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A focus group study of fish consumption behaviors among Asian women in Milwaukee, Wisconsin

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ABSTRACT

Consumption of locally caught fish provides health benefits but can be a route of exposure to methylmercury and other persistent environmental contaminants. Previous studies found that Asian women of childbearing age (WCBA) in the Milwaukee area have high levels of exposure through fish consumption but limited awareness of fish advisories. We conducted a focus group project to understand the influence of culture, attitudes, and beliefs on the fish consumption habits of Chinese, Hmong, and Karen WCBA who reside in the Milwaukee area to develop culturally appropriate educational materials.

A total of 19 women aged 18–50 years identifying as Chinese, Hmong, or Karen were recruited. Three focus groups were held, each consisting of 6–7 participants from one ethnicity. Focus group transcripts were thematically analyzed and coded based on the integrated behavioral model.

Nutritional benefits and availability were the most common reasons to eat locally caught fish. All participants were aware of risks associated with eating fish, yet few knew ways to mitigate risk and maximize benefits. Participants expressed interest in receiving health messages from trusted sources and recommended that messaging target families rather than just individuals. Participants who were confident in their self-efficacy expressed a greater likelihood of following health message guidelines.

Results suggest providing culturally appropriate educational materials in preferred languages to Asian communities via local community organizations may increase self-efficacy and adherence to fish advisories. Future projects will evaluate the effectiveness of self-affirmation messaging among Asian WCBA and assess changes in fish consumption based on message content.

1. Introduction

Sportfish consumption is a major route of exposure to methylmercury and other persistent environmental pollutants (PEPs) such as per- and polyfluoroalkyl substances (PFAS) (Christensen et al., 2017). Nevertheless, fish consumption has numerous health benefits, including reduced risk of cardiovascular disease (Mohan et al., 2021), promotion of fetal growth and development (Stratakis et al., 2016) and improved cognitive function (Teisen et al., 2020). It is critical that advisories communicate the balance between the risks and benefits associated with fish consumption (Taylor et al., 2018).

Surveys have demonstrated that Asian immigrants in urban areas across North America consume fish more frequently and have higher levels of methylmercury than their non-Asian counterparts (Buchanan et al., 2015; Dix-Cooper & Kosatsky, 2018; Li et al., 2022; Liu et al., 2018; Silver et al., 2007; Tsuchiya et al., 2009). Given the potential adverse health exposures among these groups, the Wisconsin Department of Health Services (WDHS) and the Agency for Toxic Substances and Disease Registry (ATSDR) conducted a biomonitoring study in 2016 with Burmese refugees in Milwaukee County. The study found that most participants were unaware of safe-eating fish guidelines for Wisconsin (88 %) or Milwaukee (96 %) waterbodies. Even those aware of the guidelines continued to consume fish high in PEPs, suggesting a lack of understanding and/or uptake of the recommendations (He et al., 2021). These findings indicate that Asian women of childbearing age (WCBA) residing in the Milwaukee area are at risk of exposure to PEPs due to fish consumption (He et al., 2021). However, fish consumption guidelines have not been developed specifically for this population, and the impact of cultural factors are not well understood.

The integrated behavioral model (IBM) framework allows for a

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better understanding of these cultural factors (Fig. A1). This theory examines the psychosocial influences that affect behavior change and the impact of self-efficacy, perceived norms and attitudes on initiation and maintenance of a desired health behavior (Edwards et al., 2018; Marcinow et al., 2017). Collecting open-ended qualitative data via focus groups is more appropriate than traditional surveys to address the changeability of health-related beliefs (Connelly et al., 2022; Cyr, 2019).

To gather rich qualitative information to better understand the influence of culture, attitudes, and beliefs on the fish consumption habits of Asian American women, we conducted a series of focus groups among Chinese, Hmong and Karen residents in the Milwaukee area. This knowledge is needed for the development of culturally appropriate outreach and educational materials for these communities.

2. Materials and methods

2.1. Participant eligibility and recruitment

Eligible participants were Asian women aged 18–50 years identifying as Chinese, Hmong, or Karen who lived in Milwaukee County for one year or longer and consumed fish caught from local waterbodies at least 4 times per year. Participants were identified by the community advisory group (CAG) that comprised of members from the Milwaukee Asian community to ensure that the needs and concerns of each community were fairly represented. Recruitment information was shared with community groups and non-profit agencies serving these populations. Enrollment was completed on a rolling basis until each session was deemed full. A total of 6–7 participants were included in each of the three focus groups and received a $30 gift card for participation.

