

**Conference for Food Protection
2010 Issue Form**

**Internal Number: 090
Issue: 2010 I-006**

Council Recommendation:	Accepted as Submitted _____	Accepted as Amended _____	No Action _____
Delegate Action:	Accepted _____	Rejected _____	

All information above the line is for conference use only.

Title:

Grocery Seafood Advisory for Women of Childbearing Age and Children

Issue you would like the Conference to consider:

This proposal asks the Conference to require grocery stores to post fish advisory information aimed at Women of Childbearing Age and Children (the "TARGET GROUP"). This "FISH ADVISORY" will apply only to retail seafood purchases in grocery stores, excluding "ready to eat" food, and would not apply to ready to eat food provided by other non-grocery FOOD ESTABLISHMENTS. The purpose of the proposal is to communicate to the TARGET GROUP federal Food and Drug Administration and Environmental Protection Agency consumption advice regarding the benefits of fish and the relative presence of methylmercury in seafood species. This information is primarily only available online through these agencies and should be communicated to the TARGET GROUP at grocery stores.

Public Health Significance:

This issue represents a public health matter of the highest order: protecting children's developing brains and cognitive health. Women of childbearing age need this information posted at grocery stores rather than online. First, this will reduce the problem of concerned women avoiding otherwise-healthy seafood that is important for fetal development when they are unsure about which seafood is safe to eat. Second, it will address the problem of ill-informed consumers in the TARGET GROUP unknowingly exposing developing fetuses and children to seafood that contains high amounts of methylmercury.

Though most people do not have elevated mercury levels, developing fetuses are particularly susceptible to mercury exposure and consumption of contaminated fish is the main source of exposure to methylmercury. As the EPA explains on its website, studies in other countries have shown that "mothers with no symptoms of nervous system damage [have given] birth to infants with severe disabilities, [from which] it became clear that the developing nervous system of the fetus may be more vulnerable to methylmercury than is the adult nervous system" (Attachment 3, EPA Health Effects). Most children do not exhibit such disabilities but instead may suffer from subtle, sub-clinical neurological deficits that can lower their IQ and educational attainment.

Studies analyzing data from the Centers for Disease Control's National Health and Nutrition Examination Survey ("NHANES") have shown that perhaps 400,000 children each year

may have mercury levels at or above the Reference Dose level set by the EPA (Mahaffey et al. 2005, Transande et al. 2005). Further, these figures are significantly higher if the recent studies on the higher ratio of fetal cord blood to maternal blood are taken into account.[1] Recent studies from the more comprehensive 1999-2004 NHANES results show that overall, 4.7% of women of childbearing age exceed the EPA's 5.8ug/L standard and 10.4% exceed the suggested, more sensitive 3.5ug/L level (Mahaffey et al. 2009)(See also Attachment 5, CDC NHANES Data on Levels Exceeding EPA RfD).

This burden on the population can have long-range health and economic implications for states and the nation as a whole. Seafood has nutritional benefits which can enhance cognitive function in children, however, so it is important from a public health perspective that women of childbearing age and children not eliminate seafood from their diets. To ensure this, consumers need better information on the relative mercury contents of fish so they can enjoy fish consumption while lowering their mercury exposure by consuming lower-mercury seafood. For this reason it is imperative that the TARGET GROUP have access at grocery stores to the federal fish consumption advice that the FDA and EPA jointly publish online (Attachment 1, Online Advisory).

The proposed changes first reflect the recommendations of the FDA-EPA's 2004 Online Advisory in an easy-to-understand format. The FISH ADVISORY also facilitates these recommendations by containing a chart that categorizes seafood by relative mercury content, the majority of this seafood being low in mercury. These proposed changes are intended to better protect the public health of fetal and child cognitive development by disseminating to the TARGET GROUP the federal Online Advisory. This proposal will thereby also restore consumer confidence in the safety of the commercial seafood supply by expanding awareness among the TARGET GROUP of healthy, lower mercury seafood products.

Currently, the online FDA-EPA Advisory does not effectively reach consumers. Indeed, most women of childbearing age either do not know of the risks of mercury or, if they do, they are confused about the extent of their exposure and which fish species represent safe, healthy choices. While the Online Advisory lists four "DO NOT EAT" fish and a handful of lower-mercury choices, it leaves consumers in the dark about the vast majority of other fish, most of which are low in mercury. This limits consumer choice and undermines confidence in the seafood industry, which in turn may jeopardize public health.

Background

Since 2004, the FDA and EPA have jointly published an Online Advisory to communicate recommended guidelines for the consumption of seafood by women of childbearing age (ages 45 or under) and children (the TARGET GROUP)(Attachment 1, Online Advisory). The Online Advisory states that the TARGET GROUP should not eat certain high-mercury species (shark, swordfish, tilefish, and king mackerel), and should limit albacore tuna to six ounces per week, to reduce fetal and childhood exposure to methylmercury. Methylmercury is present in most seafood in varying amounts and is a neurotoxin that can impair child neurodevelopment when consumed at certain levels.

The FDA-EPA's Online Advisory is designed to reduce methylmercury exposure within the TARGET GROUP, to generally keep levels generally at or below the EPA's Reference Level of 5.8 ug of mercury per liter of blood, which corresponds to a Reference Dose of 0.1 ug Hg/kg-bw/day (the "RfD"). The EPA established this RfD for methylmercury in 1999, based on the best evidence then available, using data from a long-term epidemiological study in the Faeroe Islands carried out by researchers at Harvard University and elsewhere.

Research since then confirms that public health concern over methylmercury exposure is justified, and that efforts to guide women to pick low-mercury fish must be expanded and improved (Attachment 6, Review of Recent Scientific Studies). Since women are advised to consume fish while pregnant, for nutritional benefits, it is vitally important that women have information to help them identify low-mercury fish, so they (and their babies) can simultaneously enjoy these nutritional benefits while minimizing their exposure to methylmercury.

The federal commercial fish Online Advisory translates the EPA's Reference Dose into consumption recommendations based on the relative average mercury content of various seafood species. Based on this, for example, the federal Online Advisory (Attachment 1) makes the following three major recommendations to the TARGET GROUP:

- Do not eat very high-mercury species such as shark, swordfish, tilefish, and king mackerel;
- Limit canned albacore tuna to 6-ounces per week; and
- Eat two servings (up to 12-ounces) of lower mercury fish per week, including shrimp, salmon, and light canned tuna.

For example, as to the recommendation for lower-mercury fish, for an average-weight woman this consumption recommendation comports with the EPA's RfD guidelines for seafood that contain 0.12 ppm or less of methylmercury. This grouping includes light canned tuna, which contains an average of 0.118 ppm of methylmercury and thus can be consumed by the TARGET GROUP up to two times a week (Attachment 4, FDA Fish Data).

It is also key to note that the EPA's RfD is based on weight, whereas the consumption recommendations by the EPA and FDA are based on a hypothetical, average-weight woman. Therefore, lighter-weight individuals in the TARGET GROUP—such as children and smaller women—who follow the ounce recommendations would have mercury exposure above the EPA's RfD.[2] The federal Online Advisory addresses this by advising that children eat smaller-sized portions, though women with below-average weight also should eat smaller portion sizes to remain within the EPA's RfD.

The federal Online Advisory does not give any information on other fish, other than the very high-mercury fish and a handful of lower mercury species of seafood; it leaves out, for example, both other fish in the low mercury category and fish with moderate mercury. The proposed FISH ADVISORY will remedy this to give women the information they need to make informed health decisions. (Attachment 7, Proposed Fish Advisory)

Proposed Changes

The proposed changes to the Model Food Code solve this problem by giving consumers expanded species-specific information about the relative mercury levels in most seafood sold commercially in the U.S., based on FDA seafood data. It also gives the TARGET GROUP more comprehensive EPA consumption guidelines to allow for a broader range of seafood choices than does the Online Advisory. These changes seek to better promote public health not only by giving the TARGET GROUP this federal advice where they need it - *in grocery stores* - rather than online, but also by filling in the information gaps that the Online Advisory left unanswered.

Seafood contains important nutrients, which for many seafood species include high amounts of beneficial Omega-3 fatty acids. The majority of the nation's seafood market is in fact low in mercury, and consumers in the TARGET GROUP need greater awareness of the array of low-mercury seafood choices from which they can consume healthy seafood while

at the same time protecting fetal and childhood development. For these reasons it is vital to effectively communicate to the TARGET GROUP not only the recommended consumption limits but also which seafood species are low in mercury and thus meet the consumption limits.

