# Applied Statistical Analysis

## EDUC 6050

## Week 1

Finding clarity using data

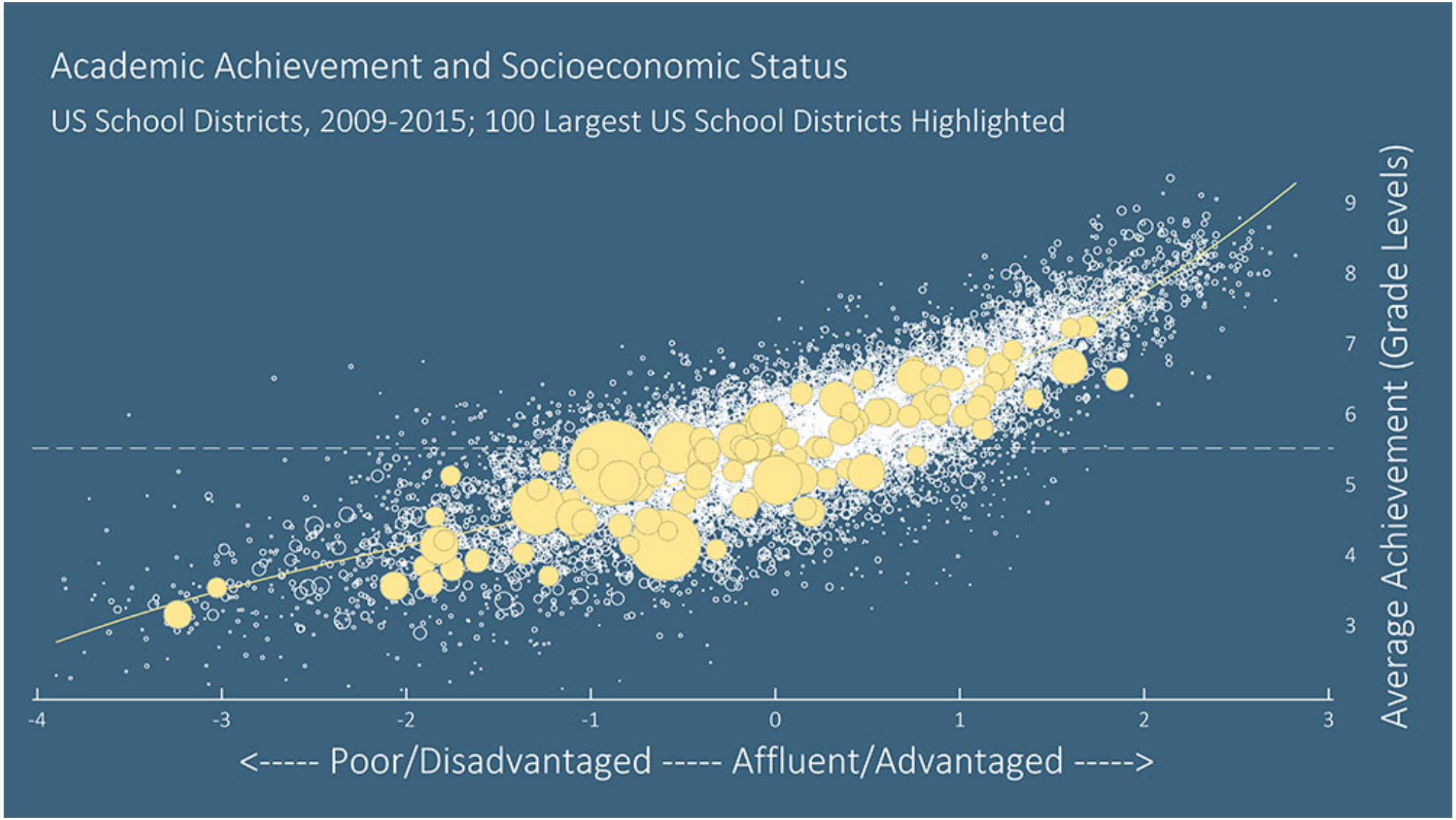
# Welcome

1. What is quantitative research?
2. How does data inform our world?
3. How are data analyzed?

# Data, Data, Data, Data, Data, ...

Tesla Autopilot

# Data, Data, Data, Data, Data, ...



# Data, Data, Data, Data, Data, ...

Health Care Policy and Cost

# Data are/is Cool

“In God we trust. All others must bring data.”
W. Edwards Deming

“It is a capital mistake to theorize before one has data.”
Sherlock Holmes, “A Study in Scarlett” (Arthur Conan Doyle).

