

# Modern Statistical Learning Methods for Observational Data and Applications to Comparative Effectiveness Research

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## Introduction

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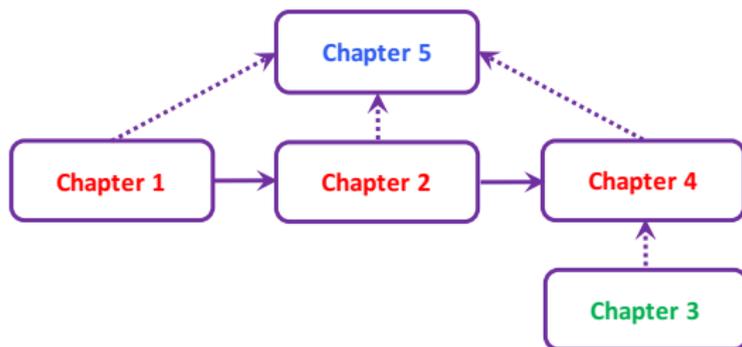
### MODULE 14

**4th Annual Summer Institute for Statistics in Clinical Research**

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# Organization of this course

- 1 Introduction to causal inference
- 2 Basic identification and estimation of an average treatment effect
- 3 Super learning
- 4 Efficient, doubly-robust estimation of an average treatment effect
- 5 Additional topics



## 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 causal effects that address the scientific question of interest;
- 3 the key identification formulas – i.e., G-computation and inverse-probability-of-treatment weighting (IPTW) – for linking counterfactual and observed data parameters in the context of observational data;
- 4 the various traditional techniques for causal inference and their limitations;
- 5 the benefits of the Super Learner as an optimal, data-driven and pre-specified approach to flexible estimation;
- 6 the benefits of more advanced techniques for causal inference, including the augmented IPTW and TMLE estimators.

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 day...**

- 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 is the first offering of this course, so there is still plenty of room for improvement. Feedback is therefore particularly welcome.