster discussion that would reveal participants' meaning and understanding of fish consumption risks and advisories. During individual angler interviews at fishing access sites, open-ended responses to the same set of questions were recorded directly onto data sheets. For all sources, the frequency distribution information quantifies the extent of various responses within our sample population, since researchers often fail to provide enough information to enable others to judge the quality of the research procedures (Morgan 1996).

Results

Awareness

Analysis of focus group (n=16 events), public meeting (n=1 event), and community dinner (n=3 events) responses (n=155 participants) indicate that a majority of respondents have few to no concerns about eating fish, especially local fish. One Alger county woman stated that she, “grew up in Detroit where the water is filthy and wouldn’t eat anything out of Lake St. Clair, but would eat fish from the Great Lakes [in the Upper Peninsula] even when pregnant.” Similarly, another Alger county woman said, “we eat fish here because the water is clean.” Many other participants expressed more comfort eating fish from Lake

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<td>Anglers</td>
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Superior because they viewed it as more pristine than Lake Huron or Lake Michigan. Participants also frequently explained their lack of concern with eating fish due to the easy access to fresh fish, with such close spatial proximity to recreationally and commercially available fish especially in Lake Superior. A common saying used by one Alger county man was “the fish you eat today slept last night in Munising Bay [Lake Superior].” Another male angler from Alger county stated that they “never had a problem here; restaurants serve fresh whitefish and trout from Lake Superior.” However, in a focus group in Chippewa county, one of the participants mentioned that people simply assumed that the whitefish they bought in stores and restaurants in the Upper Peninsula originated in Lake Superior; but, the fish could originate in Lake Michigan or Lake Huron. Focus group participants in Marquette and Alger county discussed their ability to know the source of their whitefish because they can buy it directly from commercial fishing businesses who harvest and sell their fish. One woman in Marquette stated that she knew the local commercial fisherman had lived in the area for generations and she believed that he would not sell her something that was not safe. A male angler from Marquette also identified the main commercial fisherman in Marquette as a trustworthy source of fish, “I take [his] word for it.” Even those in Gogebic county who lacked direct access to a commercial fishing retail store expressed their faith in the safety and quality of fresh fish from Lake Superior as well as their ability to detect fish that was not fresh: “when going to nice restaurants in Detroit or Chicago, you would be served lake trout with ¼ in fat and skin on it, didn’t taste good and you knew it wasn’t from Lake Superior.” A Chippewa county male expressed a similar concern with taste stating, “I buy the freshest fish that I can find, don’t want indigestion from eating older fish.” Furthermore, participants believed that they failed to eat sufficient quantities of fish even if contamination existed. A woman from Gogebic county put it this way saying that there are “conflicting reports some say don’t eat, other reports say its only a concern if you ate so much fish, but reality is you would never eat that much.” Participants most frequently claimed fish consumption rates between 1–4 meals a month, with most frequent consumption during the summer. Every focus group mentioned the prevalence and cultural importance of local Friday night fish fries. Others used the lack of local evidence of fish contaminant impacts on human health as reasons not to worry about eating fish. A male angler from Chippewa county noted that he has “been eating fish forever and
still around.” When asked about his level of concern about eating fish a Marquette county male angler said, “ain’t dead yet, about the same risk as eating a hamburger.” Other expressions from male anglers along this line were, “don’t know, been eating them my whole life; I grew up here”; “hasn’t killed me yet.” Focus group members in one county pointed to a retired commercial fisherman in the group as evidence that if this fisherman had no effects then no else one would due to the multiple fish meals consumed per week over 70 years.

Most focus group participants (59%) had not read the official fish consumption advisory (Figure 1). For males, 50 percent had not read the advisory compared with 66 percent of females. Similar results appeared through angler interviews (n=62). In terms of advisory awareness, 47 percent of anglers interviewed stated they had not read the advisory. Eighty-nine percent of the 14 female anglers had not read the advisory, while 38 percent of the 47 males stated they had not read the advisory. However, 23 percent of those males stated they had read the advisory in the fishing license guide, when in fact the advisory has not been published there for ten years.

