Hold the Mercury:

How to Avoid Mercury When Buying Fish

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Mercury Policy Project

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

"One-third of sushi tuna samples exceeded the FDA 'action-level' of 1 part per million."

Today's seafood cases and sushi menus present a wide variety of fish to choose from, such as swordfish from South Africa, salmon from Alaska, or tilapia from Honduras. And the typical consumer checking out his or her options isn't aware that some types of fish contain high levels of mercury contamination and others contain vastly lower levels. As a result, many people do not know that they can avoid the risks of mercury exposure while still enjoying the benefits of including seafood in their diets.

For those who buy their fish at stores that post the U.S. Food and Drug Administration (FDA) advice about mercury in fish, choosing low mercury fish is simple. Most people, however, shop at stores that are not posting such warning signs, leaving customers at the mercy of grocery counter attendants who, this report shows, are unlikely to advise them well or accurately. This means that there may be few protections for those people, especially women and children, who may already be at risk from high levels of mercury in their bodies.[1]

Tuna is the primary source of mercury in the American diet,[2] due largely to high levels of tuna consumption despite the reportedly moderate levels of mercury in tuna. While tuna comes in many forms, sushi tuna and fresh tuna steaks have recently sky-rocketed in popularity. These types of tuna unfortunately are the high mercury varieties, compared to the less glamorous canned light tuna which the FDA considers to be a low mercury fish.

To confirm that some fish are high in mercury and others are not, Oceana volunteers collected fish samples from grocery stores and sushi restaurants in 26 U.S. cities and had them analyzed to determine their mercury content. Most grocery stores where samples were purchased were not posting the FDA advice at the seafood counter. Volunteers, including some Oceana staff, also surveyed seafood counter attendants to find out whether they could effectively communicate the FDA advice on mercury in fish at the point of sale. This report summarizes Oceana's analysis of mercury levels in fish purchased at grocery stores and sushi restaurants and summarizes the results of the seafood counter surveys. Some of the results may be surprising:

- Mercury levels in tuna were higher than FDA data suggest: The average mercury concentration for grocery store tuna was 0.68 parts per million (ppm), which is nearly double the FDA's average concentration of 0.38 ppm for fresh or frozen tuna tested by the FDA. Sushi tuna was even higher, with an average value of 0.86 ppm. This level of mercury is comparable to the level in king mackerel, a fish the FDA recommends that sensitive populations should avoid.

- One-third of sushi tuna samples exceeded the FDA "action level": The highest sushi tuna sample had a mercury content of 2.2 ppm, more than twice the FDA action level, and one in three samples tested above that level. This mercury level, if enforced, would allow the FDA to take these tuna off the market. All but three tuna sushi samples exceeded the Japanese "provisional regulatory value" for seafood (0.4 ppm).

- The FDA lacks data on popular sushi tuna species: There are no data for bluefin tuna in the FDA database. For other species commonly sold in stores and sushi restaurants (yellowfin, bigeye, and albacore), the FDA data are unacceptably sparse.

- Average mercury levels in swordfish exceeded the FDA "action level": The average mercury concentration of swordfish we tested was 1.2 ppm. Two thirds (67%) of those tested were at or above the FDA's 1 ppm "action level."

- Very few (13%) seafood counter attendants could provide FDA advice when asked: When asked about the government's advice for women thinking of having children, 87% of seafood counter attendants either indicated they did not know, or gave a wrong answer to shoppers. Only 13% of those asked gave the correct information to shoppers, and half of those respondents referred to either a posted warning sign or the internet to obtain the FDA advice. Clearly consumers cannot rely on seafood counter attendants for this information, demonstrating the importance of warning signs at the point of sale.

- "Low mercury" tilapia is still a good option: The average mercury level in tilapia from this analysis was 0.08 ppm, well below the FDA "action level" of 1.0 ppm. This qualifies tilapia as a low-mercury fish. However, these levels are much higher than the average of the small number of fish (eight) tested by the FDA (0.01 ppm).

- Mackerel or "Saba" is a good low mercury option for sushi eaters: Mackerel mercury levels were also generally low, with an average of 0.1 ppm. Typically, sushi mackerel is either horse, Atlantic, Pacific or chubb mackerel, as opposed to king mackerel, which has high mercury levels and is on the FDA's "Do Not Eat" list.

RECOMMENDATIONS

Based on these findings and others, Oceana and Mercury Policy Project make the following recommendations which are described in more detail later in the report.

- ✓ Grocery companies should post the FDA advice on signs at seafood counters
- ✓ The FDA should increase the frequency of its testing for commonly consumed fish
- ✓ The FDA should consider including fresh tuna on its "Do Not Eat" list
- ✓ The FDA should require warnings to be posted where fish covered by U.S. government advisories are sold

INTRODUCTION

Mercury is a dangerous neurotoxin that enters the environment as a result of human activities such as burning coal and producing chlorine. Although volcanoes and other natural sources contribute to mercury's pervasive nature, two thirds of the mercury present in our environment is a result of human activities.[3]

Once released into the air, mercury is deposited back onto land and water. Bacteria then convert mercury to toxic methylmercury. This methylmercury is absorbed or consumed by small plants and animals, such as plankton, which are then eaten by larger animals including fish. These larger animals accumulate mercury from their prey through a process called bioaccumulation. This continues through the food chain so larger predatory fish such as tuna, sharks and swordfish have the highest mercury levels among fish. Animals that eat these fish, including humans, have even higher levels. Fish consumption is the primary way humans are exposed to mercury.[4]

Methylmercury can damage critical organs of the central nervous and cardiovascular systems.[5] Children are particularly vulnerable to mercury's toxic effects. Infants and children exposed to high doses of mercury in the womb or after birth may have problems with attention span, language, visual-spatial skills, memory and coordination. Very high levels of mercury exposure in children can lead to brain damage, seizures, blindness and mental retardation.[6] An EPA scientist has estimated that hundreds of thousands of newborns each year are at increased risk for developmental delays due to the mother's mercury exposure.[7]

Mercury's effects on adults can vary from increasing the risk of heart disease[8] to a tingling sensation in the fingers.[9] People often do not associate their symptoms with mercury poisoning because the effects are often very subtle. As a result, many people may continue to eat fish with high mercury levels, worsening the problem. Nervous system problems can include impaired coordination, tremors, irritability, memory loss, depression, blurred vision and a tingling sensation in the skin. Other symptoms include fatigue, nausea, headache, decreased concentration and muscle or joint pain.[10]

Recognizing the harmful effects of mercury exposure, in 2004 the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) jointly published a consumer advisory on fish consumption.[11] The advisory warns women of childbearing age and young children to avoid eating four high-mercury fish species: swordfish, shark, tilefish and king mackerel. In addition to warnings against high-mercury fish, the advisory recommends limiting consumption of albacore tuna or tuna steaks to six ounces or less each week and limiting other low mercury fish to 12 ounces or less per week.

