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## Can fish consumption advisories do better? Providing benefit and risk information to increase knowledge



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## ABSTRACT

Humans exposed to methylmercury (MeHg) can suffer from adverse health impacts, e.g., serious neurological damage; however, fish is also a good source of omega-3 fish oils which promotes infants' neurological development. Because eating fish is the primary mechanism of MeHg exposure, federal and state agencies issue fish consumption advisories to inform the public about the risks of eating contaminated fish. An advisory's purpose is to provide information to consumers to increase their knowledge of specific product attributes; however, the difficulty in communicating both the risks and benefits of eating fish leads readers of fish advisories to over-restrict their fish consumption. Because the effectiveness of fish consumption advisories are not often evaluated by states, we help fill this gap by evaluating the effectiveness of Maine's fish consumption advisory in terms of improving knowledge.

The results suggest the advisory successfully increased women's knowledge of both the benefits and risks of consuming fish while pregnant. The advisory also increased their ability to differentiate fish by their MeHg content, knowledge of both low and high-MeHg fish and knowledge of detailed attributes of seemingly substitutable goods, such as white tuna, light tuna and pre-packaged salmon. People who did not read the advisory lack the knowledge of how to identify fish that provide: health benefits like Omega-3 fatty acids, or health risks like MeHg; reading the advisory reduces this lack of knowledge. Readers increased ability to make specific substitutions to minimize risk while maintaining the benefits of fish eating suggests the advisory has the potential of reducing MeHg-related health risks while avoiding the drop in fish consumption show in other studies.

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### 1. Introduction

Humans exposed to methylmercury (hereafter, MeHg) in high (Harada, 1995) as well as low, but chronic, doses can suffer from adverse health impacts, e.g., serious neurological damage (Karagas et al., 2012). Because eating fish is the primary mechanism of MeHg exposure in humans (Knobeloch et al., 2005; Johnsson et al., 2005), federal and state agencies issue fish consumption advisories to inform the public about the risks of eating contaminated fish. However, fish is also a good source of lean protein, essential nutrients, and omega-3 fish oils (U.S.F.D.A. and U.S.E.P.A. (Food and Drug Administration &

Environmental Protection Agency), 2004) that deliver many health benefits (Mahaffey et al., 2011; Oken et al., 2012). These risks and benefits are heightened for pregnant women and infants because the fetus's nervous system is more vulnerable to MeHg than that of adults (U.S.E.P.A. (Environmental Protection Agency), 2012) while omega-3 fish oil consumption is important in infants' proper neurological development (Cansev et al., 2009; Levant et al., 2010; Ryan et al., 2010).

The purpose of an advisory is to provide information to the most at-risk consumers in order to increase their knowledge and awareness about specific product attributes. In its most basic sense, fish consumption advisories provide consumers with an important ability – to differentiate among seemingly substitutable goods. However, it is difficult to communicate both the risks of consuming contaminated fish and the benefits of consuming low-MeHg fish (Burger and Gochfeld, 2009; Anderson et al., 2004; Stern and Korn, 2011; Scherer et al., 2008; ). Despite the multitude of positive health impacts associated with eating fish, many consumers over-restrict their fish consumption because of MeHg advisories (Lando et al., 2012; Oken et al., 2003; Shimshack et al., 2007).

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Because the effectiveness of fish consumption advisories are not often evaluated by states (U.S.E.P.A. (Environmental Protection Agency), 2011), we aim to fill this gap in public health outreach evaluation by assessing the effectiveness of Maine CDC's updated Family Fish Guide (hereafter, guide). Of most importance to the Maine CDC, is whether the guide is being read, understood and used so it works to increase (at least not decrease) overall fish consumption while simultaneously causing people to shift away from high to low MeHg fish. A first step to answering these questions is to see if the guide is being read and leads to appropriate knowledge changes (e.g., an increased understanding of the benefits of eating low-MeHg fish) as knowledge leads to better choices and health outcomes (Shieh et al., 2009).

## 2. Context: Maine's efforts to improve its advisory

In 2000 and 2006, the Maine CDC developed plain language booklets<sup>2</sup> about store-bought and wild-caught fish and fish consumption for pregnant women. The process of developing the guides was similar. Qualitative formative research methods, including focus groups (Krueger and Casey, 2000) were used to develop both booklets to assure they addressed the information needs and appealed to the intended audience. The groups included parents of young children who were economically and geographically diverse (e.g., coastal vs. inland). A process of "collaborative composing" was used to engage audiences with potential messages, using what we learned from them to shape and reshape the booklet (Zarcadoolas et al., 2001). One of the authors (SS), a health literacy/plain language expert, used this model of partnering with the audience so the booklet information would reflect the science, but also grab attention and engage the reader. Iterative audience testing helped refine and nuance messages, determine placement of key content, and select images that inclusively represented Maine people. Key informants, including health care providers, nutrition educators, social service workers, and cooperative extension agents, also provided feedback, helping us fine-tune the booklet so it would appeal across a broad range of consumers with diverse education and socio-economic backgrounds.

