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Pb isotopic composition as a tracer of human lead exposure in Bangladesh

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Lead exposure is a health concern worldwide, but the dominant sources of exposure are often unclear. Previous work in rural Bangladesh [1] has demonstrated the utility of Pb-isotopic composition as a tracer of potential sources of Pb in individuals with high blood lead levels (BLL). This approach compares a "fingerprint" of the Pb-isotopic composition of potential exposure sources to the Pb isotopic composition in the blood of individuals. This provides a powerful tool for remediation allowing public health officials to direct mitigation efforts to the most impactful potential sources. This study aims to characterize the isotopic composition of high-Pb concentration potential sources present in urban homes in Bangladesh. Materials from households include dust, paint, cosmetics, household products and cigarettes; materials from the surrounding environment include airborne particulates, soil and outfall from nearby industrial activity. The study leverages paired blood and Pb-contaminated materials from the same households. The compositions of many sources have overlapping 207Pb/204Pb vs 206Pb/204Pb ranges, but some clustered results for cosmetics, high-Pb household products have limited ranges. Despite the spread in values, these potential source compositions will be able to be directly compared to their paired blood samples to provide estimates of dominant source exposures or identification of sources that are likely minor contributors.

[1] Forsyth et al 2019. Sources of Blood Lead Exposure in Rural Bangladesh. Environmental Science & Technology 53(19):11429–11436