HEALTH BENEFITS OF FISH

While high mercury levels in fish pose a significant health risk, fish serve as an excellent low-fat source of protein. Research has linked seafood in diets to numerous health benefits for developing fetuses, infants and adults, including those at risk for heart disease. These benefits include improved vision, increased pregnancy length, and improved cognitive development for infants and young children. For adults, seafood consumption may help reduce the risk for cardiovascular disease.[12] Some of these benefits may be attributed to the long-chain omega-3 fatty acids.

While fish consumption may have health benefits, mercury may also counteract these benefits. For example, studies have shown that mercury exposure could increase the risk of cardiovascular complications such as heart attacks[13] and hardening (atherosclerosis) of the carotid artery.[14] Additionally, gestation length and infant cognition may be compromised when the mother's mercury levels are elevated.[15] Thus, the benefits derived from fish consumption for both child neurodevelopment and adult cardiovascular health are greater when mercury exposure is low.[16]

While seafood is the primary source of omega-3 fatty acids in human diets, not all seafood is rich in these fatty acids.[17] Also, not all seafood has equal amounts of mercury. Average mercury concentrations vary as much as 50-fold among fish and shellfish species, while omega-3 fatty acid content may vary up to 200-fold among different types of seafood.[18] As a result, consumers must choose fish wisely to maximize their omega-3 intake while limiting mercury. For examples of low mercury fish high in omega-3 fatty acids, see Table 1 below.

[TABLE 1] Many Low-Mercury Fish are High in Omega-3 Fatty Acids, EPA, and DHA

SPECIES	AVERAGE MERCURY CONCENTRATION (PPM)[a]	TOTAL EPA AND DHA (g/100 g)
Salmon (farmed)	0.014	2.650[b]
Mackerel (North Atlantic)	0.05	2.390[c]
Herring	0.044	2.055[b,c]
Anchovies	0.043	1.973[b,c]
Salmon (canned)	<0.01	1.960[c]
Salmon (wild)	0.014	1.880[b,c]
Tuna (canned, light)	0.118	1.600[c]
Sardines	0.016	0.982[b]
Pollock	0.041	0.540[d]
Crab (blue, king, snow)	0.06	0.420[d]
Scallop	0.05	0.370[b]
Shrimp	<0.01	0.310[d]
Flatfish (sole, flounder, plaice)	0.045	0.189[c]
Catfish	0.049	0.180[d]
Cod	0.095	0.150[d]
Tilapia	0.01	0.110[d]

Source: [a] U.S. FDA, 2006 [b] Mozaffarian and Rimm, 2006
[c] Mahaffey, 2004. [d] Nesheim and Yaktine, 2006

Seafood: Benefits vs. Risks

While some have tried to argue that the benefits of fish justify ignoring the risks of mercury exposure, many prestigious studies have concluded that the best way to maximize the health benefits of seafood is to focus on omega-3 intake while carefully limiting mercury exposure.[19] This is not difficult to do. For example, two to six ounces of wild Alaska salmon per week provides a recommended level of omega-3's while minimizing mercury exposure.[20]

MERCURY ADVICE IS NOT GETTING TO THOSE WHO NEED IT MOST

Despite evidence linking mercury exposure from seafood consumption to adverse health consequences, mercury advice is not being communicated to the public effectively or accurately. Two years after the FDA and EPA established their advice, a study conducted by the Center for Science in the Public Interest found that 31 percent of pregnant women, women planning on becoming pregnant, and nursing mothers were unaware that high-mercury seafood could be harmful. At the same time, an additional 18 percent of fish consumers may have misunderstood the advice and unnecessarily reduced their fish intake.[21]

An Oceana study confirmed that this advice is not reaching the vast majority of Americans where it is needed most: the seafood counter.[22] The stores posting signs with the FDA's advice are limited in number and geographical reach. As a result, the average shopper is unlikely to see the advice prior to purchasing fish. While some companies have argued that their counter personnel are trained to convey this information, it is not clear that this training has been sufficient.

To help consumers make informed choices about fish consumption, Oceana launched its Campaign to Stop Seafood Contamination in 2005 and asked major grocery companies to post the FDA's advice about mercury in seafood at the point of sale.

Since that time, nearly 3,000 grocery stores nationwide (representing about 14 percent of the nation's major grocery chain stores) have agreed to voluntarily post this information. Oceana has published the names of those companies on its Green List.[23] Conversely, companies that have refused to post the advice are included on Oceana's Red List. Both are provided in Figure 1.

The current project quantifies the levels of mercury in some popular fish from both grocery stores and sushi restaurants. It also assesses the level of knowledge of the FDA fish advisory by seafood counter personnel.

[FIGURE 1] Most Grocery Stores Still Not Posting the FDA Advice

[GREEN LIST]

Acme
Albertsons*
Carrs
City Market
Dillons
Dominick's
Genuardi's
Gerbes
Hilander
Jay C
Jewel Osco
Kroger
Food 4 Less
Foods Co
Fred Meyer
Fry's
Owen's
Pay Less
QFC
Ralphs
Randalls
Safeway
Smith's
Star Market
Tom Thumb
Trader Joe's
Vons
Whole Foods
Wild Oats

[RED LIST]

A&P
Albertsons
ALDI
Bell Markets
Bi-Lo
Cala Foods
Copps
Costco
Cub Foods
Farm Fresh
Farmer Jack
The Food Emporium
Food Lion
Giant
Giant Eagle
Hannaford Bros.
Harris Teeter
Harvey's
HEB
Hy-Vee
IGA
Ingles
Meijer
Pathmark
Pick'n Save
Price Chopper
Publix
Rainbow
Sam's Club
Sav-a-Center
Save-A-Lot
Schnucks
Shoppers
ShopRite
Stop & Shop
Super Fresh
Super Target
Sweet Bay
Tops Market
Waldbaum's
Wal-Mart
Wegmans
Weis Markets
Winn-Dixie

*Albertsons in AZ, CO, FL, LA, OK, TX do not post the FDA advice

SIGNS vs. BROCHURES:

The FDA advice on mercury can be summarized in a brief message:

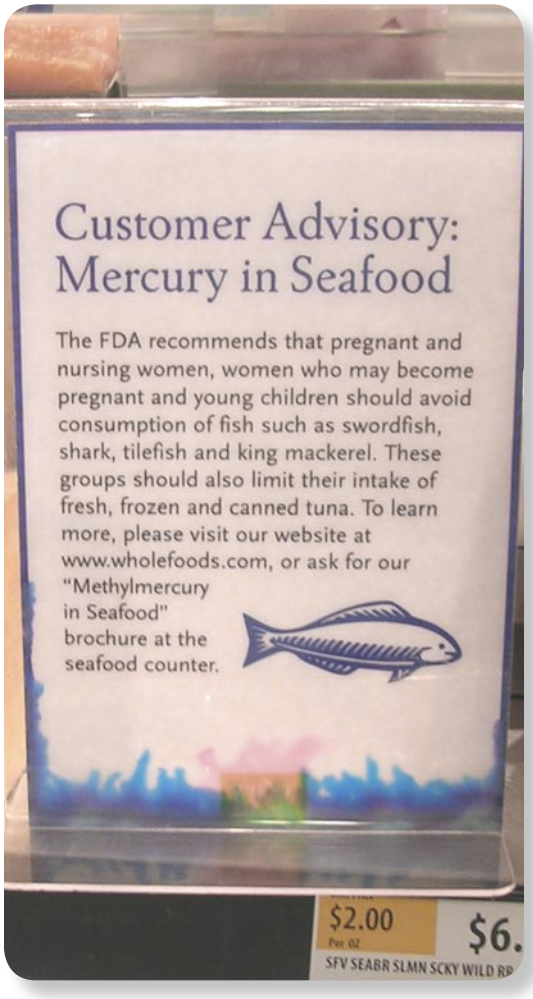
Women of childbearing age and young children can eat up to 12 ounces of seafood per week, but should not eat swordfish, tilefish, king mackerel or shark. They should also limit consumption of albacore tuna and tuna steaks to six ounces a week or less.

This advice was issued in 2004, yet some grocery companies are still refusing to post a simple sign to help their customers make smart choices for their families. Some companies argue that they provide the advice in a brochure. However, Oceana has found that many of these materials are not providing the full story about the FDA advice; and for those that do have the information, the brochures are simply not as accessible a format as a sign at the seafood counter would be. Most shoppers do not have the time or inclination to read up on the issue while they are shopping. However, a simple message on the counter can provide all that is needed to make an informed choice.

While some companies have argued that signs could hurt business, it is equally possible that the opposite is true. Shoppers by now may have heard something about mercury in fish and may shy away from purchasing fish altogether if they don't get a clear message about which fish they are to avoid. On the other hand, a sign listing which specific fish to avoid or limit could prompt a shopper to purchase flounder, tilapia, wild salmon, or any number of other alternatives, (See Table 1) rather than passing by the seafood counter altogether.

For those companies that still have refused to post signs, and instead are using brochures, Oceana recommends that signs be created and posted to supplement the brochures.

OCEANA'S MERCURY SAMPLING PROJECT



Oceana volunteers collected fish samples for mercury testing between October 25 and November 13, 2007, from grocery stores and sushi restaurants in 26 cities across the United States. Most grocery stores visited in the project were not posting the FDA advice at the seafood counter.

Volunteers were asked to purchase swordfish and tuna steaks from their grocery stores. If swordfish or tuna was unavailable, tilapia was substituted. To assess the knowledge of seafood counter attendants about mercury contamination, Oceana voulnteers asked the following question in 40 stores in 38 cities:

> **"What is the government advice on mercury in seafood for women who are thinking about having kids?"**

Two samples of nigiri or sashimi were purchased from volunteer-chosen sushi restaurants. Volunteers were asked to purchase tuna and mackerel, with a preference toward bluefin tuna (kuromaguro) or bigeye tuna (bachi-maguro) and Atlantic mackerel (saba) all of which are popular sushi choices.

Fresh or frozen fish samples were shipped overnight in coolers to a facility certified by the National Environmental Laboratory Accreditation Conference (NELAC), New Age/Landmark Laboratory in Benton Harbor Michigan between November 3rd and November 14th 2007. The laboratory performed analysis for total mercury using a DMA 8 mercury analyzer (EPA Method 7473). All QA/QC analytical results (spike recovery, duplicates, and standard materials) met NELAC Standards.

RESULTS

Ninety four fish samples for mercury testing were purchased from grocery stores and sushi restaurants in 26 cities. While the following tables contain rankings of fish by mercury level, it should not be inferred that any particular city, grocery store or sushi restaurant is responsible for the mercury levels in the fish. Tuna, swordfish and many other species of fish are traded on a global market. This means that a shopper or diner would be equally likely to find high mercury fish in any given establishment. Also, the country of origin for grocery fish is listed where available, but only to highlight the global nature of our fish supply.

GROCERY RESULTS

Tuna: The average mercury concentration of 23 fresh tuna samples was 0.68 ppm (Table 2), which is nearly double the FDA average for all fresh/frozen tuna (0.38 ppm).[26] Values ranged between 0.14-1.8 ppm, with 3 grocery tuna samples (or 13%) exceeding 1 ppm. The average mercury level for fresh tuna is close to the average of fresh grocery tuna samples reported in a New Jersey study.[27]

The most common type of the tuna identified in this portion of the survey was yellowfin, representing at least 70% of our grocery tuna samples. The remaining samples were either unidentified species or sold as "ahi" tuna (3 samples). The FDA "Seafood List", a compilation of acceptable market names for seafood, identifies "ahi" as the vernacular name for either yellowfin or bigeye tuna.[28]

[TABLE 2] Some Mercury Levels in Fresh **Tuna** Meet or Exceed FDA Action Level

RANK	LOCATION	RESULTS (ppm)	TYPE OF TUNA	COUNTRY OF ORGIN	GROCER
1	St. Petersburg, FL	1.8	Yellowfin	USA	Publix
2	New York, NY	1.6	Yellowfin	n/a*	The Food Emporium
3	Detroit, MI	1.1	Yellowfin	n/a*	Kroger
4	Miami, FL	0.93	Yellowfin	Costa Rica	Publix
5	Pittsburgh, PA	0.84	Yellowfin	Phillipines	Giant Eagle
6	Orlando, FL	0.82	Yellowfin	USA	Publix
7	Birmingham, AL	0.78	Yellowfin	Malaysia (wild)	Publix
8	Lakeland, FL	0.77	Yellowfin	Costa Rica	Publix
9	Nashville, TN	0.75	Yellowfin	Fiji	Publix
10	Atlanta, GA	0.73	n/a*	Vietnam	Publix
11	Chicago, IL	0.72	Ahi	USA	Costco
12	Baltimore, MD	0.69	Yellowfin	n/a*	Giant
13	Philadelphia, PA	0.56	Yellowfin	Indonesia	Super Fresh
14	Portland, OR	0.52	Ahi	Phillipines	Costco
15	Washington, DC	0.51	n/a*	n/a*	Giant
16	Rochester, NY	0.43	Yellowfin	Sri Lanka	Wegmans
17	New Orleans, LA	0.41	n/a*	Bali, Indonesia	Winn Dixie
18	Houston, TX	0.39	Yellowfin	U.S.A. (Hawaii)	H.E.B.
19	Fort Worth, TX	0.33	Yellowfin	USA	Central Market (HEB)
20	Hartford, CT	0.27	n/a*	USA	Stop & Shop
21	Seattle, WA	0.25	Ahi	Phillipines	Costco
22	St. Louis, MO	0.2	Yellowfin	Indonesia	Schnucks
23	Charlotte, NC	0.14	Yellowfin	Phillippines	Harris Teeter
	Average	**0.68**			
	Median	**0.69**			