“You can have data without information, but you cannot have information without data.”
Daniel Keys Moran

# Purpose of this course

Develop quantitative understanding and skills

Prepare you for:
1. Your thesis
2. Your career

# What is expected of you

- Attend and participate in class
- Prepare for class (readings before class)
- Professional correspondence with colleagues
- Use assignments to learn
- Ask questions
- Communicate with me

# Grading

## I. Statistics Organizer, 20% of grade

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## II. Research Portfolio, 20% of grade

An important aspect of this course is discovering how statistics are used in your field. You must find a minimum of **TEN** journal articles in your field with a quantitative component (look for numbers). Create a grid (in Excel or Word) that states the author, year, journal, major research questions, the major constructs (IV or DV), the different statistical methods, and brief summary of findings. Finally, write a roughly two-paragraph response to each article on how the statistical information provided an insight into the research questions (in other words, what did we learn within these studies that we didn't already know?). In addition, near the end of the semester we will have you share some of the more interesting articles that you found with the class.

## III. Assignments, 30% of grade

**SIX** equally weighted assignments form the basis for learning the practice of statistics at the level required by this course. These assignments are based on analyzing data in Jamovi (or SPSS if you prefer). These use data that you collect (via a survey that we develop the first day of class) or any other data source that you are interested in.

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## IV. Examinations, 30% of grade

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# Grading

## Statistics Organizer

**20% of Grade**

**You decide how it looks**
**-> Can use on Exams**

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# Grading

## Research Portfolio

**20% of Grade**

**10 journal articles in your area using quantitative research**

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# Grading

## Assignments

30% of Grade

6 applied assignments using Jamovi (or SPSS)

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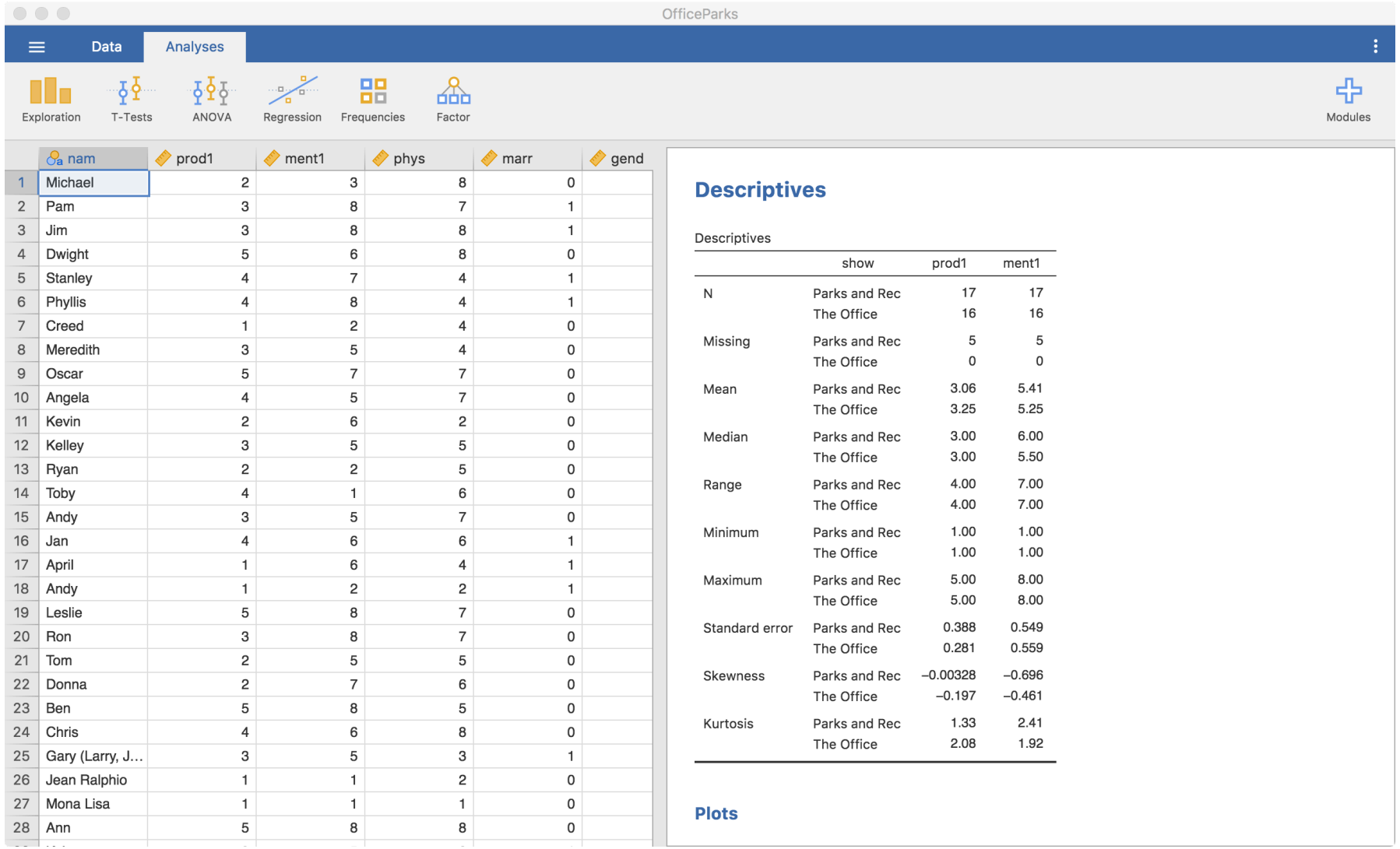
# Jamovi




