

# Field Experiments

Version of 14/05/2021

(DRAFT)

EUI Swiss Chair & Dept of Political and Social Science  
3rd Term Workshop 2021

## Instructor Info —



Jake Bowers



Zoom Office Hours:

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## Course Info —



Monday to Friday



15:30–18:00 Florence CET



Classes via Zoom



Course platform: Campuswire

## FAQs —



Is this the final version of the syllabus?

No. This is a new class. I will post new versions on Campuswire as we go.



How many credits is this workshop worth?

This workshop is worth 10 credits.

## Overview

This short course aims to help social scientists to create randomized experimental designs and to analyze the data arising from such studies. Because we focus on randomized field experiments, and because each field experiment is unique in its context and challenges, the course emphasizes statistical theory that would empower scholars to make creative choices in design and analysis. The course relies on simulation using the R statistical computing environment to develop intuitions about randomization, testing, estimation, and statistical power.

This course is offered by the Swiss Chair on Federalism and Democracy and the Department of Political and Social Sciences (EUI).

## Learning Objectives

By the end of the class, I hope that students will be able to answer the following questions:

- Why would a social scientist manipulate an intervention so that some people or groups of people receive it and others do not? When might we *not* want to experiment? What are common approaches to preventing harm to experimental subjects?
- What does "X causes Y" mean in the counterfactual causal framework? What is a "potential outcome"? How might learning about counterfactual causal relationships help us understand our theories better?
- Why might we use randomization to learn about counterfactual causal relationships?
- How might randomization and experimental design justify hypothesis testing choices? How might hypothesis tests play a role in helping us detecting causal effects?
- What is statistical power? What is the false positive rate of a hypothesis test? What is the family wise error rate of multiple hypothesis tests? Why should we care about these kinds of characteristics of tests?
- How might randomization and experimental design justify estimation choices? How might estimation play a role in learning about causal effects?
- What is bias in an estimator? What is precision of an estimator? Why should we care about these kinds of characteristics of estimators?
- What is the relationship between confidence intervals and hypothesis tests?
- What is the Complier Average Causal Effect or Local Average Treatment Effect? When might we want to learn about this causal effect? How might we use estimation and/or testing to learn about it?
- What are some useful tactics for dealing with the problems that arise from missing data on outcomes versus missing data on covariates?
- How might one use of covariates to increasing the power of hypothesis tests and/or the precision of estimation in randomized experiments either in the design phase or outcome analysis phase of the research?
- What is a pre-analysis plan? Why do researchers and organizations use them?

I also hope that student will have sketched a research design for a randomized experiment following the [EGAP Research Design Form](#).

## Class Plans

I have found that methods classes are most fun when a student has a project to which the material might be directly applied.

I have also found that they are most fun when the class sessions are filled with questions and discussion.

Because we only have a week, I will probably begin each session with about 30 mins of presentation, allowing for an hour of discussion from the class. And then another hour of work by students on their own research designs — where I am available for discussion and to help confront the many code errors that will arise.

## Class Schedule

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### 6/7(Mon) Introductions, Causal Inference, Randomization

- Introduction to the course and each other
- Why would a social scientist manipulate an intervention so that some people or groups of people receive it and others do not? When might we *not* want to experiment? What are common approaches to preventing harm to experimental subjects?
- What does "X causes Y" mean in the counterfactual causal framework? What is a "potential outcome"? How might learning about counterfactual causal relationships help us understand our theories better?
- Why might we use randomization to learn about counterfactual causal relationships?
- How to use R to randomly assign units in different types of randomized designs: simple, complete, blocked, clustered.

#### Read:

- Gerber and Green, [2012](#)[Chapter 1 and 2]
- Bowers, Voors, and Ichino, [2021](#)[Modules on Causal Inference and Randomization] (See also the links to EGAP Methods Guides)
- Rosenbaum, [2017](#)[Chapter 1 and 2]

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### 6/8(Tue) Statistical Inference about Causal Effects: Hypothesis Testing and Estimation

- Why test a hypothesis to learn about the causal effect of an experimental intervention?
- How might randomization and experimental design justify hypothesis testing choices? How might hypothesis tests play a role in helping us detecting causal effects?
- What is the false positive rate of a hypothesis test? What is the family wise error rate of multiple hypothesis tests? Why should we care about these characteristics of tests?
- Why estimate an average causal effect?
- How might randomization and experimental design justify estimation choices? How might estimation play a role in learning about causal effects?
- What is bias in an estimator? What is precision of an estimator? Why should we care about these kinds of characteristics of estimators?
- What is the relationship the relationship between confidence intervals and hypothesis tests?
- (Maybe) How might one use covariates to increase the power of hypothesis tests and/or the precision of estimation in randomized experiments either in the design phase or outcome analysis phase of the research?
- How to use R to test hypotheses about counterfactual causal effects in randomized experiments.
- How to use R to estimate average counterfactual causal effects in randomized experiments.

#### Read:

- Rosenbaum, [2017](#)[Chapter 3]
- Bowers, Voors, and Ichino, [2021](#)[Module on Hypothesis testing] (Including links to EGAP Guides)
- Gerber and Green, [2012](#)[Chapter 3 & 4]
- Bowers, Voors, and Ichino, [2021](#)[Module on Estimation] (Including links to EGAP Guides)
- (Maybe) Bowers and Leavitt, [2020](#)

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#### Power

### 6/9(Wed)

- What is statistical power? Why should we care about statistical power?
- How to do power analysis using R and `DeclareDesign`?

#### Read:

- Bowers, Voors, and Ichino, [2021](#)[Module on Statistical Power] (see also the EGAP Methods Guides linked therein)
- Something from the [DeclareDesign website](#) or [DeclareDesign book](#)

6/10(Thu) Non-Compliance & Missing Data

- What is the Complier Average Causal Effect or Local Average Treatment Effect? When might we want to learn about this causal effect? How might we use estimation and/or testing to learn about it?
- What are some useful tactics for dealing with the problems that arise from missing data on outcomes versus missing data on covariates?
- How to estimate and test hypotheses about the CACE/LATE using R?

Read:

- Gerber and Green, 2012 [Chapter 5 and 6]
- Bowers, Voors, and Ichino, 2021 [Module on Threats]

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6/11(Fri) Pre-analysis plans & Workshop

- What is a pre-analysis plan? Why do researchers and organizations use them?
- (Depending on class size) Students present research designs for class discussion.

Read:

- [EGAP guide to Pre-Analysis Plans](#)

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## Readings

Bowers, Jake and Thomas Leavitt (2020). "Causality & Design-Based Inference". In: *The SAGE Handbook of Research Methods in Political Science and International Relations*. Ed. by Luigi Curini and Robert Franzese. Sage Publications Ltd.

Bowers, Jake, Maarten Voors, and Nahomi Ichino (2021). *The Theory and Practice of Field Experiments: An Introduction from the EGAP Learning Days*. Open Source Textbook. Evidence in Governance and Politics. url: [https://egap.github.io/theory\\_and\\_practice\\_of\\_field\\_experiments/](https://egap.github.io/theory_and_practice_of_field_experiments/).

Gerber, Alan S and Donald P Green (2012). *Field experiments: Design, analysis, and interpretation*. WW Norton.

Rosenbaum, Paul R. (2017). *Observation and experiment : an introduction to causal inference*. Cambridge, MA: Harvard University Press, p. 374. isbn: 9780674975576.