

Primer on Experimental Methods

Instructor: Kevin (Vin) Arceneaux

Course Description

Across the sciences, experiments are the primary way to study cause and effect. Experimental methods take many forms in both the natural and social domains of scientific inquiry, but what unites them all is that the researcher carefully controls the presence (and absence) of some causal agent to measure its effect. In the social sciences, the randomized experiment is the gold standard for causal inference, and it will be our focus in this short course.

Randomized experiments take place in many settings: controlled laboratories, embedded within surveys, and embedded unobtrusively in people's natural environment. Each of these approaches comes with benefits and tradeoffs that affect the internal and external validity. This course is designed to introduce design and analysis principles for best research practices across the domain of experimentation.

Topics

May 29: Foundations

1) Why experiments?

A brief introduction to the Neyman-Rubin causal model to illustrate the power of experimental methods to study cause and effect.

2) Estimating the counterfactual

A discussion of the statistical and substantive issues and challenges involved in using randomized experiments to estimate causal effects. We will touch on quasi-experiments as well.

3) Basic Elements of Experimental Design: What makes a good experiment?

An introduction to experimental design: parallel treatments, demand effects, testing effects, attrition

4) Statistical analysis and experiments

Hypothesis testing with experiments (frequentists and Bayesian approaches), post-treatment bias, moderators, covariate adjustment.

5) Statistical Interpretation: internal and external validity

May 30: Practice

6) Lab Experiments

A discussion of the benefits and weaknesses of controlled lab experiments. We will discuss special issues in design, implementation, and analysis with examples.

7) Field Experiments

A discussion of the benefits and weakness of field experiments. We will discuss special issues in design, implementation, and analysis with examples.

8) Survey Experiments

A discussion of the benefits and weakness of embedded survey experiments. We will discuss special issues in design, implementation, and analysis with examples.

9) Can we get at causal mechanisms?

A discussion of the promise and perils of mediation analysis

10) Ethics

With experiments, the researchers manipulate elements of participants' social and psychological environment, which brings potential risks and harms. Thought and care should be given to the ethics of experimental designs.

11) Producing reproducible science

We will conclude with a discussion of the open science movement and the need to rethink standard research practices.