

Upon completion of Intro to Statistics, students will be able to:

I. Exploring Data: Observing patterns and departures from patterns

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

A. Interpreting graphical displays and distributions of univariate data (dotplot, stemplot, histogram)

1. Center and spread
2. Clusters and gaps
3. Outliers and other unusual features
4. Shapes

B. Summarizing distributions of univariate data

1. Measuring center: median, mean
2. Measuring spread: range, interquartile range, standard deviation
3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
4. Using boxplots
5. The effect of changing units on summary measures

C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)

1. Comparing center and spread: within group, between group variation
2. Comparing clusters and gaps
3. Comparing outliers and other unusual features
4. Comparing shapes

D. Exploring bivariate data

1. Analyzing patterns in scatterplots
2. Correlation and linearity
3. Least squares regression line
4. Outliers and influential points

E. Exploring categorical data: frequency tables

1. Marginal and joint frequencies for two-way tables
2. Conditional relative frequencies and association

II. Planning a Study: Deciding what and how to measure

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

A. Overview of methods of data collection

1. Census
2. Sample survey
3. Experiment
4. Observational study

B. Planning and conducting surveys

1. Probability samples (SRS, stratified, cluster, systematic)
2. Characteristics of a well-designed and conducted survey
3. Sources of bias in surveys

C. Planning and conducting experiments

1. Experiments versus observational studies versus surveys
2. Confounding, control groups, placebo effects, blinding
3. Treatments, experimental units, and randomization
4. Completely randomized design for two treatments
5. Replication, blocking, and generalizability of results

III. Probability and Simulation

A. Probability

1. Basic and conditional probabilities
2. Events (disjoint, overlapping, dependent, and independent)
3. Addition rule and multiplication rule
4. Simulations

B. The normal distribution

1. Properties of the normal distribution
2. Using tables of the normal distribution
3. The normal distribution as a model for measurements