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Causal Inference Program Opening Workshop
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SPEAKER TITLES/ABSTRACTS

Michael E. Sobel
Columbia University

"Estimating Causal Effects in Studies of Human Brain Function: new models, methods and estimates"

Neuroscientists often use functional magnetic resonance imaging (fMRI) to infer effects of treatments on neural activity in brain regions. In a typical fMRI experiment, each subject is observed at several hundred time points. At each point, the blood oxygenation level dependent (BOLD) response is measured at 100,000 or more locations (voxels). Typically, these responses are modeled treating each voxel separately, and no rationale for interpreting associations as effects is given. Building on Sobel and Lindquist (2014), who used potential outcomes to define unit and average effects at each voxel and time point, we define and estimate both \point" and \cumulated" effects for brain regions. Second, we construct a multi-subject multi-voxel multi-run whole brain causal model with explicit parameters for regions. We justify estimation using BOLD responses averaged over voxels within regions, making feasible estimation for all regions simultaneously, thereby also facilitating inferences about association between effects in different regions. We apply the model to a study of pain, finding effects in standard pain regions. We also observe more cerebellar activity than observed in previous studies using prevailing methods.

Co-author: Martin A. Lindquist, Johns Hopkins University