Source: Oceana

*n/a: not available

Swordfish: The average mercury concentration of 15 swordfish samples was 1.2 parts per million (ppm) (Table 3). The samples ranged from 0.19-2.5 ppm. Two-thirds of the swordfish samples were at or above the FDA 'action level' of 1 ppm.[24] Meanwhile, the FDA samples of swordfish exceeded this level only about one-third of the time.

> **"Two-thirds of the swordfish samples were at or above the FDA 'action level' of 1 ppm."**

Oceana's swordfish mercury data are similar to, and fall within, the range of what has been reported for over 600 swordfish samples by the FDA.[25] However, only 37% of the FDA swordfish samples meet or exceed 1 ppm, roughly half the percentage of samples in this study. These data reinforce the importance of the FDA "Do Not Eat" advisory for this high mercury fish for women of childbearing age and children.

Tilapia: In eleven stores (42% of those visited) that did not carry swordfish, tilapia was purchased and analyzed instead. Tilapia is typically a farm-raised fish which is identified in the FDA advice as having low mercury levels. The average mercury concentration of Oceana's 10 tilapia samples was 0.079 ppm, with concentrations ranging between 0.017-0.21 ppm (Table 4). Mercury levels in tilapia from this study are higher than the average of 8 samples analyzed by the FDA (0.01 ppm).

[TABLE 3] Two Thirds of **Swordfish** Meet or Exceed the FDA Action Level

RANK	LOCATION	RESULTS (ppm)	COUNTRY OF ORGIN	GROCER
1	Rochester, NY	2.5	South Africa	Wegmans
2	Hartford, CT	2.3	USA	Stop & Shop
3	Boston, MA	1.8	Chile	Stop & Shop
4	Atlanta, GA	1.5	Singapore	Publix
5	St. Petersburg, FL	1.5	USA	Publix
6	Charlotte, NC	1.4	Ecuador	Harris Teeter
7	Fort Worth, TX	1.3	USA	Central Market (HEB)
8	Birmingham, AL	1.0	Canada	Publix
9	Philadelphia, PA	1.0	Indonesia	Super Fresh
10	Baltimore, MD	0.96	n/a*	Giant
11	New York, NY	0.8	n/a*	The Food Emporium
12	Pittsburgh, PA	0.8	Indonesia	Giant Eagle
13	Miami, FL	0.79	Equador	Publix
14	St. Louis, MO	0.55	Indonesia	Schnucks
15	Washington, DC	0.19	n/a*	Giant
	Average	**1.226**		
	Median	**1.0**		

Source: Oceana

*n/a: not available

[TABLE 4] **Tilapia** are Low in Mercury

RANK	LOCATION	RESULTS (ppm)	COUNTRY OF ORGIN	GROCER
1	Phoenix, AZ	0.21	Honduras	Frys
2	Detroit, MI	0.16	Costa Rica	Meijer
3	Jacksonville, FL	0.11	Vietnam	Winn Dixie
4	Lakeland, FL	0.079	Costa Rica	Publix
5	Orlando, FL	0.07	Costa Rica	Publix
6	Houston, TX	0.06	Honduras	H.E.B.
7	Nashville, TN	0.038	Ecuador	Publix
8	Seattle, WA	0.034	Honduras	Costco
9	New Orleans, LA	0.017	China	Winn Dixie
10	Chicago, IL	0.011	Honduras	Costco
	Average	**0.0789**		
	Median	**0.065**		

Source: Oceana

SUSHI RESULTS

Fish samples were obtained from sushi restaurants in 23 cities, with sashimi or nigiri style tuna and mackerel preferred, to obtain fish-only samples for testing.

Tuna: Tuna samples (24) from sushi restaurants were higher in mercury than grocery store tuna, with an average value of 0.86 ppm (Table 5). The highest tuna mercury value, 2.2 ppm, is more than twice the FDA action level. One in three samples was above the action level, with half the samples reaching 0.92 ppm or more, a value close to the action level.

Fewer sushi tuna samples were identified as to their species, compared to the grocery tuna samples. Four different species were identified: bluefin, bigeye, yellowfin, and white (or albacore); each of these included samples with values above 1 ppm. Although the species of tuna is not always identified on a menu, these data show that any of these species can carry high levels of mercury.

There are no data for mercury levels in bluefin tuna in the FDA data set. For the other tuna species measured in this report (yellowfin, bigeye, and albacore), both our average and highest mercury values exceed those measured by the FDA (Figure 2). In fact, these tuna mercury levels are close to or exceed the average value of the four fish species the FDA warns women of childbearing age and children not to eat.

The average mercury levels in sushi tuna measured in this report are also higher than other recent reports from four different cities and had a higher percentage near the FDA action level.[29] All but three of our samples exceed the Japanese "provisional regulatory value" for mercury in fish (0.4 ppm).

[TABLE 5] One in Three **Sushi Tuna** Samples Exceed the FDA Action Level

RANK	LOCATION	RESULTS (ppm)	TYPE OF TUNA	JAPANESE NAME	RESTAURANT
1	Charlotte, NC	2.2	Bigeye	Bachi-maguro toro	Nikko Japanese Restaurant and Sushi Bar
2	Nashville, TN	1.5	White	n/a*	Fulin's Asian Cuisine
3	St. Petersburg, FL	1.4	Yellowfin	Kuromaguro	Hook's Restaurant
4	Birmingham, AL	1.4	Bluefin tuna	Kuromaguro	Sumo
5	New Orleans, LA	1.2	n/a*	Toro	Ninja
6	Miami, FL	1.2	Yellowfin	Maguro	Su-Shin Izakaya, Coral Gables
7	Philadelphia, PA	1.1	n/a*	Maguro	Sushi on the Square
8	Phoenix, AZ	1.0	n/a*	Maguro	Shogun
9	Hartford, CT	0.97	Bigeye	Toro	Wasa B
10	St. Louis, MO	0.96	n/a*	Maguro	San Sui
11	Washington, DC	0.92	Bluefin	Toro	Sushi-Ko
12	Baltimore, MD	0.92	n/a*	Maguro	Chiyo Sushi
13	Houston, TX	0.72	Yellowfin	Toro	Tomo Japanese Cuisine
14	Seattle, WA	0.69	Bigeye	Maguro	Rikki Rikki
15	Fort Worth, TX	0.68	Bluefin	Kuromaguro	Sushi Axium
16	Chicago, IL	0.66	n/a*	Maguro	Coast Sushi Bar
17	Detroit, MI	0.65	n/a*	Maguro	Tokyo Sushi
18	Boston, MA	0.58	n/a*	Maguro	Shanghai Tokyo
19	Nashville, TN	0.57	n/a*	Maguro	Fulin's Asian Cuisine
20	New York, NY	0.45	White tuna	n/a*	Ginger
21	Atlanta, GA	0.43	n/a*	Maguro	Edo Japanese Steak House
22	Pittsburgh, PA	0.2	Bluefin	Kuromaguro	Pacific Ring Pan Asian Cuisine
23	Portland, OR	0.18	Yellowfin	Maguro	Kappaya
24	Rochester, NY	0.14	Yellowfin	Maguro	Arigato
	Average	**0.86**			
	Median	**0.82**			