This type of confusion dominated people’s identification of the actual advisory. For example, a typical case was a male angler who later recanted his statement that he had read the advisory after receiving a copy of the official advisory, stating that he had never seen the advisory booklet. Throughout, participants explained how the fishing regulation guide used to come with the fish advisory, however over the last few years the inclusion of the advisory in the regulation guide no longer occurs. Others assumed that if they had read the fishing regulations guide that they had also read the fish advisory. Several comments made by focus group participants also led us to believe that they may not have actually read the official advisory even though they reported reading it. For example, one Marquette county man said, “[I] read [the advisory] a couple of years ago and felt like now what am I suppose to do? [it]seemed too vague.” Other participants mentioned that the advisory lacked sufficient information about the names of the lakes contaminated, the location of contaminated lakes, or the species of fish to avoid. However, the official advisory provides all of this information.

All of the anglers interviewed and most of the focus group participants expressed ignorance regarding whether the fish they were eating were safe to eat. Many residents used other cues to determine the safety of the fish. A Chippewa county man said, “location, some areas are just known to be contaminated,” This thought was supported by another Chippewa county man in the same focus group who said, “if you know the history of the area then you have an idea of places to
fish.’’ In Marquette county, where one lake in particular is highly contaminated with mercury 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].’’

Others use the looks of the fish or the water body such as this male angler from Chippewa county, ‘‘the water quality’s been getting better, you don’t find black lines in fish as much anymore.’’ Another Chippewa county angler said, ‘‘I look for sores, damage in fish, looks healthy, I know better than others because I’m a cook, used to cook 300 lbs of whitefish a night at the casino in Brimley.’’ Some participants expressed doubt due to the uncertainty of the information available, ‘‘no one really knows where the contamination is coming from, [we] read the information but don’t know who to believe’’ (Chippewa county male focus group participant).

In addition to trusting the local fishermen, a Gogebic county woman expressed hope in government and retail markets, ‘‘because of what you buy in the store, trust that the federal government is regulating what kind of fish they can sell, if it has a stamp of approval then it should be safe.’’ Similarly, a woman in Marquette County said, ‘‘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’s safe, I assume that it is.’’

In terms of contaminants, focus group participants identified mercury (58%) and PCBs (15%) as the main contaminants (Figure 2); while the angler interviewees identified mercury (75%) and PCBs (24%). With the open ended angler interview questions, 86 percent of the females identified mercury, while 14 percent identified PCBs. For males, 73 percent identified mercury and 27 percent mentioned PCBs. PCB awareness among males across sites was 25 percent in the Great Lakes site (9/36), 16 percent in an impaired site (2/12), and 15 percent at inland lake sites (2/13).

Knowledge

The majority of focus group participants correctly identified large (58%) or fatty (53%) fish as presenting a greater risk. However, a minority (41%) correctly identified fish-eating predatory fish as a greater risk, with a plurality (45%) incorrectly stated that a fish’s prey had no impact on risk (Figure 3). A minority of both men (36%) and women (44%) correctly identified the increased risk of eating fish that eat other fish. During angler interviews, a minority of anglers correctly identified the increased risk of eating large (43%), old (23%), fatty (16%), or fish-eating predators (5%). Bottom-feeding fish comprised
the second most frequent (28%), though incorrect response. A minority of both men (7%) and women (14%) correctly identified predator fish as having an increased risk. Lake trout emerged as the most frequent species of concern, principally a deep-bodied variety called siscowet that contains a high level of fat. An Alger county man recounted a story that his daughter bought fifty pounds of lake trout for a family event but he would not even clean them because they were too fat and therefore possibly contaminated, so he went and replaced the fish with 50 pounds of whitefish. The lake trout were black inside which generated concern.

A majority of focus group participants (77%) correctly identified that fish consumption guidelines applied more restrictions on women and/or children. During angler interviews, a majority (71%) of the women indicated that more fish consumption guidelines apply to pregnant women or women of child-bearing age than other groups, whereas 64 percent of the males identified such guidelines.

