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A Method for Collaborative Assessment of Fish Consumption Risks and Benefits

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Abstract: Conflicting media messages about the health benefits of eating fish have increased during the past decade. Mercury concentrations in fish continue to be documented, while nutritionists promote the benefits of eating fish high in omega-3 fatty acids. A simple, low-cost method to assess consumption patterns by anglers was developed in collaboration with a mercury chemist and state wildlife officials. This information will help Extension professionals develop and deliver research-based recommendations about the risks and benefits of eating fish while incorporating local fish advisories.

Introduction

Contamination of edible fish by mercury is well documented (Mahaffey, 2004; Sheaffer & O'Leary, 2005; Stahl, Snyder, Olsen, & Pitt, 2009). National advisories limiting fish consumption have increased steadily, with 43% of the nation's total lake acreage and 39% of the nation's total river miles now included (U.S. EPA, 2009). In 2009, the U.S. Geologic Survey documented mercury in fish, sediment, and streams across the United States (Scudder et al., 2009). Fish mercury concentrations exceeded the U.S. EPA's human-health criterion of 0.3 ug/g fish wet weight at 27% of sites sampled. Mercury is a neurotoxin that is especially dangerous for pregnant women and young children (Mergler et al., 2007). Little is known about specific eating patterns by local anglers (Sheaffer & O'Leary, 2005).

At the same time, increasing attention has focused on the health benefits of eating fish. An early article focused on a method for creating displays about the health benefits of eating fish (Filchak & Welch, 1990). Fish is a source of high-quality protein and omega-3 fatty acids, which have recognized cardiovascular benefits (Mozaffarian & Rimm, 2006).

Fish consumers are presented with a bewildering assortment of advice about the risks and benefits of eating fish. Nutrition and natural resources specialists lack adequate data about fish consumption practices among specialty audiences at higher potential risk from contamination, such as anglers. Information is needed to allow Extension specialists and educators to develop and deliver meaningful local guidelines about fish

contamination and fish-eating practices.

The project described here involved development of a simple angler survey to assess fish intake patterns among anglers and collect vital data about consumption frequency, species eaten, and serving sizes. The method can be adapted to use with any specialty audience.

Collaborative Framework

We were interested in determining how much fish anglers ate, both fish that was caught in reservoirs in Northern Nevada and commercial sources of fish, and whether patterns of consumption indicated risk of mercury toxicity or potential health benefits. This required a somewhat unique partnership between a water quality specialist and a nutrition specialist. We also partnered with a mercury chemistry professor at University of Nevada, Reno to determine which reservoirs and fish species to target, based on water and fish tissue sampling. We then approached Nevada Department of Wildlife (NDOW) for assistance in administering a survey with their annual mailing sent to all licensed anglers. By collaborating with Extension to mail and collect the surveys, NDOW received valuable information about angler fish-eating habits.

Survey Development and Administration

We developed a one-page, two-sided survey that included some questions used in the National Health and Nutrition Examination Survey (NHANES) to allow comparison with national consumption rates (National Center for Health Statistics, 2004). These questions focused on portion sizes and frequency with which fish was eaten. We also asked the anglers to tell us which reservoirs and rivers they had fished, which species they had eaten (both amount and frequency), and the amount and frequency of commercial fish consumed. We used a deck of cards as a graphic visual aid to depict a three-ounce serving size. Other questions focused on reasons for eating fish and typical demographics. Selected survey text is presented in Figure 1. Survey length was limited to a single sheet of paper so that postage rates would not increase for NDOW's mailing.

Figure 1.
Selected Questions from the Angler Fish Consumption Survey

1. In the past year, did you **fish at any of the sites** listed below? (Check all that apply)
    a. (Include list of locally relevant water bodies)
2. About **how often** do you eat the various types of fish you have caught? Mark all that apply by placing an "X" in the appropriate box. (categories based on those used in NHANES)
    a. Never
    b. Less than once a month
    c. One time per month
    d. Once a week
    e. Two times a week
    f. Three to six times a week
    g. Every day
3. In the past year, about **how often** did you eat **any** type of fish, whether caught by you or purchased?
    a. Never
    b. Less than once a month
    c. One time per month
    d. Once a week
    e. Two times a week
    f. Three to six times a week
    g. Every day
4. What are your **top three reasons** for eating fish? (select and rank up to three responses)
    a. I caught it
    b. It tastes good
    c. It's quick to fix
    d. It's easy to fix
    e. It's healthy
    f. It's inexpensive
    g. It's readily available
    h. My family likes it
    i. Other
5. Tell us **how often** you eat each type of fish that you bought during the course of a year by marking an "X" in the appropriate box (cod, halibut, red snapper, salmon, sole, tilapia, tuna, other)
    a. Never
    b. Less than once a month
    c. One time per month
    d. Once a week
    e. Two times a week
    f. Three to six times a week
    g. Every day
6. What best describes the **average amount** of fish you eat at a meal, compared to a serving the size of a deck of cards (check one):
    a. Smaller than a deck of cards
    b. About the size of a deck of cards
    c. Larger than a deck of cards (say, 2 decks of cards)
    d. Much larger than a deck of cards (say, 3 or 4 decks of cards)
7. Demographics:
    a. Gender
    b. Pregnant female
    c. County of residence
    d. Age
    e. Ethnicity
    f. Education
    g. Income

