BIOSTATISTICS SEMINAR

Quantifying Ozone-Related Mortality Under Climate Change: Methods to Incorporate Uncertainty in Future Ozone Exposures

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Abstract

Climate change is expected to have many impacts on the environment, including changes in ozone concentrations at the surface level. A key public health concern is the potential increase in ozone-related summertime mortality if surface ozone concentrations rise in response to climate change. Previous health impact studies have not incorporated the variability of ozone into their prediction models. We propose a Bayesian posterior analysis and Monte Carlo estimation method for quantifying health effects of future ozone. The key features of our methodology are (i) the propagation of uncertainty in both the health effect and the ozone projections and (ii) use of the empirical distribution of the daily ozone projections to account for their variation. We use interpolation to improve the accuracy of averaging ozone exposures over the irregular shaped county regions where mortality and demographic information is reported. In addition, we compare our thin plate spline interpolation to other linear interpolators. By carefully staging our computations and using efficient and parallel data analysis tools we are able to handle a very large volume model output and still do relevant computations on a daily time scale. We quantify the expected change in ozone-related summertime mortality in the contiguous United States between 2000 and 2050 under a changing climate, and we compare two future emissions scenarios.

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