

Causal Mediation Analysis by Linda Valeri

Abstract

Mediation analysis concerns assessing the mechanisms and pathways by which causal effects operate. The course will cover the relationship between traditional methods for mediation in epidemiology and the social sciences and new methods in causal inference. All theoretical concepts will be set into the context of research questions in the biomedical social sciences. The course will enable the participants to conduct their own mediation analyses in settings with either single or multiple mediators. R packages, SAS and Stata commands to implement these techniques will be covered and distributed to course participants. The use and implementation of sensitivity analysis techniques to assess the how sensitive conclusions are to violations of assumptions will be covered.

Outline

- Module 1a – Traditional statistical approaches for mediation analysis and their limitations (approx. 1h)
- Module 1b – Theory of counterfactual based mediation analysis (approx. 1h)
- Module 2a – Regression based approaches for mediation analysis theory and application with R package *CMAverse* (approx. 2h)
- Module 2b – Weighting based approaches for mediation analysis theory and application with R package *CMAverse* (approx. 2h)
- Module 3a – Sensitivity analyses for unmeasured confounding and measurement error theory and application with R package *CMAverse* (approx. 1h)
- Module 3b – Decomposition of the total effect in mediating and interactive mechanisms theory and application with R package *CMAverse* (approx. 1h)

Learning Outcomes At the end of the course, participants should:

1. Understand the limitations of traditional mediation analyses based on structural equation models.
2. Understand the meaning of natural direct and indirect effects.
3. Be able to assess the plausibility of the assumptions required for the identification of natural direct and indirect effects.
4. Be able to interpret causal mediation analysis models.
5. Be able to conduct mediation analyses based on *CMAverse* in R.
6. Be able to communicate the results and assumptions of a mediation analysis

Audience All participants are expected to have ample experience with the application of regression based modeling (i.e. multiple linear regressions and logistic regressions as a minimum) and familiarity with R. Participants are not expected to have had prior exposure to the potential outcome framework for causal inference