Chapter 1: Notes

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Section 1.1

Descriptive Statistics

Descriptive statistics consists of methods for organizing and summarizing information.

Population and Sample

Population: The collection of all individuals or items under consideration in a statistical study.

Sample: That part of the population from which information obtained

Inferential Statistics

Inferential statistics consists of methods of drawing and measuring the reliability of conclusions about a population based on information obtained from a sample of the population.

Section 1.2

Simple Random Sampling; Simple Random Sample

Simple random sampling: A sampling procedure for which each possible sample of given size is equally likely to be the one obtained.

Simple random sample: A sample obtained by simple random sampling.

Simple random sampling corresponds to our intuitive notion of random selection by lot.

Section 1.3

Systematic Random Sampling

Step 1 Divide the population size by the sample size and round the result down to the nearest whole number, m.

Step 2 Use a random-number table or technology to obtain a number, k, between 1 and m.

Step 3 Select for the sample those members of the population that are numbered $k, k + m, k + 2m, \ldots$

Cluster Sampling

Step 1 Divide the population into groups (clusters).

Step 2 Obtain a simple random sample of the clusters.

Step 3 Use all the members of the clusters obtained in Step 2 as the sample.

Stratified Random Sampling with Proportional Allocation

Step 1 Divide the population into subpopulations (strata).

Step 2 From each stratum, obtain a simple random sample of size proportional to the size of the stratum; that is, the sample size for a stratum equals the total sample size times the stratum size divided by the population size.

Step 3 Use all the members obtained in Step 2 as the sample.

Section 1.4

Experimental Units; Subjects

In a designed experiment, the individuals or items on which the experiment is performed are called experimental units. When the experimental units are humans, the rem subject is often used in place of experimental unit.

Principles of Experimental Design

The following principles of experimental design enable a researcher to conclude that differences in the results of an experiment not reasonably attributable to chance are likely caused by the treatments.

Control: Two or more treatments should be compared.

Randomization: The experimental units should be randomly divided into groups to avoid unintentional selection bias in constituting the groups.

Replication: A sufficient number of experimental units should be used to ensure that randomization creates groups that resemble each other closely and to increase the chances of detecting any differences among the treatments.

Response Variable, Factors, Levels, and Treatments

Response variable: The characteristic of the experimental outcomes that is to be measured or observed.

Factor: A variable whose effect on the response variable is of interest in the experiment.

Levels: The possible values of a factor

Treatment: Each experimental condition. For one-factor experiments, the treatments are the levels of the single factor. For multifactor experiments, each treatment is a combination of levels of the factors.

Completely Randomized Design

In a completely randomized Design, all the experimental units are assigned randomly among all the treatments.

Randomized Block Design

In a randomized block design, the experimental units are assigned randomly among all the treatments separately within each block.