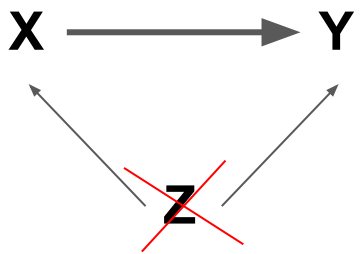
Political Science 210: Introduction to Empirical Methods

Week 4: Experiments

Causal Inference

- Remember that in social science we often want to know whether there is a *causal* relationship between two things:



- But in the “real world,” there might be other confounding factors affecting the process…
- …which means we need to somehow control for other confounding factors and isolate the relationship between X and Y

The problem with observation

We might try to observe the process in action, but how do we know that we've controlled for all potential confounding variables?

What issues might we face if we try to observe…

- How watching a political debate affects a person's vote?
- How electing a female political representative impacts policymaking?
- How studying an extra hour will improve your grade on your next midterm?

Can we ever really know if we've accounted for every confounding factor?

The goal of causal inference

We want to compare the outcome (Y) with its *counterfactual*:

- How can we measure Y after exposure to X?
- How does it compare to an identical version of Y *in the same time period* that is not exposed to X?

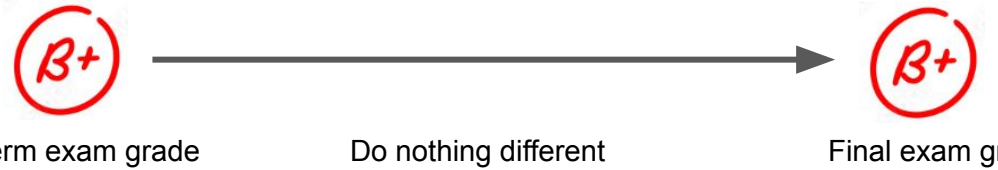
$$Y_{after \mid treat} - Y_{after \mid no\ treat} = \text{Treatment effect}$$

The goal of causal inference

Example: Let's say you want to improve your midterm grade and plan to study an extra hour so you can get a better grade on the final. Will it have any effect?

Universe 1:

Universe 2:



Effect of extra studying: Half a letter grade

We can study this effect through:

- Traveling to an alternate dimension
- Cloning (???)
- Magic

Random assignment

Since we can’t have two identical copies of the same person at the same time, we can instead take a *group*, divide it randomly, and give the treatment to one group.

Random assignment

We assume the groups are identical if they are selected *randomly*, given sufficient sample size.

If there's no systematic bias in the assignment to the two groups, we assume that the **average** outcomes will be the same if there is no treatment.