2.2. Focus group sessions

The focus group guide was based on the IBM (Supplemental File). Topics included: reasons that women eat or do not eat locally caught fish, perceived health benefits and risks of locally caught fish, awareness of fish advisories, and fish preparation methods. Participants reviewed health messages highlighting risks and benefits from eating locally caught fish (Fig. A2) and were then asked a list of standardized questions regarding attitudes, perceived norms, and perceived outcomes of following the recommendations. The final question solicited the reasons and self-efficacy (i.e., the belief that one could make the desired changes to their behavior) regarding following fish consumption frequency suggested in the messages.

Focus group sessions were held on Zoom for a maximum of 120 min including discussion and pre- and post-surveys regarding demographics and fish consumption behaviors. Each session was led by a trained moderator identified by the International Institute of Wisconsin (IIW), a local refugee resettlement organization.

Sessions were conducted using an interview template available in each focus group's respective language. The template was originally written in English and translated by IIW interpreters into the targeted languages.

Translated recordings were coded using Dedoose Version 9.0.17, a qualitative data analysis software program. Transcriptions and translations were completed by IIW. This focus group project was deemed by WDHS to constitute public health surveillance and practice, thus review by an institutional review board was not required.

2.3. Coding and thematic analysis

Coding was based on the IBM and completed by five independent coders. Two authors (XH and AH) developed the codebook and analytic strategies. Transcripts were analyzed using a mixed deductive (content analysis) and inductive (grounded theory) approach. The first level codes were determined from the focus group guide. The second level codes were based off the IBM and participant responses. The remaining codes were developed from an iterative review of the transcripts. All authors reviewed the codes. Four blinded coders independently coded transcripts (XH, MK, KX, BA). The fifth coder combined all coded transcripts (SS). Codes with unanimous agreement were deemed final. Codes without unanimous agreement were compared and discussed to determine final codes. The fifth coder reviewed all final codes, reviewed

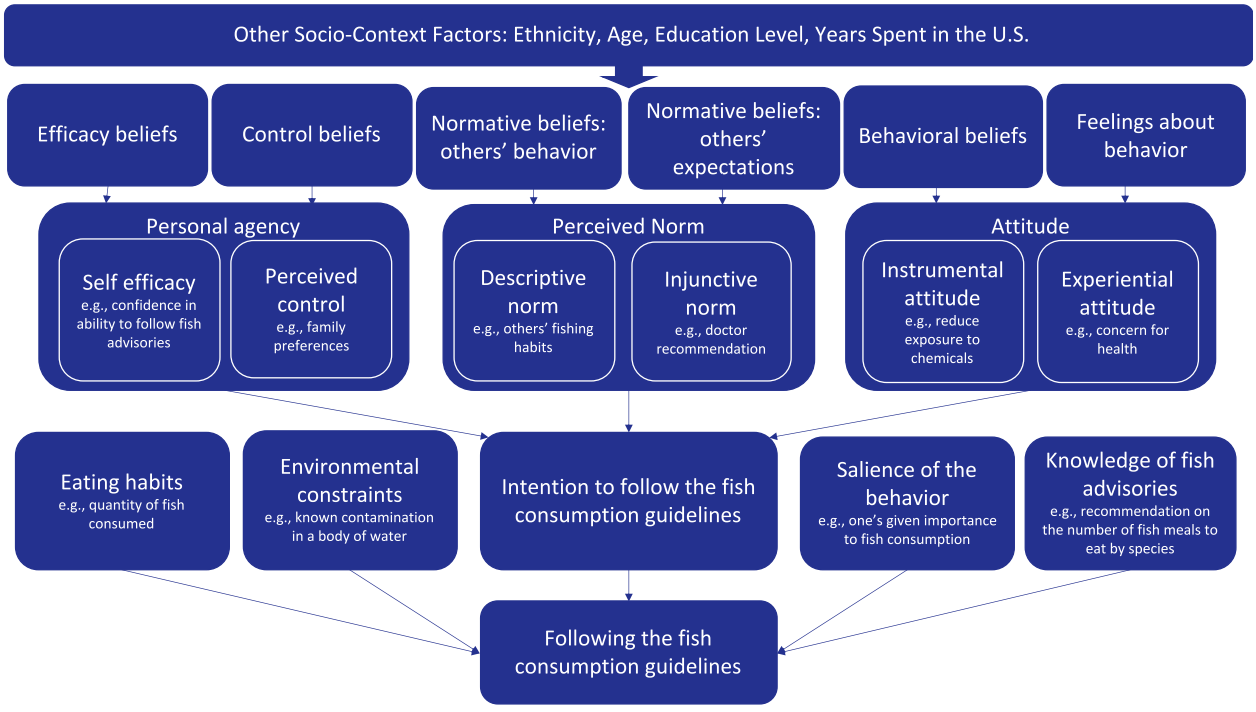

Fig. A1. Integrated behavioral model adapted for following fish consumption guidelines using results from 2021 focus groups with Chinese, Hmong and Karen women from Milwaukee, Wisconsin.

