Hmong Fishing Activity and Fish Consumption

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ABSTRACT. We examined the fishing activity and fish consumption of Hmong residents of Green Bay, Wisconsin to determine whether their fishing activity was similar to other Wisconsin residents. Previous studies have raised concerns that higher fish consumption by minority groups living in urban areas may increase their health risks from consuming contaminated fish. Using data from a random sample of households representing nearly half of the local Hmong population, we determined that members of 60 percent of Hmong households participated in fishing activity and often traveled to fishing locations 30 to 40 miles beyond their local community. One quarter of the households reporting fishing activity consumed fish at least once per week. The most commonly reported species caught, white bass, was captured twice as often as the next most frequently reported species. Since contaminant levels in white bass vary widely (0 to 4.8 ppm PCBs in 1992) depending on the fishing location, some Green Bay Hmong residents may be consuming fish in excess of recommended state health advisories.

INDEX WORDS: Fish, consumption, Hmong, PCB, white bass, Green Bay, sport fishing.

INTRODUCTION

The accumulation of toxic substances in the Great Lakes has raised concern over human health risks association with fish consumption, a suspected major exposure route of toxicants for humans (Fein et al. 1984, Rogan et al. 1987, Dar et al. 1992). In a study of 192 Wisconsin sport anglers, 69 percent were found to have detectable PCBs in their serum samples (Fiore et al. 1989). Research on fishing activity and fishing consumption of minority groups in Michigan suggested that black and Native American anglers consumed greater quantities of fish than white anglers (West et al. 1992). In particular, non-white anglers consumed greater quantities of white bass and sheepshead from the Detroit River than white anglers (West 1992). In a survey of licensed Great Lakes anglers Connelly and Knuth (1993) observed that Hispanics and those with lower incomes were less likely to be aware of fish consumption advisories.

Contaminant levels of PCBs in the lower Green Bay-Fox River ecosystem have resulted in fish consumption advisories, published jointly by the Wisconsin Department of Natural Resources and the Wisconsin Division of Health since 1976 (Wisconsin DNR 1993). These advisories have consistently recommended against consuming large walleye and nine other species of fish from the lower Fox River and Green Bay due to polychlorinated biphenyl (PCB) contamination. Recent improvements in water quality for the lower Green Bay-Fox River ecosystem, resulting in higher dissolved oxygen levels, have produced an expanded sport fishery (Harris 1992). This situation poses some special health concerns for anglers who make regular use of the Fox River and lower Green Bay.

Anecdotal reports of extensive angling along the Fox River by Hmong immigrants have repeatedly been brought to the attention of one of the authors (C.K.), raising a concern that non-English-speaking
immigrants to the Green Bay area may not be aware of potential health hazards from the consumption of Great Lakes fish. This concern is amplified by the high birth-rate and large numbers of young children in the Hmong population (Hutchison 1992). This study was initiated to address the issue of whether Hmong residents of Green Bay, Wisconsin, exhibit angling or fish consumption habits that are different from those of other Wisconsin residents.

Fish consumption by Wisconsin anglers has been previously addressed in a study conducted by the Wisconsin Division of Health and State Laboratory of Hygiene (Fiore et al. 1989). This survey indicated a high level of awareness and compliance with the Wisconsin Fish Consumption Advisory (Fiore et al. 1989). However, a New York study suggested that some anglers consciously ignore warnings about contaminated fish (Connelly et al. 1992). The question of angling behavior and fish consumption among ethnic minority populations in Wisconsin has not been addressed by previous research.

Information regarding the extent of fishing activity and fish consumption among the Hmong population in Green Bay-Brown County was collected through a research project sponsored by the University of Wisconsin Institute on Race and Ethnicity (Hutchison 1992). Personal interviews with 125 Hmong households were completed during the period November 1989 through February 1990. The research results presented here focus on two questions: (1) what is the extent of fishing activity among the Hmong population residing in Green Bay-Brown County? and (2) what patterns of fish consumption are observed within this population?

