



Urban anglers in the Great Lakes region: Fish consumption patterns, influences, and responses to advisory messages



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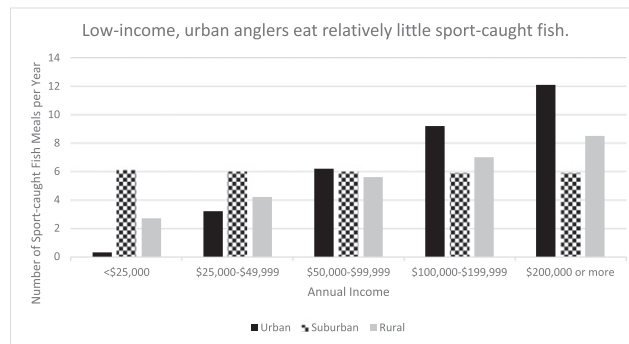
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HIGHLIGHTS

- The US EPA considers urban anglers at risk from fish consumption.
- We found few differences between urban and nonurban anglers in the Great Lakes.
- Immigrant populations, however, are more exposed to potentially contaminated fish.
- Risk communication with these anglers may benefit from community-based programs.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 12 December 2016

Received in revised form 7 February 2017

Accepted 23 February 2017

Available online 9 March 2017

Editor: D. Barcelo

Keywords:

Fish consumption

Urban anglers

Fish consumption advisories

Great Lakes

ABSTRACT

The U.S. Environmental Protection Agency and many state advisory programs consider urban anglers at high risk of being exposed to contaminants through fish consumption because the urban poor may be dependent on fish they catch for food and lack access to non-contaminated fishing sites. Past research has supported this characterization of urban anglers, but most studies have been site-specific and limited to subsets of urban anglers. We used a mail survey and focus groups to (a) explore how urban anglers living in the Great Lakes region of the United States differed from rural and suburban anglers and (b) characterize their fishing patterns, fish consumption, factors influencing their fish consumption, and response to fish consumption advisory messages. Although we detected some differences between licensed urban, suburban, and rural anglers, their magnitude was not striking. Lower income urban anglers tended to consume less purchased and sport-caught fish than higher income urban anglers and were not at high risk as a group. Nevertheless, focus group data suggested there may be subpopulations of urban anglers, particularly from immigrant populations, that consume higher amounts of potentially contaminated fish. Although urban anglers in general may not require a special approach for communicating fish consumption advice, subpopulations within this group may be best targeted by using community-based programs to communicate fish consumption advice.

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1. Introduction

Eating fish provides health benefits, but it also poses health risks. Fish may carry contaminants, such as mercury and polychlorinated biphenyls (PCBs), which can lead to a variety of health problems if consumed in too great quantities. The risks of fish consumption are a particular concern in the Great Lakes region of the USA because concentration of some contaminants, such as PCBs, is relatively high in Great Lakes fish. People in the Great Lakes region also eat fish at higher rates than in other regions of the USA. The eight Great Lakes states have developed fish consumption advisory programs to help people determine how much and what types of fish they can safely eat. The guidelines are based on estimates of the maximum levels of contaminants that can be safely consumed (e.g., 0.05 µg/kg of body weight/day for PCBs and 0.1 µg/kg of body weight/day for mercury) (Anderson et al., 1993; McCann et al., 2007). The levels of contaminants in fish vary not only for different species of fish, but for fish of different lengths, and fish in different regions and water bodies. Consequently, the advisories vary from one state to another in the Great Lakes region, and many of the states provide advice that is specific to particular bodies of water.

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). Urban waters are often heavily polluted, and therefore fish in those waters may be more likely than fish in other areas to accumulate some contaminants. Fish consumption advisories for urban waters are often 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.

Concerns about urban anglers are also influenced by the perception that these anglers are more dependent than other anglers on the fish they catch for food and less likely to have access to non-contaminated fishing sites (Derrick et al., 2008; West et al., 1993). This perception is based in part on evidence about the demographics of urban anglers. For example, Burger et al. (1999) studied urban anglers fishing in the waters of the Newark Bay complex of New York and New Jersey, which is a heavily urbanized area. These anglers tended to be low income (median household income of \$25,000–\$34,999), which could make them more dependent on the fish they catch for food. In addition, they had relatively low levels of education (28% had not graduated from high school) and included a high percentage of individuals from immigrant and non-English speaking populations (17% were more comfortable reading a language other than English), which might make fish consumption advisories less accessible to them.

