

STATISTICS COLLOQUIUM

MONDAY, APRIL 29, 2013

TALK: 4:15 PM — SCIENCE CENTER RM. 705

RECEPTION: 3:50 PM — SCIENCE CENTER, 7TH FLOOR

“Bayesian Effect Estimation Accounting for Adjustment Uncertainty”

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ABSTRACT

Model-based estimation of the effect of an exposure (or treatment) on an outcome is generally sensitive to the choice of which confounding factors are included in the model. We propose a new approach, which we call Bayesian adjustment for confounding (BAC), to estimate the effect of an exposure of interest on the outcome, while accounting for the uncertainty in the choice of confounders. Our approach is based on specifying two models: (1) the outcome as a function of the exposure and the potential confounders (the outcome model); and (2) the exposure as a function of the potential confounders (the exposure model). We consider Bayesian variable selection on both models and link the two by introducing a dependence parameter, ω , denoting the prior odds of including a predictor in the outcome model, given that the same predictor is in the exposure model. In the absence of dependence ($\omega = 1$), BAC reduces to traditional Bayesian model averaging (BMA). In simulation studies, we show that BAC, with $\omega > 1$, estimates the exposure effect with smaller bias than traditional BMA, and improved coverage. We, then, compare BAC, and traditional BMA in a time series data set of hospital admissions, air pollution levels, and weather variables in Nassau, NY for the period 1999–2005. Using each approach, we estimate the short-term effects of PM_{2.5} on emergency admissions for cardiovascular diseases, accounting for confounding. This application illustrates the potentially significant pitfalls of misusing variable selection methods in the context of adjustment uncertainty.