STUDY POPULATION

In 1990 the Hmong population in Green Bay-Brown County numbered some 2,000 persons, a large increase from the 200–300 Hmong persons living in the community in 1980. This rapid population increase was due to three factors: (1) the continuing in-migration of persons from refugee camps in Thailand, (2) secondary migration of households to Green Bay from other communities and states, and (3) a very high birth rate and corresponding large family size among Green Bay Hmong households (Hutchison 1992).

A 1988 study by the U.S. Office of Refugee Services indicated that in the mid-1980s Wisconsin surpassed Minnesota as the state with the second-largest Hmong population (California, with 54,000 Hmong residents, ranked first; see Yang and North 1988). Green Bay is the largest Wisconsin urban center, outside of Milwaukee, with a substantial Hmong population.

METHODS

To draw a random sample of the Hmong population, we obtained a complete list of all Hmong households living in the Green Bay-Brown County area. This list was compiled by the Hmong Association of Brown County from information provided by the local sponsoring agencies and from records of persons who had applied for programs and assistance through the Hmong Association. We then checked this listing with several long-term members of the local community to ensure that it was complete (i.e., that all households known to live in the community were included in the list).

Our final list included more than 330 Hmong households. From this list we drew a random sample of 160 names; 125 of the 160 households were interviewed. We were unable to locate 25 households, and a further check with the county Hmong Association and others in the community indicated that these families had moved from the Green Bay area. Another 10 households declined to participate in the study. Interviews were conducted from October 1989 through January 1990. Native Hmong speakers (students at the University of Wisconsin-Green Bay) conducted 120 interviews in the Hmong language at respondents' homes; five interviews were conducted by telephone to accommodate the schedules of respondents and the research staff.

Completed interviews with heads of households included responses from 64 males and 45 females. An additional nine interviews were conducted with both males and females at the request of participating households. Our final response/participation rate was approximately 92 percent. The very high response rate may be explained by the association of the project with the Brown County Hmong Association, interviews conducted in Hmong by native Hmong-language speakers, and the use of interviewers from the local community.

The project made extensive use of materials drawn from a Hmong-language questionnaire previously used in the Indochinese Health and Adaptation project (Rumbaut and Ima 1988). Approximately one-third of the questions included in the Green Bay study consisted of new material to measure acculturation to life in northeastern Wisconsin. Included in the Green Bay study were seven questions designed
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To measure the extent of fishing activity and fish consumption among the local Hmong population. These questions asked for the frequency of fishing activity among household members, composition of fishing groups, locations where fishing usually took place, type of fish caught, and frequency of consumption of fish taken from local waters.

RESULTS

The frequency of reported fishing activity for all Hmong households included in the sample, as well as for the 72 households where fishing activity was reported, is shown in Figure 1. These results were derived from the closed-ended question “How frequently does ___ go fishing?” More than half—58 percent of all respondents—indicated that they or other members of the household participated in fishing. Seventeen percent of all households reported fishing once or two to three times each week, although no respondents reported fishing as a daily activity. A slightly greater proportion of the respondents (18 percent) reported that they or other members of their household fished “2–3” times each month, and nearly one-quarter of the households reported fishing activity only once each month.

Fewer than 20 percent of the households interviewed included persons other than nuclear family members (mother, father, children); approximately five percent of the households included an older parent, and fifteen percent included the brother or sister of one spouse. The average number of children per family in our survey was 3.8.

The typical fishing group among Hmong residents consisted of male members of the household, usually the father (46 percent) and occasionally the male children (32 percent). This information was obtained from the relative frequency of responses to the open-ended question “Who is it that usually goes fishing?” Father-son fishing groups occurred less frequently (15 percent). Less than one in ten (8 percent) of the households indicated that fishing

![Fishing Activity](image)

**FIG. 1.** Frequency of fishing activity shown for all households surveyed, and separately for those households with anglers present. Fishing activity is reported as number of fishing trips per interval (daily, two to three times per week, once per week, two to three times per month, once per month, never).
was a family activity, frequently as part of a family picnic. None of the female respondents indicated that they fished, and female members of the household were not included in fishing groups except as part of larger “family groups.” This pattern of gender segregation is similar to that reported for other ethnic subgroups with more “traditional” family structures (Hutchison and Fidel 1984).

