

# Review

## Lecture 52

Robb T. Koether

Hampden-Sydney College

Mon, Apr 25, 2016

# Outline

- 1 Time and Place
- 2 Part I – Exploring Data
- 3 Part II – Producing Data
- 4 Part III – From Data Production to Inference
- 5 Part IV – Inference about Variables
- 6 Part V – Inference about Relationships
- 7 Confidence Intervals
- 8 Hypothesis Tests
- 9 Making Decisions

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# Time and Place

- Time: Tuesday, May 3, 2:00 - 5:00 pm.
- Place: Bagby 022 (here).

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# Graphical Methods

## Graphical Methods

- Pie charts
- Bar graphs
- Histograms
- Stemplots
- Boxplots
- Scatterplots

## Numerical Calculations

- Mean (1-Var-Stats)
- Median (1-Var-Stats)
- Quartiles (1-Var-Stats)
- Standard deviation (1-Var-Stats)
- Correlation (LinReg (a+bx))
- Regression line (LinReg (a+bx))

## Probability Distributions

- Uniform distribution
- Normal distribution (`normalcdf`, `invNorm`)
- Later on...
  - $t$  distribution (`tcdf`, `invT`)
  - $\chi^2$  distribution ( `$\chi^2$ cdf`)



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# Terminology

## Terminology

- Variable
- Explanatory variable
- Response variable
- Confounding variable
- Observational study
- Experimental study

# Random Samples

## Random Samples

- Simple random sample (`randInt`)
- Stratified sample

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# Sampling Distributions

## Sampling Distributions

- Parameter
- Statistic
- Sampling distribution of  $\bar{x}$
- The Central Limit Theorem

# Confidence Intervals

## Confidence Intervals

- Confidence interval for  $\bar{x}$
- Point estimate
- Level of confidence
- Standard error
- Margin of error

# Hypothesis Tests

## Hypothesis Tests

- Hypothesis tests for  $\bar{x}$
- The Six Steps
- Null hypothesis
- Alternative hypothesis
- Level of confidence
- Test statistic
- $p$ -value

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## Inferences about Means

- The  $t$  distribution
- Degrees of freedom
- One sample vs. two samples
- Sampling distribution of  $\bar{X}_1 - \bar{X}_2$

# Inferences about Proportions

## Inferences about Proportions

- Sampling distribution of  $\hat{p}$
- Sampling distribution of  $\hat{p}_1 - \hat{p}_2$
- Pooled estimate of  $\hat{p}$

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# The $\chi^2$ Tests

## The $\chi^2$ Tests

- Expected counts
- $\chi^2$  statistic

# Regression Inferences

## Regression Inferences

- Regression standard error
- Standard error of  $b$

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# Confidence Intervals

## Confidence Intervals

- Mean, one sample ( $Z_{\text{Interval}}$ ,  $T_{\text{Interval}}$ )
- Mean, matched pairs ( $Z_{\text{Interval}}$ ,  $T_{\text{Interval}}$ )
- Two means ( $2\text{-Samp}Z_{\text{Int}}$ ,  $2\text{-Samp}T_{\text{Int}}$ )
- Proportion, one sample ( $1\text{-Prop}Z_{\text{Int}}$ )
- Two proportions ( $2\text{-Prop}Z_{\text{Int}}$ )

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# Hypothesis Tests

## Hypothesis Tests

- Mean, one sample (Z-Test, T-Test)
- Mean, matched pairs (Z-Test, T-Test)
- Two means (2-SampZTest, 2-SampTTest)
- Proportion, one sample (1-PropZTest)
- Two proportions (2-PropTest)
- Two way table (two variables) ( $\chi^2$ -Test)
- Goodness-of-fit (one variable) ( $\chi^2$ GOF-Test)
- Regression (LinRegTTest)

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# Making Decisions

## Making Decisions

- How would you recognize a hypothesis-testing problem?

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- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a matched-difference problem?

# Making Decisions

## Making Decisions

- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a matched-difference problem?
- How would you recognize a confidence-interval problem?

# Making Decisions

## Making Decisions

- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a matched-difference problem?
- How would you recognize a confidence-interval problem?
- How would you recognize a two-way problem?



# Making Decisions

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- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a matched-difference problem?
- How would you recognize a confidence-interval problem?
- How would you recognize a two-way problem?
- How would you recognize a goodness-of-fit problem?