**Behavior**

A plurality of focus group participants prepared their fish as fillets without the skin or bones (47%) and most frequently ate fried fish (43%) (Figure 4). 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 interviews more male anglers (85%) than female anglers (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 that health provides the greatest benefit of eating fish, 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. 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 can drip away with the fat.
Information Sources

A plurality of focus group participants reported obtaining their fish consumption information from media sources (38%) and secondarily from the Department of Natural Resources (16%) (Figure 5). 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%). Both focus group participants (40%) and angler interviewees (47%) most often identified the DNR as the most reliable source of information (Figure 6). 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.

In terms of the media, most participants expressed a degree of confusion about media stories concerning fish. 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 led to doubt and apathy. As many male anglers at access sites stated, “you are going to die of something.” When asked whether he knew the fish he ate was safe, a Marquette angler put it this way, “I don’t, but I also don’t know about the safety of the beef, chicken or pork I eat either.” Other anglers also mentioned

![Figure 6. Reliability of Information Sources by Focus Group Participants](image-url)
this perspective. A Chippewa county male angler mentioned the need to have an official advisory for beef and pork as well. A female angler relied on a two-pronged strategy for her information, “if you catch it [fish] yourself you know [it is safe]; at restaurants you just expect it would be safe.” However, one Alger county angler expressed doubt about any retail advisory “I don’t like anything in grocery stores; can’t assume FDA [federal Food and Drug Administration] or seller cares.”

Discussion

Across all data collection methods, participants express a lack of interaction with the official fish consumption advisory, have difficulty understanding the difference between mercury and PCBs in terms of inland and Great Lakes waterbodies, and do not understand the role of bioaccumulation that yields to higher risk from eating fish that eat other fish. Further, participants attribute information reliability toward the DNR in managing fish consumption advisories, when the Department of Community Health is actually the governing entity. What remains of most concern is despite the fact that women are the target audience for fish consumption advisories they remain the least aware and knowledgeable. The lack of awareness about fish consumption advisories mirrors previous research in the Great Lakes region (EPA 2002; Knobeloch et al. 2005; Steenport et al. 2000; Tilden et al 1997), elsewhere in the United States (Burger et al. 1998; Connelly and Knuth 1993; EPA 2001 2002; Flaherty et al. 2003), and Canada (Jardine 2003). Several possible structural and cultural explanations lead to these findings in Michigan.

Structure

We first highlight organizational features that govern the rules and resources that provide one aspect of the structural dimensions of the institutional field (Dimaggio and Powell 1983; Hoffman 2001; McLaughlin 2001; Scott 2004) of fish consumption advisories. Pidgeon et al (2003b:3) suggest the need within risk amplification to study “the ways in which real risks are created, amplified and/or dampened by the very persons and organizations that are expected to control or manage them. These human and organizational factors can be important or even dominant contributors to the overall risks from complex socio-technical systems.” Several state agencies play a role in developing action levels for, studying the hazardous affects of, and communicating advisory information to the public about fish contamination.
In Michigan, the Department of Natural Resources (DNR) manages fishery populations through population assessment, development of fishing regulations, and maintenance of fishing access areas. The DNR mission is to both protect the resource, but also to provide access to the resource for the public (Table 2).

The Department of Environmental Quality’s (DEQ) mission is to maintain the environmental quality of the state’s resources and has less of a resource use endeavor. DEQ staff members sample air, biota, soil, and water for contaminants; but, they also review and issue permits that govern discharges into the environment. The DEQ maintains regulatory authority over some of the potential sources of mercury contamination such as coal-fired power plants, waste incinerators and toxic waste cleanup sites. The DEQ also manages the internet-based fish contaminant database that houses the results of fish contaminant sampling statewide.

The Department of Community Health (DCH) focuses strictly on human health as its main concern. In addition to physical and mental health efforts, they provide guidance and collect human health information concerning environmental contaminants such as lead. They also work collaboratively with the DNR and Department of Agriculture on the human health implications of diseases such as bird flu and tuberculosis in cows and deer. Ultimately, the DCH acts as the authority for reviewing the fish contaminant data and determining the nature of the fish consumption advisory (Michigan Department of Community Health 2003). They are also charged with disseminating the advisory information.