Random assignment

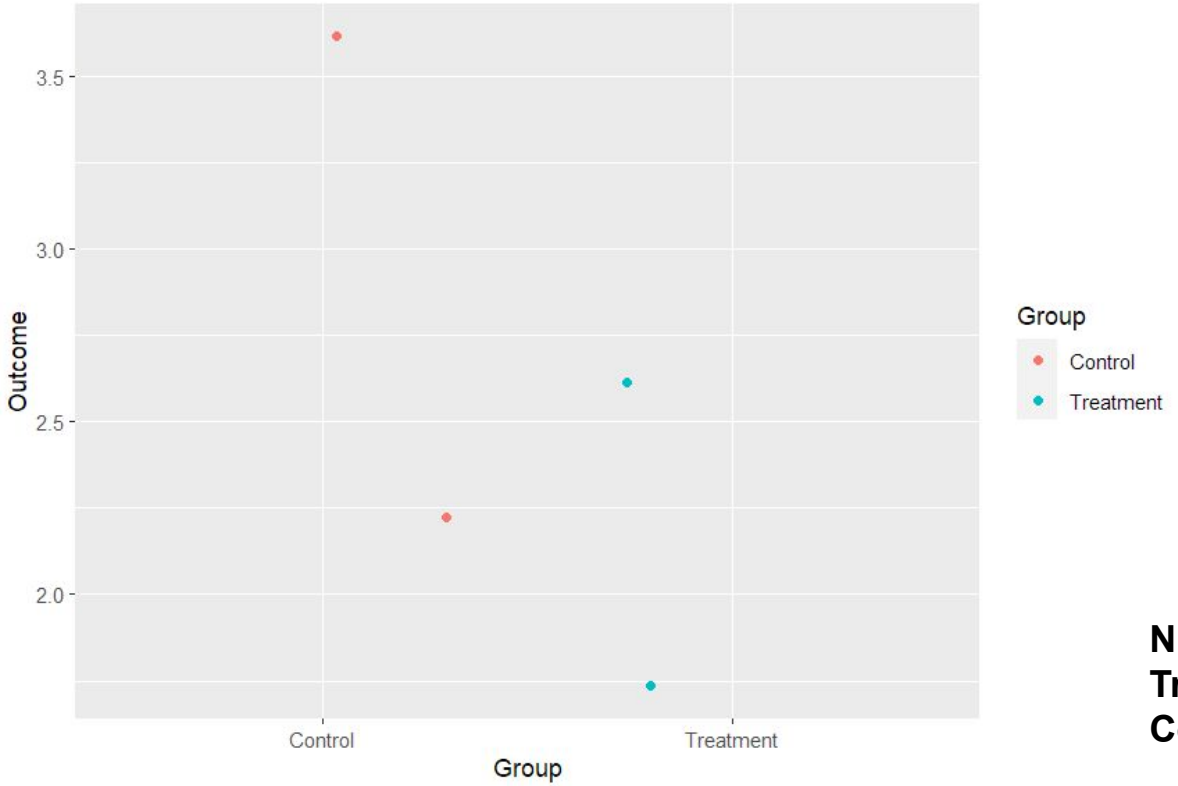
The manipulation of treatment to one of the two groups is what makes a study an *experiment*.

Random assignment

average(Studying) - average(Not studying) = average(effect of Studying)