In providing this information, the proposed FISH ADVISORY presents a simple, color-code chart displaying the relative mercury levels in the majority of commercial seafood, divided into high, moderate, and lower-mercury categories. These categories are based on EPA calculations of recommended fish consumption, based on the EPA's RfD for the average woman, which also serves as the foundation for the FDA-EPA joint advice in the 2004 Online Advisory. (Attachment 2, EPA Consumption Recommendations by PPM Level) Specifically, the changes expand the range of seafood choices for the TARGET GROUP beyond the Online Advisory's current, limited list of low-mercury species. Further, these changes are based strictly on federal information available through the FDA and EPA, including FDA data on the mercury content in commercial fish species and EPA consumption guidelines for the TARGET GROUP (Attachment 2, EPA Consumption Recommendations). The EPA has six consumption categories, but for ease of understanding the proposed FISH ADVISORY uses a chart with only three "red-yellow-green" groupings:

1. The proposal eliminates the gap left by the FDA-EPA Online Advisory, by giving the complete list of low mercury seafood (defined as containing 0.12 ppm or less of methylmercury) that can be consumed twice a week by average-weight individuals in the TARGET GROUP;

2. It expands the list to include moderate-mercury seafood (containing 0.13 - 0.31 ppm of mercury), which are not mentioned on the Online Advisory despite the fact that under EPA guidelines the TARGET GROUP may safely consume fish from this category up to once a week;^[3] and

3. It identifies higher-mercury species (above 0.31 ppm), which under EPA guidelines the TARGET GROUP should avoid. (The higher-mercury grouping in the current proposal does not contain albacore tuna, since the FDA-EPA Online Advisory issues specific consumption advice for albacore which the proposed FISH ADVISORY communicates elsewhere.)^[4] The EPA guidelines specify that fish in excess of 0.31 ppm of mercury should only be eaten once every two weeks, or once a month or less for fish with higher levels, with no other fish eaten during that period. Such infrequent seafood intake by the TARGET GROUP would deprive developing fetuses and children of the benefits of seafood, which the FDA recommends should ideally be consumed (from lower mercury species) twice a week, for up to a total of 12 ounces per week. Members of the TARGET GROUP who follow the proposed chart's "avoid" advice for these higher-mercury species will thus be able to more frequently consume seafood in the moderate- and lower-mercury categories. (Attachment 7, Proposed Fish Advisory Chart)

These figures were derived from the Online Advisory and/or the EPA's RfD consumption recommendations on which the Online Advisory is based. As the EPA stated in its 2004 Derivation of Safe Fish Consumption Rate (for noncommercial fish, which has the same RfD standard as commercial seafood), "one can safely consume 2 meals/week at concentrations ranging from >0.078 ppm to 0.12 ppm, and should consume no more than 1 meal/month at concentrations ranging from >.47 ppm to 0.94 ppm" (Attachment 2, EPA Consumption Recommendations by PPM Level). These breakdowns are also found in the

EPA's "Monthly Fish Consumption Limits for Noncarcinogenic Health Endpoint - Methylmercury." (Attachment ___????___)

The EPA further sets forth that moderate-mercury fish with >0.12 -0.23 ppm be consumed once a week (four times a month) and fish with 0.23 - 0.31 ppm be consumed slightly less than once a week (three times a month) [4] (Attachment 2). The proposed FISH ADVISORY reflects this consumption limit on the "moderate"-mercury (or yellow-designated) portion of the chart, to be consumed only once a week.

Including the full range of seafood in this way, which THE REGULATORY AUTHORITY may expand by adding information about locally-caught noncommercial fish), will further enable members of the TARGET GROUP to accurately assess their overall mercury exposure to make better-informed decisions about which seafood to purchase at the grocery store. This expanded information will eliminate uncertainty among consumers in the TARGET GROUP and restore their confidence in the safety of seafood products. In the absence of this information, confusion might lead some consumers to otherwise avoid healthy seafood products.

Moreover, the proposed FISH ADVISORY communicates this information in the clear, easily-understood format of a color-coded chart. This method will quickly convey information to TARGET GROUP consumers and is supported by a study on the effectiveness of advisories, which showed that such red-yellow-green designations are a preferred format for communicating fish advisory information (Ujihara). Most importantly, the proposal gives consumers this information where they need it most, at the point of sale in the grocery store. With these changes, consumers within the TARGET GROUP can be confident that the seafood products they purchase are safe based on their individual consumption patterns.

Notes:

[1] Several studies have estimated would lower the EPA Reference Dose level from 5.8 ug of mercury per liter of blood to 3.5 ug/L[1] (Stern and Smith 2003) and that 15.7% of women of childbearing age were found in the 1999-2001 NHANES study to exceed this level (NRC 2006, Mahaffey et al.2004, Trasande et al. 2005).

[2] *Mercury Update: Impact on Fish Advisories* (EPA 2001), found at: www.epa.gov/ost/fishadvice/mercupd.

[3] This category is technically not as protective as the EPA guidelines, since the proposal for the moderate-mercury category includes fish with 0.23-0.31 ppm of mercury, which the EPA recommends that the target group consume only three times a month, rather than the current proposal's higher, once per week recommendation.

[4] The instant FISH ADVISORY is not designed to establish the most protective mercury consumption advice, but simply to convey the current federal advice.

[5] Table 4-3 from US EPA, 2000, cited in 2004 EPA Derivation of Safe Fish Consumption Rate, National Noncommercial Fish Advisory.

Recommended Solution: The Conference recommends...:

that the Conference Chair send a letter to the FDA Commissioner to urge the following addition to the 2009 Food Code to require grocery stores to post a FISH ADVISORY for

Women of Childbearing Age and Children (the "TARGET GROUP") to communicate to the TARGET GROUP:

- 1) the FDA-EPA 2004 Advisory recommendations ("Online Advisory", see Attachment 1);
- 2) EPA consumption recommendations for moderate and higher-mercury fish; and,
- 3) a chart displaying the relative mercury content of commercial seafood..

The specific proposed language to add NEW sections to the Model Food Code as follows:
3-603.12 Seafood Methylmercury Disclosure for Consumption of Seafood Products by Women of Childbearing Age and Children.

(A) GROCERY STORES shall post a commercial Fish Advisory to inform consumers of the recommended FDA-EPA consumption guidelines for Women of Childbearing Age (Under Age 45) and Children (collectively the "TARGET GROUP") and the relative amounts of methylmercury in various seafood species using written advisories and/or placards posted at the point of sale (the "FISH ADVISORY") as specified in paragraphs (B) - (F) of this section.

(B) CONTENT OF DISCLOSURE. The FISH ADVISORY shall contain the following primary components, conform to the format set forth below, and shall essentially follow the sample sign presented below in section (F).

(1) Title. The sign shall be entitled "FISH ADVISORY", depicted in bold 48-point font size and be immediately followed by the underlined heading "Women Under Age 45 and Children" in bold 36-point font size.

(2) Explanatory Information. Immediately below this title, the FISH ADVISORY must contain the following prefatory statement to explain the purpose and the intended TARGET GROUP. This statement, in large type (at least 20-point font size) for ease of visibility, shall state: "Seafood contains important nutrients, including Omega-3 fatty acids, but also contains mercury, which can be harmful to women and children."

(3) Key Consumption Limits. The sign shall then post the following key consumption recommendations by the FDA-EPA Joint Fish Advisory for the TARGET GROUP:

(a) The first statement, boxed and in at least 28-point font size, shall state the "DO NOT EAT" list of fish which includes the following high-mercury species: swordfish, shark, tilefish, and king mackerel.

(b) A second statement, boxed and in at least 17-point font size, shall state to the TARGET GROUP: "Limit albacore tuna to one, 6-ounce serving per week, and eat no other fish that week. Light canned tuna, however, may be eaten twice per week."

(4) Seafood Chart. Second, the FISH ADVISORY shall contain a simple, color-coded chart that groups seafood species by methylmercury content into three, easily-understood high, medium, and low categories. These three categories, separated into three columns, shall be correspondingly delineated by red, yellow and green color designations and by the accompanying consumption recommendations, as set forth below in paragraphs (a)-(c).