The involvement of multiple agencies such as the DCH, DEQ and DNR provide external, supra-individual constraints and opportunities that serve as structural processes that affect social behavior and understanding (Rubinstein 2001). Understanding the structure and operations of the government agencies involved in risk communication provide some insight in terms of understanding the efficacy of risk management (Chess 2001; Chess, Burger and McDermott 2005). Fish contamination and consumption information is complicated by the fact that these agencies have differing missions (Table 2) and responsibilities with respect to fish contamination and consumption. This can lead to confusion and undesired risk behavior (Burger et al. 2003a).

The fishing public interacts mainly with the DNR through purchase of fishing licenses, interaction with data collection clerks at access sites who record the amount and type of fish harvested, DNR signage at access sites, and DNR fish management public hearings. Further, fish advisories previously appeared bundled together with the fishing
license regulation book that anglers obtained with their license purchase. It is natural that the public assumes that the DNR acts as the responsible party.

Although the DCH holds the authority for the fish consumption advisory program, since 2003 the Michigan legislature eliminated funding for the DCH to produce and distribute the fish advisories (Meyerson 2004). The DCH did not update the advisory from 2003–2006 and only distributes the advisory electronically through a website. While the DNR often collects fish for the contaminants program and the DEQ actually analyzes and reports the contaminants, the one organization charged with compiling and disseminating the advisory (DCH) lacks the structural resources to adequately communicate the risk of fish consumption advisories.

The key structural implication is that no one organization possesses all the rules (jurisdiction, mandate) and resources (financial, expertise) to act or communicate with the public regarding fish consumption advisories. The demise of funding to distribute the advisory only exacerbates the jurisdictional incongruence. Fish consumption advisories thus present a different kind of organizational risk failure (Perrow 1984) because there is not one sole organization that can be seen as deficient, negligent or guilty of recreancy (Freudenburg 2003) that “involves the failure of experts or specialized organizations to carry out the responsibilities to the broader collectivity with which they have been implicitly or explicitly entrusted” (Pidgeon et al 2003b:3) Instead of an intra-organizational failure, fish consumption advisories provide an emerging example of a systems failure among organizations within the institutional field.

### Table 2. Mission Statements of Michigan Governmental Agencies

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<th>Department of Natural Resources</th>
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<tr>
<td>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.</td>
<td>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.</td>
<td>Michigan’s Department of Community Health (MDCH) strives for a healthier Michigan.</td>
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<td>• promote access to the broadest possible range of quality services and supports;</td>
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<td>• take steps to prevent disease, promote wellness and improve quality of life; and</td>
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<td>• strive for the delivery of those services and supports in a fiscally prudent manner.</td>
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Culture

The Agency for Toxic Substances and Disease Registry specifically targeted Michigan’s Upper Peninsula due to particular concerns about the geography and culture of the region in terms of greater dependence and enjoyment of natural resources in a sparsely populated area (ATSDR 2003). Visual evidence suggest that there are indeed strong cues regarding fish consumption in the U.P. that might explain people’s higher consumption of Great Lakes fish than non-Great Lakes, the lack of concern regarding fish consumption risks, and the preference for frying fish. Both focus group and angler interviews emphasize the enjoyment of fresh fish that the U.P. affords its residents. In particular focus group participants favor consumption of whitefish. Whitefish from Lake Superior present one of the safest fish to consume; however, larger whitefish from Lake Michigan and Lake Huron still contain advisories for women and children.

The availability of fresh fish is manifest in roadside advertisements in each of our study areas. Such advertisements provide cues regarding the cultural and symbolic importance of fish consumption. Advertisements appear in retail outlets operated by commercial fishermen, local restaurants, and even chain or franchise restaurants. The notion of fresh fish has become culturally embedded in sayings such as, “the fish you eat today slept last night in Munising (Marquette) Bay” that emerged in both focus groups and in retail brochures. Not only do appeals for fish consumption appear on a daily basis, but such appeals are heightened during celebrations such as school graduations and weddings. Throughout the study area, residents mention and signs advertise the importance of Friday fish fries. It can be argued that these present evidence for the routinization of fish consumption into the cultural fabric and habitus of the U.P.

