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Urban anglers' adherence to fish consumption advisories in the Great Lakes region

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ABSTRACT

Urban anglers are considered a group at high risk of being exposed to contaminants from fish consumption. Past studies of urban anglers' fish consumption, however, have had significant limitations making it difficult to generalize their findings broadly and to assess the degree to which urban anglers are complying with advisory recommendations. We used a diary method to collect detailed information on fish consumption in three cities in the Great Lakes region for a 4-month period during the summer of 2014. We assessed how much fish anglers were consuming, whether they were complying with fish consumption advisories, and how fish consumption and advisory compliance varied for different demographic groups and in different locations. We estimated a mean of 1.12 meals/week of fish and 25.1–26.8 g/day of fish, and the amount of fish consumed varied by no >25% from one site to another. Advisory exceedance was more variable, however, ranging from 7–10% to 27–40% in our three study sites. Fish consumption increased with age, education, and income, and was higher for non-whites than for whites. Advisory exceedance was higher for women, non-whites, and older anglers. At each site, the types of fish that contributed the most to advisory exceedance varied, which points to the benefits of community-specific (and resource-intensive) fish consumption advisories. Our findings could help fish consumption advisory programs tailor their advice to vulnerable populations and particular locations.

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Introduction

The Great Lakes Restoration Initiative Action Plan II identifies urban anglers as a group at high risk of being exposed to contaminants through fish consumption (Great Lakes Interagency Task Force, 2014). Although eating fish provides a variety of health benefits, urban waters in industrialized areas may be polluted, and some types of fish in those waters accumulate high levels of industrial contaminants (Burger et al., 1999). Eating contaminated fish is associated with higher body burdens of contaminants such as PCBs and mirex (Bloom et al., 2005; Knobeloch et al., 2009). Therefore, fish consumption advisories have been promulgated for many waters, and the advisories for urban waters are sometimes more restrictive than advisories for other waters. Urban anglers are considered more likely than other anglers to fish at urban sites and, if they eat the fish they catch, more likely to be exposed to the contaminants in these fish.

Past work on urban anglers has explored the demographic characteristics of urban anglers (Burger et al., 1999; Lauber et al., 2017), fish consumption by demographic groups that are more prevalent in urban areas, such as low income individuals, racial minorities, and immigrant groups (Burger et al., 1999; Silver et al., 2007; West et al., 1993), and how urban anglers make decisions about fish consumption and use fish advisories (Beehler et al., 2001, 2003; Burger et al., 1993; Lauber et al., 2017; Pflugh et al., 1999). Relatively little work, however, has investigated the fish consumption patterns and adherence to advisories of urban anglers themselves. The limited work that has been done on this topic provides some insight into how much fish urban anglers are eating and which types of people are eating more. Overall, this work finds considerable variation in the volume of sport-caught and purchased fish consumption as well as the potential for exposure to contaminants through excessive consumption beyond that which health authorities advise.

Some of this work has explored fish consumption by urban ethnic populations that were expected to eat a lot of fish. Hutchison and Kraft (1994) studied sportfish consumption in the Hmong community of Green Bay, Wisconsin, in 1989 and 1990. They interviewed 125 Hmong households to collect information on the types of fish people reported catching and how frequently they ate fish they caught over the course of a year. They reported that 61% ate sportfish once a month or less and only 9% ate sportfish at least once a week. They calculated an average of 30 sportfish meals for each household over the course of a year, which was considerably higher than the rate of fish consumption among Wisconsin anglers overall. Their conclusion was that some members of the Hmong community were likely eating sportfish in excess of fish advisory recommendations, but they did not quantify advisory adherence.

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Murkin et al. (2003) documented patterns of fish consumption among frequent fish consumers in five Ontario Great Lakes Areas of Concern (sites with significant impairment of beneficial uses) between 1995 and 1997. They targeted two groups of people they considered at risk of eating too much contaminated fish: Asian-born anglers (identified through key informants, social and religious community organizations, newspapers, and health fairs) and anglers observed to be fishing at selected shore fishing sites (a group that has been a common focus in urban angler studies). Through home visits with 91 participants, they collected data on quantity and type of fish consumed during each season over the previous twelve months. They reported means of 33 meals of Great Lakes fish over the summer, 99 sportfish meals each year, and 157 total fish meals each year. Asian-born anglers consumed more fish than European- Canadian- or United States-born anglers. Considerable variation existed in the types and parts of fish that were eaten.

Burger (2002) reported fish consumption patterns of anglers fishing in the urban Newark Bay complex of New York and New Jersey. She interviewed 267 people fishing on site between May and September 1999. She reported 4.06 meals (1410 g) of fish/month for anglers who only fished and 3.56 meals (1630 g) of fish/month for anglers who both fished and crabbed. Consumption increased with age, and non-whites were more likely to eat their catch.