Source: Oceana

*n/a: not available

Mackerel: Mackerel samples (saba or aji) showed low levels of mercury, with an average of 0.1 ppm and a maximum of 0.27 ppm (Table 6).

This type of fish would be a good alternative for those sushi eaters concerned with their mercury exposure.

It should be stressed that these mackerel species (typically horse, Atlantic, Pacific or chubb) are low in mercury and also high in omega-3 fatty acids (see Table 7). These should not be confused with king mackerel, a high mercury fish species listed in the FDA "Do Not Eat" advisory.

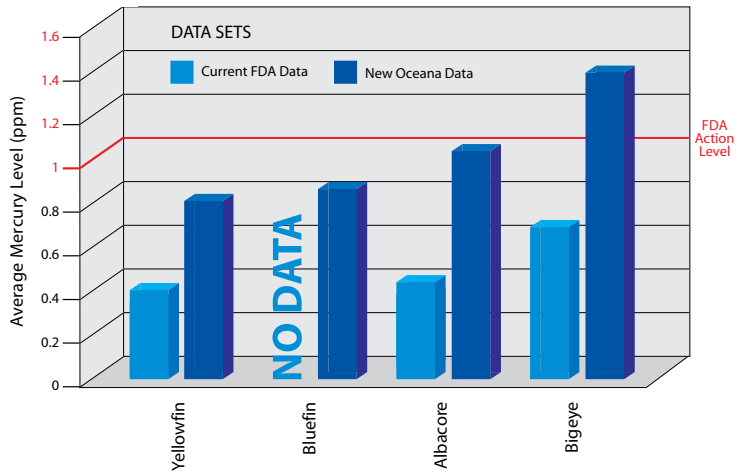
[TABLE 6] **Mackerel** is a Low-Mercury Option for Sushi Eaters

RANK	LOCATION	RESULTS (ppm)	TYPE OF FISH	JAPANESE NAME	RESTAURANT
1	New York, NY	0.27	Mackerel	Saba	Ginger
2	Washington, DC	0.21	Mackerel, horse	Aji	Sushi-Ko
3	Phoenix, AZ	0.15	Mackerel	Saba	Shogun
4	St. Louis, MO	0.12	Mackerel	Shimesaba	San Sui
5	Rochester, NY	0.11	Mackerel	Saba	Arigato
6	Hartford, CT	0.11	Mackerel	Saba	Wasa B
7	Charlotte, NC	0.11	Mackerel	Saba	Nikko Japanese Restaurant and Sushi Bar
8	Chicago, IL	0.097	Mackerel	Saba	Coast Sushi Bar
9	Portland, OR	0.088	Mackerel	Saba	Sushi Sushi
10	Philadelphia, PA	0.088	Mackerel	Saba	Sushi on the Square
11	Fort Worth, TX	0.087	Mackerel	Saba	Sushi Axium
12	Atlanta, GA	0.086	Mackerel	Saba	Edo Japanese Steak House
13	New Orleans, LA	0.081	Mackerel	Saba	Ninja
14	Baltimore, MD	0.077	Mackerel	Saba	Chiyo Sushi
15	Boston, MA	0.074	Mackerel, Atlantic	Saba	Shanghai Tokyo
16	St. Petersburg, FL	0.072	Mackerel	n/a*	Hook's Restaurant
17	Seattle, WA	0.066	Mackerel	Saba	Rikki Rikki
18	Birmingham, AL	0.061	Mackerel	Saba	Sumo
19	Detroit, MI	0.059	Mackerel	Saba	Nami
20	Houston, TX	0.058	Mackerel	Saba	Tomo Japanese Cuisine
21	Miami, FL	0.056	Mackerel	Saba	Su-Shin Izakaya, Coral Gables
22	Pittsburgh, PA	0.049	Mackerel	Saba	Pacific Ring Pan Asian Cuisine
	Average	**0.1**			
	Median	**0.086**			

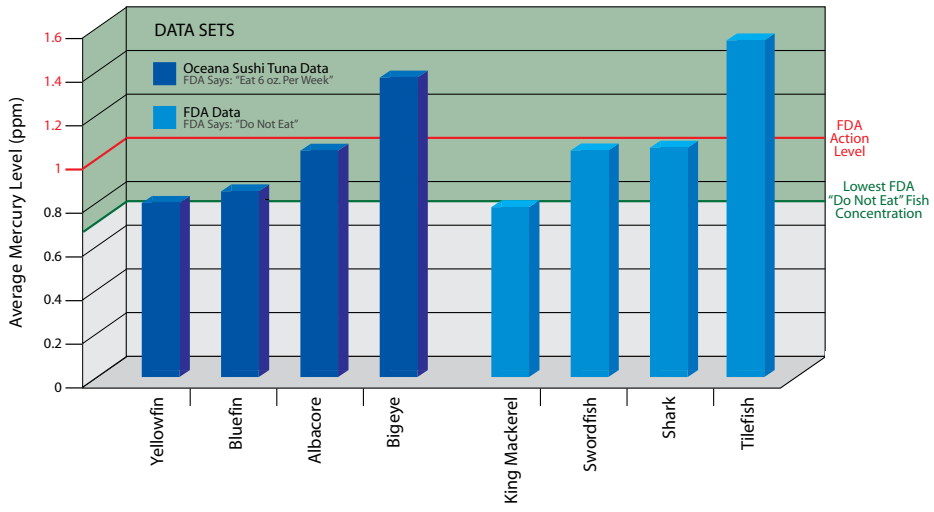
Source: Oceana

*n/a: not available

[FIGURE 2A] Fresh Tuna Sampled by Oceana Exceeds Average Mercury Levels in FDA Tested Tuna



[FIGURE 2B] Mercury Levels in Fresh Tuna are Comparable to Fish on FDA's "Do Not Eat" List



TYPES OF TUNA

Bluefin Tuna

The largest of the tuna family, bluefin is highly prized for sushi. It can reach weights of over 1,000 pounds. On January 5th 2001, in Tokyo, a 444-pound bluefin tuna sold for a record $173,600 (or about $391 a pound).[30] Bluefin often have higher mercury levels than other tuna.