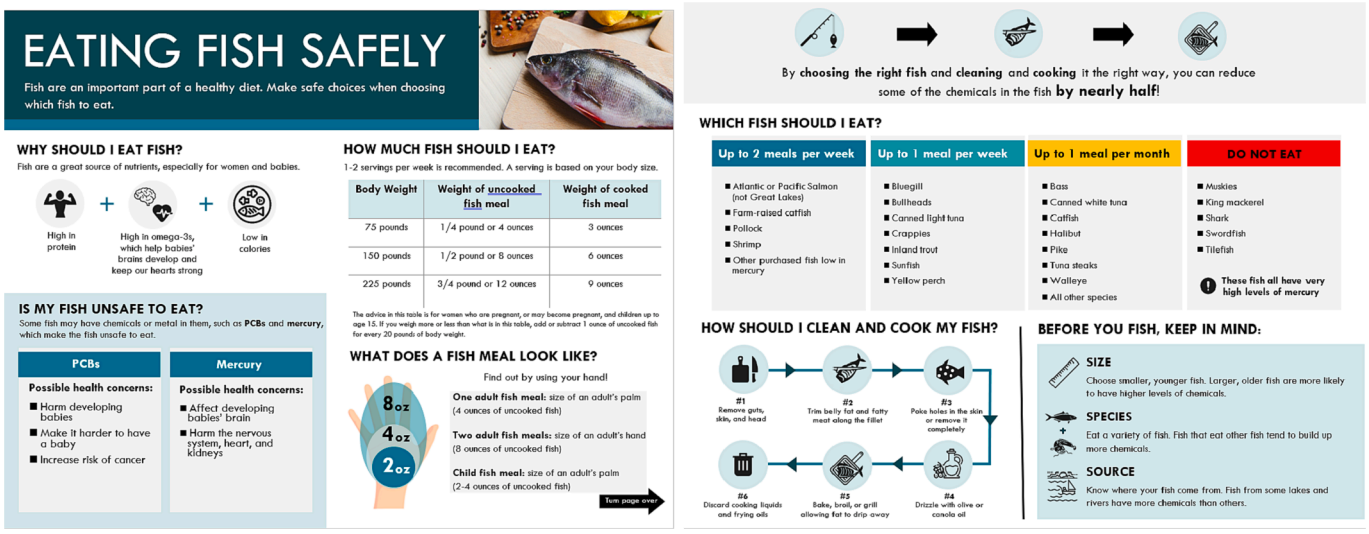

Fig. A2. Health messages presented to focus groups with Chinese, Hmong and Karen women from Milwaukee, Wisconsin (Note: Health messages were translated into each group's respective languages).

coding analysis comments and discussion, and ensured transcripts were coded correctly (e.g., correct use of sub-codes with primary codes).

Cleaned transcripts were added to Dedoose at a group and individual coding level. Demographics were then added to codes using individual pre- and post-survey data.

3. Results

3.1. Demographics

The focus groups consisted of 6 Chinese, 6 Hmong, and 7 Karen participants. Participant quotes are cited with a letter indicating each respective ethnic group and a number for each participant (e.g., Chinese participants, C1, C2, and Karen participants, K1, K2, etc.). Among the 19 participants, the median age was 32 years (range 18–48 years, Table A1). The median number of years living in the United States was 11 years (range 1–38 years). Hmong participants had a greater proportion who had spent 11 or more years in the United States. Most Karen participants (71 %) had less than a high school educational attainment. All Chinese participants had at least a bachelor's degree. Twelve participants (63 %) lived with children under the age of 15. All Karen participants lived with a child under the age of 15 while no Hmong participants fit this category.

3.2. Thematic findings

Thematic findings are structured below as sub headers based on the main questions of the focus group guide: (1) factors influencing fish consumption, (2) factors influencing perceptions of the health messages, and (3) factors influencing willingness to follow the health messages. Fourteen primary themes are shown italicized and bolded and 37 s level sub-themes are solely bolded in the text. All themes and sub-themes are shown in Table A2 along with sample quotes from the focus group sessions. Fig. A1 describes how each IBM-based theme determines whether one ultimately follows fish consumption guidelines.

3.2.1. Factors influencing fish consumption

3.2.1.1. Reasons to eat locally caught fish. The most common theme to co-occur with ***why to eat locally caught fish*** was **nutritional benefits** such as being high in protein and omega-3 fatty acids. Participants praised fish as beneficial for a person's overall health and good for those with diabetes, high cholesterol, needing "health strengthening," and who are pregnant and/or breastfeeding. One participant mentioned a mental/spiritual benefit because fishing allowed for *"watching the fish [while fishing, and] meditating makes me feel good, good for my spirit"* (C6).