Sheaffer and O'Leary (2005) collected data on fish consumption through an on-site survey of 946 anglers who were fishing in metropolitan areas of Indiana in the spring and summer and compared it with similar data collected for 1743 licensed Indiana anglers collected through a statewide mail survey. The data were collected in 1997 and 1998. The mail survey asked anglers to report their consumption over the past three months, and it was administered to different samples of anglers at three different times of the year to obtain better estimates of annual fish consumption. They found slightly higher consumption of sportfish in the metropolitan anglers compared to the statewide sample (22.9 vs. 19.8 g/day) with 18% of the metropolitan anglers eating in excess of advisory limits compared to 16% of the statewide sample. Non-white anglers in the metropolitan areas consumed more fish than white anglers.

Kearney and Cole (2003) reported on fish consumption of 232 licensed anglers in two Ontario cities in 1992. The sample was selected to represent anglers who ate a lot of Great Lakes fish. Anglers were asked to recall the numbers and species of Great Lakes fish consumed over a 12-month period, reporting the results by season whenever that was possible. The authors found differences in the amount and species of fish eaten in the two communities, with reported fish consumption ranging from 10.9–34.2 meals/year and 12.3–19.9 g/day. Sportfish consumption was not related to age or income. In one of the communities, anglers with the lowest levels of education ate more fish.

Lauber et al. (2017) characterized the fish consumption of anglers who self-identified as being from urban areas in a mail survey of licensed anglers from the Great Lakes region of the United States. They reported means of 5.4 sportfish meals/year (with 63% eating at least some sportfish) and 12.5 purchased fish meals/year (with 70% eating at least some purchased fish). Fish consumption increased with income. Their study was the only one of this set that selected a representative sample of anglers living in urban areas. The others all selected samples of anglers that were expected to consume a lot of fish because of their ethnicity, fishing locations, or the results of a screening process.

These studies have some significant limitations. The narrow definition of study populations as well as the approach to sampling in some studies would make it difficult to generalize to larger populations. Most sample sizes were relatively small, making it difficult to compare subpopulations within groups. Many of the studies only considered sportfish consumption, although consumption of purchased fish can also contribute to risk. Most of these studies report on data collected in the 1990s or earlier and are now dated. Finally, participants in the studies were asked to report fish consumption by recalling either how much fish they typically ate or based on their recall of a specific 3- to 12-month period; these methods of reporting are likely to be less accurate than more proximal recollections (e.g., in the past few weeks).

In addition, only one of these studies reported whether fish consumption complied with fish consumption advisory recommendations. Federal, state, and tribal agencies provide advisories for fish consumers on the amounts and types of fish they can safely consume based on analyses of contaminants in fish and different waters. With sufficient data on fish consumption, noncompliance with advisories can serve as an indicator of excessive exposure to contaminants in fish. Although advisory compliance is not a measure of contaminant exposure, it is indicative of whether state and federal agencies consider likely levels of contaminant exposure (based on estimates obtained by sampling of contaminants from fish in various waterbodies) to be within safe limits. Studies measuring advisory compliance, therefore, can contribute to risk management decisions.

This study seeks to complement previous studies by reporting on urban anglers' fish consumption and compliance with fish advisories based on data collected from 1200 anglers in 3 metropolitan areas in the Great Lakes region of the United States in the summer of 2014. We selected a representative sample of licensed urban anglers, which allows us to explore how vulnerable subpopulations are similar to or different from the larger population of anglers living in cities. We used a diary method, in which anglers reported fish consumed on at least a bi-weekly basis, to assess the amounts and types (species, lengths, and location caught) of fish consumed over a 4-month period. These detailed data on fish consumption enable us to assess advisory compliance. We report on anglers' adherence to fish consumption advisories in each area and how fish consumption and advisory compliance varied with demographic characteristics.

Methods

Study sites

We selected three urban counties in the Great Lakes region as our study sites: the counties containing Kalamazoo, MI, Erie, PA, and Rochester, NY. Each of these cities had populations of at least 75,000 people. All 3 sites had statewide sportfish advisories as well as advisories for local bodies of water (with advice for particular species and lengths of fish), but the complexity of these advisories varied. In Rochester and Erie, only one to three local bodies of water had special advisories, but 11 local bodies of water had special advisories in Kalamazoo. Michigan is also the only state of the three that publishes advice for the consumption of purchased fish.

Sample selection and diary recruitment

We drew a sample of 15,000 fishing licenses sold to licensed anglers who lived in one of three study sites; we drew 5000 licenses for each site. We sent invitation letters to each member of the sample in February 2014. The letter described the study and what would be required of participants. It also offered a financial incentive of up to $20 for participation in the project and provided a link to a sign-up page on the Internet. We provided a postage-paid return postcard for people to opt out of the study because they did not eat fish, did not have regular Internet access, or were not interested in participating. We sent a follow-up letter to all invitees a week later encouraging participation.

We called those who did not sign-up or return a postcard to encourage participation and allow them to sign up over the telephone. Calling ceased when at least 2000 total participants and at least 600 participants in each city had been reached. During the study sign-up process, we obtained email addresses and then checked them by sending out a

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