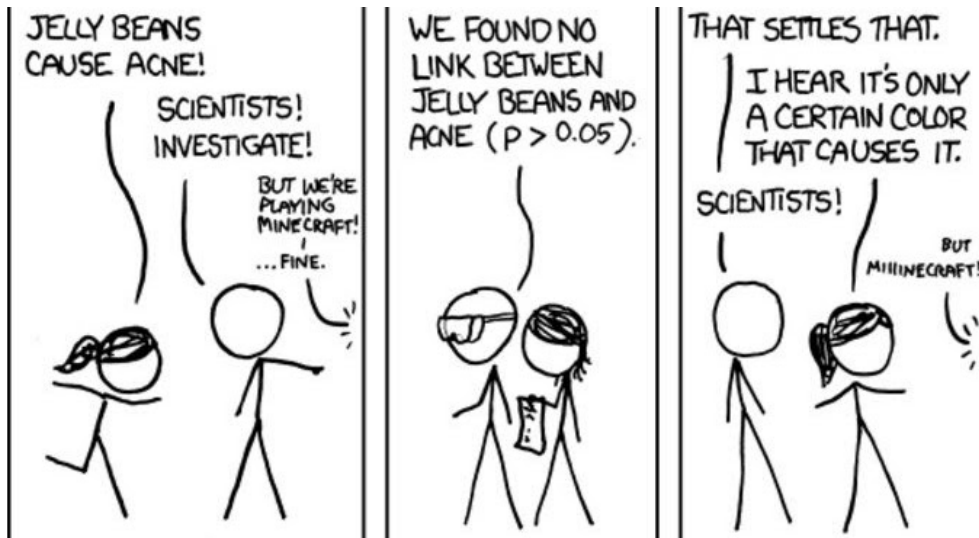


STA 235H - Randomized Controlled Trials I

Fall 2022

McCombs School of Business, UT Austin

Continuing our path of Causal Inference



Randomized Controlled Trials:

- Assumptions: The power of randomization
- Design: What should we consider?
- Limitations: Gold Standard?

The Magic of Randomization

The Fundamental Problem of Causal Inference

- Remember that we can only see one potential outcome
 - E.g. if Z is binary, either $Y(0)$ OR $Y(1)$

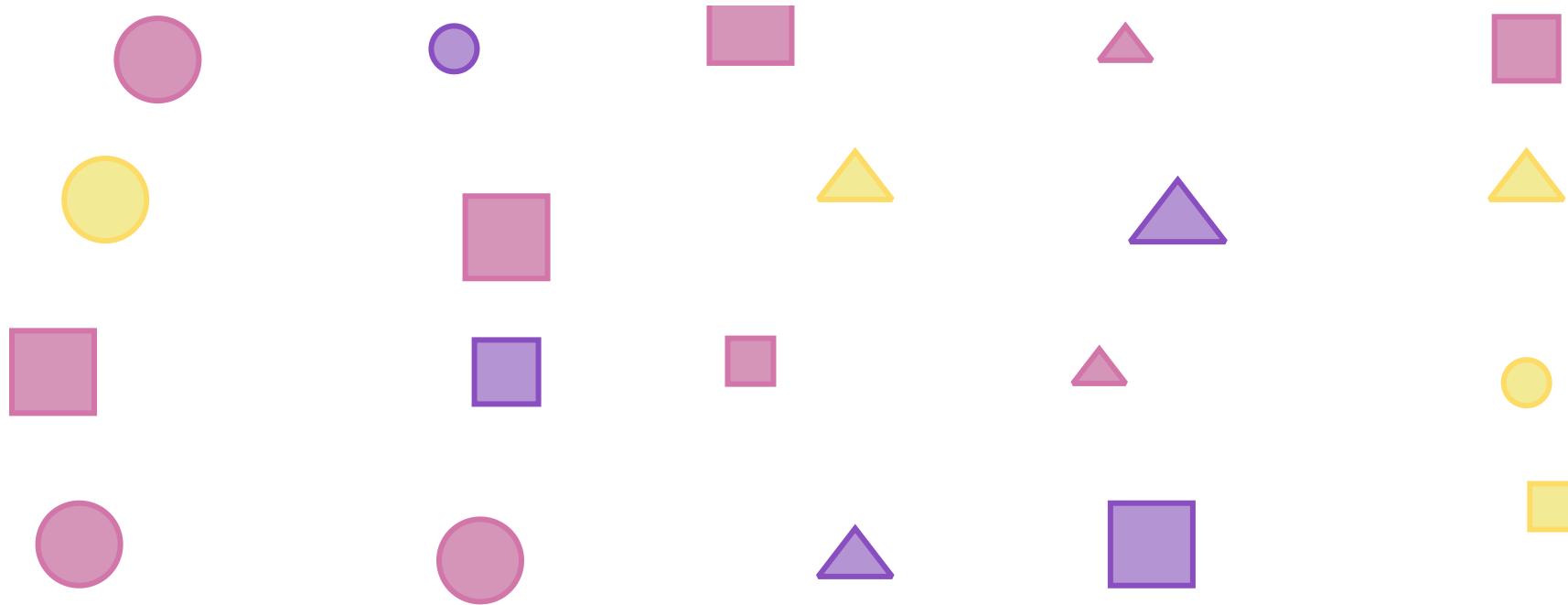
Fundamental Problem of Causal Inference

- Need for the **ignorability assumption**

$$Y(z) \perp\!\!\!\perp Z \quad \forall z \in Z$$

- Most times, **the ignorability assumption doesn't hold**

The problem with self-selection



Play

The power of randomization

- One way to make sure the ignorability assumption holds is to do it by design:

Randomize the assignment of Z

i.e. Some units will **randomly** be chosen to be in the treatment group and others to be in the control group.