Indeed, several studies have found that populations who commonly live in urban areas, such as low income individuals, racial minorities, and immigrant groups tend to have higher rates of fish consumption, which could lead to more contaminant exposure if they are eating locally-caught fish. For example, Silver et al. (2007) studied fish consumption among low income women in the Sacramento-San Joaquin Delta region of California and reported the highest levels of fish consumption in African Americans and Asians (particularly Vietnamese and Cambodians). The percentage of women who ate sport-caught fish was highest for Hmong and Cambodian women. Burger et al. (1999) studied anglers in the urban Newark Bay complex and found that the percentage of anglers who ate the fish they caught varied with race; Latino anglers were most likely to eat blue crab, and black anglers were most likely to eat bluefish and striped bass. West et al. (1993) conducted a survey of Michigan anglers and concluded that low income anglers and racial minorities consumed the most fish.

The accumulated evidence, however, is not entirely consistent. Knobeloch et al. (2005) conducted a study of fish consumption and mercury levels across a 12-state region, finding that Asian women tended to eat shellfish more often than women of other racial/ethnic backgrounds, and Native American women ate more commercial and

sport-caught fish than other groups. Shellfish consumption, however, was also positively correlated with income and education, which contrasts with previous findings about higher fish consumption among lower income populations.

Many of these studies have focused on how patterns of fish consumption vary with race, income, and education, but not specifically on fish consumption among urban populations. A few studies, however, have examined how urban anglers make decisions about fish consumption and how they use fish consumption advisories. Several studies reported that urban anglers fishing in the Newark Bay complex in the New York City metropolitan area (Burger et al., 1993; Pflugh et al., 1999) and minority urban anglers in Buffalo, New York (Beehler et al., 2003; Beehler et al., 2001) were not aware of fish consumption advisories or were not using those advisories for a variety of reasons (e.g., because they did not believe them, were unconcerned about health effects, etc.). Rather, to judge whether fish were safe to eat or not, they tended to rely on personal experience, direct observation, and advice from other anglers (Beehler et al., 2001; Burger et al., 1993; Pflugh et al., 1999).

The characteristics of urban anglers and demographic groups that are most likely to live in urban areas have implications for communication of fish consumption advisories. Anderson et al. (2004) has argued that reaching any distinctive subpopulation of anglers requires targeted messaging, and various authors have noted the need to take local knowledge, lifestyles, and culture into account in fish advisory communication (Beehler et al., 2003; Chess et al., 2005; Derrick et al., 2008). Some urban angler characteristics may make the development of advisories particularly challenging. For example, Shubat et al. (1996) warned that it may be more difficult to communicate fish consumption guidelines effectively when language and cultural barriers exist. Shimshack et al. (2007) argued that a lack of education could be a barrier to communication, reporting that less educated consumers showed no response to advisory materials about consumption of store-bought fish.

Although past research has generally reached similar conclusions about urban anglers in several site-specific studies, these studies have been limited to particular subsets of urban anglers. The current study sought to characterize urban anglers across a larger geographic region: Great Lakes states in the United States of America (USA). We explored how urban anglers differed from anglers from rural and suburban areas, and characterized their fishing, fish consumption, factors influencing their fish consumption, and responses to advisory information.

2. Materials and methods

We draw on data from two distinct sources and methods. First, we conducted a mail survey of licensed anglers living in the Great Lakes states in the USA. This survey was designed to characterize fish consumption patterns, awareness of consumption advisories, and demographic characteristics of both urban and non-urban anglers. Second, we conducted a series of focus groups of anglers who live and fish in urban areas in the Great Lakes region in the USA to explore how urban anglers make decisions about fish consumption and respond to advisory information. This work was conducted in collaboration with the Great Lakes Consortium for Fish Consumption Advisories, a consortium of the Great Lakes states' health, environmental, and natural resource agencies (Anderson et al., 1993; McCann et al., 2007).

2.1. Mail survey

All individuals fishing in the Great Lakes and surrounding waters are required by law to have fishing licenses. We obtained a sample of 8001 licensed anglers from all states bordering the Great Lakes, except Ohio. (A state executive order at the time prohibited Ohio from releasing the names and addresses of anglers purchasing a fishing license in the

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