–

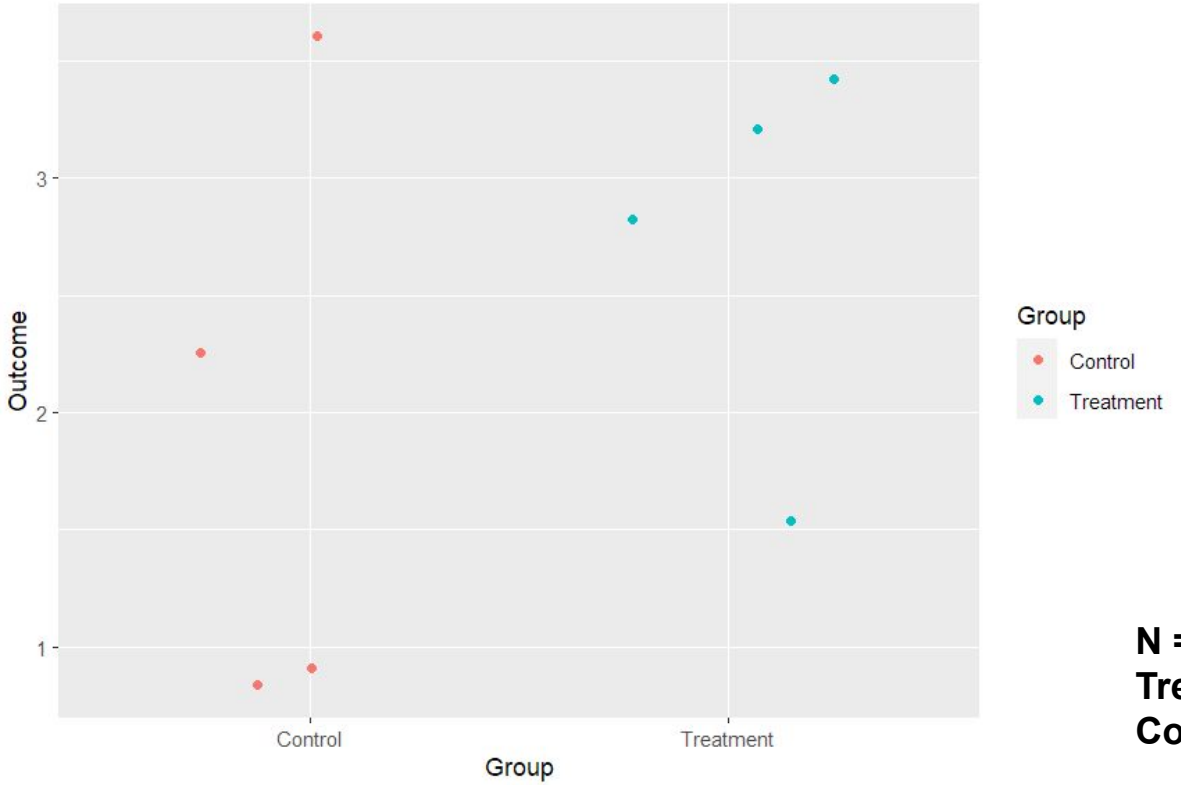
Sample size



You'll need a large enough sample size to make sure that random selection isn't making biased selections by accident

N = 4
Treatment group: 2
Control group: 2

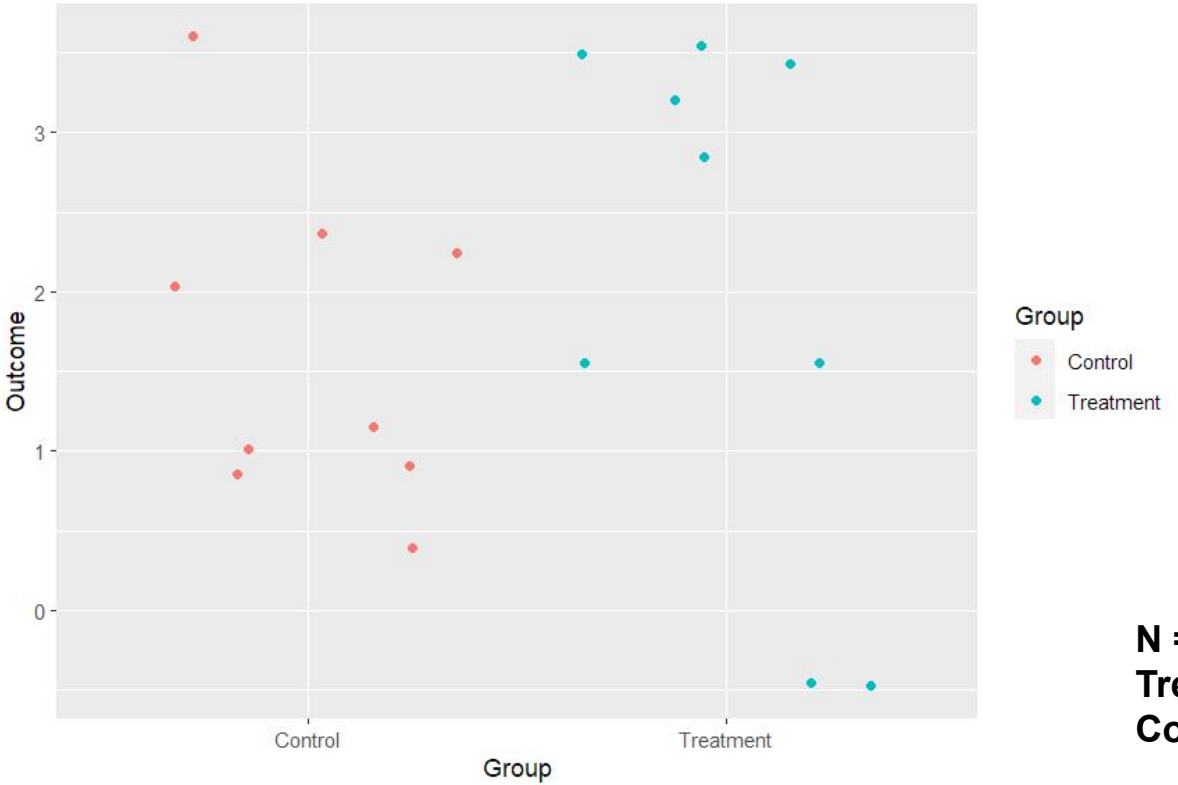
Sample size



You'll need a large enough sample size to make sure that random selection isn't making biased selections by accident

