

Lecture 15

10-18-2021

What did we cover last time?

Last week we covered attrition

We discussed briefly bounding and weighting methods to get an estimate of $E[Y]$

What are we doing this week

Checkpoint 9, WP6, and PS3 are due on Friday.

The back half of the course is focused on "observational" studies

Today we are going to (re)introduce some of the assumptions we need to claim causality in an observational study

What is an observational study?

An observational study is a research design where treatment is not under control of the researcher.

Observational studies vary in their plausibility.

"If you can do the experiment, do the experiment. If you cannot do the experiment, find something that resembles it as closely as possible."

Treatment Assignment in Observational Studies

Good observational studies have a well-defined treatment that began at a well defined time. Treatment assignment is not necessarily random, but the circumstances of the study indicate that it is plausibly random.

Poor observational studies do not have a well-defined treatment

Observational studies **must** rely on the unconfoundedness assumption, which may be more or less plausible in a given study

Comparability of Treatment and Control Arms

In good observational studies, the two groups have similar balance across treatment and control groups along *observable covariates*

You should be able to find a table that shows whether this holds.

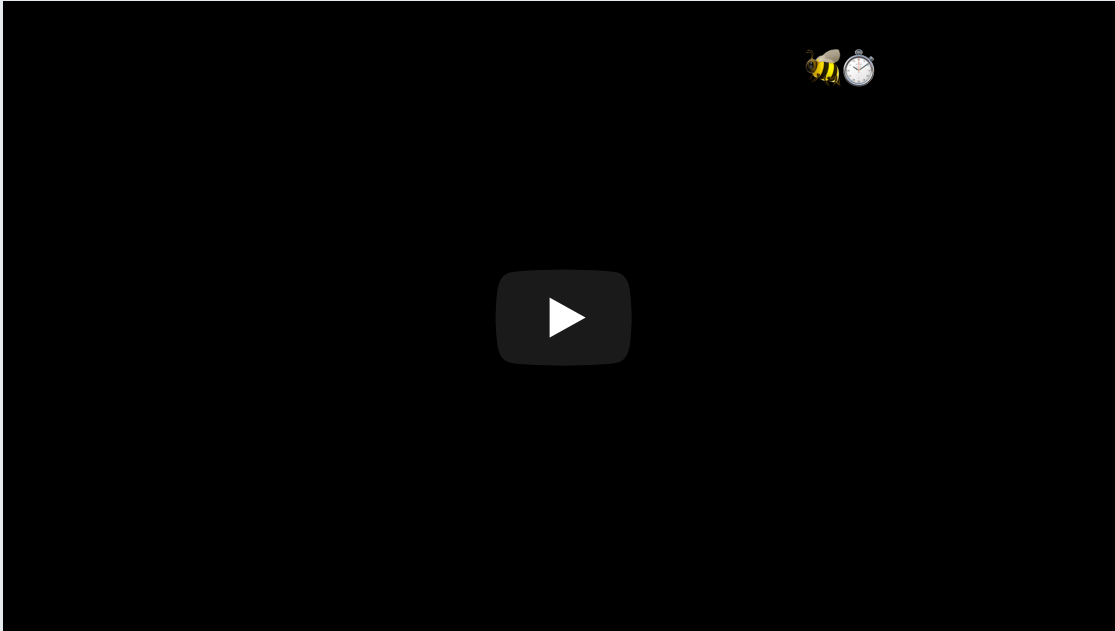
Alternatives to Treatment Effects

Good observational studies provide the most plausible alternatives to the treatment effect as identified.

The design of the study includes features to test (at least) implications of these alternatives.

Bad observational studies may only mention alternatives, but do not test them.

A Brief Aside about Bees



Should you wear a seatbelt?

Driver Result	Passenger Result	NB/B	B/NB
Driver Died	Passenger Survived	189	153
Driver Survived	Passenger Died	111	363

Exclusion Criteria in Observational Studies

In good observational studies, units are included based on covariates and the same criteria are used in both treatment and control groups.

In bad observational studies, the criteria for membership in the treated and control groups differ.

Can Units leave the treatment group?

In a good observational study units do not exit from their treatment status. Units who do not comply with assigned treatment remain in the assigned treatment group with these characteristics noted.

In a bad observational study, there is no clear distinction of what constitutes assignment to treatment, acceptance of treatment, receipt of treatment, or switching treatments.

Treatment Assignment Questions in Observational Studies

"What is the theoretical estimand of interest?"

"Why can't you do an experiment?"

"Why did this unit receive treatment?"

A dictum about Observational Studies

"With an experiment, natural experiment, a discontinuity, or some other strong design, no amount of econometric or statistical modeling can make the move from correlation to causation persuasive" Jasjeet S. Sekhon

Okay so what if we assume selection on observables?

A common estimand of interest in observational studies is the ATT

$$E[Y_i(1)|D_i = 1] - E[Y_i(0)|D_i = 1]$$

This holds under "Strong Ignorability"

$$Y_i(0), Y_i(1) \perp\!\!\!\perp D_i | X$$

$$0 < P[D = 1|X] < 1$$

Okay so what if we assume selection on observables?

Given strong ignorability:

$$E[Y_{ij}|D_i = 1, X_i] = E[Y_{ij}|D_i = 0, X_i]$$

In words: once we make an assumption we can continue as if treatment was randomly assigned.

By conditioning on observed covariates, we achieve balance on observables and make the assumption that the only difference between the two groups is the potential outcomes we observe.