Yale SCHOOL OF PUBLIC HEALTH
Biostatistics

SEMINAR

Bayesian effect estimation accounting for adjustment uncertainty

Francesca Dominici, Ph.D.
Associate Dean and Professor
Department of Statistics
Harvard School of Public Health

ABSTRACT

Model-based estimation of the effect of an exposure 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 (ω= 1), BAC reduces to traditional Bayesian model averaging (BMA). In simulation studies, we show that BAC, with ω \textgreater 1, estimates the exposure effect with smaller bias than traditional BMA, and improved coverage. We, then, compare BAC, a recent approach of Crainiceanu, Dominici, and Parmigiani (2008, Biometrika 95, 635-651), 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 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.

reference: Wang C, Parmigiani G, **Dominici F**. (2012) Bayesian effect estimation accounting for adjustment uncertainty *Biometrics*. DOI: 10.1111/j.1541-0420.2011.01731.x

4:15 p.m. Tuesday, March 26, 2013

LEPH 115, 60 College Street