Hmong fishermen catch common species of fish that do not require expensive fishing equipment and are relatively easy to catch (Table 1). White bass were reported as caught with twice the frequency as the next most common species, trout (an uncertain category that possibly refers to a number of species). Perch and walleye, two of the most commonly caught after local species, followed in frequency of being reported as caught. Whether deliberate or not, species frequently listed on fish consumption advisories and commonly associated with low income groups (e.g., carp and catfish) were not reported by the Hmong anglers. The results in Table 1 were obtained from the open-ended question “What type of fish do you usually catch?” All of the seven “don’t know” responses were reported by female heads of households.

A wide variety of fishing areas were reported as being used, some requiring extensive travel (Table 2). About one-third (31 percent) of the Hmong anglers fished in areas that have been included in fish consumption advisories (this includes the Fox River in the cities of both Green Bay and Appleton, and the bay of Green Bay, including the Oconto and Peshtigo rivers at their confluence with the bay). The most frequently reported fishing site was the Lake Winnebago-Lake Butte des Morts area, followed by the Oconto River. This information was obtained from the open-ended question “Where do you usually go fishing?” Several preferred fishing locations were those most distant from the local community. Although fishing is possible in numerous locations both within the city limits of Green Bay and in close proximity to the city, the three most commonly mentioned fishing locations are located about 40 miles away.

Two survey questions were designed to measure the extent of fish consumption by Hmong anglers and their households. More than 90 percent of those respondents who reported fishing activity by household members said that they consumed fish taken from local waters. The wording for this closed-ended question was, “Do you and other persons in your household eat the fish that (you) catch on these trips?” Respondents who answered this question positively were then asked to indicate how frequently they consumed fish caught in local waters. Responses to this question are shown in Table 3.

### Table 1. Frequency of type of fish caught in local waters by Hmong anglers.

<table>
<thead>
<tr>
<th>Fish</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Bass</td>
<td>39</td>
</tr>
<tr>
<td>Trout</td>
<td>18</td>
</tr>
<tr>
<td>Perch</td>
<td>12</td>
</tr>
<tr>
<td>Walleye</td>
<td>7</td>
</tr>
<tr>
<td>Smelt</td>
<td>3</td>
</tr>
<tr>
<td>Carp</td>
<td>2</td>
</tr>
<tr>
<td>Catfish</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

N = 72

### Table 2. Location of fishing activity reported by Green Bay Hmong anglers.

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent of Respondents</th>
<th>Distance (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butte des Morts</td>
<td>14</td>
<td>48</td>
</tr>
<tr>
<td>Lake Winnebago</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>Oconto River</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>Fox River–Green Bay</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>Manitowoc River</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>Fox River–Appleton</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>Peshtigo River</td>
<td>2</td>
<td>29</td>
</tr>
</tbody>
</table>

N = 72

### Table 3. Frequency of consumption of fish from local waters by Hmong anglers.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyday</td>
<td>0</td>
</tr>
<tr>
<td>2–3 times a week</td>
<td>14</td>
</tr>
<tr>
<td>Once a week</td>
<td>9</td>
</tr>
<tr>
<td>2–3 times a month</td>
<td>15</td>
</tr>
<tr>
<td>Once a month</td>
<td>53</td>
</tr>
<tr>
<td>Never</td>
<td>8</td>
</tr>
</tbody>
</table>

N = 72
Nearly two-thirds (61 percent) of the households reported consuming fish caught in area waters only “once a month” or “never.” Fewer than 1 in 7 (14 percent) reported fish consumption several times a week, and about 1 in 10 households (9 percent) reported eating fish once a week. This information came from the closed ended question: “How frequently do you eat fish that you catch on these trips?” This question was asked only of those Hmong respondents who reported that they consumed sport-caught game fish.

