Biostatistics: Causal Inference and Measurement Error

Chair: Mohammad Ehsanul Karim (University of British Columbia)

STEVE FERREIRA, Université de Montréal
Causal Inference Methodology to Evaluate the Time-Varying Effect of Asthma Medication on Pregnancy Duration

Uncontrolled asthma during pregnancy could have potentially adverse effects on the fetus' health. To assess the comparative impact of maternal use of different asthma controlling therapies on pregnancy duration we used a cohort of pregnant women from the linkage of provincial administrative databases (RAMQ and MED-ECHO). Since asthma control is a time-varying confounder it must be adjusted for using a causal analysis. We will address this issue by defining the causal parameter of interest through Marginal Structural Cox Models estimated using Inverse Probability of Treatment Weighting and Targeted Minimum Loss-based Estimation. I will present early results from this study.

PABLO GONZALEZ GINESTET, McGill University
Bayesian Adjustment for Confounding in Bayesian Propensity Score Estimation

I propose a Bayesian approach for Propensity Score (PS) variable selection and estimating the average causal effect as a weighted average over different PS. The approach is a two-stage modeling and is based on specifying three models: (1) the prognostic score model; (2) the PS model, and (3) the outcome model. The key to my approach is the incorporation in the second stage of an informative prior distribution on the parameter that controls the inclusion of each covariate in the PS, which is obtained in the first stage. Throughout, I use Reversible Jump MCMC algorithm for each stage.

YEYING ZHU, University of Waterloo
Variable Selection in the Potential Outcomes Framework

A recent topic of much interest in causal inference is model selection. In this talk, we describe a framework in which to consider penalized regression approaches to variable selection for causal effects. Analogies and links with the literature on machine learning methods, missing data and imputation are drawn. A difference LASSO algorithm is defined, along with its multiple imputation analogues. The procedures are illustrated using a well-known right heart catheterization dataset.

MICHELLE XIA, Northern Illinois University
Bayesian Inference for Unidirectional Misclassification in Regression Models

We consider unidirectional misclassification, meaning that the direction of error is known. Well-known examples of unidirectional misclassification include misrepresentation in self-reported measures. We investigate the identifiability of Bayesian regression models when either the binary covariate or response is subject to unidirectional misclassification. We consider whether the knowledge on the direction of error suffices, so that adjustment for misclassification can be undertaken without any source of information on the magnitude of the error. While measurement error models are generally nonidentified, for the case of unidirectional misclassification, we can obtain model identifiability (partial identification) when the response variable is non-binary (binary).

KHOKAN SIKDAR, University of Calgary
Estimating the Prevalence of Hypertension from Administrative Data in the Absence of a Gold Standard

The study proposes a case ascertainment algorithm for surveillance of hypertension in children and youth in Alberta. First, multiple case ascertainment algorithms were used and compared to estimate the prevalence of hypertension across the province, assessing for regional differences and the effects of demographic factors. Second, a Bayesian latent class regression model was

developed to assess the performance of the algorithm, when there is no perfect reference for a gold standard. The real data included all patients with hypertension aged 20 years or below in years 1994/95 to 2009/10; Population-based administrative data were used to identify patients diagnosed with hypertension.

ROJIAR HADDADIAN, University of Manitoba

Simulation-based Estimation in Generalized Linear Models with a Binary Response Variable and Mismeasured Covariates

The method of moments estimation provides feasible alternatives to the likelihood approach when the likelihood function involves multiple integrals which do not have closed forms. We present a simulation-based method-of-moments approach for constructing estimators for unknown parameters of generalized linear models with a binary response variable and mismeasured covariates. We prove consistency and asymptotically normality of the proposed estimators under some regularity conditions on the distribution of the unobserved covariates and error components. We also derive a model specification test. Our approach is illustrated through simulation studies and data from Aids Clinical Trial Group (ACTG175).