The survey was piloted by 12 individuals and revised in response to their suggestions. We provided the printed final version for inclusion in NDOW's January 2008 annual angler survey mailing. Surveys were returned to NDOW, separated, and conveyed to us. The only cost involved in survey distribution was the

printing of the survey instrument (27,000 surveys, $746). Because distribution occurred as part of NDOW's regular annual mailing, no follow-up contacts were made. However, the large number sent out ensured we would receive a reasonable number of responses.

We received 1,897 surveys. Following data entry, we then calculated the low and high average fish intake values and compared them to the recommended upper limit of 12 ounces per week (U.S. EPA, 2004) and the reported male and female intake rates from NHANES. We also examined intakes by pregnant females to determine whether fish intake was sufficient to benefit the developing fetus, or whether excessive fish consumption presented a risk. We were also able to compare consumption of locally caught fish with mercury concentrations measured by our partners.

Discussion and Recommendations

Surveys such as this are essential to understanding the potential risks and benefits of fish eating by the public and special higher-risk groups. We benefitted from our collaborative approach by limiting the survey cost while collecting numerous responses. The results were used to write two fact sheets and presented at a 4-hour workshop for fisheries managers and health department personnel. Because NDOW sends out their survey annually, we can include additional questions to collect more detailed information in subsequent years. The survey approach could be easily modified to determine fish consumption by pregnant females and distributed with assistance from obstetricians.

Study limitations include omission of data from unlicensed, possibly subsistence anglers who may be at risk if certain species of fish are consumed regularly. This method also relies on the accuracy of self-reported fish consumption. It misses those for whom literacy is an issue. We do suggest asking whether fear of mercury contamination limits consumption of any species of fish. Other researchers have suggested that written surveys be accompanied by daily post-fishing surveys and on-site interviews at various water bodies. These methods, however, would be very time-consuming and relatively expensive.

Extension professionals are uniquely positioned to clarify this complex topic, through collaborative research and by providing information on local fish advisories designed to help constituents make informed choices to minimize the risk and maximize the health benefits of eating fish.

References

Filchak, K. K., & Welch, M. E. (1990). Promoting seafood for health. *Journal of Extension* [On-line], 28(2) Article 2IAW1. Available at: http://www.joe.org/joe/1990summer/iw1.php

Mahaffey, K. R. (2004). Fish and shellfish as dietary sources of methylmercury and the omega-3 fatty acids. *Environmental Research* 95, 414-428.

Mergler, D., Anderson, H. A., Chan, L. H. M., Mahaffey, K. R., Murray, M., Sakamoto, M., & Stern, A.H. (2007). Methylmercury exposure and health effects in humans: A worldwide concern. *Ambio*, 36, 3-11.

Mozaffarian, D., & Rimm, E. B. (2006). Fish intake, contaminants, and human health: Evaluating the risks and the benefits. *JAMA*, 296, 1885-1900.

National Center for Health Statistics (2004). National Health and Nutrition Examination Survey Food Frequency Questionnaire 2003-2004. U.S. Dept. of Health and Human Services, Centers for Disease Control, Beltsville, MD. Retrieved November 14, 2009 from:

http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/questexam03_04.htm

Scudder, B. C., Chasar, L. C., Wentz, D. A., Bauch, N. J., Brigham, M. E., Moran, P. W., & Krabbenhoft, D. P. (2009). Mercury in fish, bed sediment, and water from streams across the United States, 1998â 2005: U.S. Geological Survey Scientific Investigations Report 2009â 5109, 74 p.

Sheaffer, A., & O'Leary, J. (2005). Noncommercial fish consumption and anglers at risk. *Human Dimensions of Wildlife*, 10, 229-238.

Stahl, L. L., Snyder, B. D., Olsen, A. R., & Pitt, J.L. (2009). Contaminants in fish tissue from US lakes and reservoirs: A national probabilistic study. *Environmental Monitoring & Assessment*, 150, 3-19.

U.S. EPA (2009). 2008 Biennial National Listing of Fish Advisories. U.S. Environmental Protection Agency Fact Sheet EPA-823-F-09-007. Retrieved September 30, 2009 from: http://www.epa.gov/waterscience/fish/advisories/tech2008.html

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