Chapter 12

EXPERIMENTS AND OBSERVATIONAL STUDIES

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TYPES OF STUDIES

- An observational study is where we observe and measure specific variables but don't attempt to modify the participants being studied
  - Example: Nielsen poll
  - Retrospective study/prospective study
- An experiment is where we apply some treatment and observe its effect on the participants
  - Example: Salk vaccine

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EXPERIMENTS

- Randomized Experiments: participants are randomly assigned to participate in one condition or another
- Treatments: the different conditions of an experiment
- Unit: A single individual or object being measured
- Experimental Unit: the most basic entity to which treatments can be assigned. If you are dealing with people, they are called participants; animals or objects may be called subjects

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VARIABLES

- An explanatory variable (or independent variable) may explain or cause differences in a response variable (also called outcome variable or dependent variable)

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MORE VARIABLES

- A confounding variable affects the response variable and is related to the explanatory variable. The effects of the two variables can't be separated from one another.
- A lurking variable is a potential confounding variable not measured or considered in the study.
- Randomized experiments are designed to help control for confounding variables.

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RANDOMIZING

- Intended to make groups approximately equal in all respects except for the explanatory variable.
- In this way, significant differences in the response variable can be attributed to the explanatory variable.

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RANDOMIZING

- We can
  - Randomize the type of treatment; randomly assigning the treatments to the experimental units
    - Prevents assignments favorable to hypothesis
    - Protects against hidden or unknown biases
  - Randomize the order of treatment; used if all treatments are applied to each unit
    - Prevents inflated results due to learning effect
    - Prevents assignments favorable to hypothesis

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EXPERIMENTAL LANGUAGE

- Control group: treated identically in all respects except they don't receive the experimental treatment.
- Placebo effect: occurs when an untreated subject incorrectly believes that he is receiving a treatment and reports improvement in symptoms
- Blinding: People involved with the study don't know whether a subject is receiving treatment

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BLINDING

- There are two main classes of individuals who can affect the outcome of the experiment:
  - those who could influence the results (subjects, treatment administrators, technicians)
  - those who evaluate the results (judges, treating physicians, etc.)
- When every individual in *either one* of these classes is blinded, an experiment is said to be single-blind.
- When everyone in *both* classes is blinded, the experiment is called double-blind.

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EXPERIMENTAL DESIGN

- Block-design: experimental units are divided into homogeneous groups then each treatment is randomly assigned to one or more units in each block
- Matched-pair design: uses either two matched individuals or the same individual to receive each of two treatments
- Repeated-measures design: some participants are measured repeatedly under different conditions

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