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SCIENCE
SINCE MADISON

What's Really Happening in the Great Mercury Debate

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Introduction

In March 2007, barely seven months after the International Conference on Mercury as a Global Pollutant was held in Wisconsin's capital, the event's organizers publicized their breathless claim that mercury exposure from the fish we eat constitutes a global public health threat. But during those months, a series of landmark scientific publications made this "Madison Declaration" and its frightening language a moot point, at least for consumers whose only direct encounter with mercury comes through traces that have always been present in the fish they eat.

Evidence continues to mount that fish, on balance, deserves its reputation as a health food. Real-world neurological health risks associated with eating fish are near-impossible to identify in individual consumers, and the medical literature has failed to provide a single fish-related mercury poisoning case in the United States. But the health benefits of fish consumption are well documented and generally uncontested. (The chief dissenter remains the animal "rights" lobby, whose argument for a global diet devoid of all animal protein is motivated by political ideology, not human health concerns.)

Recent years have seen a squabble between competing fish-mercury studies carried out in the Seychelle Islands (which found no health risk to children from their mothers' prenatal fish intake) and the Faroe Islands (which claimed to identify a developmental risk too small to be seen in individuals, yet perceptible in a large population). But now they have both been eclipsed by a study more robust than either. The last scientific word on the subject is that pregnant women who eat the most fish appear to have the smartest children.

The peripheral debate over whether retailers should scare pregnant women away from the fish counter with "warning" signs about trace levels of mercury took an unexpected turn, thanks

to the law of unintended consequences. The federal government's Institute of Medicine has warned that other Americans (post-menopausal women and men of all ages, for instance), for whom even the most creative mercury fabulist cannot construct a logical reason to fear fish, also read *and obey* such signs. And the public health threat posed by their loss of seafood's health benefits dwarfs anything mercury traces could ever visit upon newborn babies.

The ongoing Faroe Islands research into mercury-related health risks also had a self-induced hiccup, as the study's research team acknowledged publicly that their estimation of mercury's public-health threat is based on a population whose dietary mercury comes from whale meat, not fish. Since Faroese natives eat copious amounts of pilot whale, ingesting mercury without the fish-related health *benefits* other populations enjoy, their diet now appears to be a glaringly inappropriate model for what happens when modern mainlanders eat seafood.

Researchers on the Faroe Islands team continue to cling to their self-anointed position as global arbiters of mercury health hazards. They insist that their study is all the more relevant to toxicology since mercury in whales is naturally separate from the omega-3 fatty acids, selenium, and other beneficial nutrients that typically accompany the toxin in fish. But while this is an interesting intellectual exercise, it tells average consumers nothing about the real-world risks and benefits of their seafood consumption.

That practical message has been delivered by a comprehensive review of seafood science, published by the Institute of Medicine. The news for consumers is unequivocally good. The justification for alarm is practically nonexistent. And the alarming Madison Declaration now seems to have been hopelessly obsolete before its ink was dry.

The Lancet

It's Great Britain's most prestigious medical journal, and the pronouncements on its pages have changed the direction of dozens of scientific debates. *The Lancet* has historically been unafraid to weigh in on controversial subjects. The question of whether mercury traces in fish are worth worrying about certainly qualifies as controversial.

Through the end of 2006, two competing long-term studies on the subject competed for public attention and scientific approval as the "last word" on mercury in fish.

One research team in the Seychelle Islands found that elevated mercury levels during women's pregnancies had no negative impact on the long-term development of their children. Another group of scientists, working in the Faroe Islands, found extremely subtle statistical differences among children whose pregnant mothers' hair had contained varying levels of mercury. None of these children, it must be noted, had any actual clinical symptoms that would indicate mercury poisoning.

A few other (much smaller) studies exist on the periphery. But these two projects, each of which tracked more than 700 women and their children over more than a decade, were collectively seen as the "gold standard" in their field—even as scientists (including those in U.S. government agencies) have squabbled over which arrived nearer to the truth.

