



JOHNS HOPKINS  
BLOOMBERG  
SCHOOL of PUBLIC HEALTH

*Department of Biostatistics*

## BIOSTATISTICS SEMINAR

### **Instrumental Variables Estimation of Mann-Whitney Causal Effect in Randomized Trials with Non-Compliance**

Dr. Lu Mao, Assistant Professor, Department of Biostatistics and Medical Informatics,  
University of Wisconsin, Madison

#### Abstract:

The instrumental variable (IV) approach is a popular and ingenious way of drawing causal inference under non-ignorable treatment. The existing literature on IV estimation has been centered around the (local) average causal effect (ACE), the difference between the expectations of potential outcomes. An alternative causal estimand, called the Mann-Whitney causal effect (MWCE), concerns the probabilities for the relative magnitude of randomly chosen potential outcomes, and has recently aroused much interest for its robustness and interpretability. Estimation of the MWCE has been studied in settings with ignorable treatment. In this talk, we consider inference of local MWCE for compliers in randomized trials with non-compliance using binary randomization status as IV. An estimator is constructed based on the estimators for the marginal distribution functions of potential outcomes and its asymptotic variance derived via the functional delta method. We also develop sensitivity bounds for the estimand when key IV assumptions, such as exclusion restriction and monotonicity, are at fault. Furthermore, we derive and compare the asymptotic relative efficiencies of hypothesis tests based on the local MWCE and local ACE and those based on intention-to-treatment analysis under simplifying conditions. The proposed methods are demonstrated through extensive simulation studies and analysis of real data from a job training program. Finally, we show how the ideas used in our approach can be expanded to accommodate multi-valued instrument, censored outcome, and general causal estimand.

Johns Hopkins Bloomberg School of Public Health, Department of Biostatistics  
Monday, September 10, 2019, 12:15:1-15, Room W2008 (Refreshments 12:00pm)

For disability access information or listening devices, please contact the Office of Support Services at 410-955-1197 or on the web [www.jhsph.edu/SupportServices](http://www.jhsph.edu/SupportServices). EO/AA

**Dept. of Biostatistics, 615 N. Wolfe Street, Suite E3527 Baltimore, MD 21205**