Availability was the second most common reason when participants were asked why women eat locally caught fish. One participant stated, *"For me 'to eat or not to eat' depends on if I can get fish from people"* (C2). Some participants had no interest in going to the store to buy fish during the winter because locally caught fish **taste** better and were **cheaper** than store bought fish.

The **location** of the fish was also important when participants described the ***type of fish they consumed***. Other community members fishing in the same area provided a sense of safety and enforced beliefs that fish came from a clean source. One participant stated that *"I think the fish from there are safe to eat because it looks like many people fish there"* (C1). Some reported eating locally caught fish **despite concerns if a fish came from a clean source** based on the belief that there is **no way to avoid pollution**. Over half (n = 10) of participants agreed somewhat or strongly that there is not much you can do to protect your health, with Karen participants having the greatest proportion of those who agree with the fatalistic belief (Table A1). Overall, participants generally **do not consider health risks** when eating locally caught fish. *"I have no concern about safety. They gave me the fish and I felt happy. […] I quite like those locally caught fish, not much worry"* (C2). One participant reasoned that she did not worry about locally caught fish because *"you know there is no organic fish. If there is pollution, it is in rivers, lakes, and seas. You have no way to avoid it."* (C1).

3.2.1.2. Reasons not to eat locally caught fish. Fifteen participants (79 %) **perceived harms of eating locally caught fish** because of water pollution. Contaminants of concern included 'mercury,' 'oil,' 'pesticides,' 'garbage,' 'heavy metals' and 'toxic elements.'.

"The bad thing is the concern about pollution makes me not dare to eat much of the fish, knowing the bad stuff may hurt the brain and make me become dumb [laughing]. Not sure if our body can get rid of the harmful things, just like the pesticide, which may stay in the body." (C6).

Other reasons that participants did not eat fish included **difficulty cleaning and storing fish**, seasonality, not liking the sights and smells of fish, allergies to fish and seafood, and doctor recommendations during pregnancy. Participants only reported doctor recommendations regarding avoiding fish during pregnancy.

3.2.1.3. Fish preparation practices. Certain cleaning methods were used

Table A1
2021 Focus group participants' demographics and fish consumption behaviors by ethnic group for Chinese, Hmong and Karen women in Milwaukee, Wisconsin.

	Chinese (n = 6)	Hmong (n = 6)	Karen (n = 7)
	N(%)	N(%)	N(%)
Pre focus group questions			
Age			
18–30	1(17)	5(83)	2(29)
31–40	2(33)	1(17)	4(57)
41–50	3(50)	0(0)	1(14)
Education			
Less than high school	0(0)	0(0)	5(71)
High school, or some college	0(0)	5(83)	2(29)
Bachelor's degree or higher	6(100)	1(17)	0(0)
Years in USA			
1–5	1(17)	0(0)	2(29)
6–10	2(33)	0(0)	3(43)
11 or more	3(50)	6(100)	2(7)
Living with children under the age of 15			
Yes	3(50)	2(33)	7(100)
No	3(50)	4(67)	0(0)
Confidence in information seeking			
Not at all to a little confident	0(0)	2(33)	4(57)
Somewhat confident	2(33)	2(33)	2(29)
Very to completely confident	4(67)	2(33)	1(14)
Fatalism: There is not much you can do to protect your health			
Strongly to somewhat disagree	3(50)	4(67)	1(14)
Somewhat to strongly agree	3(50)	2(33)	5(71)
Non-response*	0(0)	0(0)	1(14)
Sportfish meals in the past 30 days			
<5	4(67)	4(67)	3(42)
≥5	0(0)	1(17)	0(0)
Non-response*	2(33)	1(17)	4(57)
Store bought fish meals in the past 30 days			
<5	1(17)	2(33)	2(29)
5–10	4(67)	3 (50)	1(14)
Non-response*	1(17)	1(17)	4(57)
Fish advisory awareness			
Yes	3(50)	1(17)	2(29)
No	3(50)	5(83)	5(71)
Post focus group questions			
In the next 30 days, do you plan to do any of the following recommendations?			
Eat 1–2 fish meals per week			
Yes	5(83)	5(83)	7(100)
No	1(17)	0(0)	0(0)
Non-response*	0(0)	1(17)	0(0)
Choose safer species of fish to eat			
Yes	5(83)	6(100)	4(57)
No	0(0)	0(0)	1(14)
Non-response*	1(17)	0(0)	2(29)
Clean and cook fish using safe steps			
Yes	5(83)	5(83)	6(86)
No	0(0)	1(17)	1(14)
Non-response*	1(17)	0(0)	0(0)

*Non-response = Missing, Don't know, and Prefer not to answer.

by participants to mitigate risk. For example, *"for local fish, it can be harmful for your health because they might be very dirty. So, you have to clean it thoroughly before cooking the fish"* (K7). Following cleaning with water, participants removed certain parts of the fish such as belly fat, head, skin, and innards. **Frying** was the most common cooking method with 11 participants referencing this practice.