What does randomization buy us?

The power of randomization

- One way to make sure the ignorability assumption holds, is to do it by design:

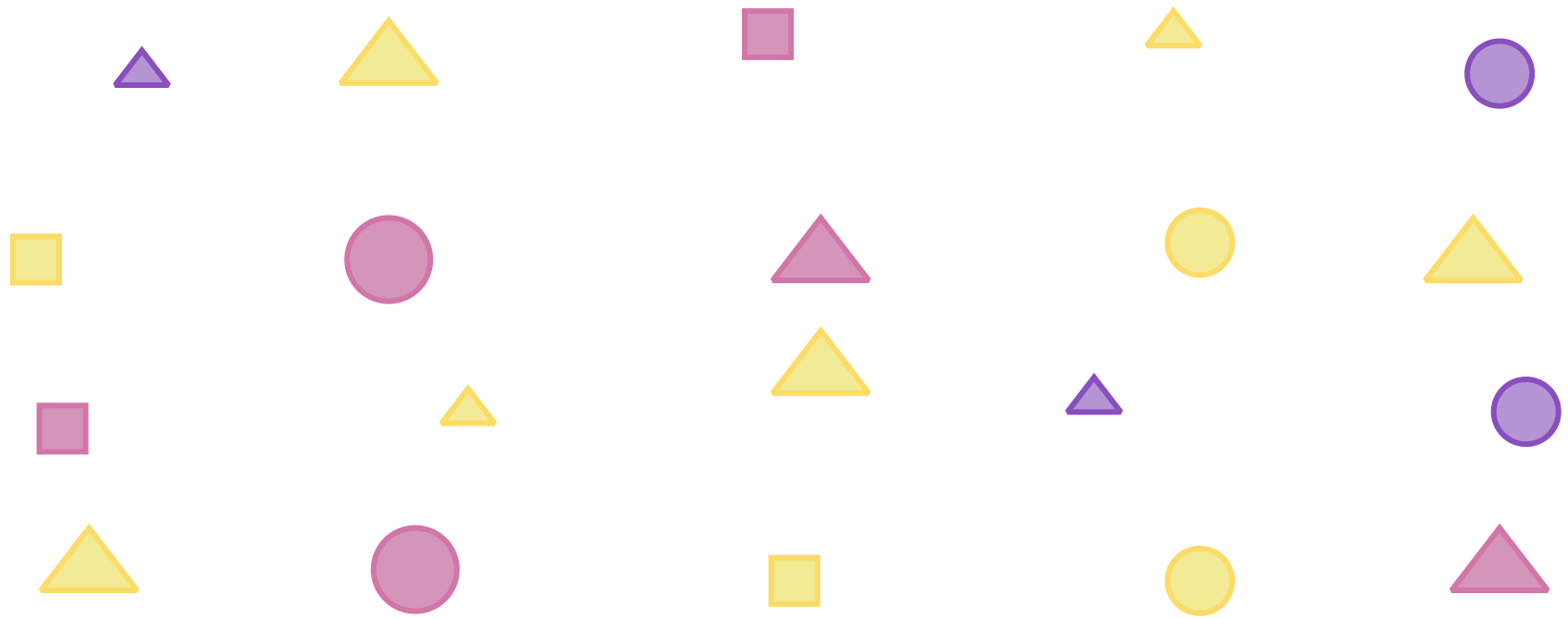
Randomize the assignment of Z

i.e. Some units will **randomly** be chosen to be in the treatment group and others to be in the control group.

What does randomization buy us?

No (systematic) selection on observables OR unobservables

Randomization of z



Play

Observational Causal Graph



Experimental Causal Graph



If I randomize treatment allocation...

Can the treatment be potentially correlated with a confounder?

Just by chance!



Definition: Identification Strategy

According to Keele (2015):

"A **research design** intended to solve the identification problem"

"Consists of an assumption or set of assumptions that will **identify the causal effect** of interest"

RCTs: The Gold Standard



How to analyze RCTs?

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Easy! (Statistically speaking)

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1) Check for balance

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Easy! (Statistically speaking)

1) Check for balance

2) Calculate difference in sample means between treatment and control group

Let's see an example

Are Emily and Greg More Employable Than Lakisha and Jamal?

- Actual **field experiment** conducted in Boston and Chicago.
- Send out resumes with **randomly assigned names**:
 - Female- and male-sounding names.
 - White- and African American-sounding names
- Measure whether **applicant was called back**

Let's go to R

Next class

- Finish with **randomized controlled trials**:
 - How do we assign treatment randomly in practice?
 - Stratification
 - Limitations of RCTs.
- Selection on **observables**
- The wonderful world of **matching!**



References

- Angrist, J. and S. Pischke. (2015). "Mastering Metrics". *Chapter 1*.
- Heiss, A. (2020). "Program Evaluation for Public Policy". *Class 7: Randomization and Matching, Course at BYU*
- Imbens, G. and D. Rubin. (2015). "Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction". *Chapter 1*