

Chapter 13: Experiments and Observational Studies

Designing Experiments:

If we want to observe individuals and record data without any intervention, we conduct an _____. Observational studies can look at data that has already been collected (called a _____ study) or it can look at data as it occurs (called a _____ study). Observational studies are valuable for discovering trends and possible relationships, but they cannot demonstrate _____ relationships.

If we want to examine a cause-and-effect relationship, we must conduct a controlled _____ rather than an observational study.

The individuals on which the experiment is done are called _____. If the units are people, they are called _____.

The experimental condition we apply to the units is called the _____. The explanatory variables (causing a change in the other variables) are called _____. These factors may be applied in different _____.

When designing an experiment we want to minimize the effect of _____ so that our results are not biased. Because we may not be able to identify and eliminate all lurking variables, it is essential that we use a _____. The _____ gets either no treatment, or a fake treatment to counter the _____ and/or any other lurking variables present. Having a _____ allows us to compare the results of the treatments.

Experimental Design

Step 1: Choose treatments

- _____
- _____

Step 2: Assign the experimental units to the treatments

- _____
- _____

Remember, if we want to examine a cause-and-effect relationship, we conduct an _____. If an experiment is well-designed, a strong association in the data _____ imply causation, since any possible lurking variables are controlled.

Principles of Experimental Design:

1. _____ the effects of lurking variables by comparing several treatments (include a control group if possible/applicable).
2. Use _____ to assign subjects/units to treatments. Without randomization, we do not have a valid experiment and will not be able to draw conclusions from your study.
3. _____ the experiment on many subjects/units to reduce chance variation in the results. If the experimental group is not representative of the population of interest, we may need to replicate the entire experiment for different groups in different places and/or at different times.

An effect is called _____ if it is too great to be caused simply by chance.

Even a well-designed experiment can contain _____, so it is extremely important to handle the subjects/units in exactly the same way. One way to avoid hidden bias is to conduct a _____ experiment. In a _____ experiment, neither the subjects nor the people who have contact with them know which treatment a subject has received.

Types of Experimental Design:

1. In a _____, all subjects are randomly assigned to treatment groups.
2. In a _____, subjects are first split into groups called _____. Subjects within each block have some _____ (for example: gender, age, education, ethnicity, etc.) Then, within each block, subjects are randomly assigned to treatment groups.
3. In a _____, there are only two treatments. In each block, there is either: a _____ receiving _____ or a _____ each receiving a _____.

Lurking and Confounding Variables:

A _____ variable creates an association between two other variables that tempts us to think that one may _____ the other. A lurking variable is usually thought of as a prior cause of both y and x that makes it appear that x may be causing y .

_____ can arise in experiments when some other variables associated with a factor have an effect on the response variable. Unlike a lurking variable, a confounding variable is associated in a _____ way with a factor and affects the response. Because of the confounding, we find that we can't tell whether any effect we see was caused by our factor or by the confounding factor (or by both working together).