

Chapter 1 Introduction to Statistics
--Chapter 1.3 Experimental Design

Targets:

After studying Chapter 1.3, students should be able to:

- design a statistical study
- collect data by taking a census using a sampling, simulation, or performing an experiment
- create a sample using random sampling, simple random sampling, stratified sampling, cluster sampling, and systematic sampling
- identify a biased sample

Statistical study goals:

- collect data
- use the data to make a decision

Guidelines to design a statistical study

- 1) Identify the variable(s) of interest and the population
- 2) Develop a plan for collecting data. If using a sample, make sure it represents population.
- 3) Collect data
- 4) Describe the data
- 5) Interpret the data and make decisions about the population
- 6) Identify any possible errors

Data Collection

1. Census

- measures entire population
- Pro: complete and accurate
- Con: costly and difficult

2. Sampling

- measures part of a population
- Pro: cheaper and easier than a census
- Con: may lose accuracy

3. Simulation

- use a model to reproduce conditions
- Pro: can study difficult or dangerous situations
- Con: may be inaccurate and/or expensive

4. Experiment

- apply a treatment and observe responses
- compare results to a control group
- Pro: strict controls
- Con: expensive

- placebo effect?
 - psychological cure
- double blind experiment
 - neither researcher or subjects are aware of treatment vs. control group

Has anyone participated in an experiment?

Survey

- investigation of one or more characteristics of a population
- asks people questions

Random sample

- every member of a population has an equal chance of being selected

Simple random sample

- every possible sample of the same size has the same chance of being selected

Try It Yourself 2, p. 17

- on board: copy part of Table 1

Sample

a) with replacement

- same population member can be selected more than once

b) without replacement

- same population member cannot be selected more than once (after being selected, population member is not “replaced” into the population before another selection)

Sampling Techniques

1) Stratified Sample

- includes members from each segment of a population
- population is divided into strata
- sample is randomly selected from each strata

2) Cluster Sample

- population is divided into clusters
- clusters must share similar characteristics
- sample is a selected cluster

3) Systematic Sample

- each population member is assigned a number
- a starting number is chosen randomly
- sample members are then chosen at regular intervals

Convenience sample

- consists only of available people

Assign:

1.3 Exercises, p. 20-21

1-8, 10-18 (even), 19, 20, 23