3.2.1.4. Knowledge of fish advisories. Most participants (n = 13, 68 %) reported not being aware of fish advisories prior to the focus group (Table A1). Knowledge of fish advisories included "*basics like that when you're pregnant you shouldn't be eating too much fish"* (H4). A gap in knowledge was shown with a participant being unaware of recommendations regarding cooked fish: *"I know there is a limit on raw food because they're raw. But as to cooked, I never even heard there's a limit to it"* (H1).

Those aware of advisories cited growing awareness after moving to

Table A2
2021 Focus group themes with sample quotes from Chinese, Hmong and Karen women in Milwaukee, Wisconsin.

Themes	Sub-theme	Sample Quote
Why eat locally caught fish	Available: friends share caught fish	I usually eat those fish shared to me by friends who went fishing. (C1)
	Eat fish despite health concerns: belief that there is no way to avoid pollution	When you eat fish, you are concerned about pollution. How about meat? You know there is no organic fish. If there is pollution, it is in rivers, lakes, and seas. You have no way to avoid it. When one wants to eat fish, one may just go ahead and eat then. (C1)
	No health concerns: fish comes from clean source	I don't think it will endanger our health for occasionally eating the caught fish once or twice. (C2)
	Hard to catch so should eat	My reason to eat the caught fish is because since it is not easy to catch the fish, it's better to take home and try at least one of the few fish that was caught. (C6)
	Taste good/fresh	Well, I eat them also because my parents and my husband enjoy fishing. And I think it's just the freshness of it that we enjoy. (H3)
	Cost is cheaper	I eat them though. Saves money. (H2)
Why not eat locally caught fish	Perceived harms of eating locally caught fish	My parents are always skeptical about eating fish. They're always saying that within the city it's scary cause they're eating garbage so you can get sick from eating them. (H4)
	Not easy to clean fish	Why I don't eat all the caught fish is because of the pollution concern and it's troublesome to clean the fish (K6)
	Other reasons	to fish is not to satisfy one's appetite, it's just for fun. (K6)
Benefits of eating fish	Nutritious benefits	[…] fish meat containing less fat and good proteins is good for people whose health needs to be strengthened. (C8)
Self-efficacy	Confident	I think I will be fine. I don't have any problem with complying [with] the guideline. (K6)
	Not very confident	For me on a scale of one to ten, ten being confident, I would say three. Just cause I don't think it's possible. (H4)
Fish consumption frequency		When I was little, I would eat lots of the fish my parents caught but now I don't dare to eat the fish I caught in recent years, less and less. In fact, I ate more, many years ago, the fish I caught than I do now (C6)
What type of fish you eat	Location/source is important	The locally caught fish I had before also came from friends who went fishing, but I know the place they fished is kind of far away from the polluted area. We don't often eat [a] special type of fish, but I feel the fish from there tastes good, the meat is tender and fresh,

(*continued on next page*)

Table A2 (*continued*)

