SORA-TABA Annual Workshop & DLSPH Biostatistics Research Day

Fundamentals of Causal Inference: With R

Monday
May 15th, 2023
9:00am – 5:00pm

Dalla Lana School of Public Health
University of Toronto
155 College Street, Toronto
Virtual Attendance Option Available

Babette Brumback

Professor Emerita, University of Florida, Department of Biostatistics

Abstract: One of the primary motivations for clinical trials and observational studies of humans is to infer cause and effect. Disentangling causation from confounding is of utmost importance. Fundamentals of Causal Inference: With R explains and relates different methods of confounding adjustment in terms of potential outcomes and graphical models, including standardization, doubly robust estimation, difference-in-differences estimation, front-door estimation, and instrumental variables estimation. These methods are compared in terms of estimating the average effect of treatment on the treated (ATT). The fundamentals of mediation analysis and adjusting for time-dependent confounding are also presented. Several real data examples, simulation studies, and analyses using R motivate and illustrate the methods throughout. The course assumes familiarity with basic statistics and probability, regression, and R. The course will be taught with a blend of lecture and worked examples.

Program:

1) **Introduction**
   a. Definitions and Datasets
   b. Potential Outcomes Framework
   c. Directed Acyclic Graph

2) **Adjusting for Confounding Part One**
   a. Standardization
   b. Difference-in-Differences Estimation

3) **Adjusting for Confounding Part Two**
   a. Front-Door Estimation
   b. Instrumental Variables Estimation
   c. Comparison of the Four Methods (in terms of estimating the average effect of treatment on the treated, or ATT)

4) **More Advanced Topics**
   a. Mediation
   b. Time-Dependent Confounding *(time permitting)*

Speaker Bio: Babette Brumback is known for her work on causal inference. She is the author of the recently published textbook, *Fundamentals of Causal Inference: With R*. Babette is Professor Emerita of Biostatistics at the University of Florida, and she is an elected member of Delta Omega and a Fellow of the American Statistical Association. Babette's statistical research has concentrated on methods for longitudinal data analysis, causal modeling, bias adjustment, and analysis of data from complex sampling designs. She has also collaborated extensively on public health and medical studies concerning a broad array of research areas.

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