

Designing Experiments to Reduce Variability

Study Types

- Experiment
 - Clinical Trial
- Observational study

Study Types

- Experiment
 - Clinical Trial
 - Observational study
- } Involves use of two treatments

Study Types

- Experiment
 - Clinical Trial
- } Comparison of accepted treatment to new/alternate treatment
- Observational study

Study Types

- Experiment
 - Clinical Trial
- Observational study

Clinical trials
involve *risk!*



Study Types

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 - Clinical Trial
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Clinical Trials are used for drug trials or medical treatments

Difference Between Treatments

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- Good experimental design plan
 - Eliminate/reduce within-treatment variability

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- Good experimental design plan
 - Allow one to measure any variability that cannot be eliminated

Protocol

- A protocol is a careful description of exactly how the experiment is to be performed
 - A set of rules to follow
 - A list of steps to perform

Protocol

- A protocol is a careful description of exactly how the experiment is to be performed
- Must
 - Identify sources of within-treatment variability
 - ⦿ Must know the situation very well

- The college health service at a small college wants to see if putting antibacterial soap in the dormitory bathrooms will reduce the number of visits to the infirmary. In all 1800 students from 20 dormitories participate. Half the dormitories, chosen at random, are supplied with the special soap; the remaining ones are supplied with regular soap. At the end of the semester, the two groups of students are compared, using the average number of visits to the infirmary per person per semester.

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 - Students living in dormitories at a small college

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- **Experiment, Clinical Trial, or
Observational Study?**

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- What is the treatment?

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- **What is the treatment?**
 - **Antibacterial soap available in the dormitory bathrooms**

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 - Some dorms may have less healthy atmosphere (stuffy, contaminated drinking fountain, dirty bathrooms)

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- What are some sources of variability?
 - Health of student groups vary (athletes, partiers, studiers)

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 - to equalize variation between treatments

Completely Randomized Design

- Treatments assigned completely at random without prior sorting or restrictions
- Use a chance device to randomly assign a treatment to each experimental unit

Randomized Paired Comparison Design

- For a randomized paired comparison design,
 - First, sort the experimental units into pairs of similar units
 - Randomly decide which unit of each pair is assigned to which treatment

a.k.a Matched-Pairs Design

- For a matched-pairs design,
 - First, sort the experimental units into pairs of similar units
 - Randomly decide which unit of each pair is assigned to which treatment

Blocks

- **Blocks are groups of similar units**

Randomized Block Design

- For a randomized block design,
 - First, sort/subdivide the experimental units into blocks (groups of similar units)
 - Randomly assign treatments to each unit within the blocks separately

Blind vs. Double Blind

- **Blind**
 - Experimental units do not know which treatment they receive
- **Double Blind**
 - Neither the experimental units nor the experimenter interacting with them know which treatment they receive