Themes	Sub-theme	Sample Quote
		better than the one I bought from the market. (C3)
	Do not pay attention to safety	I pay attention to freshness not safety. (C7)
	Provides the specific fish types	My favorite type of fishes are Stinging Catfish and Mrigal Carp. (K4)
	Whatever is available	I usually don't pay much attention to the type of fish and its origin, just buy whatever is available, very casually. (C7)
Cleaning methods	Removing fish head	Half the time I chop [off] the head if you know my parents are not home and they don't eat that, and I don't eat that, so I just chop the head off. (H2)
	Removing skin	Sometimes I feel eating the fish skin is quite good, smelling good too. Without the skin, there is no good smell then. (C3)
	Removing belly fat	But they think it's a healthy way to remove the fat from the fish, as they think the bad stuff is more contained in the fish fat and would like to purposely remove the fat. (C1)
	Removing guts, organs, or innards	And they just eat it like that with the scales on, leave the intestines in there on. I don't know why I never ask. They just taste better cause I guess the stuff from the intestines or whatever makes the fish taste better. (H2)
Cooking methods	Fry	I like to eat catfish. I don't like it when you cook it. I only like it fried. (K5)
	Braise	I usually cook fish in soy sauce. I like to clean the scales, remove the internal organs and fins myself, usually freshwater fish. Then I marinate the meat with green onions, ginger, and cooking wine, pan-fry and then cook with more soy sauce and a bit [of] cooking wine (C3)
	Boil	Yeah, after that I rinse it after that and chop it up and make my soup. (H2)
	Miscellaneous	We usually clean and marinate fish with salt for over 20 min. (C8)
Knowledge of fish advisories		I don't think I've ever even heard of recommendations to ladies about how many fish they should eat. (H1)
Initial thoughts provoked by the health messages		Well, it seems very manageable to get the recommended amount of servings. I was surprised that it wasn't more. So, it seems like it's very manageable. So that's a good thing. (H5)
Questions about the health messages	Fish species	I agree with all the things you guys have just said. I don't eat fish that much. Most of the time, I only eat catfish and mrigal carp. I don't know most of the fish that are on the list. It will be more helpful if there are pictures of the fish along with their names. When I see some of the fish on the list, I have heard of them. However, I have never seen them before. It will be better if there are pictures of the fish with the names. So, I know how many times I should eat this or that fish in a week. I can comply with the guideline as well. (K4)
	How to know body burden of heavy metals	Since I have eaten so much fish, maybe I need to have a physical test to see if there is more than usual mercury in the blood. (C6)
Behavioral intention	Implementation intention	I think the biggest reason to influence me is to see if I can think of it. This is a practical issue in life. This may not be a very important thing in my life, so if I can remember, I will do it. If I don't remember, then I won't do it. (C7)
Perceived norms	Subjective/injunctive norm	Usually, it's my boyfriend who takes care of the caught fish. If I let him know the new cleaning method, I think he will accept and try the new way to clean the fish. (C6)
	Descriptive norm	And then I know where the fish my friend gave to me came from. It's about over an hour drive from here. I think the fish from there are safe to eat because it looks like many people fish there. (C1)
Willingness to follow the advice or not	Already made behavioral changes from past	I used to eat fish a lot, but that has changed. In the past, I used to store about 200 – 300 fishes in the freezer for winter. Now if you go look in the freezer, you will find shrimps and frozen pizza only. My kids only eat fish when I cook for them. (K1)
	Experiential attitude	I have no concern about safety. They gave me the fish and I felt happy. (C2)
	Instrumental attitude	I think the suggestion has its point. If we follow it, we may reduce a lot of intake of polluted stuff. (C1)
	Perceived control: perceived barriers	Well, the reason it would be hard for me is I don't like a lot of other proteins so like I said earlier. So, for me it's a matter of whether there's plant-based protein options available or not which there seems like there's definitely a lot more options for that in substitution of seafood. (H5)
	Perceived control: perceived facilitators	I want the answer to be my health but knowing myself I can be dying and probably won't eat it if I don't want to eat it. I think the biggest factor for me to encourage me to eat more is definitely my family, like my immediate family. My husband, my in-laws if they're eating it and their trying to improve their health that would definitely encourage me, we're all in this together.

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Table A2 (*continued*)

Themes	Sub-theme	Sample Quote
		We all need to keep eating to stay healthy. (H4)
	Follow: adjusting consumption quantity/ frequency	I can reduce the number of fish I eat. In the past, sometimes, I used to eat fish every day in a week. Now I know that eating fish in such an amount might not have good benefits, so I will reduce the number of fish I eat. (K3)
	Follow: perceived response efficacy/ confident in self-efficacy	From the lesson, I can share with my family what fish to eat and not to eat. This is good for my family so we should comply with the guideline. (K5)
	Mixed response	I am driven by my personal craving; I eat whatever I want to eat. (C3)

the United States. *"I had no idea about the heavy metal's potential danger to the body before when I lived in Zhuhai. […] Since the doctor told me about this […] I am aware of this issue now"* (C8). The most common source for receiving information on fish advisories was family and friends. Other sources for information used by participants included government agencies, health care providers, and media.

3.2.2. Factors influencing perceptions of health messages

3.2.2.1. Initial thoughts provoked by the health messages. Participants showed positive initial thoughts towards the health messages, such as: *"I think the suggestion has its point. If we follow it, we may reduce a lot of intake of polluted stuff"* (C1). Every focus group discussed learning something new from the health messages such as "*what fish is safe to eat and what fish is dangerous to eat"* (K7). New knowledge acquired by participants included: (1) methods to decrease harmful exposures (2) 'why' there are fish advisories; and (3) techniques for measuring the recommended amounts (e.g., the palm of your hand).

Some of this new knowledge contradicted participants' current fish consumption habits or what they had previously known because *"in the past, all we know was that all fishes are healthy to eat regardless of whether they are local fish or seafood"* (K6). One health message was not completely relevant to our participants since it was missing fish species that our participants routinely ate or included species that participants did not eat or did not know (Table A3). One participant suggested that "*it will be more helpful if there are pictures of the fish along with their names"* (K4).

