

Module 8a – Tests of Significance

[Review Against All Odds: Unit 25](#) (Tests of Significance)

Stat Procedure Diagram – Where we are

| | | <u>Descriptive Statistics (Describing Pops or Samples)</u> | | <u>Inferential Statistics (from Samples)</u> |
|--------------|--|--|--|---|
| | Variable Types | Display | Describe | Estimation |
| Univariate | categorical (nominal or ordinal)* | Bar Graph/Pie Chart | Counts/Percentages | When binary/dichotomous: Confidence interval for proportions |
| | quantitative/continuous | Histogram/Stem & Leaf Box Plot | Mean/St Dev (normal) Median/Min, Q1, Q3, Max (skewed) | Confidence interval for means |
| | | Display | Describe | Significance Tests/Hypothesis Tests |
| Bivariate | 2 categorical | Tables or Bar Graphs | Two-way tables/Crosstabulation | Chi-square test (for goodness of fit) |
| | 1 categorical, 1 quant. | Bar Graphs | Comparison of means/averages | T-test (one sample/group, two samples/groups) ANOVA (two or more samples/groups) |
| | 2 quant. | Scatterplot | Correlation Coef. (Coef. of determ)/ Regression Line | T-test for correlation |
| | | Display | Describe | Significance Tests/Hypothesis Tests |
| Multivariate | Response Variable is Quant. | - | Ordinary Least Squares Regression (OLS) | F-test for overall model T-tests for each explanatory variable |
| | Response Variable is categorical (dichotomous) | - | Logistic Regression | Chi-square tests of significance |

NOTE: Items highlighted in yellow are covered in this course.

*When a categorical variable has two categories, it is called dichotomous.

Hypothesis testing (bivariate analysis)

- Simplest form: comparing a sample average to some “standard” or “known value”
 - e.g. Do Mountain State graduates, on average, earn more/less than the national median (\$43,000 annually)?
 - Categorical/Dich IV (Mountain State vs Nat'l Median)
 - Quantitative/Continuous DV (Annual Income)

Hypotheses

- Every hypothesis consists of a null and alternative/research statement.
 - Null: Statement of no effect (no relationship) or no difference.
 - Alternative: Three types:
 - One-sided: Greater than
 - One-sided: Less than
 - Two-sided: Greater than or less than

Hypothesis testing (bivariate analysis)

- Do Mountain State graduates, on average, earn more/less than the national median (\$43,000 annually)?

- H_0 : Null Hypothesis: Mountain State graduates earn the same (on average) as the national median.

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these

- H_a : Alternative Hypothesis: Mountain State graduates earn more (on average) than the national median.
- H_a : Alternative Hypothesis: Mountain State graduates earn less (on average) than the national median.
- H_a : Alternative Hypothesis: Mountain State graduates earn more or less (on average) than the national median.

Hypothesis Test Results

- Two possibilities
 - We either *reject the null* hypothesis or we *fail to reject the null* hypothesis
- How do we know
 - We run a test for *statistical significance*
 - The results of a significance test are a *test statistic* and a *p-value*

Significance test results