| | nam | prod1 | ment1 | phys | marr | gend |
|---|---|---|---|---|---|---|
| 1 | Michael | 2 | 3 | 8 | 0 | |
| 2 | Pam | 3 | 8 | 7 | 1 | |
| 3 | Jim | 3 | 8 | 8 | 1 | |
| 4 | Dwight | 5 | 6 | 8 | 0 | |
| 5 | Stanley | 4 | 7 | 4 | 1 | |
| 6 | Phyllis | 4 | 8 | 4 | 1 | |
| 7 | Creed | 1 | 2 | 4 | 0 | |
| 8 | Meredith | 3 | 5 | 4 | 0 | |
| 9 | Oscar | 5 | 7 | 7 | 0 | |
| 10 | Angela | 4 | 5 | 7 | 0 | |
| 11 | Kevin | 2 | 6 | 2 | 0 | |
| 12 | Kelley | 3 | 5 | 5 | 0 | |
| 13 | Ryan | 2 | 2 | 5 | 0 | |
| 14 | Toby | 4 | 1 | 6 | 0 | |
| 15 | Andy | 3 | 5 | 7 | 0 | |
| 16 | Jan | 4 | 6 | 6 | 1 | |
| 17 | April | 1 | 6 | 4 | 1 | |
| 18 | Andy | 1 | 2 | 2 | 1 | |
| 19 | Leslie | 5 | 8 | 7 | 0 | |
| 20 | Ron | 3 | 8 | 7 | 0 | |
| 21 | Tom | 2 | 5 | 5 | 0 | |
| 22 | Donna | 2 | 7 | 6 | 0 | |
| 23 | Ben | 5 | 8 | 5 | 0 | |
| 24 | Chris | 4 | 6 | 8 | 0 | |
| 25 | Gary (Larry, J… | 3 | 5 | 3 | 1 | |
| 26 | Jean Ralphio | 1 | 1 | 2 | 0 | |
| 27 | Mona Lisa | 1 | 1 | 1 | 0 | |
| 28 | Ann | 5 | 8 | 8 | 0 | |