The U.S. Environmental Protection Agency (EPA), for instance, looked at both studies when setting a Reference Dose* for methylmercury, the organic form of the element found in fish. But the EPA effort, led by a handful of partisans, ultimately ignored the Seychelle research and focused on the Faroe data alone. Why?

Research subjects in the Seychelles actually had higher mercury levels than those in the Faroes. But as the EPA itself notes, the Seychelle study "yielded scant evidence of impairment."

A more accurate statement would have been "zero" evidence rather than the ambiguous "scant." And from the EPA's perspective, you can't calculate harm if you're forced to multiply by zero.

In February 2007 the entire Faroe-vs-Seychelle paradigm shifted. Seismically. That's when *The Lancet* published "Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood." This study compared nutrition data collected from more than 8,900 mothers with the results from IQ, motor-skill, and other developmental tests performed on their children.**

The research, funded by the U.S. government and led by Dr. Joseph Hibbeln, a leading National Institutes of Health physician, established that children whose mothers eat the most fish during pregnancy are likely to score the *highest* on IQ and developmental tests. "[T]he lower the intake of seafood during pregnancy," the researchers wrote, "the higher the risk of [children's] suboptimum developmental outcome."

Given the consistent emphasis by environmental groups (and a few government agencies) on fish as a net negative for prenatal health, this unambiguous result has turned the conventional wisdom on its head. If eating large amounts of fish during pregnancy is, as some activists claim, akin to guaranteeing the delivery of a brain-damaged infant—and if, as a few dogmatic zealots insist, grocery stores should hang "warning" signs wherever fish

"We recorded no evidence to lend support to the warnings of the U.S. advisory that pregnant women should limit their seafood consumption."

— National Institutes of Health researcher Dr. Joseph Hibbeln and his colleagues, writing in *The Lancet*





are sold—an iron-clad scientific result to the contrary bears some explanation.

Eating fish, it turns out, is imperative for moms-to-be for the same reason others should include fish in their diets. It now appears undeniable that the health benefits of omega-3 fatty acids and other nutrients found in fish more than compensate for comparatively tiny levels of mercury (and other toxins) that have always accompanied them. Omega-3s are essential for neurological development and health.

In the *Lancet* authors' words, "the risks from losing the benefits of nutrients essential to neurodevelopment exceeds the risk of exposure to trace concentrations of contaminants [in fish]."

One very sensible interpretation of the *Lancet* study is that mothers who eat little or no fish deprive their children of

omega-3s, resulting in poor neurological development and, ultimately, low IQ scores later in childhood. "[A]dvice to limit seafood consumption" during pregnancy, Dr. Hibbeln and his co-authors note, "could actually be detrimental."

The policy implications of this study are staggering. Armed with a methylmercury Reference Dose that relies almost exclusively on data from the Faroe Islands, the U.S. Environmental Protection Agency and many states have issued puritan-sounding fish advisories to women of childbearing age.

But as Dr. Hibbeln told *Newsweek*, the EPA advisory "didn't calculate in the beneficial effects of the nutrients in seafood." As a result, he said, mercury's effects "may have been overestimated," rendering the EPA advisory a public health disaster in the making. "The advisory," he concluded, "causes the harm it intended to prevent."

“These results highlight the importance of including fish in the maternal diet during pregnancy and lend support to the popular opinion that fish is brain food.”

— University of Rochester pediatric neurologist Dr. Gary Myers and pediatric psychiatrist Dr. Philip Davidson, commenting on Dr. Hibbeln's study in *The Lancet*

* A "Reference Dose" is an estimate of the highest daily oral exposure to a substance, over an entire lifetime, which isn't likely to subject people to significant health risks. Since they're estimates, Reference Doses include generous safety cushions, which can mislead the public into thinking they represent hard-and-fast safety thresholds.

** *The Lancet* has graciously made the full study available to the public (visit <http://tinyurl.com/3xeqbz>).

JAMA

Countless scientific studies have demonstrated the health benefits of eating fish. In addition to being plentiful in omega-3 fatty acids, fish is naturally high in protein.* But the public has been expected to balance this against frightening and confusing news stories about mercury, PCBs, dioxins, and other toxins.

