

Chapter 1

- Design
- Description
- Inference
- Population
- Parameters
- Samples
- Statistics

Chapter 2

- Categorical Data
- Discrete Quantitative Data
- Continuous Quantitative Data

Histogram: Shape, Center, Spread

Stem and Leaf Plot

Measures of Center:

- Mean
- Median
- Mode

Measures of Spread

- Range
- IQR
- Variance
- Std. Dev.

Quartiles and Boxplots

Empirical Rule

Chapter 3

- Explanatory variable
- Response variable
- Conditional Probability
- Contingency tables
- Scatterplots (direction, spread, trend)
- Correlation

Least Squares Regression

- What is it?
- Be able to use the slope and y intercept formulas
- Be able to interpret the slope and y intercept
- What is R^2 ?
- Be able to make predictions.

Residual Analysis

- What is a residual?
- What are outliers?
- What are influential outliers?

Cautions

- Extrapolation
- Lurking Variables -- Misuse of Cause and Effect
- Simpson's Paradox
- Confounding

Chapter 4

Design of Experiments:

Experiments vs Observational Studies

Elements of an Experimental Design:

- Treatments
- Factors
- Response
- Experimental Units

Other issues:

- Placebo effect
- Blind and Double-blind experiments

Principles of Experimental Design:

- Control
- Randomization
- Replication

Matched Pairs and Blocks - more advanced methods of control

Statistically Significant Effects

Sampling Designs

- SRS vs biased samples
- Other sources of bias in surveys (undercoverage, nonresponse, response bias, wording of question)

- Accuracy of results -- margin of error = $\frac{1}{\sqrt{n}}$

Types of Observational Studies.

- Cross Sectional – “Snapshot”
- Case Control – retrospective
- Prospective

Chapter 5

- Probability vs Statistics
- Rules of Probability
 - all probabilities between 0 and 1
 - they add up to 1
 - complement rule
 - A or B: can add up probabilities for disjoint events
 - A and B: can multiply probabilities for independent events

Chapter 6

- Random Variables – numerical outcomes
 - Discrete Random Variable
 - list of all possible outcomes with probabilities
 - probability histogram
 - Expected Value
 - eg – dice, coins,
 - Special Case Binomial
 - Continuous
 - intervals of outcomes
 - density curve (smooth histogram, area under curve equals 1, areas=probabilities=proportions)
 - eg – Uniform, Normal

Normal

- Z scores
- Given x, find area. (less than, greater than, in between)
- Given an area, find x. (Top%, Bottom%, Central)

Binomial

- Conditions
- Mean and Standard deviation
- Using formula for probabilities