The responses refer only to the consumption of fish caught by household members in local waters, not to total fish consumption (the question was asked only of those households that reported one or more family members engaged in fishing activity). Reported fish consumption was consistently lower than the frequency of reported fishing activity. For example, while 21 percent of the households whose members engaged in fishing activity reported fishing once a week and 32 percent reported fishing 2–3 times a month (Fig. 1), the corresponding figures for frequency of fish consumption were 9 and 15 percent. Because the questions reported here were included as part of a larger survey of leisure and recreation activity within the Hmong population (Hutchison 1993), they do not directly correspond to those in other studies of fish consumption, and our comparisons to the results of other studies are thus indirect. The responses do not, for example, allow us to directly measure the weekly consumption of contaminated fish.

**DISCUSSION**

It is useful to compare the results of the Hmong survey with two other studies of leisure and recreation activity in northeastern Wisconsin. A survey of leisure and recreation activities among a random sample of (male and female) residents of Oshkosh indicated that hunting, fishing, and bowling were the three most common recreation activities, with 20-30 percent of the population participating in each activity. A more recent study of leisure and recreation activities among the Green Bay-Brown County population also found hunting, fishing, and bowling to be the most common activities, although fishing was mentioned by only 19 percent of the households (Hutchison 1988).

Individuals in Hmong households in Green Bay may consume fish more frequently than the typical Wisconsin angler. The mean number of reported fish meals consumed per household in this study was 30 per year, assuming conservatively that households reporting having consumed “2–3” meals of locally-caught fish per week or per month actually consumed two meals. By comparison, the mean number of sport-caught fish meals by Wisconsin anglers in 1984 was 18 (Fiore et al. 1989). This difference probably relates to cultural patterns and learned behavior from Laos, where fishing was a common activity to supplement the household’s diet. Widespread opportunities for fishing in the Green Bay area encourage continuation of this activity.

Our data suggest that contaminated fish consumption by some Hmong households may often exceed state guidelines. Over 50 percent of white bass tested for PCBs—a species clearly preferred by Hmong anglers—exceed Wisconsin state fish consumption advisory levels (2 ppm) at several popular fishing locations listed by one-third of respondents (Fox River-Green Bay, Oconto River, Peshtigo River, and Fox River-Appleton). At these locations white bass are placed in “Category 3” of the Wisconsin state fish consumption advisory, which recommends that “no one should eat these fish” (Wisconsin DNR 1993). PCB levels in white bass from the lower Fox River ranged up to 4.8 ppm in fish collected during 1992 (Jim Amrhein, Wisconsin Dept. of Natural Resources, personal communication 22/7/93). White bass are not listed on fish consumption advisories for other reported locations; no tested fish at these sites contained PCBs at levels above the state health standard of 2 ppm. No detectable levels of PCBs have been found in white bass collected from Lake Winnebago (Jim Amrhein, Wisconsin Dept. of Natural Resources, personal communication 22/7/93).

The preference for white bass by Hmong anglers contrasts with previously reported preferences by Wisconsin anglers (Fiore et al. 1989), in which white bass were not among the top eight most sought-after fish species. The commonly expressed concern that Hmong households consume large quantities of contaminated carp and catfish is not supported by our results (Table 1). Walleye from the lower Fox River and Green Bay are another readily available species also included in Category 3 of the Wisconsin state health advisory but were infrequently reported as caught. It is difficult to determine whether fish reported as “trout” were actually various species of trout, or whether this description was used as a catch-all for a variety of species.
The finding that the Lake Butte des Morts-Lake Winnebago area is the most frequent fishing location corresponds to other responses from this survey. White bass was the preferred game fish reported by Hmong anglers, and Lake Winnebago offers relatively consistent fishing opportunities for this species. Few spiny-rayed fishes are common in southeast Asian regions native to Hmong immigrants, and hook-and-line angling is not a common practice in these regions (W. Rainboth, UW-Oshkosh Dept. of Biology, personal communication). Therefore, the Hmong preference for white bass is probably specific to local conditions (e.g., catchability and taste), and appropriate fishing methods have been learned since arriving in the United States.