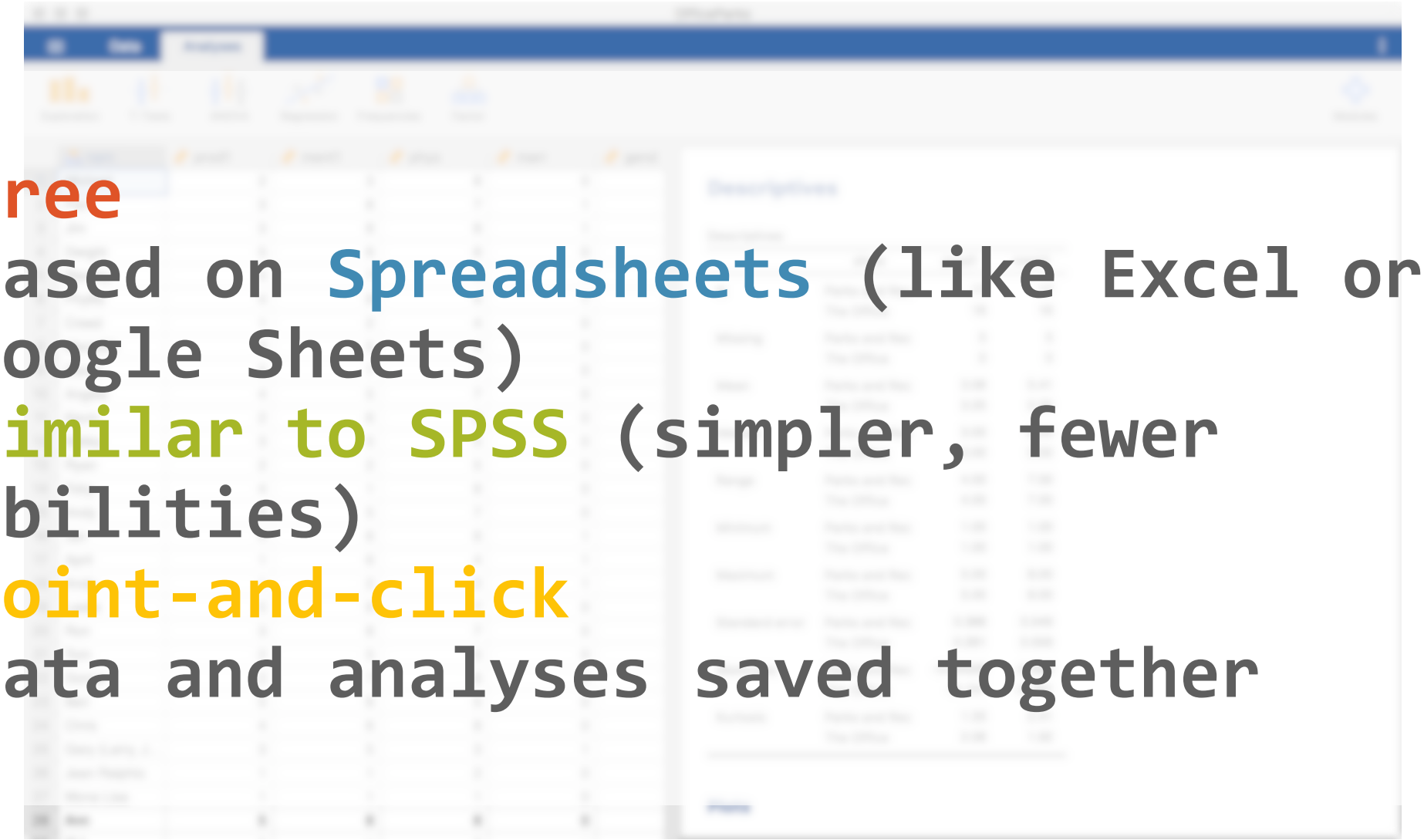
## Descriptives

Descriptives

| | show | prod1 | ment1 |
|---|---|---|---|
| N | Parks and Rec | 17 | 17 |
| | The Office | 16 | 16 |
| Missing | Parks and Rec | 5 | 5 |
| | The Office | 0 | 0 |
| Mean | Parks and Rec | 3.06 | 5.41 |
| | The Office | 3.25 | 5.25 |
| Median | Parks and Rec | 3.00 | 6.00 |
| | The Office | 3.00 | 5.50 |
| Range | Parks and Rec | 4.00 | 7.00 |
| | The Office | 4.00 | 7.00 |
| Minimum | Parks and Rec | 1.00 | 1.00 |
| | The Office | 1.00 | 1.00 |
| Maximum | Parks and Rec | 5.00 | 8.00 |
| | The Office | 5.00 | 8.00 |
| Standard error | Parks and Rec | 0.388 | 0.549 |
| | The Office | 0.281 | 0.559 |
| Skewness | Parks and Rec | −0.00328 | −0.696 |
| | The Office | −0.197 | −0.461 |
| Kurtosis | Parks and Rec | 1.33 | 2.41 |
| | The Office | 2.08 | 1.92 |

## Plots

# Jamovi



- Free
- Based on Spreadsheets (like Excel or Google Sheets)
- Similar to SPSS (simpler, fewer abilities)
- Point-and-click
- Data and analyses saved together