(a) Lower-Mercury Seafood:

(i) The first column on the chart shall list those species which contain 0.12 parts per million ("ppm") or less of methylmercury, according to FDA monitoring data or more recent data obtained by the REGULATORY AUTHORITY;

(ii) These species shall include, in ascending value of mercury content, fish that contain above 0.05% of market share and are listed on Table 2 of the FDA's information on Mercury Levels in Commercial Fish and Shellfish as "Fish and Shellfish With Lower Levels of Mercury" (at or below 0.12 ppm of methylmercury): shrimp, sardines, tilapia,

clams/oysters, scallops/mussels, salmon, crayfish, freshwater trout, ocean perch/mullet, pollock, Atlantic mackerel, anchovy/herring, sole/flounder, crab, pike, butterfish, catfish, squid, Atlantic croaker, whitefish, Pacific mackerel/chub, smelt, cod, canned light tuna and spiny lobster;

(iii) The chart shall entitle this group "lower" mercury seafood, designate this category by a green color coding, and state that these fish should be eaten by the TARGET GROUP no more than 12-ounces per week.

(b) Moderate-Mercury Seafood:

(i) The second column on the chart shall list those species which contain 0.13 - 0.31 ppm of methylmercury, according to FDA monitoring data or more recent data obtained by the REGULATORY AUTHORITY;

(ii) These species shall include, in ascending value of mercury content: snapper, skate, freshwater perch, monkfish, halibut, sablefish, sea bass, sea trout, and American lobster;

(iii) The chart shall entitle this group "Moderate" mercury seafood, designate this category by a yellow color coding, and state the EPA Reference Dose advice that these fish should be eaten by the TARGET GROUP no more than one serving per week, with no other fish eaten that week.

(c) High-Mercury Seafood:

(i) The third column shall list those commercial seafood species which contain above 0.31 ppm of methylmercury, according to FDA monitoring data or more recent data obtained by the REGULATORY AUTHORITY, subject to section (iv) below.

(ii) These species shall include, in ascending value of mercury content: fresh/frozen tuna, Spanish mackerel (South Atlantic), Chilean bass, grouper, marlin, and orange roughy;

(iii) The chart shall entitle this group "High" mercury seafood, delineate this category by a red color coding, and label on the chart that the TARGET GROUP should "Avoid" these fish.

(iv) This "High" category shall exclude canned albacore tuna, given that the FISH ADVISORY set forth in this section specifies per paragraph (B)(3)(b) above that the TARGET GROUP may consume up to 6-ounces of albacore tuna. It shall also exclude the "DO NOT EAT" fish that are highlighted at the top of the FISH ADVISORY per paragraph (B)(3)(a) above.

(5) In addition to the provisions of paragraphs (B)(1)-(B)(3) above, the FISH ADVISORY shall generally follow the content and format set forth in section (F).

(C) LOCATION OF FISH ADVISORY. The FISH ADVISORY shall be posted in GROCERY STORES as follows:

(1) The FISH ADVISORY shall be displayed on a laminated, 8.5-inch by 11-inch sign or placard; and

(2) The FISH ADVISORY shall be displayed prominently at the point-of-sale, at or immediately adjacent to the specific location where the seafood is being sold, as close as reasonably possible to the seafood product.

(a) Disclosure for frozen SEAFOOD PRODUCTS shall be centrally affixed to the glass display case that contains the SEAFOOD PRODUCTS or, if there is no glass display case, otherwise in a prominent location within the display case that is clearly visible to consumers.

(b) Disclosure for SEAFOOD PRODUCTS sold at the fresh seafood counter in GROCERY STORES shall be displayed on the display case and also posted atop the seafood counter at the point-of-sale.

(c) Disclosure for canned or nonperishable, packaged SEAFOOD PRODUCTS shall be affixed prominently to the shelving or, if none, otherwise at or within two feet of the display area where they are located.

(D) DEFINITIONS.

(1) Under this section "SEAFOOD PRODUCT" shall be defined to include any food product offered for sale in a GROCERY STORE that contains two or more ounces of seafood per serving size.

(2) Under this section "GROCERY STORE" shall be defined in the normal sense of the word, to exclude retail FOOD ESTABLISHMENTS other than restaurants and other entities that sell "ready to eat" products.

(E) MODIFICATIONS. The REGULATORY AUTHORITY may modify the FISH ADVISORY in any of the following ways:

(1) To designate by an asterisk the seafood species that contain high Omega-3s;

(2) To add to the lists of high-, moderate-, or lower-mercury categories locally-caught fish from local lakes, streams, or coastal areas, so that consumers may more accurately assess their total mercury exposure when buying commercial seafood products;

(3) To add information on serving or portion sizes for children;

(4) To add a state contact phone number or state governmental website address for consumers to contact for more information concerning seafood consumption.

(5) To add other information that the REGULATORY AUTHORITY may reasonably deem important for the health of or seafood purchasing decisions of members of the TARGET GROUP.

(F) SAMPLE CHART. [See Attachment 7, Proposed Fish Advisory Chart]

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Attachments:

- "ONLINE ADVISORY, JOINT EPA-FDA FISH ADVISORY"
- "ATTACHMENT 2: EPA CONSUMPTION RECOMMENDATION BY PPM LEVEL"
- "ATTACHMENT 3: EPA, HEALTH EFFECTS"
- "ATTACHMENT 4: FDA FISH DATA"
- "ATTACHMENT 5: CDC, NHANES DATA ON MERCURY LEVELS EXCEEDING EPA RfD"
- "ATTACHMENT 6: REVIEW OF RECENT SCIENTIFIC STUDIES"
- "ATTACHMENT 7: PROPOSED FISH ADVISORY CHART"

It is the policy of the Conference for Food Protection to not accept Issues that would endorse a brand name or a commercial proprietary process.

ATTACHMENT 1

FDA- EPA ADVISORY (“ONLINE ADVISORY”)

<http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm110591.htm>

What You Need to Know About Mercury in Fish and Shellfish (Brochure)

March 2004

EPA-823-R-04-005

(This document is also available in [PDF](#) (228 KB) and [en Español \(Spanish\)](#))



Advice for
**Women Who Might Become
Pregnant
Women Who are Pregnant
Nursing Mothers
Young Children**

from the
**U.S. Food and Drug Administration
U.S. Environmental Protection Agency**

The Facts

Fish and shellfish are an important part of a healthy diet. Fish and shellfish contain high-quality protein and other essential nutrients, are low in saturated fat, and contain omega-3 fatty acids. A well-balanced diet that includes a variety of fish and shellfish can contribute to heart health and children's proper growth and development. So, women and young children in particular should include fish or shellfish in their diets due to the many nutritional benefits.

However, nearly all fish and shellfish contain traces of mercury. For most people, the risk from mercury by eating fish and shellfish is not a health concern. Yet, some fish and shellfish contain higher levels of mercury that may harm an unborn baby or young child's developing nervous system. The risks from mercury in fish and shellfish depend on the amount of fish and shellfish eaten and the levels of mercury in the fish and shellfish. Therefore, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) are advising women who may become pregnant, pregnant women, nursing mothers, and young children to avoid some types of fish and eat fish and shellfish that are lower in mercury.

3 Safety Tips

By following these 3 recommendations for selecting and eating fish or shellfish, women and young children will receive the benefits of eating fish and shellfish and be confident that they have reduced their exposure to the harmful effects of mercury.

1. **Do not eat**
 - **Shark**
 - **Swordfish**
 - **King Mackerel**
 - **Tilefish**

They contain high levels of mercury.

2. **Eat up to 12 ounces (2 average meals) a week of a variety of fish and shellfish that are lower in mercury.**
 - Five of the most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish.
 - Another commonly eaten fish, albacore ("white") tuna has more mercury than canned light tuna. So, when choosing your two meals of fish and shellfish, you may eat up to 6 ounces (one average meal) of albacore tuna per week.
3. **Check local advisories about the safety of fish caught by family and friends in your local lakes, rivers, and coastal areas.**

If no advice is available, eat up to 6 ounces (one average meal) per week of fish you catch from local waters, but don't consume any other fish during that week.

Follow these same recommendations when feeding fish and shellfish to your young child, but serve smaller portions.

Frequently Asked Questions *about Mercury in Fish and Shellfish:*



Note:

If you have questions or think you've been exposed to large amounts of methylmercury, see your doctor or health care provider immediately.

1. **What is mercury and methylmercury?**

Mercury occurs naturally in the environment and can also be released into the air through industrial pollution. Mercury falls from the air and can accumulate in streams and oceans and is turned into methylmercury in the water. It is this type of mercury that can be harmful to your unborn baby and young child. Fish absorb the methylmercury as they feed in these waters and so it builds up in them. It builds up more in some types of fish and shellfish than others, depending on what the fish eat, which is why the levels vary.

