Using Geographically Weighted Regression for Analyzing Disproportionate Environmental Impacts: Adverse Health Risks From Air Toxics in Florida

***Angela Gilbert* and Jayajit Chakraborty**
Department of Geography, University of South Florida, Tampa, FL

Background and Objectives: Previous quantitative research on racial/ethnic and socioeconomic inequities in the distribution of environmental hazards has been limited by a focus on residential proximity to pollution sources and the use of traditional regression techniques that fail to discern spatial variations in the statistical relationships between environmental risk and race/ethnicity or socioeconomic status (SES). These methodological gaps are addressed through a case study that seeks to determine: (1) if potential health risks from exposure to hazardous air pollutants in Florida are distributed inequitably with respect to race/ethnicity and SES, and (2) how the nature and significance of the statistical association between cancer risk and race/ethnicity or SES varies across the state.

Methods: This study integrates census tract-level estimates of cumulative cancer risk from the U.S. Environmental Protection Agency's 1999 National-Scale Air Toxics Assessment with Census 2000 sociodemographic data. An innovative local spatial statistical technique known as geographically weighted regression (GWR), which produces a separate regression equation for each tract, is utilized to explore spatial variations in statistical relationships between cancer risk and explanatory factors within Florida.

Results: Results indicate that race and ethnicity are significantly associated with cancer risks in Florida. Furthermore, maps of model parameters demonstrate that these statistical relationships differ significantly across Florida.

Conclusion: Conventional multivariate regression can mask important local variations in statistical relationships relevant to the analysis of environmental justice (EJ). Future use of statistical methods in EJ should be sensitive to the local processes of spatial effects.