The presence of fresh local fish can serve as a deamplification of risk. In two of the focus groups, participants referred to the presence of and reliance upon local commercial fishermen as cues toward the safety of fish consumption. Despite one participant’s academic background in environmental science, the participant deferred to the local fisherman in explaining that the fisherman would not sell bad fish since the fisherman had lived there for years and had built trust in the community. In every focus group, participants indicated that given the uncertainty, they trusted fish from Lake Superior and the Upper Peninsula because of the pristine nature of the area, and would not eat fish coming from the lower peninsula of Michigan or the other Great Lakes. However, as one focus group participant indicated, not all of the fish available locally originates from Lake Superior or even the U.P.
because of fish distribution networks. Across all focus groups and angler interviews, participants commented that they trust the fish they eat because they catch it themselves or they know the people who catch it, so they know the origin of the fish. This supports the notion of subjective risk as it shows the power of fresh, local fish and local information sources in contrast to the objective, scientific information that appears in the fish consumption advisory.

**Agency**

Upper Peninsula residents exhibit agency through the decisions they make regarding the fish they catch and eat in terms of species, cooking and preparation and how they situate information such as trimming fat in terms of risk or taste as a controlling factor for that singular behavior. Emirbayer and Mische (1998) suggest the components of agency include selective attention, type recognition, categorical location, and expectation maintenance. While most people explained that they eat the majority of their fish from the Great Lakes and not from inland lakes, one would expect greater awareness of PCB as a contaminant and not mercury. Low PCB awareness persisted even among anglers fishing in the Great Lakes sites. Therefore, residents display selective attention as manifest by their disproportionate concern with mercury instead of PCB as a contaminant (Figure 2) and through their notions of access to fresh fish as an indicator of good health. The focus groups, community dinners and angler interviews indicate that actors express confusion and uncertainty regarding the scientific information about risks and benefits in line with the notion of type recognition. The fish advisories represent another case of dueling and uncertain science especially as it relates to health information. For example, consider the emerging information that exposure to ultraviolet sunlight might actually serve to improve health instead of only serve as a contributor to declining health (Marchione 2005; Neighmond 2005).

People’s relationships with other people and events such as the social experience of Friday fish fries, getting information through other anglers and friends, and fishing as a social activity in general, represent the categorical location dimension of agency. Expectation maintenance consists of the belief in the reliability of fish consumption information provided by the Department of Natural Resources when in fact the DNR has very little control or influence over fish consumption advisories. People simply expect that the DNR has a role since it manages the fisheries and distributes information about fish, develops fish regulations, and maintains fishing access sites.
Integration

We attribute the situation of fish consumption advisories in the U.P. to conditions of risk that emerge through interaction of the structural dimensions of bureaucracy with a strong natural resource–based culture that affects the agency of residents. As such, the structural and cultural factors contribute to the agency exhibited by U.P. residents that in turn affect people’s responses to the structural and cultural factors that exist as expected through structuration. The uncertainty of the science regarding the mixed benefits (high protein, low fat, high omega-3) and concerns (PCB and mercury) of fish consumption (Knuth et al. 2003) interacts with the inconsistent organizational structure and strong local fresh fish culture to create conditions of risk.

Anglers equate the uncertainty of fish consumption risks with eating other items in the food system such as beef. They know little about the comparative health risks of anything they eat, so they wonder why they should single out fish. This suggests that in the U.P. a hazard oasis (Lidskog 2000) may exist where people downplay risk significance, especially in the presence of scientific uncertainty, through habituation fostered through social networks and weekly fish fries, signs that perpetuate the fresh fish image, and lack of risk information from the one state agency they deem, albeit incorrectly, to have the most reliable information on the issue. Such a process illustrates how actors negotiate objective threats with their cultural and social experience to determine “rules of how to select, order and explain signals from the physical world” (Kasperson 1992:158). One would hope that people who identify strongly with fish consumption would have a strong understanding of the benefits and risk of fish consumption (Knuth et al. 2003). In contrast, our exploration revealed a weak understanding. However, the amount and kinds of fish consumed on average reduce the consequences of such risk gaps. Data suggest that only a few residents eat more than one meal of fish a week on average, while most people consume whitefish and not top predator fish like lake trout and bass species. Yet, conditions that support the deamplification of risk pervade the study and suggest a need to address the conditions while current exposure is relatively low, although several more serious situations remain.

