

## *HS167 Topics*

### 1: MEASUREMENT AND SAMPLING

- Introduction (What is statistics, etc.)
- Measurement
- Population and Sampling

### 2: FREQUENCY DISTRIBUTIONS

- Stem-and-Leaf Plots
- What to Look for in a Distribution
- Frequency Tables
- Histograms and Other Frequency Charts

### 3: SUMMARY STATISTICS

- Measures of Central Location
- Five-point Summaries
- Measures of Spread

### 4: PROBABILITY

- Introduction
- Binomial Distributions
- Normal Distribution

### 5: INFERENCE ABOUT A MEAN: ESTIMATION

- Statistical Inference and Sampling Distributions
- Confidence Interval for  $\mu$  ( $\sigma$  known)
- Student's  $t$  distribution
- Confidence Interval for  $\mu$  ( $\sigma$  is estimated)
- Sample size requirements

### 6: INFERENCE ABOUT A MEAN: HYPOTHESIS TESTING

- Testing Procedure
- Type I Errors and Type II Errors
- One-sample  $z$  test
- One-sample  $t$  test

### 7: PAIRED SAMPLES AND THEIR DIFFERENCES

- Introduction
- EDA
- Confidence interval for  $\mu_d$
- Hypothesis test
- Power of  $z/t$  test

### 8: INDEPENDENT SAMPLES AND THEIR DIFFERENCE

- Introduction
- EDA
- Confidence interval for  $\mu_1 - \mu_2$
- Hypothesis test
- Sample size requirements for  $t$  test

### 9: INFERENCE ABOUT A PROPORTION

- Re-introduction to binary outcomes
- Confidence Interval for  $p$

### 10: INDEPENDENT PROPORTIONS AND CROSS-TABULATED COUNTS

- 2-by-2 table
- Comparison of two proportions
- Chi-Square distribution and test
- R-by-C table

## Selected Items for Review

1. Distinctions are important.
  - a. Read every word of every question. Take your time. Don't jump to a conclusion before understanding what is being asked for.
  - b. Examples of distinctions. Can you distinguish between a:
    - i. variable and value
    - ii. population parameter and sample statistic
    - iii.  $\alpha$  level and  $p$  value
    - iv. type I error and type II error
    - v. *etc.*
2. Terminology is important, too. Can you define things like:
  - a. measurement
  - b. sample
  - c. population
  - d. relative frequency
  - e. confidence
  - f. power
  - g. sampling distribution of the mean
  - h. *etc.*
3. Data quality (measurement accuracy) and sample quality trumps all other elements of any statistical analysis. We should discuss:
  - a. measurement error and processing error
  - b. random samples and non-random samples (and the prevention from selection bias)
4. There are many correct ways to interpret any given statistic. There are also many incorrect ways. For example, we might describe a confidence interval as the point estimate  $\pm$  margin or error. We might also describe interval in terms of our confidence in capturing what it seeks. Both are correct. (Another example: rejection of  $H_0 =$  significant difference; retention of  $H_0 =$  insignificant difference)
5. We might practice some analyses:
  - a. stem-and-leaf plots (Ex. 2.4)
  - b. means and standard deviations (Ex. 3.10)
  - c. confidence intervals for means and mean differences (Ex. 7.4A)
  - d. testing a mean or mean difference (Ex. 7.4B)
  - e. independent  $t$  test basics, including setting up the test, calculating the pooled estimate of variance, the se based on the pooled estimate of variance, and assumptions required by the test (Ex. 8.6)
  - f. the side-by-side boxplot as a supplement to the independent  $t$  test (Ex. 8.4A)
  - g. inference about a proportion (Ex. 9.4)
  - h. analysis of a 2-by-2 table (Ex. 10.4) and other cross-tabulations (Ex. 10.7)