Abstract

Lead is a significant health threat to people, especially for children where elevated absorption of lead into the bloodstream can cause permanent damage. One site for concern of lead exposure is the surrounding communities of the retired Exide Technologies lead-acid battery smelter in Vernon, California. The California Department of Toxic Substances Control (DTSC) is leading an extensive cleanup effort to remove lead-contaminated soil from affected residences and eliminate the negative health risks posed by the contamination. Soil sampling conducted for approximately 8,500 parcels serves as the primary dataset for this research. While DTSC is currently undertaking the cleanup process on a parcel-by-parcel basis, this thesis works toward understanding the effect of geographic scale in the estimation of levels of lead contamination. It also offers alternatives for identifying priority areas for cleanup by using various aggregation methods and examining how the resulting values may be affected by scale. This research used Empirical Bayesian Kriging to produce interpolated surfaces of lead concentration values. Various aggregation methods were then utilized to aggregate the surfaces into easily defined geographical units of different scales, including block groups, blocks, and parcels. The resulting aggregation values include the mean, percent area, and a Hazard Quotient, an index value for determining health risk. The results demonstrate that the larger areas of the block groups moderate high lead concentration values and thus have lower overall aggregation values for the block groups. In contrast, blocks have a greater tendency to include these high lead concentrations in the aggregations resulting in higher overall values and wider ranges of values for the blocks. This research provides alternative approaches for prioritizing the cleanup of contaminated sites that could be more effective to address the health risks associated with contamination and can be applied to other areas faced with the same problem in the future.