3.2.2.2. Questions about the health messages. Questions were asked by participants on cleaning and cooking recommendations and why one should use *"veggie oil or olive oil to wash the fish meat"* (C1) vs water and salt and what parts of the fish produce nutritious fish oil. Another Chinese participant questioned how to measure one's body burden of contaminants from fish consumption. Ultimately, one of the most common concerns across ethnic groups was how they would translate the recommendations into practice:

"We were told that it is good for our health to eat fish. And now you are saying that we can only eat half of a fish. How can we eat half of a fish with our whole family? We can only make soup out of the half of a fish" (K1).

Table A3
Fish species consumed by ethnic group from 2021 focus groups with Chinese, Hmong and Karen women in Milwaukee, Wisconsin.

Ethnic group	Fish types referenced as being consumed
Chinese	salmon, smoked salmon, **cod**, sea bass, **ribbonfish**, **pomfret**, **saury**, tuna, **yellow croaker**, **flat mouth fish**
Hmong	white bass, tilapia, catfish, salmon
Karen	catfish, **mrigal carp**, shrimp, tuna, stinging catfish, **Kuria labeo** (a species of carp), **snakehead murrel**

Fish in bold are not referenced in the health messages in Fig. A2.

3.2.3. Factors influencing willingness to follow the health messages

The most common theme to co-occur with **willingness to follow the health messages** was **self-efficacy**. For example, one participant's reaction to the health messages was that following the recommendations would "*help you look out for you"* (H2). The focus group with the greatest proportion of confident participants was the Chinese group (67 %). Over 50 % of Karen participants responded in an unconfident manner related to self-efficacy (Table A1).

According to the post-focus group survey, 100 % of participants whose responses were **confident** answered yes to planning to eat 1–2 fish meals per week in the future. Only 8 % of those who identified as **not confident** responded yes.

"We have a choice of seeking clean, fresh, high-quality fish. We can improve the methods of cooking. Hope we can improve our health by eating fish, instead of causing issues" (C2).

The most common facilitator for following the health messages was nutritional benefits, and participants cited this as a reason to share this information with their friends and family.

Chinese and Hmong participants noted that the dietary norms of older generations acted as a barrier to adopting the health messages, specifically, distrust or "superstition" of things they hear on the news (H3); there was *"no industrial pollution in those days"* (C1); they have *"been eating it for so long"* (H2); and not understanding *"the disadvantage of […] having too much fish"*(H1).

Other barriers included **adjustments to fish consumption quantity and frequency**, changing **cleaning and cooking methods**, **craving fish and/or personal preferences**, and **cost**. For example, one participant stated, *"For me quantity is a big change"* (C6). Another Chinese participant explained that decreasing fish intake was *"not a big problem"*, and the *"hard part is persisting in doing so […] After a few weeks one may forget and go back to the old way"* (C7).

According to the post-focus group survey, 16 participants planned to cook and clean as recommended in the next 30 days. However, it would take "*some time to make changes for us, especially the cleaning method of removing the fish skin and heads"* (C3). Chinese and Karen participants saw their **craving or personal preference** for fish as a potential barrier, however, the **nutritional benefits** of complying with the guidelines overcame this barrier.

"When I was pregnant, my doctor told me not to eat the Norwegian [mackerel]. […] I quite like eating [mackerel]. But the doctor thinks it may be harmful for the baby, so I didn't eat that fish for a while. But later sometimes I still feel the [mackerel] is tempting to me" (C1).

Economic benefit was another reason to follow or not follow the fish advisories for Hmong participants. Participants considered it feasible to increase their fish consumption to the recommended frequency when locally caught fish are available because it would be cheaper than buying from the market.

4. Discussion

Our findings suggest cultural context influences health behaviors and risk perceptions for eating locally caught fish. Slight differences between ethnicities were observed for perceptions of benefits and risks and willingness to follow health messages. Our participants' reasons to eat locally caught fish were previously reported in the literature: availability, taste, cost, eating despite health concerns because of the belief that there is no way to avoid pollution (Connelly et al., 2022; Lauber et al., 2017). Culturally relevant health messages on how to safely eat fish are needed (e.g., how to appropriately cook family portion sized meals, including commonly consumed fish species, etc.).

Nutritional benefits and availability were the most common reasons to eat locally caught fish (Glanz et al., 2005). For example, seeing people fish or receiving fish from others gave participants a reason to fish at certain areas or consume a specific fish. This supports data that show personal health values and practices in Asian American culture are based on interdependence and collectivism more than the individualistic culture common in the West (Chang & Subramaniam, 2008). Most participants were aware of the risks of eating locally caught fish with the most common perceived harm being the potential exposure to pollution where the fish reside.

