Economic Impact of Mercury Exposure Study in Brief  
January 2017

Why is this study important?
*Economic implications of mercury exposure in the contest of the global mercury treaty: Hair mercury levels and estimated lost economic productivity in developing countries,* published in *Journal of Environmental Management,* is the first peer-reviewed study to estimate the economic impact of mercury pollution in developing and transition countries.

The study estimated a total of USD$77.4 million in annual lost earning potential at sites in 15 countries located near sources of mercury pollution named in the Minamata Convention. Governments agreed that these are among the most dangerous sources of mercury in the world. The study only examined a small number of sites, therefore, its findings suggest that a large economic burden in developing and transition countries could be avoided by timely implementation of measures to prevent mercury exposures. This is also the first peer-reviewed study to provide data on hair mercury levels in Belarus, Cameroon, Cook Islands, Nepal, Sri Lanka, and Uruguay. Previous studies measured hair mercury levels in Albania, Bangladesh, India, Kenya, Mexico, Russia, and Thailand but did not necessarily target communities located near mercury sources identified by the Minamata Convention.

What was measured?
The study measured mercury in the hair of 236 participants from 15 countries: Albania, Bangladesh, Belarus, Cameroon, Cook Islands, India, Indonesia, Kenya, Mexico, Nepal, Russia, Sri Lanka, Tanzania, Thailand, and Uruguay.

Where do the participants live?
The participants live near sources of mercury pollution named in the Minamata Convention. The Minamata Convention obligates actions to minimize and eliminate mercury pollution to protect human health and the environment. This includes releases from: chlor-alkali plants (Article 5); artisanal small-scale gold mining (ASGM) (Article 7); coal-fired power plants, waste incineration, non-ferrous metal smelting, and cement plants (Article 8); wastes (Article 11); and contaminated sites (Article 12). Sites with mixed sources of mercury pollution also were included since these represent the reality of emission sources encountered in most countries. One Small Island Developing State without industrial sources (Cook Islands) was included to reflect mercury sources from global deposition to oceans and subsequent contamination of fish.

What mercury levels were found?
Mercury levels in the hair of community participants across all sites and countries ranged up to 13.30 ppm. Average mercury levels varied from 0.48 ppm to 4.60 ppm across all 15 countries. Sixty-one percent of all the participants had hair mercury concentrations greater than 1 ppm, the level that approximately corresponds to the USA EPA reference dose. Updated calculations of this value have led to limit value of 0.58 ppm. Seventy-three percent of the participants had mercury hair levels equal to or greater than 0.58 ppm.

What do the 1 ppm and 0.58 standards mean?
A mercury concentration of 1 ppm in hair approximately corresponds to the US EPA reference dose. This is the daily exposure that US EPA considers "likely to be without an appreciable risk of deleterious effects during a lifetime." The 0.58 ppm standard has been proposed in light of data suggesting harmful effects of mercury at even lower levels of exposure.

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What are the health effects of mercury exposure?
Mercury damages the nervous system, kidneys and the cardiovascular system. The World Health Organization states that, “developing organ systems (such as the fetal nervous system) are the most sensitive to toxic effects of mercury...Other systems that may be affected include the respiratory, gastrointestinal, hematologic, immune, and reproductive systems.” Human exposure to mercury occurs primarily via the consumption of contaminated fish, although rice and even direct exposure to mercury vapor can be locally significant pathways.

What are the estimates of economic impact at these sites?
A total of USD$77.4 million in lost economic productivity was estimated assuming a 1 ppm reference level and USD$130 million if no reference level was used.

How was the estimate of economic impact calculated?
Researchers modeled the mercury levels on the premise that the distribution in the population sampled would be similar for pregnant women, resulting in fetal exposure and subsequent IQ loss in their children. They then obtained the birthrate for the area to calculate the number of IQ points lost per year, and assigned an economic impact based on previous research that estimated the value of each IQ point at USD$19,269. Researchers used this value to produce a country-specific estimate of the value of an IQ point that accounted for differences in GDP to estimate the economic impact of mercury-induced IQ loss at each location.

What does the “no reference level” mean in the economic calculations?
No reference level refers to the notion that no safe level of methylmercury exposure has been identified. Economic impacts calculated using no reference level are larger since any level of methylmercury exposure is assumed to result in some IQ loss.

What are the limitations of the study?
The potential impacts of atmospheric mercury emissions may range from local impacts to global impacts due to the long-range transport, but assessing mercury transport was beyond the scope of our study. We sampled a modest proportion of the population from each area, and we did not perform formal tests to evaluate population representativeness. IQ loss relationships with lifetime economic productivity were also modeled based upon data from the US. Given that technological growth in low- and middle-income countries (LMICs) is probably faster, we are likely to have underestimated the lost economic productivity due to methylmercury exposure. We also appreciate that there is significant variability in technological growth rates across LMICs, and so there is potential for significant uncertainty introduced by using an input from a single, industrialized nation. Due to resource constraints, we were not able to include a control group in our study, comprised of subjects living away from industrial sites. Future studies addressing this area are warranted.

What is the publication reference?