

Consumer Reports

Mercury in Fish Recommendations Methodology

In order to develop our recommendations we analyzed the FDA database of mercury in fish posted in 2011.¹ We used this data to create lists of the fish with lowest, low, and higher levels of mercury. We devised recommendations based on these lists to assure the safety of women of childbearing age and young children. We created two lists of low mercury fish: one of lowest mercury fish that can be consumed six times a week (6 oz serving for adults and 3 oz serving for children) and a second low mercury group for fish that can be eaten 3 times per week for adults and 2 times per week for children.

To develop our fish lists, we looked at the FDA database posted on its website which indicates the number of samples it tested, and the mean, minimum and maximum mercury levels found in the species in parts per million, and other information.² We calculated the maximum amount of fish a person could eat and not exceed the EPA reference dose of 0.1 micrograms per kilogram body weight per day.³ We made our calculations based on vulnerable consumers, which were considered a child of 20 kilograms (44 pounds a weight that approximates average of 3-6 year old children⁴) and a woman of childbearing age 60 kilograms (132 pounds) (approximately the 25th Percentile of women of childbearing age⁵).⁶

In order to make the **Lowest** Mercury Fish list, the data in the FDA Data set for the species had to meet the following criteria

- (1) At least 20 samples of the species
- (2) **mean mercury concentration** was 0.027 ppm or lower.

At this level a 20 kilogram child could consume about 18 ounces of the fish per week and not consume enough mercury to exceed the EPA reference dose of 0.1 microgram per kilogram of body weight per day and a 132 lb adult could consume at least 36 ounces.^{7,8}

- (3) the **maximum mercury concentration** for any samples from the species was 0.25 ppm or less.

Species with levels above this concentration were excluded from the list even if the mean concentration was less than 0.027 ppm, because of the potential for consumers to encounter fish with these spiked levels.

At 0.25 ppm a 60 kilogram woman could exceed the EPA reference dose after eating only 6 oz of the species per week.⁹

In order to make the **Low** Mercury Fish list, the data in the FDA Data set for the species had to meet the following criteria

- (1) At least 20 samples of the species
- (2) **mean mercury concentration** was 0.082 ppm or lower

At this level a 20 kilogram child could consume 6 ounces of the fish per week and not consume enough mercury to exceed the EPA reference dose of 0.1 microgram per kilogram of body weight per day and a 132 lb adult could consume up to 18 ounces.^{10,11}

- (3) the **maximum mercury concentration** for any samples from the species was 0.25 ppm or less.

Fish fell into the higher mercury fish category if they met the following criteria

(1) At least 15 samples of the species

AND

(2) **Mean mercury concentration** was higher than 0.3 ppm.

At this level a 20 kilogram child would exceed the EPA reference dose by consuming only 1.6 ounces of the fish per week and a 132 lbs adult would exceed it after less than 5 ounces.¹²

OR

(3) the **maximum mercury concentration** for any samples from the species was 1ppm or greater in multiple non-consecutive years.

At 1 ppm a 132 lb woman could exceed the EPA reference dose after eating only 1.5 oz of the species per week.¹³

Other Considerations That Can Impact Specific Recommendations

Environmental Considerations

In terms of making sure your fish consumption is not contributing to major environmental damage or endangering fish species, we have checked our list of recommended low mercury fish against the Monterey Aquarium's national "avoid" list—one we consider to provide a high standard for fish and ocean conservation efforts.¹⁴ Most of the low mercury fish are not endangered nor otherwise pose environmental hazards, according to the Aquarium. However there are some things to be concerned about. For example, Monterey recommends that when buying squid (calamari) you purchase domestic fish, not imported.¹⁵ Monterey also says to avoid haddock from the Gulf of Maine, although haddock from the Georges Banks, Canada and Iceland are good alternatives due to environmental issues.¹⁶ It's always a good idea to check their list when choosing the fish you eat
http://www.seafoodwatch.org/cr/cr_seafoodwatch/sfw_recommendations.aspx.

If we only considered the mercury level, shrimp would be good choice, however there are many other factors that make it more tricky to recommend. The majority of shrimp in the United States are imported from countries and produced in aquaculture systems that raise many environmental concerns.¹⁷ Monterey recommends that you not purchase imported farmed shrimp, or wild shrimp imported from Mexico.

Overall, we have not included types of fish on our recommended list that are low in mercury but cause major environmental damage. For this reason we are recommending only US farmed and most wild shrimp¹⁸ and only domestic squid¹⁵ and crawfish¹⁹.

PCB Considerations

In addition to mercury levels PCBs are another contaminant of concern in fish. When it comes to fish that are commercially caught or farmed there is not a significant amount of reliable data available that we were able to use to guide our recommendations. As a result we were not able to take PCB levels into account when creating our lists but advise consumers to check current advisories.