2. **I'm a woman who could have children but I'm not pregnant - so why should I be concerned about methylmercury?**

If you regularly eat types of fish that are high in methylmercury, it can accumulate in your blood stream over time. Methylmercury is removed from the body naturally, but it may take over a year for the levels to drop significantly. Thus, it may be present in a woman even before she becomes pregnant. This is the reason why women who are trying to become pregnant should also avoid eating certain types of fish.

3. **Is there methylmercury in all fish and shellfish?**

Nearly all fish and shellfish contain traces of methylmercury. However, larger fish that have lived longer have the highest levels of methylmercury because they've had more time to accumulate it. These large fish (swordfish, shark, king mackerel and tilefish) pose the greatest risk. Other types of fish and shellfish may be eaten in the amounts recommended by FDA and EPA.

4. **I don't see the fish I eat in the advisory. What should I do?**

If you want more information about the levels in the various types of fish you eat, see the FDA food safety website or the EPA website at www.epa.gov/ost/fish.

5. **What about fish sticks and fast food sandwiches?**

Fish sticks and "fast-food" sandwiches are commonly made from fish that are low in mercury.

6. **The advice about canned tuna is in the advisory, but what's the advice about tuna steaks?**

Because tuna steak generally contains higher levels of mercury than canned light tuna, when choosing your two meals of fish and shellfish, you may eat up to 6 ounces (one average meal) of tuna steak per week.

7. **What if I eat more than the recommended amount of fish and shellfish in a week?**

One week's consumption of fish does not change the level of methylmercury in the body much at all. If you eat a lot of fish one week, you can cut back for the next week or two. Just make sure you average the recommended amount per week.

8. **Where do I get information about the safety of fish caught recreationally by family or friends?**

Before you go fishing, check your Fishing Regulations Booklet for information about recreationally caught fish. You can also contact your local health department for information about local advisories. You need to check local advisories because some kinds of fish and shellfish caught in your local waters may have higher or much lower than average levels of mercury. This depends on the levels of mercury in the water in which the fish are caught. Those fish with much lower levels may be eaten more frequently and in larger amounts.

For further information about the risks of mercury in fish and shellfish call the U.S. Food and Drug Administration's food information line toll-free at 1-888-SAFEFOOD or visit [FDA's Food Safety](#) website.

For further information about the safety of locally caught fish and shellfish, visit the [Environmental Protection Agency's Fish Advisory website](#) or contact your State or Local Health Department. A [list of state or local health department contacts](#) is available. Click on Federal, State, and Tribal Contacts. For information on EPA's actions to control mercury, visit [EPA's mercury website](#).

ATTACHMENT 2

EPA CONSUMPTION RECOMMENDATIONS BY PPM LEVEL

<http://www.epa.gov/fishadvisories/advice/1-meal-per-week.pdf>

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
WATER

TECHNICAL MEMORANDUM

DATE: March 11, 2004

RE: Origin of 1 Meal/Week Noncommercial Fish Consumption Rate in National

Advisory for Mercury

Background

The national advisory states that, for noncommercial fish, consumers should first consult any local advisories that may pertain to their catch. In case of no local advisory, consumers are advised to restrict consumption to 1 meal/week. Because states and tribes have not monitored nor posted advisories on all waters in the U.S., the noncommercial fish consumption advice is provided as a baseline of protection. This technical memorandum provides the methodology from which the default safe consumption rate is derived.

Introduction

Statistics on mercury concentrations in noncommercial fish were calculated from a national database. Mean fish tissue concentrations were compared against default fish consumption limits for mercury, as presented in EPA guidance. Noncommercial fish can be consumed at a rate of one 6-oz. meal of fish per week for the vast majority of species.

Fish Tissue Database

Database: National Listing of Fish and Wildlife Advisories (NLFWA), US EPA, 2003.

Date range: All dates covering a range of years from 1987 to 2003.

Species selected: All species with data from at least 100 sampling stations in the database.

Sample type: Fillet only. Whole fish samples not included, as these are relevant for ecological risk.

Additional Notes: The NLFWA fish tissue database is data voluntarily provided to EPA, representing sampling and analysis performed by States and Tribes for the purpose of fish consumption advisory assessments. Thus the data collection is targeted to those areas of concern for increased fish contaminant levels. All fish data are from adult fish. Juveniles and fish organs are not included in the database as such data are relevant for ecological risk assessments, rather than human health risk assessments.

Fish Tissue Statistics

Statistics for each species are provided in Table 1. All of the statistics calculated for Table 1 are based on sampling station averages (means). That is, the mean value was calculated at each sampling station for each species. The statistics shown in Table 1 (count, mean, median, minimum, and maximum), then are calculated based on the station level averages. While some stations had as few as a single sample per species, others might have hundreds of samples. Thus, using station-level averages eliminates biasing toward stations with a large number of samples, and produces statistics that are more representative of the

ATTACHMENT 2, page:
EPA CONSUMPTION RECOMMENDATION BY PPM LEVEL

entire population of sampling stations. From Table 1, one can see that species means range from 0.06 ppm to 0.96 ppm, but that the bulk of the species (27 out of 34) have average mercury concentrations between 0.13 ppm and 0.43 ppm.

Risk Based Fish Consumption Limits

US EPA, 2000, Table 4-3 (see attachment) presents risk-based fish consumption limits which relate the number of fish meals that can be eaten per month to fish tissue concentrations of methylmercury. The inputs used in the development of Table 4-3, are described in Section 3.3 of the same document (US EPA, 2000). These include:

Reference Dose (RfD): 1×10^{-4} mg/kg-d.

Meal Size: 8 oz., uncooked corresponding with 6 oz. cooked as used in the national advisory.

Body Weight: 70 kg, average body weight of adult males and females combined, in the U.S. population.

Derivation of Safe Fish Consumption Rate

US EPA, 2000, Table 4-3 (see attachment) presents safe fish consumption rates corresponding to various ranges of mercury contaminant concentrations. While Table 4-3 is quite detailed, most states have issued fish consumption advisories according to a more coarse consumption rate categorization, i.e.: no consumption, 1 meal/month, 1 meal/week, and 2 meals/week. At this categorization, states typically collapse the 2-4 meals/month consumption rates to a single 1 meal/week category. That is, by Table 4-3 (US EPA, 2000), one can safely consume 2 meals/week at concentrations ranging from >0.078 ppm to 0.12 ppm, and should consume no more than 1 meal/month at concentrations ranging from >0.47 ppm to 0.94 ppm. As can be seen from Table 1, below, the vast majority of fish species with contamination data (27 out of 34 species) have concentrations within the coarse 1 meal/week range (i.e. 2-4 meals/month range or > 0.12 ppm - 0.47 ppm). Thus, the general consumer should be advised to eat no more than 1 meal/week of noncommercial fish in the U.S. *Note:* Collapsing the 2-4 meal/month consumption rate to a 1 meal/week consumption rate strikes a balance between a too detailed advisory that would overwhelm or confuse most consumers, and simplified advice that balances risks from mercury with the benefits of fish. Consumers are encouraged to use more detailed information where available for the waterbodies on which they fish, and the fish species they choose to consume. Also, as can be seen from the minimum and maximum values in Table 1, mercury concentrations in fish vary considerably from waterbody to waterbody and region to region. Consumers should, first and foremost, consider any local advisories.

Derivation of Safe Fish Consumption Rate

US EPA, 2000, Table 4-3 (see attachment) presents safe fish consumption rates corresponding to various ranges of mercury contaminant concentrations. While Table 4-3 is quite detailed, most states have issued fish consumption advisories according to a more coarse consumption rate categorization, i.e.: no consumption, 1 meal/month, 1 meal/week, and 2 meals/week. At this categorization, states typically collapse the 2-4 meals/month consumption rates to a single 1 meal/week category. That is, by Table 4-3 (US EPA, 2000), one can safely consume 2 meals/week at concentrations ranging from >0.078 ppm to 0.12 ppm, and should consume no more than 1 meal/month at concentrations ranging from >0.47 ppm to 0.94 ppm. As can be seen from Table 1, below, the vast majority of fish species with contamination data (27 out of 34 species) have concentrations within the coarse 1 meal/week range (i.e. 2-4 meals/month range or > 0.12 ppm - 0.47 ppm). Thus, the general consumer should be advised to eat no more than 1 meal/week of noncommercial fish in the U.S.

