

## **INDIVIDUAL VERSUS ECOLOGICAL ANALYSES: EXPERIMENTS WITH SYRACUSE, NY PEDIATRIC LEAD POISONING DATA**

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**ABSTRACT.** One serious weakness of the ecological approach is an inability to draw proper inferences from areally aggregated entities to individual entities constituting these aggregates. But such ecological correlation studies assessing health effects of environmental exposure are in increasing demand because individual-level assessments in these types of situations frequently are too difficult, and their data too noisy, messy, and dirty (e.g., group averaging can dampen measurement error, increasing the group range of a response over that for individuals can improve statistical power). Although individual-level inferences can be drawn from ecological analyses when a predictor-response relationship is linear, in practice this additive specification often is unlikely. Rather, predictors frequently act synergistically, resulting in a disproportionate increase in a response outcome as they individually increase, due to amplifications by their interactions. Accordingly, the mean response for geographic aggregates is a function of within-area individual-level means and variances/covariances, quantities that often are unavailable, frequently because of confidentiality reasons. Individual pediatric blood lead level data from Syracuse, NY, for 1992-1996, are used to explore the possibility of modeling census geography aggregates with Bayesian hierarchical random effects models to see whether computed random effects terms can be used as valid surrogates for recapturing within-area variability.