

Incorporating Spatial Predictions of Ambient Particulate Matter into an Analysis of Asthma Hospital Admissions

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Air pollution health effect studies often implicitly assume that ambient source air pollution exposures are homogeneous for all individuals within a target population. In large or topographically variable geographic areas this assumption is suspect. We make use of a relatively fine spatial scale in modeling asthma-related hospital admissions as a function of ambient PM₁₀ in the Seattle-Tacoma area. This is accomplished by using a spatio-temporal model of air pollution to predict ambient PM₁₀ at the level of zip code zones. The spatio-temporal model developed is formulated as a Markov random field with specified conditional distributions. We incorporate these into an aggregate disease model for asthma hospital admissions. Our aggregate model differs from a typical ecologic time series model in that it is derived from a plausible individual-level disease model. The health effect estimate from this model may differ from an ecologic time series model estimate because of model or predictor mis-specification (or both). We compare the various estimates and discuss the implications for air pollution health effects studies.