Note: Collapsing the 2-4 meal/month consumption rate to a 1 meal/week consumption rate strikes a balance between a too detailed advisory that would overwhelm or confuse most consumers, and simplified advice that balances risks from mercury with the benefits of fish. Consumers are encouraged to use more detailed information where available for the waterbodies on which they fish, and the fish species they choose to consume. Also, as can be seen from the minimum and maximum values in Table 1, mercury concentrations in fish vary considerably from waterbody to waterbody and region to region. Consumers should, first and foremost, consider any local advisories.

Table 1. Mercury Contamination Statistics by Species* [NONCOMMERCIAL]

Concentration Statistics (ppm)					
Species #	Stations	Mean	Median	Minimum	Maximum
Bowfin	358	0.96	0.82	0.02	4.80
Chain pickerel	250	0.61	0.54	0.05	2.25
Largemouth bass	2,425	0.43	0.34	0.00	4.47
Walleye	1,520	0.40	0.34	0.02	3.30
Warmouth sunfish	147	0.39	0.34	0.02	1.36
Flathead catfish	158	0.37	0.21	0.02	2.31
Spotted bass	163	0.36	0.28	0.02	1.72
Northern pike	1,322	0.35	0.30	0.01	1.78
Lake trout	160	0.30	0.25	0.05	1.70
Sauger	109	0.28	0.18	0.03	1.40
Smallmouth bass	738	0.27	0.22	0.01	2.50
Yellow bullhead	185	0.27	0.18	0.00	1.38
Striped bass	146	0.27	0.25	0.01	1.05
Redear sunfish	215	0.26	0.21	0.01	1.58
Yellow perch	604	0.22	0.17	0.01	1.55
White perch	133	0.22	0.15	0.01	1.05
Freshwater drum	226	0.22	0.16	0.01	1.91
White bass	212	0.21	0.14	0.01	1.30
White crappie	352	0.19	0.11	0.01	1.70
Black crappie	652	0.19	0.14	0.00	1.50
Rock bass	376	0.19	0.17	0.01	0.69
Channel catfish	1,213	0.18	0.12	0.00	7.00
Rainbow smelt	116	0.18	0.14	0.02	0.67
Brown trout	131	0.16	0.12	0.01	1.25
Bluegill sunfish	1,062	0.15	0.10	0.01	4.49
Carp	426	0.14	0.10	0.01	1.84
Common carp	737	0.14	0.12	0.00	1.80
Pumpkinseed sunfish	107	0.13	0.09	0.01	1.02
Brown bullhead	214	0.13	0.08	0.01	2.46
White sucker	714	0.11	0.09	0.01	0.68
Rainbow trout	119	0.11	0.10	0.01	0.51
Black bullhead	130	0.10	0.07	0.01	0.68
Gizzard shad	151	0.09	0.10	0.01	0.40
English sole	241	0.06	0.06	0.02	0.13

* Data source: U.S. EPA NLFWA fish tissue database. October 2003.
Concentration statistics based on sampling station averages.
Shading indicates safe consumption rate associated with mean conc.:
1 meal/mo. 2 meal/mo. 3 meal/mo. 4 meal/mo. 8 meal/mo. 12 meal/mo.

References

US EPA, 2000. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2: Risk Assessment and Fish Consumption Limits, Third Edition*, Office of Water, November 2000, EPA-823-B-00-008.

US EPA, 2003. National Listing of Fish and Wildlife Advisories (NLFWA): Fish Tissue Database. Data export October 2003. Available at: <http://www.epa.gov/ost/fish/>.

Table 4-3. Monthly Fish Consumption Limits for Noncarcinogenic Health Endpoint - Methylmercury

Risk Based Consumption Limit ^a	Noncancer Health Endpoints ^b
Fish Meals/Month	Fish Tissue Concentrations (ppm, wet weight)
Unrestricted (>16)	0 - 0.029
16	>0.029 - 0.059
12	>0.059 - 0.078
8	>0.078 - 0.12
4	>0.12 - 0.23
3	>0.23 - 0.31
2	>0.31 - 0.47
1	>0.47 - 0.94
0.5	>0.94 - 1.9
None (<0.5)	>1.9

^a The assumed meal size is 8 oz (0.227 kg). The ranges of chemical concentrations presented are conservative, e.g., the 12-meal-per-month levels represent the concentrations associated with 12 to 15.9 meals.

^b Chronic, systemic effects.

Notes:

1. Consumption limits are based on an adult body weight of 70 kg and an interim RfD of 1×10^{-4} mg/kg-d.
2. None = No consumption recommended.
3. In cases where >16 meals per month are consumed, refer to Equations 3-1 and 3-2, Section 3.2.1.2, for methods to determine safe consumption limits.
4. The detection limit for methylmercury is 1×10^{-3} mg/kg.
5. Instructions for modifying the variables in this table are found in Section 3.3.
6. Monthly limits are based on the total dose allowable over a 1-month period (based on the RfD). When the monthly limit is consumed in less than 1 month (e.g., in a few large meals), the daily dose may exceed the RfD (see Section 2.3).

ATTACHMENT 3

EPA, HEALTH EFFECTS

<http://www.epa.gov/mercury/effects.htm#meth>

Mercury

Health Effects

People in the U.S. are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain methylmercury. Whether an exposure to the various forms of mercury will harm a person's health depends on a number of factors (below). Almost all people have at least trace amounts of methylmercury in their tissues, reflecting methylmercury's widespread presence in the environment and people's exposure through the consumption of fish and shellfish. People may be exposed to mercury in any of its forms under different circumstances. The factors that determine how severe the health effects are from mercury exposure include these:

- the chemical form of mercury;
- the dose;
- the age of the person exposed (the fetus is the most susceptible);
- the duration of exposure;
- the route of exposure -- inhalation, ingestion, dermal contact, etc.; and
- the health of the person exposed.

Mercury exists in three chemical forms. They each have specific effects on human health.

- [Methylmercury](#)
- [Elemental mercury](#)
- [Other mercury compounds](#) (inorganic and organic)

Methylmercury effects

For fetuses, infants, and children, the primary health effect of methylmercury is impaired neurological development. Methylmercury exposure in the womb, which can result from a mother's consumption of fish and shellfish that contain methylmercury, can adversely affect a baby's growing brain and nervous system. Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills have been seen in children exposed to methylmercury in the womb. Recent human biological monitoring by the [Centers for Disease Control and Prevention in 1999 and 2000 \(PDF\)](#) (3 pp., 42 KB,

[About PDF](#)) shows that most people have blood mercury levels below a level associated with possible health effects. [More recent data](#) from the CDC support this general finding.

Outbreaks of methylmercury poisonings have made it clear that adults, children, and developing fetuses are at risk from ingestion exposure to methylmercury. During these poisoning outbreaks some mothers with no symptoms of nervous system damage gave birth to infants with severe disabilities, it became clear that the developing nervous system of the fetus may be more vulnerable to methylmercury than is the adult nervous system.

For more information on fish consumption advisories across the country, visit [EPA's fish consumption web pages](#).

In addition to the subtle impairments noted above, symptoms of methylmercury poisoning may include; impairment of the peripheral vision; disturbances in sensations ("pins and needles" feelings, usually in the hands, feet, and around the mouth); lack of coordination of movements; impairment of speech, hearing, walking; and muscle weakness. People concerned about their exposure to methylmercury should consult their physician.

Mercury and Cancer. No human data indicate that exposure to any form of mercury causes cancer, but the human data currently available are very limited. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. Scientists only observed these health effects at extremely high doses, above levels that produced other effects. When EPA revised its [Cancer Guidelines](#) in 2005, the Agency concluded that neither inorganic mercury nor methylmercury from environmental exposures are likely to cause cancer in humans. More technical information is available in [volume V of the 1997 Mercury Study Report to Congress \(PDF\)](#) (349 pp., 1.2 MB, [about PDF](#)) (see especially pages 47, 80, 107, and 161 of the file).

Additional Information:

Additional information on the health effects of methylmercury is available from the IRIS database at <http://www.epa.gov/iris/subst/0073.htm> and EPA's Methylmercury Water Quality Criterion Web site at <http://www.epa.gov/waterscience/criteria/methylmercury/index.html>. You can also visit the Agency for Toxic Substances and Disease Registry (ATSDR) [toxicological profile for mercury](#).