This begs the question: Do the health benefits of eating fish outweigh the risks? In the October 2006 issue of *JAMA* (the influential Journal of the American Medical Association), Harvard School of Public Health researchers published the single most comprehensive answer to date.

“Overall, for major health outcomes among adults,” lead author and Harvard epidemiologist Dr. Dariush Mozaffarian told reporters when his study was released, “the benefits of eating fish greatly outweigh the risks. Somehow this evidence has been lost on the public.”

Mozaffarian, along with Harvard’s Dr. Eric Rimm, analyzed existing studies about eating fish that had been published through April 2006. While their findings weren’t published until after the August 2006 Madison conference, all the evidence they examined—more than 200 studies in all—was readily available to the scientific community which later derided fish as a dangerous source of dietary toxins.

Most telling was the bottom line for “total mortality”—the risk of premature death for any reason—among people who eat even modest amounts of fish. *Not* eating fish, it turns out, increases

our risk of early death by a whopping 17 percent. And Americans who thumb their noses at the seafood counter are 36 percent more likely to die of heart disease.

The Harvard researchers could find “no definite evidence” that low levels of mercury that are typically found in seafood have any harmful effects. The worst they could say was that mercury “may lessen the cardiovascular benefit” from eating *some* fish without causing any harm on its own.

Rimm later told a BBC correspondent: “Unfortunately, the media and others may have contributed to this confusion by greatly exaggerating the unsubstantiated claim of a health risk from fish. These results, from over two decades of research, clearly show there is a health risk if adults *don’t* eat fish.”

Mozaffarian added in *The Baltimore Sun*: “Avoiding seafood because of a health concern is not the right answer. We were surprised by how little evidence there is for some of these reported harms.” And he told National Public Radio’s *All Things Considered*: “For the average person, we didn’t find any health effects for mercury.”

“Modest consumption of fish ... reduces risk of coronary death by 36% and total mortality by 17%.”

— Harvard scientists Dr. Dariush Mozaffarian and Dr. Eric Rimm, writing in *JAMA*

* In particular, canned tuna has traditionally been praised as a universally affordable source of low-fat protein.

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— Harvard’s Dr. Dariush Mozaffarian
in *The Baltimore Sun*





The Institute of Medicine

Appearing in the same week as the *JAMA* study, a landmark report from the federal government's Institute of Medicine (part of the National Academy of Sciences) added a few important pieces to the seafood puzzle. Eating fish, the report concluded, benefits the heart and helps develop the brains and eyes of children. A few 3-ounce servings of fish every week, the IOM panel wrote, would be beneficial for everyone.

William Hogarth, Director of the National Marine Fisheries Service (part of the National Oceanic and Atmospheric Administration, which commissioned the report), summed up the findings in *USA TODAY*. Public concerns about the risks of eating fish, Hogarth said, are “overblown” and based on “fear and misinformation.” In *The Baltimore Sun*, he added: “It all shows that health scares about seafood consumption are not based on reliable science.”

The Institute of Medicine itself was somewhat more measured in its rhetoric. Based on a qualitative (and therefore subjective) examination of studies instead of their pooled data, the report's comparatively uncertain conclusions read mostly like a committee decision tailored to appeal to scientifically conservative voices.

Still, a few startling statements made it through the vetting process. Infants whose mothers consume omega-3 fatty acids during pregnancy, the panel wrote, “may gain benefits such as longer gestation and better vision and brain development.” And federal government agencies “should encourage pregnant women, or those who may become pregnant, to include seafood in their diets.”

The authors' biggest bombshell, though, came in their understanding of how consumers make choices. They cited evidence that fish-avoidance advice targeting very narrow groups of peo-

ple “may be unnecessarily followed by other individuals, or the general public.” Messages targeting one group of Americans, they wrote (pregnant women, for instance*), may result in this “spillover effect” ensnaring other parts of the population, denying them the health benefits of fish consumption.

The most glaring example of these one-size-fits-all seafood warnings is appearing at some supermarket fish counters with alarming frequency. Often featuring the word “Mercury” or “Warning” in arresting headlines, these signs ostensibly aim to communicate government advice to pregnant women and new mothers. But the handful of vocal environmental activists who relentlessly advocate their use appear to have ignored the spillover effect, likely doing more harm than good.

