The Language of Studies

Lecture 10

Sections 3.1 - 3.3, 3.5

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Review Quiz

Example (Review Quiz)

1. In a stratified sample, all individuals have the same chance of being selected.
   (a) True.
   (b) False.

Review Quiz

Example (Review Quiz)

2. In a cluster sample, all individuals have the same chance of being selected.
   (a) True.
   (b) False.

Review Quiz

Example (Review Quiz)

3. In a 1-in-k systematic sample, all individuals have the same chance of being selected.
   (a) True.
   (b) False.
   (c) It depends on the value of k.

Review Quiz

Example (Review Quiz)

33. Stratified samples, clusters samples, and systematic samples are all examples of simple random samples.
    (a) True.
    (b) False.

Review Quiz Answers

Example (Review Quiz Answers)

1. (b) False.
2. (a) True.
3. (a) True.
4. (b) False.

Outline

Two Types of Variable

Definition (Explanatory variable)

An explanatory variable is a variable whose value influences other variables in the study.

Definition (Response variable)

A response variable is a variable whose value is influenced by other variables in the study.

Example

Example (Explanatory and Response Variables)

- In a study, a standard drug and an experimental drug are administered to patients with fevers in order to reduce the fevers.

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- The explanatory variable is the drug which was administered to the patient.

Example

Example (Explanatory and Response Variables)

- In a study, a standard drug and an experimental drug are administered to patients with fevers in order to reduce the fevers.
- The explanatory variable is the drug which was administered to the patient.
- The response variable is whether the patient's fever was reduced.

Example

- In the following situation, is it clear which is the explanatory variable and which is the response variable?
  - The more alcohol a student drinks, the more likely he is to get bad grades.

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  - The more alcohol a student drinks, the more likely he is to get bad grades.
- Nevertheless, a study is designed with one variable as the explanatory variable (cause) and the other as the response variable (effect).

Outline

Observational and Experimental Studies

Definition (Observational study)

An observational study is a study in which none of the explanatory variables are manipulated.

Definition (Experimental study)

An experimental study is a study in which at least one of the explanatory variables is manipulated (set).

Observational or Experimental

- If an experimental study gives the researchers more control over the explanatory variables, then why would anyone conduct an observational study?

Observational or Experimental

- Why should/could/must the following studies be observational rather than experimental?
- Researchers wish to determine

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Observational or Experimental

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- Researchers wish to determine
  - The relationship between drunk driving and traffic fatalities.
  - The relationship between the number of thunderstorms and the number of forest fires in July.

Levels and Treatments

Definition (Level)

A level is a value of an explanatory variable.

Definition (Treatment)

A treatment is a combination of values (levels) of two or more explanatory variables.

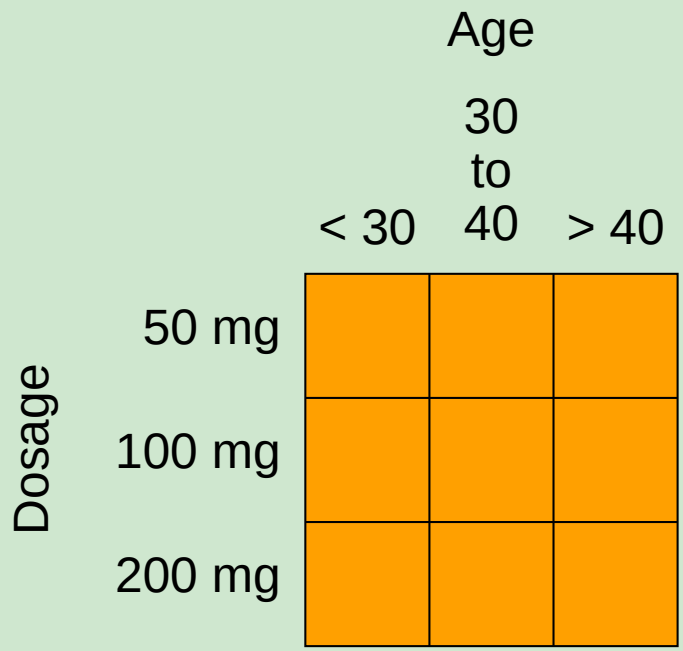
Levels and Treatments

Example (Levels and Treatments)

- Researchers administer an experimental drug to a group of patients of different ages.
- Two variables:
  - The drug dosage (50 mg, 100 mg, 200 mg).
  - The patient's age (< 30, 30 to 40, > 40).
- What are the levels and what are the treatments?

Levels and Treatments

Example (Levels and Treatments)



Outline

A Third Type of Variable

Definition (Confounding variable)

A confounding variable is a variable that is not part of the study, but one that has an effect on the response variables.

- If there are one or more confounding variables in a study, then the researchers cannot necessarily attribute changes in the response variables to the explanatory variables.

Do “Explanatory” Variables Really Explain?

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  - The more classes a student misses, the lower his final grade.

Do “Explanatory” Variables Really Explain?

- In the following situation, could there be any confounding variables? What are they?
  - The higher a student’s family income, the better his grades in school.
  - The more classes a student misses, the lower his final grade.
  - The higher the daily ice cream sales, the more drownings in pools.

Outline

Assignment

Homework

- Read Sections 3.1 - 3.3, pages 145 - 155.
- Read Section 3.5, pages 168 - 171, 173 - 182.
- Let's Do It! 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 3.8.
- Page 155, exercises 1 - 3, 5 - 8.
- Page 171, exercises 17 - 22.