ATTACHMENT 4

FDA FISH DATA

<http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FoodbornePathogensContaminants/Methylmercury/ucm115644.htm>

Mercury Levels in Commercial Fish and Shellfish

Return to [Advisory on Mercury in Seafood](#)

See also [Mercury Concentrations in Fish: FDA Monitoring Program](#)

Table 1. Fish and Shellfish With Highest Levels of Mercury

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
MACKEREL KING	0.730	N/A	N/A	0.230	1.670	213	GULF OF MEXICO REPORT 2000
SHARK	0.988	0.830	0.631	ND	4.540	351	FDA 1990-02
SWORDFISH	0.976	0.860	0.510	ND	3.220	618	FDA 1990-04
TILEFISH (Gulf of Mexico)	1.450	N/A	N/A	0.650	3.730	60	NMFS REPORT 1978

Table 2. Fish and Shellfish With Lower Levels of Mercury[†]

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
ANCHOVIES	0.043	N/A	N/A	ND	0.340	40	NMFS REPORT 1978
BUTTERFISH	0.058	N/A	N/A	ND	0.360	89	NMFS

Table 2. Fish and Shellfish With Lower Levels of Mercury[†]

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
							REPORT 1978
CATFISH	0.049	ND	0.084	ND	0.314	23	FDA 1990-04
CLAM *	ND	ND	ND	ND	ND	6	FDA 1990-02
COD	0.095	0.087	0.080	ND	0.420	39	FDA 1990-04
CRAB ¹	0.060	0.030	0.112	ND	0.610	63	FDA 1990-04
CRAWFISH	0.033	0.035	0.012	ND	0.051	44	FDA 2002-04
CROAKER ATLANTIC (Atlantic)	0.072	0.073	0.036	0.013	0.148	35	FDA 1990-03
FLATFISH ^{2*}	0.045	0.035	0.049	ND	0.180	23	FDA 1990-04
HADDOCK (Atlantic)	0.031	0.041	0.021	ND	0.041	4	FDA 1990-02
HAKE	0.014	ND	0.021	ND	0.048	9	FDA 1990-02
HERRING	0.044	N/A	N/A	ND	0.135	38	NMFS REPORT 1978
JACKSMELT	0.108	0.060	0.115	0.040	0.500	16	FDA 1990-02
LOBSTER (Spiny)	0.09	0.14	‡	ND	0.27	9	FDA SURVEY 1990-02
MACKEREL ATLANTIC (N.Atlantic)	0.050	N/A	N/A	0.020	0.160	80	NMFS REPORT 1978
MACKEREL CHUB (Pacific)	0.088	N/A	N/A	0.030	0.190	30	NMFS REPORT 1978
MULLET	0.046	N/A	N/A	ND	0.130	191	NMFS REPORT

Table 2. Fish and Shellfish With Lower Levels of Mercury[†]

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
							1978
OYSTER	0.013	ND	0.042	ND	0.250	38	FDA 1990-04
PERCH OCEAN *	ND	ND	ND	ND	0.030	6	FDA 1990-02
POLLOCK	0.041	ND	0.106	ND	0.780	62	FDA 1990-04
SALMON (CANNED) *	ND	ND	ND	ND	ND	23	FDA 1990-02
SALMON (FRESH/FROZEN) *	0.014	ND	0.041	ND	0.190	34	FDA 1990-02
SARDINE	0.016	0.013	0.007	0.004	0.035	29	FDA 2002-04
SCALLOP	0.050	N/A	N/A	ND	0.220	66	NMFS REPORT 1978
SHAD AMERICAN	0.065	N/A	N/A	ND	0.220	59	NMFS REPORT 1978
SHRIMP *	ND	ND	ND	ND	0.050	24	FDA 1990-02
SQUID	0.070	N/A	N/A	ND	0.400	200	NMFS REPORT 1978
TILAPIA *	0.010	ND	0.023	ND	0.070	9	FDA 1990-02
TROUT (FRESHWATER)	0.072	0.025	0.143	ND	0.678	34	FDA 2002-04
TUNA (CANNED, LIGHT)	0.118	0.075	0.119	ND	0.852	347	FDA 2002-04
WHITEFISH	0.069	0.054	0.067	ND	0.310	28	FDA 2002-04
WHITING	ND	ND	‡	ND	ND	2	FDA SURVEY 1990-02

Table 3. Mercury Levels of Other Fish and Shellfish[†]

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
BASS (SALTWATER, BLACK, STRIPED) ³	0.219	0.130	0.227	ND	0.960	47	FDA 1990-04
BASS CHILEAN	0.386	0.303	0.364	0.085	2.180	40	FDA 1990-04
BLUEFISH	0.337	0.303	0.127	0.139	0.634	52	FDA 2002-04
BUFFALOFISH	0.19	0.14	‡	0.05	0.43	4	FDA SURVEY 1990-02
CARP	0.14	0.14	‡	0.01	0.27	2	FDA SURVEY 1990-02
CROAKER WHITE (Pacific)	0.287	0.280	0.069	0.180	0.410	15	FDA 1990-03
GROUPEL (ALL SPECIES)	0.465	0.410	0.293	0.053	1.205	43	FDA 2002-04
HALIBUT	0.252	0.200	0.233	ND	1.520	46	FDA 1990-04
LOBSTER (NORTHERN/AMERICAN)	0.310	N/A	N/A	0.050	1.310	88	NMFS REPORT 1978
LOBSTER (Species Unknown)	0.169	0.182	0.089	ND	0.309	16	FDA 1991-2004
MACKEREL SPANISH (Gulf of Mexico)	0.454	N/A	N/A	0.070	1.560	66	NMFS REPORT 1978
MACKEREL SPANISH (S. Atlantic)	0.182	N/A	N/A	0.050	0.730	43	NMFS REPORT 1978
MARLIN *	0.485	0.390	0.237	0.100	0.920	16	FDA 1990-02
MONKFISH	0.180	N/A	N/A	0.020	1.020	81	NMFS REPORT 1978

Table 3. Mercury Levels of Other Fish and Shellfish[†]

SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
ORANGE ROUGHY	0.554	0.563	0.148	0.296	0.855	49	FDA 1990-04
PERCH (Freshwater)	0.14	0.15	‡	ND	0.31	5	FDA SURVEY 1990-02
SABLEFISH	0.220	N/A	N/A	ND	0.700	102	NMFS REPORT 1978
SCORPIONFISH	0.286	N/A	N/A	0.020	1.345	78	NMFS REPORT 1978
SHEEPSHEAD	0.128	N/A	N/A	0.020	0.625	59	NMFS REPORT 1978
SKATE	0.137	N/A	N/A	0.040	0.360	56	NMFS REPORT 1978
SNAPPER	0.189	0.114	0.274	ND	1.366	43	FDA 2002-04
TILEFISH (Atlantic)	0.144	0.099	0.122	0.042	0.533	32	FDA 2002-04
TUNA (CANNED, ALBACORE)	0.353	0.339	0.126	ND	0.853	399	FDA 2002-04
TUNA(FRESH/FROZEN, ALL)	0.383	0.322	0.269	ND	1.300	228	FDA 2002-04
TUNA (FRESH/FROZEN, ALBACORE)	0.357	0.355	0.152	ND	0.820	26	FDA 2002-04
TUNA (FRESH/FROZEN, BIGEYE)	0.639	0.560	0.184	0.410	1.040	13	FDA 2002-04
TUNA (FRESH/FROZEN, SKIPJACK)	0.205	N/A	0.078	0.205	0.260	2	FDA 1993
TUNA (FRESH/FROZEN, YELLOWFIN)	0.325	0.270	0.220	ND	1.079	87	FDA 2002-04
TUNA (FRESH/FROZEN, Species Unknown)	0.414	0.339	0.316	ND	1.300	100	FDA 1991-2004
WEAKFISH (SEA TROUT)	0.256	0.168	0.226	ND	0.744	39	FDA

Table 3. Mercury Levels of Other Fish and Shellfish [†]							
SPECIES	MERCURY CONCENTRATION (PPM)					NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	STDEV	MIN	MAX		
							2002-04

Source of data: FDA 1990-2004, "National Marine Fisheries Service Survey of Trace Elements in the Fishery Resource" Report 1978,
 "The Occurrence of Mercury in the Fishery Resources of the Gulf of Mexico" Report 2000

Mercury was measured as Total Mercury except for species (*) when only Methylmercury was analyzed.

ND - mercury concentration below detection level (Level of Detection (LOD)=0.01ppm)
 N/A - data not available

[†]The following species have been removed from the tables:

- Bass (freshwater) – not commercial
- Pickerel – not commercial

‡ Standard deviation data generated for new data 2004 or later only.

¹Includes: Blue, King, Snow

²Includes: Flounder, Plaice, Sole

³Includes: Sea bass/ Striped Bass/ Rockfish

NOTE: On February 8, 2006, technical changes were made to the data that was posted on January 19, 2006. The changes corrected data or more properly characterized the species of fish or shellfish sampled.

