

## *Technical Fact Sheet: Trends in Blood Mercury Concentrations among Women of Childbearing Age*

### Summary

One of the primary risks associated with eating contaminated finfish and shellfish is exposure to methylmercury (MeHg). EPA looked at data from 1999-2010 from the Centers for Disease Control and Prevention (CDC) National Health and Nutrition Examination Survey (NHANES), to see whether there was a trend in blood mercury concentrations and in fish consumption among women of childbearing age.

The data showed that mercury levels in women of childbearing age dropped 34 percent from a survey conducted in 1999-2000 to follow-up surveys conducted from 2001 to 2010. Additionally, the percentage of women of childbearing age with blood mercury levels above the level of concern decreased 65 percent between the 1999-2000 survey and the follow-up surveys from 2001-2010. During the survey period there was very little change in the amount of fish consumed.

### Background

People are exposed to mercury mostly through the consumption of finfish and shellfish. Mercury released into the environment is converted to MeHg in soils and sediments, and over time, bioaccumulates in finfish and shellfish. MeHg exposure to infants before birth is associated with adverse health effects, for example, neuropsychological deficits in IQ and motor function.

The EPA analyzed NHANES' 1999-2010 data to investigate trends over time in blood mercury concentrations and fish consumption in women of childbearing age (16-49 years). Each two-year NHANES survey is an independent sample that is representative of the U.S. population. EPA's analysis is described in detail in an EPA report titled, *Trends in Blood Mercury*

*Concentrations and Fish Consumption among U.S. Women of Childbearing Age, NHANES, 1999-2010.*

### How was this study conducted?

EPA developed a methodology to consistently assess trends over time in the NHANES blood mercury data. The methodology was peer reviewed, and then revised to reflect input from the peer reviewers. This methodology was applied consistently to the data over all six survey cycles.

The Agency used multiple imputation to calculate the values below the limit of detection for both blood inorganic and blood total mercury. EPA then calculated blood MeHg as the difference between the two values.

NHANES collects 24-hour dietary recall data and asks respondents how many times in the past 30 days they consumed 31 varieties of finfish and shellfish. EPA combined these data to create an estimate of 30-day finfish/ shellfish consumption in grams, and grams per kilogram bodyweight, for each respondent.

Next, EPA gathered data on fish tissue mercury concentrations from 20 sources, including the U.S. Food and Drug Administration, State Departments of Environmental Quality and Health, and data presented in peer-reviewed journals. The Agency used this data, combined with dietary recall data also from NHANES, to estimate 30-day mercury intake in micrograms per kilogram bodyweight and the mercury concentration in the fish consumed.

The Agency weighted all analyses using the recommended statistical weights. The sampling design variables were used in calculating the variance of the estimates as described in the NHANES Analytical Guidelines. EPA modeled the relationship between mean

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blood MeHg, blood MeHg above 5.8 µg/L, and fish consumption and mercury intake variables using regression analyses, adjusting for differences by respondent age, race, income, and time across NHANES releases.

## What Were the Results of the Study?

### *Trends in Blood Mercury Concentrations*

For blood MeHg, the geometric mean in 1999-2000 was 1.51 times higher than the geometric mean across the subsequent 10 years. This represents a decrease of 34 percent between 1999-2000 and 2001-2010.

The percent of women of childbearing age with blood MeHg over 5.8 µg/L in 1999-2000 was 2.86 times higher than the percent of women in 2001-2010, representing a 65 percent decrease between 1999-2000 and 2001-2010.

### *Associations between Fish Consumption Frequency and Blood Mercury Concentrations*

The study found a significant relationship between mercury intake from fish consumption and blood mercury. The analysis showed little change in fish consumption and mercury intake over the study period. There was a marginally statistically significant decreasing trend across NHANES survey releases in the ratio of mercury intake to fish consumed.

Demographic characteristics were associated with blood mercury as expected: higher concentrations observed with increasing age and income and higher concentrations observed in the “other” race category and lower concentrations observed in Latinos. Similar patterns between fish consumption and demographic characteristics were found.

## What Actions is EPA Taking to Reduce Mercury

In 2013, EPA took two significant actions toward making fish and shellfish safer to eat. In June, the Agency proposed new effluent guidelines for steam electric power plants, which would greatly reduce a major source of mercury discharges. Currently, steam electric power plants discharge 2,820 pounds of mercury into the Nation's waterbodies every year. Without

the new guidelines, EPA has determined these mercury wastes may be making fish unsafe for human consumption in 65% of the waterbodies where steam electric plants discharge. Second, in April EPA issued the new Mercury and Air Toxics rule, which sets emissions limitation standards for mercury emitted from power plants.

In support of these 2013 actions, EPA assessed its progress by looking at the measurement of blood mercury levels in women of childbearing age reported via NHANES by the CDC.

## Conclusions

The analyses found blood mercury concentrations in NHANES survey release 1999-2000 to be significantly higher than the mean of the remaining releases for both blood total mercury and blood MeHg. Additionally, the percent with MeHg greater than 5.8 µg/L is significantly higher in survey release 1999-2000. The analysis also found a slight quadratic trend in blood MeHg concentration since 1999-2000. This trend indicates decreasing blood MeHg concentrations between the initial sets of NHANES survey releases, followed by relatively small changes and a slight increase in the last years.

There was a marginally statistically significant decreasing trend across NHANES survey releases in the ratio of mercury intake to fish consumed that is consistent with women shifting their consumption to fish with lower mercury concentrations; however, other studies are needed to determine 1) if there is a link between changing consumption patterns and blood mercury, and 2) if fish advisories have led to the changing consumption patterns.

## For More Information

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