PCBs are manmade chemicals that were formally used in many industries. Banned in 1979, these chemicals still persist in our environment and many products. PCB's can accumulate in fatty tissues and levels are very influenced by feed and habitat. Sport fish caught in lakes, rivers, reservoirs and bays can sometimes have concerning levels of PCBs. Local health departments in many states monitor PCBs in fish and may issue advisories if they reach a level of concern. You can learn more about PCB's and advisories in your area from your State Health Department websites (see here for a listing of websites <http://fishadvisoryonline.epa.gov/Contacts.aspx>).

Bacteria Considerations

Various bacteria that are found in fish can cause foodborne illness, some of it very serious, such as some types of vibrio. Because these concerns tend to be episodic, we did not factor this concern into our recommendations. However, particularly when eating shellfish, we advise consumers follow local advisories about what is safe to eat. We also advise pregnant women and young children to avoid eating raw shellfish, due to bacterial risks.

The Recommendations

Our results here are directed primarily at women of childbearing age, children or people who eat a lot of fish (a pound and a half a week or more²⁰). We have created a list of “lowest mercury” fish that people in this vulnerable group can eat without concern for mercury—while getting the health benefits of eating fish. We have also created a second list of “low mercury” fish that can be eaten frequently—several times a week—by these groups. We have factored environmental and sustainability considerations into these recommended lists. We have provided links to local advisories for additional information about other contaminants. We have also created a list of highest mercury fish which pregnant women, children, and people who eat fish regularly may wish to avoid or eat only occasionally. See lists in boxes below.

Fish and Shellfish in General

LOWEST MERCURY FISH (SUSTAINABLE)

A 132lb person can safely eat 36oz per week

A 44 lb child can safely eat 18oz per week

Wild and Alaska salmon—canned or fresh

Shrimp—most wild and US farmed

Sardines

Tilapia*

Scallops**

Oysters**

Squid (calamari)*--domestic

LOW MERCURY FISH: (SUSTAINABLE)

A 132 lb person can safely eat up to 18oz per week

A 44lb child can safely eat up to 6oz per week

Haddock

Pollack

Flounder and sole (flatfish)

Catfish*#

Trout#

Atlantic mackerel

Atlantic croaker

Mullet

Crawfish--domestic

Crab**

**You may want to consider country of origin and choose domestic rather than imported if possible.*

*** Always follow any local alerts regarding when shellfish can be safely harvested and eaten. Eating shellfish RAW always carries additional risks of foodborne illness and is not recommended for vulnerable groups*

If wild caught (which includes being fished from local rivers and lakes), check with your state health department for information about PCBs especially for these fish, but it's a good idea to check for anything on the list if you are concerned about PCBs.

HIGHER MERCURY FISH:

A 132 lb. person would exceed the EPA “safe” mercury consumption level eating just 6 oz., and for some of these fish even less than that, per week. One 6 oz meal weekly is just half the total fish consumption USDA recommends. One should therefore eat these fish only very infrequently. FDA advises women of childbearing age and young children not to eat the highest mercury fish, marked with an ^x below, at all. FDA is considering adding two more to its “do not eat” list, marked with **

Swordfish^xShark^xKing Mackerel^xGulf Tilefish^x

Marlin**

Orange Roughy**

Grouper

Chilean Seabass

Bluefish

Halibut

Sablefish (Black cod)

Spanish Mackerel (Gulf)

Tuna (except Skipjack and canned light)

^xFDA says that women of childbearing age and young children should avoid these fish

**FDA is considering advising women of childbearing age and young children to avoid these fish

Tuna

Canned tuna is one of the most popular seafood items in the United States.²¹ However, as we discussed in both the CR 2006 and 2011 article, we do not recommend tuna for pregnant women. Newer FDA data only reinforces this advice. While the average level of methylmercury in canned albacore remained consistent throughout FDA's testing period from 1991-2010, the average level (mean) of methylmercury in canned chunk light tuna samples from 2005-2010 compared to those reported by FDA previously rose from .118 to .139ppm thus changing our weekly consumption advice for chunk light tuna. See tables below for how much albacore or chunk light canned tuna you can eat depending on how much you weigh.

Chunk light averages about a third the mercury of white albacore. The problem, though, even with chunk light is that while many cans are quite low in mercury, certain ones test at a relatively high level. In our own 2011 tests, we found "spikes" in 6% of samples. In FDA's new database, some 20% of chunk-light samples are have mercury levels above 0.25 ppm. *We therefore continue to recommend, more strongly than ever, that pregnant women and those who are thinking about becoming pregnant should not eat tuna for the duration of their pregnancy.* This is because the tuna might cause a spike in mercury in the woman that could affect a developing fetus at a critical point.