Bigeye Tuna

Third in commercial production among tunas, bigeye can vary in quality, but generally this tuna's high fat content adds to its sushi market value.[31] Bigeye often have mercury levels as high as bluefin.

Albacore Tuna

Also known as canned "white meat," albacore is the top tuna import in the United States with 55,978,000 metric tons being imported in 2006.[32] It is also one of the fastest fish in the sea.[33] Albacore is eaten much more frequently than bluefin or bigeye, and it gets a specific mention in the FDA's mercury consumption advice.

Yellowfin Tuna

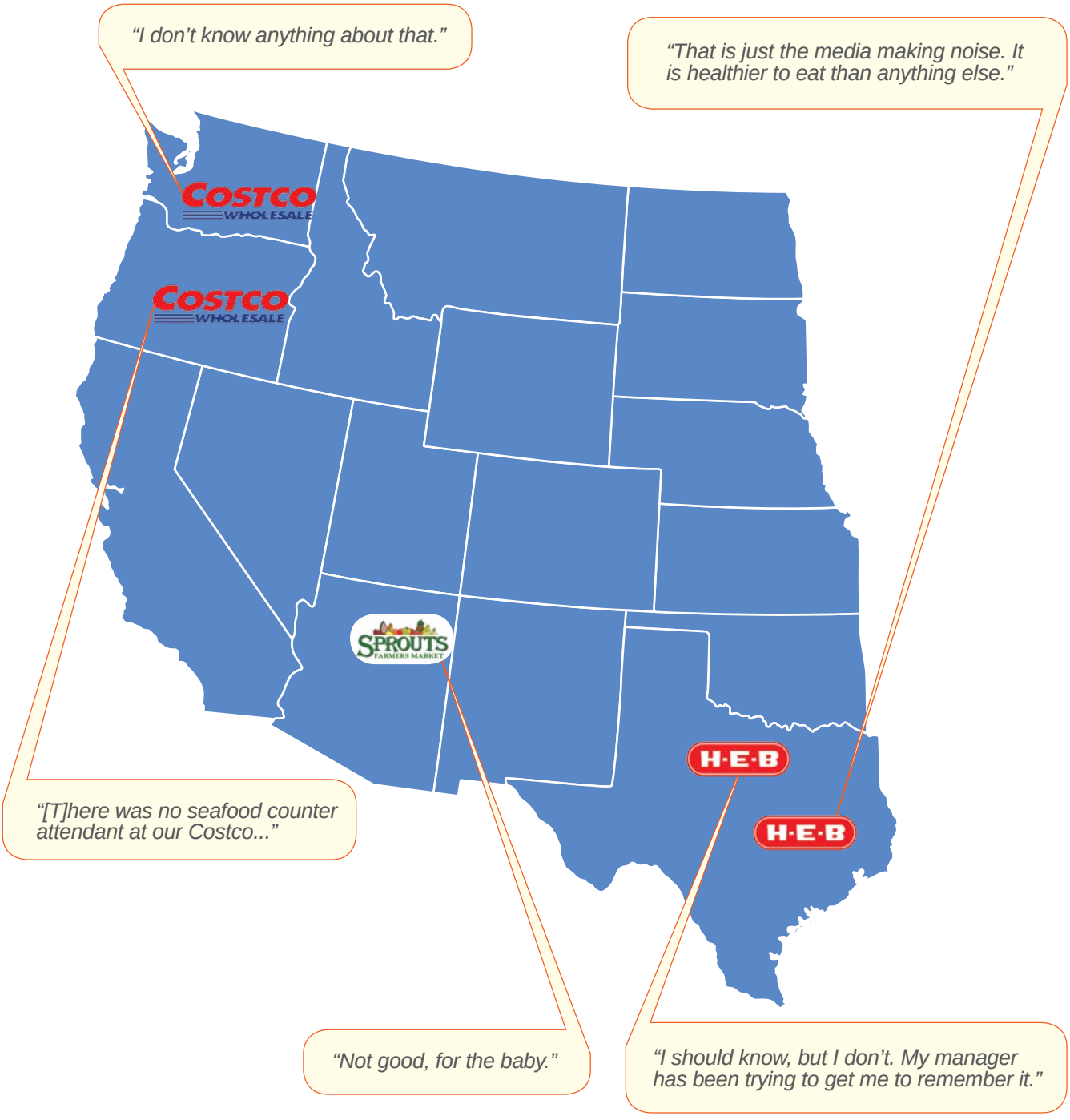
The leanest of the four used for sushi, yellowfin is often sold in the U.S. under its Hawaiian name ahi.[34] Most tuna steaks sold at grocery stores are yellowfin and contain a moderate amount of mercury.

Skipjack Tuna

The smallest of all major commercial tunas, skipjack is often found in canned "light" tuna.[35] Skipjack typically contains the lowest mercury levels; however, it still contains about 15 times more mercury, on average, than salmon.

SEAFOOD COUNTER ATTENDANTS RESPOND TO CUSTOMER QUESTION

"What is the government advice on mercury in seafood for women who are thinking about having kids?"



Source: Oceana. Statements made to, and reported by Oceana volunteers including some staff.

ONE SIMPLE QUESTION:
What Do You Need to Know about Mercury in Fish?

Consumers have a right to know about mercury in fish. However, only 14 percent of major grocery providers in the United States voluntarily post the FDA advice at the seafood counter.[36] While some companies have claimed that their seafood counter personnel are trained and armed with information on mercury in fish, our results demonstrate that this is no substitute for posted signs. As part of Oceana's fish testing project, seafood counter personnel in 40 stores were asked one simple, but important, question:

> "What is the government advice on mercury in seafood for women who are thinking about having kids?"

Specifically, the Food and Drug Administration advises women of child-bearing age and children not to eat swordfish, tilefish, king mackerel or shark, and to limit albacore tuna and tuna steaks to 6 ounces per week or less. An acceptable response to this question could focus primarily on the two species of fish most often available, tuna and swordfish, as the three others are not common at grocery stores. If personnel had been educated about mercury in seafood, the answers received should have somewhat mirrored the FDA advice on at least swordfish and tuna.