N = 8
Treatment group: 4
Control group: 4

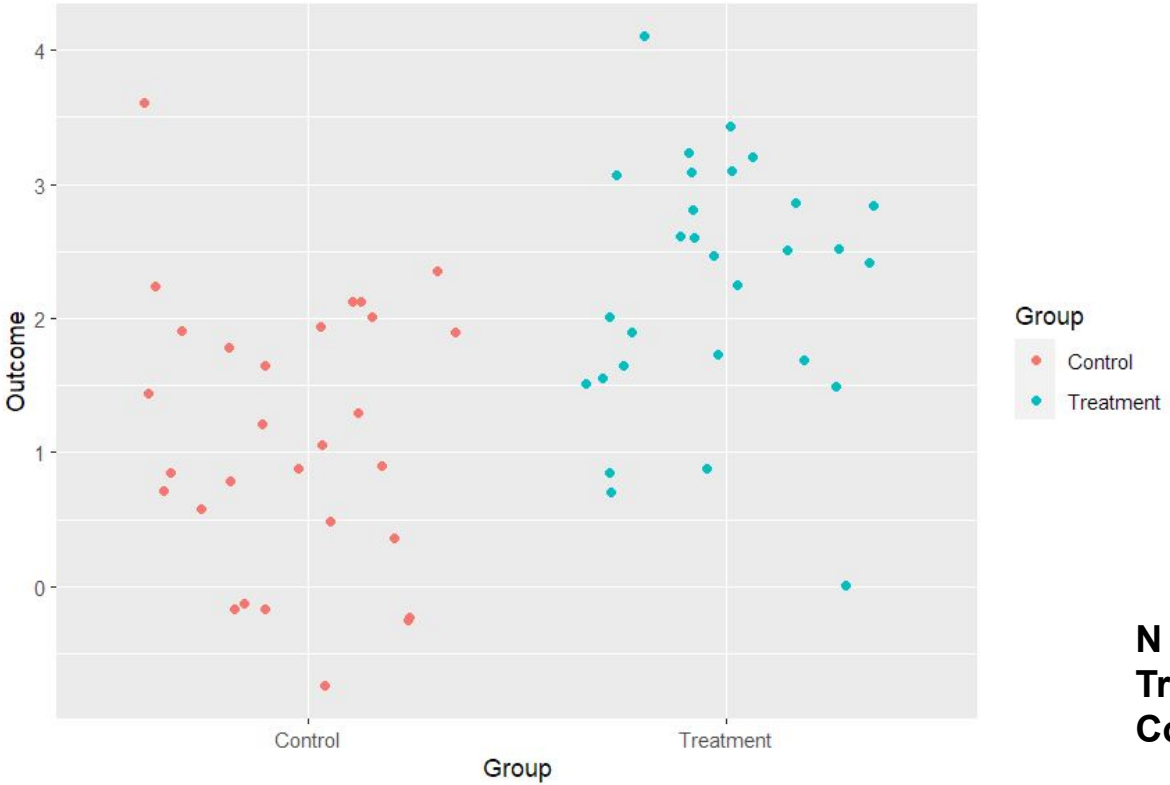
Sample size



You'll need a large enough sample size to make sure that random selection isn't making biased selections by accident

N = 18
Treatment group: 9
Control group: 9

Sample size



You'll need a large enough sample size to make sure that random selection isn't making biased selections by accident

N = 68
Treatment group: 34
Control group: 34

Sample size

You'll need a large enough sample size to make sure that random selection isn't making biased selections by accident

N = 118
Treatment group: 59
Control group: 59

Different ways to randomize

- “Lab” experiments: Can gather a group of research participants and divide them randomly
  - High measurement validity; but is it externally valid (is it realistic)?
- Survey experiments: Distribute surveys and randomly assign who receives a different survey
  - Looking for effects of changes to question wording, images, hypothetical situations
  - Measurement validity still good, but need to worry about sampling, response bias
- Field experiments: Go out into the “real world” and assign treatment
  - Attempt to improve external validity, but need to worry about cost, ethics
- Natural experiments: Take advantage of how nature or institutions might divide people into groups in arbitrary ways
  - E.g. lottery, political borders, rainfall, acts of God
  - High external validity, but people often question if assignment is random (not everyone considers this an experiment)

Consider the following research designs. Do the treatment assignments seem plausibly random? Do the designs seem externally valid? Are there any other strengths or weaknesses of the designs?