The demographic structure of the Green Bay Hmong population is a special cause for concern in regards to their potential consumption of contaminated fish. The Wisconsin fish consumption advisory states: "Generally, people who should take the most precautions are children aged 15 or less and women who intend to have children" (Wisconsin DNR 1993). The majority of the Green Bay Hmong population was age 15 and less in 1990 (Hutchison 1992), and half of the adult women were under the age of 30 and had not completed their child-bearing years. While we do not have detailed information about which household members were consuming contaminated fish, we have no evidence that individuals most at risk were excluded.

Concerns regarding the consumption of contaminated fish have been raised by other studies (West 1992, West et al. 1992, Connelly and Knuth 1993). The recognition that minorities are more likely to live in urban areas and to limit their recreation activities to sites close to home has raised concern that minorities may be more susceptible to the health risks than the general population. West (1992) reported that 15 percent of white and non-white respondents in a survey of Detroit residents reported eating fish caught from the Detroit River. Non-white anglers were more likely to view this activity as a food source and reported eating white bass and sheepshead with greater frequency than did whites. Connelly and Knuth (1993) found that Hispanic and non-white anglers in New York state consumed more fish meals annually than white anglers, and a greater proportion of these meals were from Great Lakes fish than other sources. However, non-white and non-Hispanic anglers were more likely to have made changes in fish consumption in response to health advisories than other groups surveyed.

Possible Errors in Reporting of Information

In the analysis of data from surveys the question frequently arises: How do you know if the information is accurate? Measurements made through survey questions are subject to both random and systematic error. Some respondents may give a number that is too high; others, an estimate that is too low when asked to recall the number of times that they eat fish each month. Others may provide deliberately misleading answers to questions of personal behavior, particularly when, in the case of fish consumption, they have been sensitized to potential dangers through well-publicized fish advisories in the local media and other sources; in Green Bay and other cities, the advisories have been translated into Hmong and broadcast on Hmong-language radio shows.

Even with the use of just seven questions, several opportunities were available to verify respondents' answers. First, we looked for internal consistency among responses to individual questions. As noted earlier, all respondents who indicated that no one in their household ate the fish they caught indicated on a subsequent question that they "never" ate fish (when asked for the frequency of fish consumption). In addition, the frequency of fish consumption was less than that of overall fishing activity, further suggesting that the results were reliable.

Another comparison was available between the responses of male and female head of households. None of the women in the study fished; they reported the fishing activity of other persons in the household. Yet the responses of both male and female respondents were generally consistent with one another as to the frequency of fishing activity and fish consumption. Although women reported slightly higher frequencies on both questions, the difference was not statistically significant. In addition, the rank order and frequency with which particular fish species and preferred fishing locales were cited were consistent between male and female respondents.

Perhaps the most convincing test as to whether the respondents were providing truthful responses can be found in the reported types of fish caught and the reported locations for fishing activity. The fact that the relatively distant Oshkosh-Lake Winnebago area is a preferred fishing location, and is a
likely location to catch white bass, lends further credence to the self-reported fishing behavior.

CONCLUSIONS

The information summarized in this report enables us to draw a fairly complete picture of fishing activity among the local Hmong population, and two important conclusions may be drawn:

(1) Fishing is a Popular Activity. Fishing activity among the local Hmong population was reported by more than half of the households interviewed. Fishing groups are male oriented, including either adult males or, less frequently, father-son groups. For a small segment of the Hmong population, fishing has become a recreation activity associated with family picnics. Although fishing is a very popular activity, only a third of those persons who fish do so as often as once a week. The preferred fishing locations for Hmong anglers—located 40 miles or more outside of Green Bay—ensures that fishing for white bass, the preferred game fish, is limited to a weekly or biweekly basis. Fishing activity among the Hmong resembles leisure behavior common to the majority of the local population.

(2) Fish Consumption is High. Over half of the Hmong households in our study indicated that they consume fish caught in local waters. Of greatest concern is the one quarter of households reporting fishing activity that consumed fish at least once per week. The fact that Hmong residents prefer white bass—a species that has wide-ranging contaminant levels (0 to 4.8 ppm PCBs in 1992) depending on location—is further cause for concern. Two fish species widely regarded as sources for potential contamination (carp and catfish) were generally avoided by Hmong fisherman.

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