In addition to needlessly scaring some male shoppers and older women away from the seafood counter, these point-of-sale signs may also stop hyper-precautionary pregnant women from buying fish for the rest of their family members to eat. Taking the recent research published in *The Lancet* into account, the federal advisories underpinning the signs may need to be reconsidered entirely.

Given the Institute of Medicine's well-founded concerns, it's difficult to view the promotion of these signs as anything short of irresponsible.

“Health scares about seafood consumption are not based on reliable science.”

— National Marine Fisheries Service Director
William Hogarth in *The Baltimore Sun*

* Current federal advisories about mercury in fish only apply to very small children and women of childbearing age. They are not meant to be followed by men, post-menopausal women, teenagers, or any other subset of the U.S. population.

Whale Meat Redux

Other than their geography, the chief difference between the mercury-in-fish research projects carried out in the Faroe and Seychelle Islands has to do with the *source* of mercury studied in these two populations. In the Seychelles, natives ingest small amounts of mercury by eating about 10 times as much fish as the average American. Mercury measured in Faroe Islanders, however, comes almost exclusively from the *whale* meat which is a staple of their diet.

In 2004 Dr. Pal Weihe, one of the leading Faroe researchers, acknowledged in *The Boston Herald* that the fish his research subjects eat isn't dangerous. "Fish consumption," Weihe wrote, "does not harm Faroese children. In the contrary [*sic*], the fish consumption most likely is beneficial to their health." Nevertheless, the U.S. Environmental Protection Agency relied primarily on this study (and ignored contradictory research) when it calculated how much fish could theoretically harm Americans.

Dr. Philippe Grandjean, the architect of the Faroe research, recently told *SELF* magazine that "mercury is mercury is mercury. It doesn't matter if it comes from whale or tuna." But this narrow view misses the larger point that should concern consumers. Ample research has demonstrated that the health benefits of eating fish far outweigh its theoretical risks. No such analysis exists for whale meat, which typically contains a toxic cocktail of PCBs, pesticides, and even flame retardants.

In fact, it does matter a great deal whether mercury comes from fish or whale meat, because of what comes along with it. By failing to discuss the practical world in which ordinary people live (and eat), Grandjean—unlike his colleague Dr. Weihe—missed the opportunity to put his abstract work in its proper real-world context.

In March 2007 the Faroe team published an update to their research in the U.S. government journal *Environmental Health Perspectives*, acknowledging that "fish intake and mercury exposure do not show a close correlation" in the Faroe Islands. In fact, they state matter-of-factly, "the correlation between fish intake and methylmercury exposure is relatively low, due to the fact that whale meat, rather than fish, is the main source of methylmercury exposure."

A sensible follow-up to this observation would be an acknowledgement that whale meat in the Faroese diet "confounded" (in scientific jargon) the researchers' observations about mercury in fish. Incredibly, they wrote instead that *the health benefits of fish* served to confound their findings about mercury.

Boiling their argument down to its essence, the Faroe team's position is now that it's more important to measure methylmercury's impact all by itself than to evaluate what happens when ordinary people eat fish.

Despite its impractical focus and its inability to demonstrate that individual children—even those whose mercury levels were the highest—suffered *in utero* from their mothers' seafood consumption, the Faroe Islands team's work formed the basis for the U.S. Environmental Protection Agency's mercury Reference Dose. This in turn spawned the federal government's mercury advisory for childbearing women and small children, which the EPA issued jointly with the Food and Drug Administration in 2004.

Neither agency appears concerned that this proclamation rests on the shifting sands of a study that says practically nothing about fish.

"[T]he correlation between fish intake and methylmercury exposure is relatively low, due to the fact that whale meat, rather than fish, is the main source of methylmercury exposure."

