Researchers develop new and improved model to weigh the risks and benefits of fish consumption

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A new model developed by researchers could help inform guidelines and improve evidence-based advice on the risks and benefits of fish consumption, especially during pregnancy.

In a paper published in *The American Journal of Epidemiology*, researchers from Brigham and Women's Hospital, a founding member of Mass General Brigham; Harvard T.H. Chan School of Public Health; University of Rochester Medical Center; and Cornell University present a new framework that takes into account estimated average mercury content in consumed fish, helping weigh the detrimental effects of mercury against the potential benefits of nutrients found in fish.

Applying this approach to a fish-eating population in Massachusetts, the team found that, in general, consuming increasing amounts of low mercury-containing fish during pregnancy was beneficial, while consuming more high mercury-containing fish was harmful for neurodevelopment.

"For patients who are seeking guidance about fish consumption, public advisories can be confusing and lead to decreased fish intake," said senior author Susan Korrick, MD, of the Brigham's Channing Division of Network Medicine and Division of Pulmonary and Critical Care Medicine. Korrick is also a member of the Harvard Chan-NIEHS Center for Environmental Health.

"Our study finds that eating more fish was generally beneficial for neurodevelopment when pregnant individuals consumed fish containing low levels of mercury but detrimental when individuals consumed fish with the highest average mercury levels. It's important for people to think about what kind of fish they are consuming rather than simply cutting down on fish intake entirely," said lead author Sally Thurston, Ph.D., of the University of Rochester Medical Center.

Methylmercury (MeHg) exposure can lead to neurodevelopmental toxicity. However, many nutrients in fish are beneficial for neurodevelopment, including polyunsaturated fatty acids, selenium, iodine and vitamin D.

Many studies examining the relationship between mercury exposure and health outcomes measure mercury based on its accumulation in hair.

However, relying on hair samples alone makes it impossible to disentangle the potentially harmful effects of mercury from the beneficial effects of fish intake. For example, eating lots of fish that contain low levels of mercury or very little fish that contains high amounts of mercury could result in the same level of mercury in a hair sample but have different potential health risks.

Results from analyses that use common statistical approaches to this issue can be challenging to interpret. To address these limitations, the researchers proposed a new model in which they considered the estimated average mercury content of the consumed fish.

The team looked at data from participants in the New Bedford Cohort (NBC), a study that has followed 788 children of mothers living near the New Bedford Harbor Superfund site in Massachusetts.

In addition to studying hair samples, the team used survey data from a food frequency questionnaire that mothers completed approximately 10 days after giving birth. Participants filled out details about the different types of fish they consumed during pregnancy.

The researchers looked at the relationship between fish consumption—broken out into low-, medium- and high-average fish mercury—and neurodevelopment among the children in the cohort. The team measured neurodevelopment based on tests of IQ, language,

memory, and attention.

For children whose mothers consumed more fish in the lowest mercury category, fish intake was positively (beneficially) associated with neurodevelopmental outcomes; conversely, for children whose mothers consumed fish with the highest mercury levels, the association between fish intake and neurodevelopmental outcomes was negative (detrimental).

The authors note several limitations to the study, including that estimates of mercury in fish as well as survey measures of diet are imperfect. The study's population included only participants in the New Bedford area and looked only at neurodevelopmental outcomes. The study also does not account for variation in the beneficial nutrients in the fish consumed such as PUFA or selenium content.

"Our goal is for our study to help facilitate better estimation of the risk-benefit tradeoffs of fish consumption, a key component of many healthy diets," said senior author Susan Korrick, MD, of the Brigham's Channing Division of Network Medicine and Division of Pulmonary and Critical Care Medicine.

The team hopes that future work will expand on this modeling approach, taking both the average mercury and nutritional content of fish into account.

The authors are in the process of applying this model to other large studies of maternal fish consumption, including the Seychelles Child Development Study, which Thurston serves on as an investigator.

More information: Sally Thurston et al, A Novel Approach to Assessing the Joint Effects of Mercury and Fish Consumption on Neurodevelopment in the New Bedford Cohort, *The American Journal*

of Epidemiology (2024). DOI: 10.1093/aje/kwae149