However, nearly 9 out of 10 attendants gave responses that either indicated a complete lack of knowledge or were humorously, if not frighteningly, wrong.[37] For a full list of answers, please see the Appendix. Clearly, consumers at grocery stores not posting the FDA advice at seafood counters are at the mercy of employees who probably do not know to advise customers about the best ways to avoid mercury.

The answers given by some seafood counter personnel are not only doing a disservice to consumers' health, but also to company profits. Some attendants' answers could easily scare people away from fish unnecessarily. For instance, several customers were told not eat fish at all – an overly cautious response that is not justified by the FDA advice.

A distinction should be made between high mercury and low mercury fish so that the customer can make an informed choice and purchase low mercury fish. Consider this excellent response passed along by an Oceana fish sampler, who asked the above question at a Genuardi's store near Philadelphia:

> "[*The seafood attendant*] said they should limit their intake. He specified which not to eat: swordfish, king mackerel, shark, tilefish and tuna. Then he listed some that were better choices like salmon and flounder."

This information, which is nearly identical to that posted on a sign in Genuardi's stores, allows the shopper to confidently buy fish with low mercury levels. While trusting a seafood counter attendant to be fully educated on the mercury subject would seem reasonable, it is a dangerous assumption. Some suggestions were the complete opposite of the FDA advice. For instance, at a Publix grocery store near Orlando, Florida, the attendant gave the following suggestion:

> "Women who are pregnant should not eat any fish that is farm-raised, but it is ok to eat all fish from the ocean."

If this advice were followed, a shopper could be encouraged to completely disregard the FDA advice and eat swordfish, king mackerel, tilefish and shark and not limit consumption of tuna (a high mercury fish) while forgoing low-mercury, farm raised fish, such as tilapia. If this person was considering having children, or feeding the fish to children, such a diet could put their child at risk.

A Publix store in Coral Gables, Florida, just outside of Miami, similarly instructed its customer:

> "If you are pregnant, don't eat Chilean sea bass. All the other fish are fine."

While Oceana agrees that it is wise to avoid Chilean sea bass, both because of sustainability issues, and potentially high mercury, the FDA clearly states all the other fish are simply not fine. Even though Publix claims to have taken steps to inform customers, only one out of seven Publix stores questioned gave an answer that came close to the FDA advice.

In each case, if the store had simply posted an inexpensive sign, like the ones already hanging in Green List stores throughout the country, the information would have been readily available.

DISCUSSION

The most surprising finding from this study is the high level of mercury in many fresh tuna samples, obtained from both grocery stores and sushi restaurants. Tuna mercury levels rivaled those of fish that the FDA warns women of childbearing age and children not to eat. Unfortunately, the FDA advice about consuming fresh tuna is buried on the second page of its advisory, and is therefore often overlooked. It is important to emphasize that FDA advises women of childbearing age and children to eat no more than one serving (six ounces) of albacore or fresh/frozen tuna per week.

This advice is critical due to the growing popularity of sushi. Over the past decade, sushi consumption in the United States has exploded and resulted in approximately 10,000 sushi restaurants nationwide.[38] Due to this surge in demand, many grocery stores now carry sushi with about 150 supermarkets adding the raw delicacy to their counters annually.[39] Tuna is the most widely consumed type of fish and the most frequently ordered sushi item. In fact, it is estimated that tuna is the number one source of mercury intake in America, accounting for four times more mercury exposure than swordfish.[40]

As a result of the growing popularity of sushi, young women may be consuming even more fresh tuna, instead of limiting their consumption as the government advises. Clearly, posting signs at the fish counter listing all FDA advice on fish would help women of childbearing age and children know which fish to avoid or limit and direct them toward low mercury fish options. Our testing of tilapia and mackerel emphasize that low mercury fish are available and provide a great alternative for those warned to limit their mercury exposure.

Posting the FDA advice at seafood counters would help to ensure that consumers have the information they need to make informed choices. The results of this study clearly demonstrate that seafood counter attendants cannot be relied on to convey this information. The woefully inaccurate information being given at the seafood counters demonstrates the clear need for posting the FDA advice at the point of sale. Placing this information at the seafood counters will also help consumers make informed choices later when they are in restaurants.

While our sample is modest in size, it should be noted that the FDA data set on fresh tuna and several other fish species is also quite limited. Thus, the higher mercury levels observed in this study demonstrate the need for further testing of fish, and particularly fresh tuna, by the FDA, and inclusion of the popular bluefin tuna in the FDA's monitoring program.

[RECOMMENDATIONS]

Based on these findings and others, Oceana and Mercury Policy Project make the following recommendations.

- **Grocery companies should post the FDA advice on signs at seafood counters:** All stores selling the types of fish included in the FDA advice should post signs advising shoppers about which fish should be avoided or limited by women of childbearing age and children. Five major companies are already doing this, and the others need to begin posting this advice immediately.

- **The FDA should increase the frequency of its testing for commonly consumed fish:** The FDA needs to implement systematic testing of fish to document the mercury levels and trends that may occur.[41] It is insufficient to have only eight samples of a fish as popular as tilapia. Our data suggest that mercury levels in many tuna species could be increasing. FDA should sample commonly eaten fresh and frozen tuna species more frequently.

- **The FDA should consider including fresh tuna on its "Do Not Eat" list:** Based on this analysis and others,[42] mercury levels in fresh tuna, especially the types sold as sushi, are becoming comparable to other fish on the "Do Not Eat" list, such as king mackerel. With the much greater popularity of tuna--the number one most consumed fish in the United States--it may be appropriate for fresh tuna to be added to the "Do Not Eat" List. The FDA should consider this recommendation and make the change if it is appropriate.

- **The FDA should require warnings to be posted where fish covered by U.S. government advisories are sold:** The FDA should develop more effective programs to educate the public about mercury in fish. This should include requiring stores that sell fish covered by the FDA advisory to post warning signs.