— Dr. Philippe Grandjean and his colleagues, coming clean in an *Environmental Health Perspectives* report





Policy Recommendations

Taken together, the Institute of Medicine's report and studies in *JAMA* and *The Lancet* provide important and powerful new evidence about the impact of seafood on health—evidence that must not be ignored by government policymakers. The Center for Consumer Freedom offers the following five recommendations, intended to help government agencies bring their policies in line with current science:

1. Researchers from the Faroe Islands team acknowledge that their study's conclusions about the health impact of methylmercury exposure are drawn from observations of people whose mercury intake comes from eating large amounts of whale meat, as opposed to fish (particularly ocean fish). Because whale meat is not regularly consumed in the United States, this study is not representative of Americans' diets. Meanwhile, studies of populations whose dietary patterns more closely resemble those in the U.S. and other modern countries continue to find no health risk from traces of mercury. **The Environmental Protection Agency should re-evaluate its methylmercury Reference Dose, beginning by restoring it to the level that existed prior to 2000**, when the Committee on Toxicology of Methylmercury erroneously recommended the Faroe research as the basis for this measurement.
2. Important questions persist about the confounding effects of PCBs, insecticides, and other chemicals in the pilot whale meat that makes up a significant portion of the typical diet observed in the Faroe Islands study. **The EPA should decline to include this study in its future methylmercury Reference Dose calculations until the Faroe researchers share their complete, unedited collection of data with the scientific community.** It should concern federal regulators that this important and health-critical Reference Dose is based almost entirely on a study for which raw data has never been publicly released.
3. Research published in *The Lancet* shows neurological and developmental benefits for children of women who eat generous amounts of fish—more than twice the average weekly intake for most Americans—during their pregnancies. Accordingly, **the Environmental Protection Agency and Food and Drug Administration should withdraw their seafood advisory.** These agencies have acknowledged that their chief aim has been to help pregnant women avoid harmful levels of contaminants in fish (most notably mercury), but new research published in *The Lancet* has established that the best outcomes for children occur when pregnant women eat significantly more fish than the U.S. government advisory permits. **At minimum, the FDA should withdraw its participation from the current seafood advisory in favor of a more balanced risk assessment recognizing that the health benefits of eating fish outweigh theoretical risks among all subsets of the U.S. population.**
4. The Institute of Medicine has cautioned against a “spillover effect” that results when seafood advisories intended for a narrow group of Americans unintentionally alter the behavior of other, non-targeted groups. And recent research published in *The Lancet* demonstrates that pregnant women can increase the likelihood of healthy outcomes for their children by eating more fish than activist-promoted grocery store signs recommend. **Unless appropriate consumer research can devise a strategy that will not limit fish consumption among men, non-infant children, post-menopausal women, and women on regular birth control medications, posting mercury advisories where fish is sold should be discouraged because it is likely to cause the very harm it intends to prevent.**
5. The best and most robust science now indicates that due to significant concentrations of omega-3 fatty acids and other nutrients, the health benefits of fish consumption far outweigh any hypothetical risks. **U.S. states that issue mercury advisories related to fish caught in local waterways should withdraw any advice that is more restrictive than the already hyper-cautionary federal guidelines.**

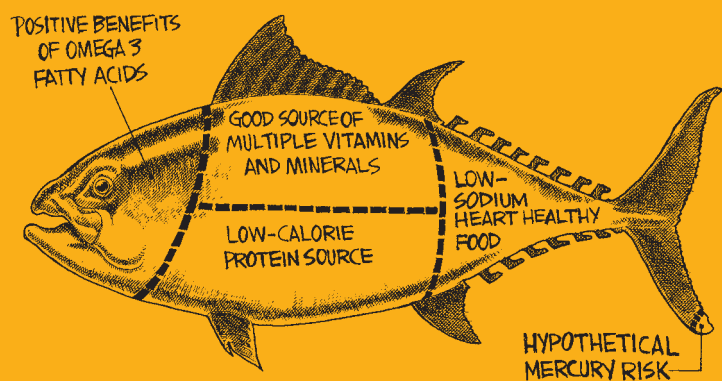
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The Center For
Consumer Freedom®

1090 Vermont Ave., NW | Suite 800 | Washington, DC 20005 | Tel: 202.463.7112 | Fax: 202.463.7107