# Grading

## Examinations

30% of Grade

2 open note exams

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- Tentative
- Readings are due before class
- Assignment by the end of the day

| Date | Readings and Such | Lecture Topic | Week | Assignment Due by 11:59pm |
|---|---|---|---|---|
| Jan 10 | Broman et al. (2017) | Syllabus, Textbook, data, and create yo' survey | 1 | |
| Jan 17 | http://r4ds.had.co.nz/tidy-data.html#introduction-6 (ignore the R code) | Working with and Analyzing Data, Overview of Statistics, Intro to Statistics Terminology, Introduction to Jamovi | 2 | |
| Jan 24 | Ch 1, 2, 3<br>Start looking for published research in your area | Statistics terminology (Hypothesis, IV and DV, Measurement, Validity and Reliability, Correlation and Experimentation, Distributions, Central Tendency and Variability) | 3 | |
| Jan 31 | Ch 4, 5, 6 | Statistics terminology continued (hypothesis testing, populations and samples, descriptive and inferential statistics, effect sizes, confidence intervals, Type I and II errors) | 3 | Statistics Organizer #1 |
| Feb 7 | Ch 7 | More on Jamovi (data manipulation, transformations, assumptions), Creating tables and figures for reports and manuscripts, Intro to t-tests | 4 | HW #1 (Central Tendency and Variability) |
| Feb 14 | Ch 7, 9, 10 | T-tests (student's, Mann-Whitney, Wilcoxon), Review of hypothesis tests | 5 | |
| Feb 21 | Ch 11, 12 | ANOVA (one-way, two-way), ANCOVA, Repeated Measures ANOVA, post-hoc analyses | 6 | HW #2 (t-tests)<br>Statistics Organizer #2 |
| Feb 28 | | Mid-Term Examination | 7 | HW #3 (ANOVA) |
| Mar 7 | Spring Break! | | | |
| Mar 14 | Ch 13 | Correlations (Pearson, Spearman, partial) | 8 | |
| Mar 21 | Ch 13 | Linear Regression (hypothesis testing, prediction, assumptions) | 9 | |
| Mar 28 | Ch 13 | Multiple Regression (moderation, mediation) | 10 | HW #4 (correlations, regression) |
| April 4 | Ch 14 | Categorical Data Analysis (Chi-square, logistic, log-linear, odds ratios) | 11 | HW # 5 (multiple regression)<br>Statistics Organizer #3 |
| April 11 | Ch 14 | Categorical Data Analysis continued (logistic, odds ratios) | 12 | |
| April 18 | | Research Portfolio, Review for final | 13 | HW #6 (categorical data) |
| April 25 | | Review (get ready for the final) | 14 | Statistics Organizer #4 |
| May 2 | | Final Examination | | |

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**Please read the syllabus in depth**

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| Feb 28 | | Mid-term Examination | 7 | HW #3 (ANOVA) |
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# Break Time

# Tell us about yourself

During the break, please go to:

https://docs.google.com/spreadsheets/d/1JaggNgUtkdzQ9T-FTNDsvf0D6DRM1psMJZvcKuYSaxI/edit?usp=sharing

- first_name: your first name
- degree: the degree you're pursuing
- grow_up: what you want to do when you grow up
- hobby: one of your hobbies
- where_from: where are you from?
- where_end: where do you want to end up living
- would_rather: fly or money?

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## We will practice with Jamovi next week using this data

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# Data and spreadsheets

## Get used to working with spreadsheets

- Excel, Google Sheets, Numbers, etc.

# Good data practices

- Save a **master data file** that does not change after you have cleaned up the file
- Do NOT save subsetted data files (e.g., removed all ages < 20)
  - Instead **save the analyses**
- Save the master file on **multiple devices** (flash drive, cloud, computer)

Broman et al. (2017)

# Good data practices

- **Double check** your work
  - Re-run the same analyses after closing down the file and software
- **Keep track** of all your data and analysis

Broman et al. (2017)

# Break Time

# Assignments require your own data

You can use any data that you'd like, if:

- It has both **continuous** and **categorical** variables
- It has at least **20 participants**
- It is available for you to use in class (**de-identified**)

# Assignments require your own data

**Continuous is where the values of the variable can be a wide, continuous range**

- It has both **continuous** and **categorical** variables
- It has at least **20 participants**
- It is available for you to use in class (**de-identified**)

# Assignments require your own data

You can use any data that you'd like, if it:

Categorical is where the values of the variable can only be a few, predefined values

- It has both continuous and categorical variables
- It has at least 20 participants
- It is available for you to use in class (de-identified)

# Create a survey

Use a survey to collect data that you can use for this class

- Needs to meet the requirements of the data

Example

# Questions?

# Next week:

1. Working with Data
2. Overview of Statistics
3. Intro to Statistical Terminology
4. Intro to Jamovi