ATTACHMENT 5:

CDC NHANES DATA ON MERCURY LEVELS EXCEEDING EPA RfD

found at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5343a5.htm>

November 5, 2004 / 53(43);1018-1020

Blood Mercury Levels in Young Children and Childbearing-Aged Women --- United States, 1999--2002

Exposure to high levels of mercury (Hg) can cause neurologic and kidney disorders (1--3). Because methylated Hg (methyl-Hg) in the aquatic environment accumulates in animal tissues up the food chain, persons in the United States can be exposed by eating freshwater fish, seafood, and shellfish. Exposure of childbearing-aged women is of particular concern because of the potential adverse neurologic effects of Hg in fetuses. To determine levels of total blood Hg in childbearing-aged women and in children aged 1--5 years in the United States, CDC's National Health and Nutrition Examination Survey (NHANES) began measuring blood Hg levels in these populations in 1999. This report summarizes NHANES results for 1999--2002 and updates previously published information (4,5). The findings confirmed that blood Hg levels in young children and women of childbearing age usually are below levels of concern. However, approximately 6% of childbearing-aged women had levels at or above a reference dose, an estimated level assumed to be without appreciable harm ($\geq 5.8 \mu\text{g/L}$). Women who are pregnant or who intend to become pregnant should follow federal and state advisories on consumption of fish.

NHANES is a continuous survey of the health and nutritional status of the civilian, noninstitutionalized U.S. population; data are released and reported in 2-year cycles (6). Each participant undergoes a household interview and a physical examination. During the physical examination, blood is collected by venipuncture from all persons aged ≥ 1 year. For this analysis, whole-blood specimens were analyzed for total and inorganic Hg for children aged 1--5 years and women aged 16--49 years by automated, cold-vapor atomic absorption spectrophotometry in CDC's inorganic toxicology laboratory. The analytic method detection limit was $0.14 \mu\text{g/L}$ (ppb) for total Hg and $0.4 \mu\text{g/L}$ (ppb) for inorganic Hg (7). Blood Hg levels less than the limit of detection were assigned a value equal to the detection limit divided by the square root of 2 for the calculation of geometric mean (GM) values.

During 1999--2002, the GMs of total blood Hg concentrations for all childbearing-aged women and for children aged 1--5 years were $0.92 \mu\text{g/L}$ and $0.33 \mu\text{g/L}$, respectively; the 95th percentiles of blood Hg for women and children were $6.04 \mu\text{g/L}$ and $2.21 \mu\text{g/L}$, respectively (Table 1). The percentage of all women aged 16--49 years with Hg levels $\geq 5.8 \mu\text{g/L}$ (the Environmental Protection Agency's [EPA] Reference Dose [RfD]) was 5.66%

(95% confidence interval [CI] = 4.04--7.95) ([Table 2](#)).

Among children aged 1--5 years, the estimated percentage who had blood Hg levels $\geq 5.8 \mu\text{g/L}$ during 1999--2002 could not be reported because the observed percentage was too low for the given sample size to calculate a statistically reliable national population estimate. Almost all inorganic blood Hg levels were undetectable, indicating that total blood Hg greater than or equal to the EPA RfD mostly reflected exposure to organic Hg (especially methyl-Hg).

Reported by: *RL Jones, PhD, T Sinks, PhD, SE Schober, PhD, M Pickett, MPH, National Center for Environmental Health; National Center for Health Statistics, CDC.*

Editorial Note:

This report updates NHANES 1999--2000 estimates of blood Hg levels (5), the first nationally representative estimates of U.S. women's and children's exposures to Hg based on biologic measures. The findings indicate that blood Hg levels in young children and childbearing-aged women usually are below levels of concern.

Among childbearing-aged women, for the 4-year period 1999--2002, estimates of the GM of blood Hg and the proportion with levels $\geq 5.8 \mu\text{g/L}$ were lower than estimates for the 2-year period 1999--2000, reflecting apparent declines in these values for the 2-year period 2001--2002. However, when these differences were evaluated by comparing estimates for the two 2-year periods, the declines were not statistically significant: the GM of blood Hg for 2001--2002 was $0.83 \mu\text{g/L}$ (CI = 0.73--0.93), compared with $1.02 \mu\text{g/L}$ (CI = 0.80--1.24) for 1999--2000, and the percentage of women with blood Hg levels $\geq 5.8 \mu\text{g/L}$ was 3.9% in 2001--2002 (CI = 2.40--6.43), compared with 7.8% in 1999--2000 (CI = 4.70--12.83). At least 2 more years of data are needed to best determine whether Hg exposure has declined among women of childbearing age in the United States.

Although NHANES data are released and often analyzed as 2-year periods, the estimates of blood Hg levels for 1999--2002 are the most reliable estimates of current exposure. The 4-year period provides greater geographic coverage, and estimates and sample errors are more stable, thus reducing variability caused by differing exposures to Hg across survey site locations. Accordingly, the National Center for Health Statistics advises users of these data that the most reliable estimates of current exposure are obtained when the 1999--2002 data are analyzed together (6).

The EPA RfD is based on measures of Hg in cord blood and is a level assumed to be without appreciable harm. The RfD was determined by applying an uncertainty factor of 10 to a dose ($58 \mu\text{g/L}$) that was the lower 95% confidence limit of a dose associated with an increased proportion of abnormal scores on the Boston Naming Test for children exposed in utero (2). All women and children in the 1999--2002 NHANES survey period had blood Hg levels below $58 \mu\text{g/L}$. The harm to a fetus from levels of exposure as measured by cord blood levels between $5.8 \mu\text{g/L}$ and $58 \mu\text{g/L}$ is uncertain.

The findings in this report are subject to at least two limitations. First, NHANES does not include an adequate sampling of women (e.g., sport fishers) who might eat large amounts of fish to characterize the distribution of total blood Hg in this group. Second, the ratio of Hg in cord to maternal blood (i.e., equivalent to NHANES measures) is uncertain (2,8). Therefore, NHANES values might not be directly comparable to the EPA RfD, which is based on cord blood Hg levels.

Fish are an important part of a diet, high in protein and nutrients and low in saturated fatty acids and cholesterol. The short-term strategy to reduce Hg exposure is to eat fish with low Hg levels and avoid or reduce consumption of fish with high Hg levels. Because exposure to methyl-Hg can harm fetuses, the Food and Drug Administration (FDA) advises that women who are or might become pregnant not eat shark, swordfish, king

mackerel, and tile fish (9). In addition, EPA and the Agency for Toxic Substances and Disease Registry have established daily consumption levels of Hg considered to be without harm (1). State-based fish advisories and bans identify fish species contaminated by Hg and their locations and provide safety advice (10). The NHANES program continues to collect Hg measurements in human tissue to monitor the effectiveness of efforts to reduce Hg exposure in the U.S. population.

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Table 1

TABLE 1. Geometric means (GMs) and selected percentiles of total blood mercury (Hg) concentrations ($\mu\text{g/L}$) for women aged 16–49 years and children aged 1–5 years, by selected variables — National Health and Nutrition Examination Survey, United States, 1999–2002

Variable	No.	GM	(95% CI)*	Selected percentile (95% CI)					
				5th	(95% CI)	10th	(95% CI)	25th	(95% CI)
Women									
Race/Ethnicity									
Mexican American	1,106	0.74	(0.64–0.84)	0.10	(0.08–0.15)	0.17	(0.12–0.23)	0.34	(0.27–0.45)
White, non-Hispanic	1,377	0.87	(0.76–0.99)	0.09	(0.08–0.10)	0.15	(0.13–0.18)	0.37	(0.34–0.45)
Black, non-Hispanic	794	1.18	(1.00–1.36)	0.17	(0.12–0.25)	0.30	(0.24–0.38)	0.60	(0.55–0.73)
Age group (yrs)									
16–29	2,004	0.68	(0.60–0.76)	0.08	(0.07–0.09)	0.11	(0.09–0.14)	0.29	(0.25–0.37)
30–49	1,633	1.10	(0.97–1.24)	0.13	(0.10–0.16)	0.24	(0.20–0.29)	0.52	(0.45–0.60)
Pregnancy status									
Pregnant	629	0.75	(0.60–0.90)	0.08	(...†–0.10)	0.10	(0.08–0.20)	0.32	(0.24–0.44)
Not pregnant	2,978	0.94	(0.84–1.04)	0.10	(0.09–0.11)	0.18	(0.15–0.21)	0.41	(0.38–0.47)
Total	3,637	0.92	(0.82–1.02)	0.09	(0.09–0.11)	0.17	(0.15–0.20)	0.40	(0.36–0.47)
Children									
Race/Ethnicity									
Mexican American	526	0.35	(0.30–0.40)	...		0.08	(...–0.09)	0.13	(0.10–0.16)
White, non-Hispanic	447	0.29	(0.24–0.33)	...		0.07	(...–0.08)	0.09	(0.09–0.10)
Black, non-Hispanic	424	0.50	(0.44–0.57)	0.08	(...–0.10)	0.10	(0.09–0.13)	0.22	(0.18–0.26)
Total	1,577	0.33	(0.30–0.37)	...		0.07	(...–0.08)	0.10	(0.09–0.12)

* Confidence interval.
 † Below the limits of detection.

