Modern Statistical Learning Methods for Observational Biomedical Data

> Chapter 0: Overview of the course

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MODULE 4

Summer Institute in Statistics for Clinical and Epidemiological Research

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- Introduction to causal inference
- 2 Basic identification and estimation of an average treatment effect
- Super learning
- Efficient, doubly-robust estimation of an average treatment effect
- Identification and inference on the average treatment effect of a time-varying intervention
- 6 Additional topics

Organization of this course



LEARNING OBJECTIVES:

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

- the role of a causal model in making explicit the available background knowledge;
- I the definition of counterfactuals and their role in defining causal effects that address the scientific question of interest;
- It he key identification formulas for linking counterfactual and observed data parameters in the context of observational data;
- 4 the various traditional techniques for causal inference and their limitations;
- It he benefits of the Super Learner as an optimal, data-driven and pre-specified approach to flexible estimation;
- the benefits of more advanced techniques for causal inference, including the augmented IPTW and TMLE estimators;
- **7** the difficulties associated to inference on the average treatment effect of a multi time-point intervention, and the extension of objectives 3 and 6 to this context.

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

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 course is always evolving, and there is still plenty of room for improvement. Feedback is very welcome.