- Do negative media portrayals of the president reduce support for his party in the following election? To find out, a communications professor at a local university invites a selection of undergraduates at a local university to participate in a study in exchange for free pizza. Some participants are shown a set of news clips that report on campaign promises that the president has not yet been able to deliver. Others are shown videos of sneezing panda bears. Afterwards, participants are asked to complete a survey about their attitudes toward each party and whether they intend to vote.
- A researcher wants to know if social pressure can improve political turnout. She sends letters to households in a neighborhood informing them of an upcoming election. In some of the letters, she informs the household that whether or not they vote is a matter of public record. Further, she tells the household that their neighbors will be informed after the election of whether or not the household voted.
- A polling firm wants to know if anti-immigrant attitudes reduce support for welfare programs. They place advertisements on social media asking users to take their survey in exchange for a chance to win an iPhone. Some users are given surveys that begin with a description of crimes committed by individuals who had immigrated to the country, while others are given surveys that begin with a description of the types of jobs that recently-arrived immigrants tend to work. All users are then asked about their attitudes towards welfare programs.
- An imperial European power abandons its colony in central Asia, dividing the area into separate territories and ceding power back to the inhabitants. The border between one of the territories runs through the middle of a village with broadly shared ethnic, linguistic, and religious characteristics. The new government in one of the territories offers free vaccines to its citizens, while the other government only offers free vaccines to its lower-income citizens. Ten years later, a researcher compares the two sides of the villages to determine if free vaccine access reduces mortality rates.

Consider the following research designs. Do the treatment assignments seem plausibly random? Do the designs seem externally valid? Are there any other strengths or weaknesses of the designs?

- Do negative media portrayals of the president reduce support for his party in the following election? To find out, a communications professor at a local university invites a selection of undergraduates at a local university to participate in a study in exchange for free pizza. Some participants are shown a set of news clips that report on campaign promises that the president has not yet been able to deliver. Others are shown videos of sneezing panda bears. Afterwards, participants are asked to complete a survey about their attitudes toward each party and whether they intend to vote.

Consider the following research designs. Do the treatment assignments seem plausibly random? Do the designs seem externally valid? Are there any other strengths or weaknesses of the designs?

- A researcher wants to know if social pressure can improve political turnout. She sends letters to households in a neighborhood informing them of an upcoming election. In some of the letters, she informs the household that whether or not they vote is a matter of public record. Further, she tells the household that their neighbors will be informed after the election of whether or not the household voted.

Consider the following research designs. Do the treatment assignments seem plausibly random? Do the designs seem externally valid? Are there any other strengths or weaknesses of the designs?

- A polling firm wants to know if anti-immigrant attitudes reduce support for welfare programs. They place advertisements on social media asking users to take their survey in exchange for a chance to win an iPhone. Some users are given surveys that begin with a description of crimes committed by individuals who had immigrated to the country, while others are given surveys that begin with a description of the types of jobs that recently-arrived immigrants tend to work. All users are then asked about their attitudes towards welfare programs.

Consider the following research designs. Do the treatment assignments seem plausibly random? Do the designs seem externally valid? Are there any other strengths or weaknesses of the designs?

- An imperial European power abandons its colony in central Asia, dividing the area into separate territories and ceding power back to the inhabitants. The border between one of the territories runs through the middle of a village with broadly shared ethnic, linguistic, and religious characteristics. The new government in one of the territories offers free vaccines to its citizens, while the other government only offers free vaccines to its lower-income citizens. Ten years later, a researcher compares the two sides of the villages to determine if free vaccine access reduces mortality rates.