

COMBINING NEWBORN BLOOD CONCENTRATIONS AND QUESTIONNAIRE DATA TO ESTIMATE INDIVIDUAL CUMULATIVE PRENATAL METHYLMERCURY EXPOSURE AMONG CHILDREN WITH AUTISM, DEVELOPMENTAL DELAY, AND TYPICAL DEVELOPMENT

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Background and Aims: Methylmercury (MeHg) is an environmental contaminant and a known developmental neurotoxicant. Because biomarker and questionnaire data have different limitations as estimates of exposure, there is increased interest in methods that combine these two types of information in order to gain the advantages of both. The aim of this study is to estimate the cumulative gestational dose of MeHg for each individual in our study population using both newborn bloodspots and seafood consumption questionnaire data collected from the Childhood Autism Risks from Genetics and the Environment (CHARGE) study, and to compare the cumulative dose among cases and controls.

Methods: CHARGE is a comprehensive, population-based case-control study with participants sampled from three strata: children with autism, children with developmental delay but not autism, and the general population. We measured total mercury concentrations in newborn bloodspots using inductively coupled plasma mass spectrometry (ICP-MS). To estimate seafood MeHg concentrations and corresponding doses for each study participant, we utilized a regression model based on a discrete one-compartment pharmacokinetic model that assumed a piecewise-constant ingestion rate. Cumulative dose was estimated based on the area under the exposure-time curve over the gestational period. Cumulative exposure was compared among the autism, developmental delay, and typically developing groups using the Kruskal-Wallis test.

Results: The regression-estimated average consumed MeHg fish concentration was 0.045 ppm. Cumulative dose did not differ significantly among the three developmental groups ($p=0.97$).

Conclusions: Our regression model estimated an average MeHg fish concentration that is consistent with several commonly consumed species in the United States, especially those that are lower in MeHg. Although cumulative exposure may be a more relevant exposure metric than biomarker concentration alone, neither measure was associated with neurodevelopmental outcomes in the CHARGE study.