[APPENDIX] Only 13% of Seafood Counter Attendants Could Provide FDA Advice to Customers

GROCERY STORE NAME	CITY	STATE	SEAFOOD COUNTER ATTENDANT'S ANSWER
Publix	Altamonte Springs	Florida	*He said, women who are pregnant should not eat any fish that is farm raised but it was OK to eat all fish from the ocean.*
Best	South Farmingdale	New York	*Neither he nor the store manager ever heard of government advice about fish or mercury.*
Food Lion	Jacksonville	North Carolina	*The attendant stated that doctors say women should not eat fish if they want to have children. She was unsure of the governments position.*
Frys	Phoenix	Arizona	*Well, women shouldn't be eating those fish but that's why we get fish from Chili, Honduras, and places that are more regulated.*
Publix	Augusta	Georgia	*He stated there is no reason to be overly cautious, that mercury is just getting a lot of attention in the media latey, that up to about three times a week a woman who is pregnant should be fine. That salmon is a good choice, and the "white" fish may have higher mercury, but not to worry.*
Piggly Wiggly	Jacksonville	North Carolina	*I have no idea what you are talking about.*
Stop & Shop	Simsbury	Connecticut	*"You'd better ask your doctor, M'am."*
Publix	Decatur	Georgia	*Women thinking about having kids should not eat certain fish, though a little bit is ok. To be safe, attendant suggested that pregnant women, instead of eating Tuna or Swordfish, eat salmon or tilapia.*
H.E.B.	Houston	Texas	*"I should know, but I don't. My manager has been trying to get me to remember it."*
Giant	Washington	District of Columbia	*"Well, my girlfriend eats fish."*
Giant	Washington	District of Columbia	*"I have no idea."*
Kroger	Birmingham	Michigan	*The benefits outweigh the risks.*
Wegmans	Rochester	New York	*They can have it, bottom feeder fish should be avoided because the mercury settles there. They can have it in moderation.*
Schnucks	Warson Woods	Missouri	*There was no one behind the counter when I arrived. A woman came off the floor to help me. She knew nothing about the fish. She couldn't answer any of my questions and there was no available literature for customers or signage about the warnings.*
Central Market (HEB)	Fort Worth	Texas	*"That is just the media making noise. It is healthier to eat than anything else."*
Costco	Woodinville	Washington	*"I don't know anything about that."*
Safeway	South Lake Tahoe	California	*At Safeway, the attendant pointed me towards a sign which was on the outside side of the seafood display, not visible while looking at the seafood, only if you looked around the edge. He also had me go behind the counter to read another sign only legible by the attendants. The attendant only made a comment about women being able to safely eat tuna once or twice a week, but if they were planning on becoming pregnant, they should ask their doctor. The signs warned against eating Shark, Swordfish, King Mackerel and Tilefish. They mentioned that canned tuna might contain somewhat less mercury than fresh, and said to limit consumption to 12oz a week. Another sign was devoted entirely to methylmercury descriptions.*
Dierbergs	St. Louis	Missouri	*I don't know that much about it. I didn't know fish had mercury in it--that doesn't sound too good for you. Maybe they shouldn't eat that much of it then.*
Genuardi's	St. Davids	Pennsylvania	*They should limit their intake. He specified which not to eat: swordfish, king mackerel, shark, tilefish and tuna. then he listed a bunch that were better choices like salmon and flounder.*

Source: Oceana. Statements made to, and reported by Oceana volunteers including some staff.

[APPENDIX] Only 13% of Seafood Counter Attendants Could Provide FDA Advice to Customers *Continued*

Giant Eagle	Washington	Pennsylvania	*Uh, they shouldn't eat it. (Referring to the fish I was purchasing- tuna and swordfish) Then he looked on the computer and read me the FDA warning.*
Giant	Baltimore	Maryland	*"I have no idea."*
Winn Dixie	New Orleans	Louisiana	*Didn't know.*
Harris Teeter	Charlotte	North Carolina	*They say women shouldn't eat fish with mercury in it, I think.*
Publix	Nashville	Tennessee	*He did not know how to answer the question. He said he was filling in for the normal seafood counter attendant. He said he should know the answer, but he did not.*
The Food Emporium	New York	New York	*No, she was unaware of any information. The only thing she knew was that if I wanted to have a boy, I should eat the very large cherrystone clams. If I wanted a girl, I should eat the smaller sized clams.*
Costco	Portland	Oregon	*There was no seafood counter attendant at our Costco.*
Stop n' Shop	Framingham	Massachusetts	*"It's really more for tuna, shellfish, and mackerel, you know the darker fish. And it's for nursing and pregnant women anyway."*
Publix	Miami	Florida	*Depends upon where the fish is from. Farm raised fish are safer than others. Can eat farm fish once a week. Tuna is worst of all and yet it travels all over the oceans. Would not eat tuna or eat it only once every two weeks.*
Publix	Hoover	Alabama	*Attendant 1: I don't know. I didn't know fish had mercury. Attendant 2: Yeah, some do. We used to have a brochure somewhere. At- tendant 1: I don't know.*
Giant Eagle	Morgantown	West Virginia	*She did not provide any information. She pointed me to the Giant Eagle pamphlet and said everything was in there.*
Whole Foods	Seattle	Washington	*Women should not eat fish.*
Martin's Supermarket	Elkhart	Indiana	*Pregnant women should avoid the larger fish, such as tuna or swordfish.*
Jewel Food Store	Chicago	Illinois	*Cod has less mercury. She informed me that I should return on Monday, she would have the answer then. The store did not display a warning about mercury in the fish nor about pregnant women's consumption of fish.*
Winn Dixie	Hialeah	Florida	*Most of the fish and shell fish is imported, the only thing from the United states were oysters that were harvested two days ago.*
Sunfress	Independence	Missouri	*"It says something. It should be on the box it came in."*
Wal-Mart	Pocahontas	Arkansas	*Said he didn't know.*
Sprouts	Glendale	Arizona	*Not good, for the baby.*
Publix	Saint Petersburg, FL - Tampa Bay Area	Florida	*He said that I shouldn't be eating the swordfish I was buying, but said nothing about the tuna I had ordered. I asked him if there were any other fish to be concerned with, and he stated that basically large fish were high in mercury, but indicated farm raised fish were safer.*
Publix	Coral Gables	Florida	*If you're pregnant, don't eat Chilean sea bass. All the other fish are fine to eat.*
Bi-Lo	Ooltewah	Tennessee	*The first man said he did not know anything about it. The second man said, "There is a catch 22 for us with this issue. Women should not eat seafood because it is not safe because of mercury, but women should also not eat farm-raised fish because they are fed something that is harmful." I asked him if some seafood was better than others and he said "no, not that I know of, I dont think you can tell which ones have more mercury." A third worker came out and said she knew a little about it. She told me that there is no way to be sure that any of it is safe. Then she recommended that I only eat catfish and trout caught from local sources because they were unlikely to have any of the contaminants.*

Source: Oceana. Statements made to, and reported by Oceana volunteers including some staff.

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Oceana campaigns to protect and restore the world's oceans. Our teams of marine scientists, economists, lawyers and advocates win specific and concrete policy changes to reduce pollution and to prevent the irreversible collapse of fish populations, marine mammals and other sea life. Global in scope and dedicated to conservation, Oceana has campaigners based in North America (Washington, DC; Juneau, AK; Monterey, CA; Portland, OR), Europe (Madrid, Spain; Brussels, Belgium) and South America (Santiago, Chile). More than 300,000 members and e-activists in over 150 countries have already joined Oceana. For more information, please visit www.Oceana.org.

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