TABLE 1. (Continued) Geometric means (GMs) and selected percentiles of total blood mercury (Hg) concentrations ($\mu\text{g/L}$) for women aged 16–49 years and children aged 1–5 years, by selected variables — National Health and Nutrition Examination Survey, United States, 1999–2002

Variable	Selected percentile (95% CI)							
	50th	(95% CI)	75th	(95% CI)	90th	(95% CI)	95th	(95% CI)
Women								
Race/Ethnicity								
Mexican American	0.73	(0.67–0.83)	1.27	(1.16–1.48)	2.38	(2.05–2.95)	3.60	(3.03–6.48)
White, non-Hispanic	0.81	(0.76–0.92)	1.69	(1.51–2.15)	3.73	(2.84–5.14)	6.17	(4.64–9.30)
Black, non-Hispanic	1.15	(1.05–1.41)	2.12	(1.86–2.70)	3.89	(3.24–5.03)	5.54	(4.27–11.08)
Age group (yrs)								
16–29	0.64	(0.55–0.77)	1.34	(1.24–1.54)	2.58	(2.28–3.13)	3.87	(3.32–7.80)
30–49	1.02	(0.91–1.19)	2.10	(1.79–2.69)	4.56	(3.74–5.76)	6.97	(5.73–11.62)
Pregnancy status								
Pregnant	0.73	(0.63–0.97)	1.50	(1.38–1.90)	3.11	(2.14–4.79)	4.86	(3.00–8.02)
Not pregnant	0.88	(0.80–1.00)	1.83	(1.65–2.11)	3.93	(3.26–4.93)	6.11	(5.12–10.90)
Total	0.86	(0.80–0.98)	1.81	(1.62–2.16)	3.89	(3.20–4.88)	6.04	(5.08–10.74)
Children								
Race/Ethnicity								
Mexican American	0.28	(0.24–0.33)	0.63	(0.56–0.81)	1.36	(1.05–1.57)	1.85	(1.60–2.66)
White, non-Hispanic	0.20	(0.17–0.25)	0.49	(0.38–0.63)	1.15	(0.80–1.49)	1.78	(1.18–2.69)
Black, non-Hispanic	0.47	(0.40–0.58)	0.88	(0.78–1.02)	1.54	(1.31–2.04)	2.37	(1.75–3.64)
Total	0.26	(0.23–0.29)	0.61	(0.56–0.70)	1.29	(1.08–1.69)	2.21	(1.80–3.66)

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Table 2

TABLE 2. Percentage of women aged 16–49 years with blood mercury (Hg) levels $\geq 5.8 \mu\text{g/L}$, by race/ethnicity — National Health and Nutrition Examination Survey, United States, 1999–2002

Race/Ethnicity	No.	% with Hg levels $\geq 5.8 \mu\text{g/L}$	(95% CI*)
Mexican American	1,106	1.70	(1.04–2.79)
White, non-Hispanic	1,377	5.77	(3.71–8.97)
Black, non-Hispanic	794	4.82	(2.55–9.11)
Total	3,637	5.66	(4.04–7.95)

* Confidence interval.

ATTACHMENT 6

REVIEW OF RECENT SCIENTIFIC STUDIES

The US EPA established the US Reference Dose for methylmercury in 1999, based on the best evidence then available, using data from a long-term epidemiological study in the Faeroe Islands carried out by researchers at Harvard and elsewhere. Research since then has sharpened scientific understanding of the benefits of maternal fish consumption for prenatal cognitive development, of the harm done by methylmercury to that cognitive development, and of improved research designs for separating the two effects. Several recent studies suggest more strongly than ever that public health concern over methylmercury exposure is completely justified, and that the effort to guide women to pick low-mercury fish must be expanded and improved.

In 2007, the Faeroe Islands research team reanalyzed their data to adjust for maternal fish intake, and determined that after adjusting for nutritional effects of fish consumption, cognitive deficits attributed to methylmercury were actually about twice as large as had originally been reported.¹ Similarly, a research team doing another long-term study, in the Seychelles Islands, which had previously reported no significant adverse effects of methylmercury on cognitive development, did a new analysis focused on measuring benefits of maternal fish consumption. In 2008, for the first time, the Seychelles researchers reported observing adverse mercury effects, which they concluded were probably masked by beneficial effects in their earlier analyses.²

Two US studies have shown that developmental benefits of fish intake and adverse effects of methylmercury occur in babies whose mothers consume average American amounts of fish. A study in Boston³ has assessed verbal development at the ages of six months and three years; high fish consumption during pregnancy improved scores, while higher mercury exposure (from the higher-mercury fish those women ate) reduced scores. The effects were of roughly comparable magnitude in the affected groups, about 5 points on a 100-point scale. A New York City study⁴ tested children's cognitive development at the ages of 12, 24, 36 and 48 months, using standard tests, and found similar results: High fish consumption enhanced performance, while elevated mercury exposure decreased performance on the same tests.

The populations in the Faeroes and Seychelles have high-fish diets, and the Faroese in fact get most of their methylmercury exposure from pilot whale meat. But the women in the Boston and New York studies had ordinary levels of fish consumption and mercury exposure. Only 7 percent of the Boston women ate two or more fish meals per week; about 5 percent of US women eat fish that often, according to CDC. The Boston research team classified a child as having high prenatal mercury exposure if his mother's hair mercury value was above the 90th percentile, which was 1.2 ppm in the study population. The 90th percentile hair NHANES mercury level is 1.1 ppm. Oken et al. did not measure blood mercury, but NHANES regional data show that the 90th percentile blood mercury level for women in New England is 5.2 µg/l.⁵ The New York study measured blood mercury, but not fish consumption. The geometric mean blood mercury level in the

women included in the study was 0.91 µg/l, while the geometric mean for the national NHANES sample was 0.92 µg/l.

Further research is needed to better document the complex relationships between fish intake during pregnancy and cognitive development. But the available evidence strongly suggests that methylmercury exposure can have adverse effects even at doses associated with just one or two fish meals per week. There is no evidence of a threshold for this toxic effect. Since women are advised to consume fish while pregnant, for the nutritional benefits, it seems vitally important that advice also be provided that helps women identify and buy low-mercury fish, so they (and their babies) can simultaneously enjoy the nutritional benefits and minimize their exposure to methylmercury.

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FISH ADVISORY

Women Under Age 45 and Children

Seafood contains important nutrients, including Omega-3 fatty acids, but also contains mercury, which can be harmful to women and children.

DO NOT EAT
Swordfish - Shark - Tilefish - King Mackerel

Limit albacore tuna to one, 6-ounce serving a week, and eat no other fish that week.
Light canned tuna, however, may be eaten twice a week.

High (avoid)	Moderate (limit to one, 6-oz serving/week)*	Lower (12-ounces or 2 servings per week) (listed from lowest to highest levels)		
Fresh/Frozen Tuna and Sushi Tuna Spanish Mackerel Chilean Sea Bass Grouper Marlin Orange Roughy	Snapper Skate Freshwater Perch Monkfish Halibut Sablefish Sea Trout Sea Bass Bluefish American Lobster	Shrimp Sardines Tilapia Clams, Oysters, Scallops, Mussels Salmon Crayfish Freshw. Trout Ocean Perch/Mullet	Pollock Atl. Mackerel Anchovy/Herring Sole, Flounder Crab Pike Butterfish Catfish Squid	Atlantic Croaker Whitefish Pac. Mackerel/Chub Smelt Cod Canned Light Tuna Spiny Lobster

(1) * Women under age 45 and children who eat fish from the yellow category should eat no other fish that week.

(2) Fish are listed from lowest to highest mercury levels.

(3) For more information see www.epa.gov/mercury or www.fda.gov.

