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Replication Study: Association between Proximity to Artisanal Gold Mining and Blood Mercury Levels in Children in the Prestea-Huni Valley District, Ghana

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Abstract

Artisanal and small-scale gold mining (ASGM) is a major source of mercury pollution in Ghana. A prior study in the Prestea-Huni Valley district found an association between living near ASGM sites and higher blood mercury levels in children. This replication study aimed to verify those findings with an independent sample. The primary purpose was to independently replicate the analysis of the association between proximity to ASGM activities and blood mercury levels in children within the same district. The objective was to assess the consistency of the originally reported association. This was a community-based, cross-sectional replication study. A new sample of children was recruited from communities at varying distances from active ASGM sites. Venous blood samples were analysed for total mercury using cold vapour atomic absorption spectrometry. Proximity was categorised via geospatial mapping. Statistical analysis used multiple linear regression, controlling for covariates such as age, sex, and dietary fish intake, to mirror the original methodology. The replication confirmed a statistically significant positive association. Children residing within 2 km of an ASGM site had a mean blood mercury level of 12.8 µg/L. This was approximately 2.5 times higher than the mean level of 5.1 µg/L observed in children living more than 5 km away. This study corroborates the original finding that closer residential proximity to artisanal gold mining operations is associated with significantly higher blood mercury levels in children in the Prestea-Huni Valley district. Public health interventions should prioritise communities near ASGM sites. Stricter enforcement of environmental regulations on mercury use and enhanced health surveillance for children in mining areas are needed. Further research should investigate specific exposure pathways and long-term health outcomes. replication study, artisanal gold mining, mercury, child health, environmental exposure, Ghana This study provides

independent verification of a key public health finding, strengthening the evidence base for policy action on mercury pollution from small-scale mining.

Keywords: *Artisanal and small-scale gold mining, Mercury exposure, Environmental epidemiology, Ghana, Child health, Biomarker, Replication study*

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