The Chinese focus group had the greatest awareness of advisories while Hmong participants had the lowest. One explanation is that the Chinese group had higher levels of educational attainment and perhaps the ability to seek out more information on fish advisories. However, overall fish advisory awareness by participants was on a basic level (e.g., avoid raw fish, avoid fish consumption while pregnant).

Most participants reported getting their knowledge of fish advisories from friends and family, similar to findings from a previous study of Milwaukee licensed anglers (He et al., 2021). However, most knowledge of advisories were only about what fish not to eat. This supports previous findings that women who are aware of advisories ate less fish than other women (Silver et al., 2007), missing potential benefits of consuming safe fish (Tsuchiya et al., 2009).

Participants perceived the health messages presented as 'simple' with a 'straightforward' layout. However, Karen and Chinese participants found that certain species they ate from local waterbodies were missing (Table A3), indicating that health messages should be revised to be congruent with the dietary habits of the target audience. In addition, questions about the health messages displayed a need for more detailed resources about advisories. There was a specific request for more approaches on how to mitigate risk with protective actions (e.g. quantity, removing belly fat, not reusing oil).

There were multiple reactions from each ethnic group to the health messages that emphasized a lack of family-level recommendations. The content of advisories should be described on an interpersonal level versus solely an intrapersonal level. Participants also proposed sharing the information learned with their friends and family, which informs the culturally-congruent health education efforts we should undertake when promoting health advisories in these ethnic groups to improve desired health outcomes (Choi, 2013; Uskul et al., 2009; Crawford et al., 2015; JaKa et al., 2021).

Finally, including a community mode of dissemination of health messages could improve self-efficacy in initiating and maintaining behaviors on safely eating fish (Marcinow et al., 2017), which ultimately leads to a higher likelihood of following fish advisories regarding choice of fish species, meal size and frequency, and cleaning and cooking methods.

This is the first study to apply the integrated behavioral model to deductively analyze the perceptions of Chinese, Hmong, and Karen women of childbearing age on eating locally caught fish in the Milwaukee area. The focus group approach provided findings that capture the nuances of individual thoughts and perceptions regarding safe fish consumption. Consequently, this focus group project complements the 2016 biomonitoring study of Milwaukee Burmese refugees which showed an overwhelming majority were not aware of fish advisories (He et al., 2021).

An additional strength of this study is that it provides insight into why following fish advisories among ethnic groups who eat locally caught fish continues to be a challenge in Wisconsin. Lastly, sampling included women with a wide age range (18–48) and education level (less than 8th grade to a graduate degree) which other focus group studies failed to do. Two limitations to note for our study: 1) the generalizability and transferability of these findings require careful consideration given the limited sample size and 2) because these sessions were conducted online during the COVID-19 pandemic, participants needed to have reliable internet which may have excluded women who have low digital literacy or no access to internet or digital devices.

5. Conclusion and recommendations

Three different focus groups provided insight into the cultural context that shapes the practices and perceptions of fish consumption, and its benefits and risks among Asian women of childbearing age. All women were aware of the risk of pollution exposure due to consuming fish living in polluted waters, however, not all knew of ways to mitigate risk and the potential benefits of eating locally caught fish. When shown the "eating safe fish" recommendations, participants requested more information about how to apply this recommendation not only to themselves, but to their family members as well.

Participants also demonstrated the need for dissemination of health messages through trusted sources since distrust and suspicion came up multiple times as a barrier. Health messages for Asian women of childbearing age should include the fish species that the ethnic groups eat from local waterbodies, and information should be presented so that it can be applied to a family, not just an individual. Culturally appropriate materials may increase self-efficacy and adherence to fish advisories. Future studies will evaluate the effectiveness of self-affirmation messaging among Asian women of childbearing age and assess changes in fish consumption based on message content.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Focus group guides and coding structure will be made available upon request.

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Consent for publication

Manuscript does not contain any individual or identifiable information.

Code availability

Dedoose Version 9.0.17, a qualitative data analysis software program.

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Ethics approval

This focus group project was deemed by WDHS to constitute public health surveillance and practice, thus review by an institutional review board was not required.

Consent to participate: A statement was read during each online session and each participant was given the opportunity to participate or decline participation: "The information you provide during this focus group is completely private. No information that identifies you will be shared with anyone outside our team or included in anything that is published. We will record the focus group discussion so that we can capture your thoughts in an accurate way. All the recordings will be destroyed after they are transcribed. We would also like to ask you to respect each other's privacy and not share anyone's name outside this group. You may stop participating at any time or choose not to answer any questions. If you have any questions after today, please contact our team."

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102528.

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