Although the development process was similar for both booklets, the advisory program evolved in order to embrace the complexity of the risk/benefit problem. The 2000 guide was focused on sport-caught fish, describing safe eating guidelines, on the harm caused by MeHg consumption, how mercury content could not be assessed by the consumer, and could not be controlled by fish preparation methods. Some of the benefits of fish consumption were presented (e.g., a low fat, high protein) in a limited manner. Although the 2000 guide included information about differences between white and light tuna in mercury content and called attention to store-bought fish high in mercury (swordfish, shark), as noted above the guide was primarily geared towards sport-caught fish.<sup>3</sup> The 2000 guide was distributed by targeted mailings to households in which someone held a Maine fishing license or had a child less than 8 years of age, and was additionally distributed through offices of health care providers providing obstetrics and gynecology services. Teisl et al. (2011) evaluated the 2000 guide and found women reading the guide decreased their consumption of higher-MeHg white tuna, and increased their consumption of lower-MeHg, light tuna.<sup>4</sup> However, they also found a general decline in fish consumption, similar to that

observed in many other studies (e.g., Oken et al., 2003; Shimshack and Ward, 2010)

In 2006, Maine undertook a complete reconceptualization of the booklet to include more information to promote overall fish consumption, such as the benefits of eating omega-3 fish oils, especially in promoting the neurological development of babies. That is, the messaging changed from a "don't" message to a positive message: "Fish: 2 Meals a Week for Good Health." The centerfold of the guide depicts fish that are both high in omega-3 fish oils and low in MeHg, alongside fish to avoid while pregnant and breastfeeding.<sup>5</sup> The guide emphasized store-bought fish,<sup>6</sup> and continued to call attention to differences between light and white tuna and also called attention to pre-packaged salmon as a substitute. To address barriers to eating fish,<sup>7</sup> information was presented on how to buy, store and prepare fish and how to eat 2 meals per week on a budget. Iterative audience testing suggested we repeat the core message about 2 fish meals a week to make sure readers got it, no matter how little they read or where they started in the booklet. To accommodate the additional content and make the messages salient, the originally imagined short brochure expanded to a 12 page booklet. A creative graphic designer enhanced booklet attraction by carefully structuring text, colors and images to help key messages "pop". Overall, the booklet development process reflects best practices from risk communication, social marketing, plain language, graphic design, and usability research.

The booklets were distributed by healthcare providers at prenatal visits and by WIC staff (but were not mailed to people with fishing licenses). A poster was also designed for display in waiting areas of health care offices; the poster had images of fish as they are purchased or caught (for sport-caught fish) with a thermometer metric to aid quick identification of fish high, moderate, and low in MeHg.

## 3. Literature review

Improved information allows consumers to refine and adapt their consumption (Oken et al., 2012). However, Blanchemanche et al. (2010) and Shimshack and Ward (2010) conclude that it is not clear whether information only about the risks of fish consumption improves decision-making because many at-risk consumers (Oken et al., 2003; Lando et al., 2012) and even non-targeted adults (Shimshack and Ward, 2010; Shimshack et al., 2007) reduced their overall fish intake ultimately resulting in a decreased intake of nutrients obtained from fish.<sup>8</sup>

State agencies may assume that risks were the only important parameter to address (Scherer et al., 2008) or may assume they do not have the authority or expertise to speak to the benefits of eating fish; for whatever reason, risk only communications led to a lack of awareness of benefits related to fish consumption. Studies indicate that highly effective communication strategies should include information about specific risks (e.g. MeHg) and benefits (e.g. omega-3s) of safe fish consumption (Stern and Korn, 2011; Burger and Gochfeld, 2009; Groth, 2010; Burger and Gochfeld,

<sup>5</sup> Providing examples of safe fish alongside fish that should be avoided helps emphasize benefits while discussing risks (Burger and Gochfeld, 2009; U.S.F.D.A. and U.S.E.P.A., 2004).

<sup>6</sup> The shift to commercial fish is important because more consumers are choosing to eat fish bought in stores and restaurants (Burger et al., 2005; Anderson et al., 2004); also, the survey examining responses to the 2000 guide indicated that 86% of respondents did not eat any sport caught fish in the previous year. Sport fish did receive attention on the inside back cover of the 2006 booklet to alert vulnerable populations to restrict consumption of certain species.

<sup>7</sup> Many focus group participants did not know how to buy or cook fish beyond frozen fish "sticks", and were concerned about their limited food budget.

<sup>8</sup> Oken et al. (2012) explain this 'boundedly rational' behavior is due to consumers' inherent difficulty in balancing risks; they often use a limited number of cognitive processes which can lead to errors or biases (Kahneman, 2003).

<sup>2</sup> [www.plainlanguage.gov](http://www.plainlanguage.gov).

<sup>3</sup> Early health advisories were typically directed at anglers and their families (Teisl et al., 2011).

<sup>4</sup> White tuna contains high levels of MeHg, while light tuna does not (Burger and Gochfeld, 2006) and pre-packaged tuna is the top dietary contributor to MeHg intake in the United States (Groth, 2010).

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