Teresa S. Bowers, Ph.D.
Xiaobin Liu

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Evaluating the Impact on IQ of Short-Term Increases in Blood Lead Levels.

Significant research has been conducted on the relationship between blood lead levels in young children and IQ (e.g. Lanphear et al., 2005). Governmental agencies have relied on determinations of the blood lead - IQ association to set permissible values for lead in environmental media, with the goal of protecting young children from elevated blood lead levels. However, an unanswered question is the degree to which long-term average vs. short-term elevations in blood lead levels are more strongly associated with the observed IQ deficits. Available datasets are for children with long-term exposures to lead. However, children in these datasets who have peak blood lead levels substantially higher than their life-time average, consistent with short-term exposure, can be identified and analyzed separately. This analysis was conducted with the Lanphear et al. (2005) pooled blood lead - IQ dataset, with corrections described by Crump et al. (2013). The data were divided by establishing a boundary between two subsets defined by peak blood lead = 10.9 + 1.6 x concurrent blood lead, where approximately 10% of the data fall above the boundary. Analyses of the full datasets using the Lanphear log-linear model reproduced the coefficients and R2s reported in Table 2 of Crump et al. The same model was run for the data subsets, regressing both peak blood lead and concurrent blood lead against IQ. The chronic exposure data subset analyses have similar regression coefficients and R2 values as reported in Crump et al. for the full dataset. Both regressions for this data subset are statistically significant. In contrast, the regressions of peak blood lead and concurrent blood lead vs. IQ for the acute exposure data subset are not statistically significant, and have positive rather than negative regression coefficients. This indicates that peak blood lead levels that are short-term are not correlated with IQ. However, concurrent blood lead levels for the acute exposure data subset are also not correlated with IQ. Several alternative analyses were also conducted, including with different blood lead metrics, different boundaries between data subsets, and with removing outliers. For all alternatives, regression results were similar. Possible explanations for the lack of correlation between blood lead and IQ for the acute exposure data subset will be presented. In conclusion, the results suggest that longterm chronic exposures to lead are more closely associated with IQ impacts than are short-term blood lead elevations.