

Section 1.3 - Collecting Sample Data

Observational study - A study in which we observe and measure specific characteristics, but we do not attempt to modify the subjects being studied

Experiment - A study in which we apply some "treatment" and then proceed to observe its effects on the subjects of the experiment

A **simple random sample** of n subjects is selected in such a way that *every possible sample of size n* has the same chance of being chosen.

A **random sample** is selected in such a way that each *individual member* in the population has an equal chance of being selected.

A **probability sample** involves selecting members from a population in such a way that each member of the population has a known (but not necessarily the same) chance of being selected.

Every simple random sample is a random sample, but not vice versa.

Systematic sampling - select every k th element in the population

Convenience sampling - use results that are easy to get

Stratified sampling - divide the population into groups (strata) so that subjects in the same group share certain characteristics, then draw a sample from each group

Cluster sampling - divide the population into groups (clusters), then randomly select some clusters

These sampling methods do not necessarily result in simple random samples. We will often require that sample data be a simple random sample!

Types of studies...

Cross-sectional study - A study in which data are observed and collected at one point in time

Retrospective study - A study in which data are collected from the past by looking back in time through records, interviews, etc.

Prospective (longitudinal) study - A study in which data are collected in the future from groups called cohorts

Characteristics of good experimental design...

- **Randomization** - assign subjects to groups through a process of random selection
- **Replication** - repeat the experiment on more than one subject so that typical erratic behavior does not hide the effects of treatment
- **Blinding** - do not allow the subject to know whether he or she is receiving the treatment or placebo; this allows for us to determine whether the treatment is significantly different from the placebo effect
- **Controlling Effects of Variables** - plan the experiment so that you are able to distinguish among the effects of other factors (i.e. eliminate confounding)

Types of experimental design...

Completely Randomized - assign subjects to treatment groups by random selection

Randomized Block - form blocks of subjects with similar features, and within blocks, randomly assign subjects to treatment groups

Rigorously Controlled - *carefully* assign to different treatment groups subjects that are similar in ways important to the experiment

Matched Pairs - compare exactly two treatment groups by using subjects matched in "related" pairs

Experimental error...

Sampling Error - difference between a sample result and the actual population result. These errors result from chance fluctuations in the samples.

Nonsampling Error - errors arising when data is incorrectly collected, measured, recorded, or analyzed