Our advice for all other consumers regarding tuna consumption is not to exceed the ounces of tuna denoted in the table depending on your weight.

Recommendations (oz/week) for Canned Light and Albacore Tuna Consumption by Weight (lbs)

Body Weight lbs	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220
Canned Light Oz/Week	1.9	2.9	3.8	4.8	5.8	6.7	7.7	8.7	9.6	10.6	11.5	12.5	13.5	14.4	15.4	16.4	17.3	18.3	19.2
Albacore Oz/Week	0.7	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5	3.9	4.2	4.6	4.9	5.3	5.6	6.0	6.3	6.7	7.0

One more question that arises about tuna is whether one can eat sushi tuna. Unfortunately for tuna lovers, however, the tuna in sushi is almost always a high mercury type. Several types often used--bigeye and blue fin--have even higher average levels than albacore.²² Indeed some tuna samples have levels comparable to shark and swordfish¹--the fish FDA puts on its "do not eat" list for women of childbearing age.

We recommend that vulnerable populations--women of childbearing age, young children, and people who eat a lot of fish--avoid sushi tuna. Others may want to consume tuna sushi only infrequently. Other types of sushi, such as salmon, can of course be eaten more frequently.

¹ <http://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm191007.htm>

² <http://www.fda.gov/Food/FoodborneIllnessContaminants/metals/ucm115644.htm>

³ <http://www.epa.gov/iris/subst/0073.htm>

⁴ EFH 2011 Table 8-3

⁵ EFH 2011 Table 8-5

⁶ We used the formula: Ounces/wk = 0.1 ug Hg/kg bw/day * kg/bw *(1 mg Hg/1000 ug Hg) * (1kg fish/Xmg Hg)*2.205 lb fish/kg fish * 16 ounces fish /lb fish *7 days/week, where X= concentration of mercury in a given fish

⁷ 0.1 ug Hg/kg bw/day * 20 kg/bw *(1 mg Hg/1000 ug Hg) * (1kg fish/0.027 mg Hg)*2.205 lb fish/kg fish * 16 ounces fish /lb fish *7 days/week = 18.3 oz/week

⁸ $0.1 \text{ ug Hg/kg bw/day} * 60 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/0.027 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 55 \text{ oz/week}$

⁹ $0.1 \text{ ug Hg/kg bw/day} * 60 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/0.25 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 5.9 \text{ oz/week}$

¹⁰ $0.1 \text{ ug Hg/kg bw/day} * 20 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/0.082 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 6 \text{ oz/week}$

¹¹ $0.1 \text{ ug Hg/kg bw/day} * 60 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/0.082 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 18 \text{ oz/week}$

¹² $0.1 \text{ ug Hg/kg bw/day} * 60 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/0.3 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 4.9 \text{ oz/week}$

¹³ $0.1 \text{ ug Hg/kg bw/day} * 60 \text{ kg/bw} * (1 \text{ mg Hg}/1000 \text{ ug Hg}) * (1 \text{ kg fish}/1 \text{ mg Hg}) * 2.205 \text{ lb fish/kg fish} * 16 \text{ ounces fish /lb fish} * 7 \text{ days/week} = 1.5 \text{ oz/week}$

¹⁴ http://www.seafoodwatch.org/cr/cr_seafoodwatch/content/media/MBA_SeafoodWatch_NationalGuide.pdf

¹⁵ http://www.seafoodwatch.org/cr/seafoodwatch/web/sfw_factsheet.aspx?gid=64

¹⁶ http://www.seafoodwatch.org/cr/seafoodwatch/web/sfw_factsheet.aspx?gid=24

¹⁷ http://www.fishwatch.gov/farmed_seafood/outside_the_us.htm

¹⁸ http://www.seafoodwatch.org/cr/seafoodwatch/web/sfw_factsheet.aspx?gid=58

¹⁹ http://www.seafoodwatch.org/cr/seafoodwatch/web/sfw_factsheet.aspx?gid=113

²⁰ This is between the 95th and 99th percentile for those who weigh 70kg and consume fish and shellfish—see EFH 2011 Table 10-7

²¹ <http://www.aboutseafood.com/about/about-seafood/top-10-consumed-seafoods>

²² <http://ehp.niehs.nih.gov/wp-content/uploads/120/11/ehp.1205122.s001.pdf>

²³ <http://www.fda.gov/food/resourcesforyou/consumers/ucm110591.htm>

²⁴ <http://www.regulations.gov/#!documentDetail;D=FDA-2014-N-0595-0001>