

# Statistical Learning in Mediation Analysis

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## Chapter 0: Overview of the course

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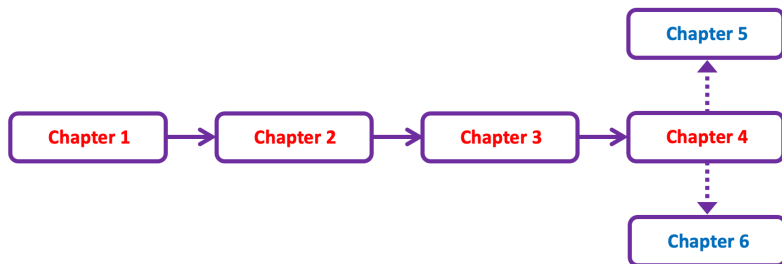
### MODULE 13

**Summer Institute in Statistics for  
Clinical and Epidemiological Research**  
July 2023

# Organization of this course

- 1 Introduction to causal inference and mediation analysis
- 2 Controlled direct effects
- 3 Natural direct and indirect effects
- 4 Controlled and natural direct effects under exposure-induced confounding
- 5 Interventional mediation effects
- 6 Direct and indirect effects for stochastic interventions

## Organization of this course



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## LEARNING OBJECTIVES:

At the end of this short course, we expect each student to have an understanding of:

- 1 the role of a causal model in making explicit the available background knowledge;
- 2 the definition of counterfactuals and their role in defining key causal parameters used to study mediation;
- 3 the key formulas for identifying causal mediation parameters based upon the observed data;
- 4 certain traditional techniques for inference on mediation parameters and their limitations;
- 5 more advanced techniques for mediation analysis that facilitate the integration of machine learning tools;
- 6 the challenges arising when there is exposure-induced confounding of the mediation-outcome relationship and possible remedies to address these;
- 7 the difficulties associated to multi time-point (i.e., longitudinal) mediation.

We expect that familiarity with the above concepts will allow students to effectively communicate and collaborate with biostatisticians on causal analyses.

# Organization of this course

## **A few guidelines for the week...**

- Audience is heterogeneous – we will try to cater to everyone as best we can.
- Slides include more details than strictly needed to understand the material.
- Please feel absolutely free to ask clarification questions at any time, but reserve 'enrichment' questions for later in the day or for one-on-one chats during breaks.
- This course is new and has ample room for improvement. Feedback is very welcome.