Fall Colloquium

October 24, 3:30-4:30pm
Seitz 313

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A spatial causal analysis of wildland fire-contributed PM using numerical model output

Abstract: Wildland fire smoke contains hazardous levels of fine particulate matter (PM2.5), a pollutant shown to adversely affect health. Estimating fire attributable PM concentrations is key to quantifying the impact on air quality and subsequent health burden. This is a challenging problem since only total PM is measured at monitoring stations and both fire-attributable PM and PM from all other sources are correlated in space and time. We propose a framework for estimating fire-contributed PM and PM from all other sources using a novel causal inference framework and bias-adjusted chemical model representations of PM under counterfactual scenarios. The chemical model representation of PM for this analysis is simulated using Community Multi-Scale Air Quality Modeling System (CMAQ), run with and without fire emissions across the contiguous U.S. for the 2008-2012 wildfire seasons. The CMAQ output is calibrated with observations from monitoring sites for the same spatial domain and time period. We use a Bayesian model that accounts for spatial variation to estimate the effect of wildland fires on PM and state assumptions under which the estimate has a valid causal interpretation. Our results include estimates of absolute, relative and cumulative contributions of wildfires smoke to PM for the contiguous U.S. Additionally, we compute the health burden associated with the PM attributable to wildfire smoke.