Consider for example the case of the 906 acre Deer Lake located in Marquette County. A high level of mercury contamination in Deer Lake fish in 1981 led to its designation as an Area of Concern (AOC) by the International Joint Commission in 1985 (EPA 2003). A remedial action plan was implemented in 1984 and the water and fish continue to be monitored. The Public Advisory Council founded in 1997 has developed fact sheets and signage related to the fish advisory and
worked with groups such as the Boy Scouts on stream cleanups, beaver dam removal, and monitoring (EPA 2003). Deer Lake is the only waterbody in the study area where the high level of mercury necessitates a no fish consumption designation. Despite the designation, Deer Lake remains a high quality catch and release walleye and northern pike fishery (EPA 2003). It is also only one of the two waterbodies in the study area that has any signage related to fish consumption advisories. Deer Lake also has the distinction of having one of the largest databases of fish contaminant data to support its advisory.

Despite the designation as an AOC, interviews with three different male anglers who claim to fish Deer Lake reveal the complexity of how structure, culture and agency interact within the social amplification of risks framework. Angler Number 1 knows Deer Lake is a mercury impacted site and claims to fish only as catch and release as it is good fishing. Angler Number 2 says he knows it's a mercury impacted lake, that it is catch and release, but that he eats some fish anyway. He says he limits his amount to no more than once per month. Angler Number 3 acknowledges that there is a sign that mercury impacts the fish in Deer Lake, but he does not believe the science that there is a problem. He believes it reflects the DNR’s attempt to keep the public from enjoying the fishery. He also does not understand how a pristine area like Deer Lake can have a fish ban, while he sees anglers in more visibly polluted, urban areas catching and eating fish without an advisory. So he eats the fish anyway. So we have one lake with the largest, objective scientific dataset on mercury levels in fish, the one clear case of risk communication (the large warning sign at the access ramp), a long history of the public involvement, and, yet, an example of three different interpretations of the risk that leads to three different stated behaviors in response to the same objective and communicated risk.

**Conclusion**

The nexus of culture, structure and agency applies to scientists, resource managers and health care providers within the institutional field of fish consumption advisories. These notions explain agency response to fish consumption advisory issues (Chess et al. 2005). The agency response is embedded within the cultures of science as well as government bureaucracy such that scientists have to deal with constraints developed through their scientific training and professions as well as through their bureaucratic context. These issues explain the frequent embrace of instrument rationality by use of technical information as solution to fish consumption advisory dilemmas (Chess et al. 2005). Singular use of structural solutions such as uniformly
delivered written fish consumption advisories emerge as inadequate, without acknowledging the intersecting roles of culture and agency. The implications loom large as Michigan’s Department of Community Health no longer distributes hard copies of the Michigan Fish Advisory and relies on the internet to disseminate information (Michigan Department of Community Health 2003).

This suggests the importance of understanding how different cultural systems respond differently to the same structural features. In other words, women and community members in Munising may respond differently to the same paternalistic scientific-medical knowledge production and delivery system than women and community members in Ironwood. This might explain how groups respond to the risks and benefits of fish consumption, but also how people might respond to any educational efforts offered by agencies based on the assumption of rational social response to objective information (Chess et al. 2005; MacDonald and Boyle 1997). After all, the amplification of risk framework suggests that the impact of any risk communication strategy depends on sound understanding of the informational symbols (emphasis on exotic species control signs at access sites), imagery (fresh fish signs), and signals (lack of hardcopy advisory distribution) that appear and how people interpret and respond to them. The strong cultural roles of fish and the structural deficits of the governmental institutions combine to mask fish consumption risks in the study areas even in the areas (Deer Lake) and among the populations (women) where such risks (PCBs) serve as the targets of risk communication.

References


Appendix: Questions for Focus Groups

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?

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?