

# Materials for Math 315-Fa 19

Video Version: <https://youtu.be/ln3HSIMbhXk>

## Learning happens before class.

Through videos, the course packet, and the textbook.

## Lecture Video

These videos are the primary source of content for this class. They must be watched PRIOR to class. All links are found on the course website. Under MATERIALS → LECTURE NOTES / HOMEWORK / READING

MATH 315 SCHEDULE MATERIALS PROJECTS TOOLS HELP DR. D'S WEBSITE

LECTURE NOTES/HOMEWORK/READING

COURSE PACKET

DATA FROM COURSE PACKET

- Video 02 Data Sets and Code Books (24:37) <https://passiondrivenstatistics.com/2015/06/02/chapter-2-draft-version/>
- Video 03 Literature Review (7:57) <https://passiondrivenstatistics.com/2015/09/16/chapter-04/>
- Video 04 Working with Data (33:34) <https://passiondrivenstatistics.com/2015/12/18/04r/>
- Video 05 Data Management (33:28) <https://passiondrivenstatistics.com/2016/01/08/r-chapter-7/>
- Video 06 Graphing: One Variable at a Time (31:33) <https://passiondrivenstatistics.com/2016/01/20/r-chapter-8/>
- Video 07 Graphing Relationships (36:11) <https://passiondrivenstatistics.com/2016/03/28/r-chapter-9/>
- Video 08 Hypothesis Testing (30:46) <https://passiondrivenstatistics.com/2015/07/15/chapter-10/>
- Video 09 ANOVA (29:48) <https://passiondrivenstatistics.com/2016/05/11/r-chapter-11/>
- Video 10 Chi-Square Test of Independence (28:36) <https://passiondrivenstatistics.com/2016/06/29/r-chapter-12/>
- Video 11 Correlation (13:43) <https://passiondrivenstatistics.com/2019/01/08/11-correlation/>
- Video 12 Moderating (21:29) <https://passiondrivenstatistics.com/2016/08/20/r-chapter-14/>
- Video 13 The Question of Causation (14:06) <https://passiondrivenstatistics.com/2018/11/13/13-the-question-of-causation/>
- Video 14 Multivariable Models and Confounding (57:43) <https://passiondrivenstatistics.com/2016/10/06/r-chapter-17/>
- Video 15 Writing for your poster (16:03) <https://passiondrivenstatistics.com/2018/06/08/chapter-18-writing-for-your-poster-presentation/>

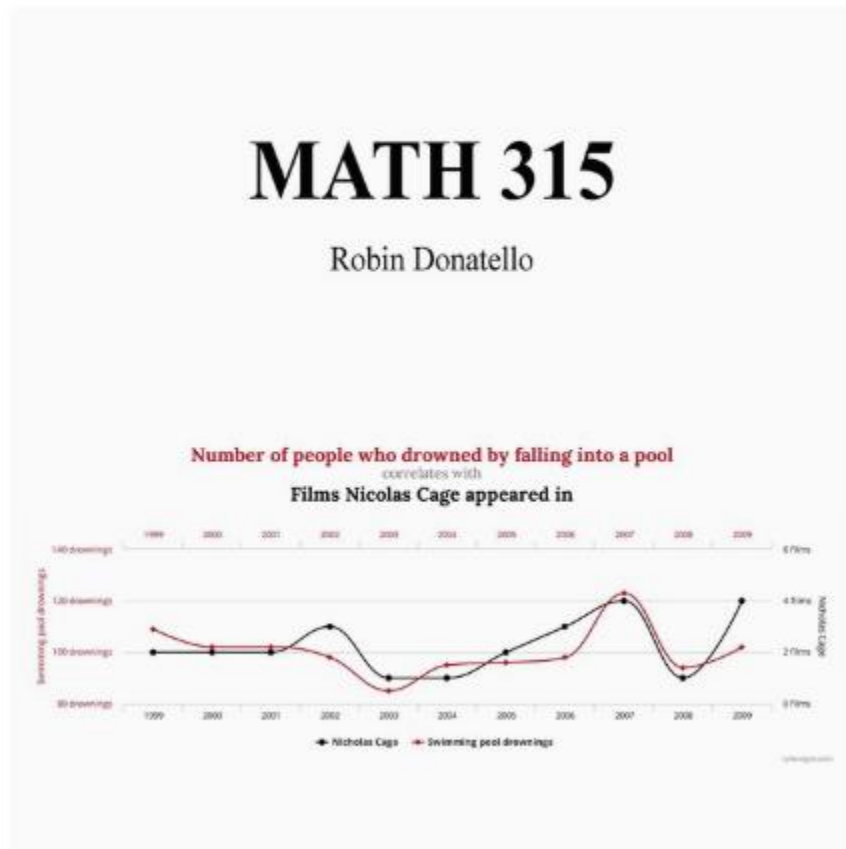
The schedule (shown later) tells you which video corresponds with what section (so does the video titles)

## Course packet

Purchase B&W copy at Chico Packet Pro. (\$24+tax) - <http://www.chicopacketpro.com/>

A color copy PDF copy will be available from the course website that you can access, but it does not replace the hard copy. You must have a hard copy and bring it with you every day.

We will be writing in these throughout the semester. You can have this on exam. Prepare answers to examples prior to the discussion in class.



## Backup Textbook

[https://www.openintro.org/stat/textbook.php?stat\\_book=os](https://www.openintro.org/stat/textbook.php?stat_book=os)

Free PDF, or \$15 for a really nice soft cover version. Excellent resource for more details and examples if you need more info on a particular topic. The red "Reading" Boxes in the course packet tell you which sections of this textbook correspond to the topic in the packet.

The screenshot shows the OpenIntro Statistics website. The header is dark blue with the text "OpenIntro Statistics" and a yellow button that says "← CLICK TO THE LEFT TO SWITCH TEXTBOOKS →". Below the header is a navigation bar with links: OVERVIEW, TEXTBOOK (highlighted), LABS, VIDEOS, TEACHERS, FORUMS, and EXTRAS. The main content area has a sidebar on the left with a "TEXTBOOKS" tab and a yellow box for "OpenIntro Statistics 3rd Edition" (2015, 436 pages). The main content area on the right has a heading "Ensure every student can access the course textbook. OpenIntro Statistics availability:" followed by a bulleted list: • FREE Download, • \$14.99 B&W paperback, Amazon (eligible for Prime), and • Bookstore and Reseller options (bulk orders). Below this list are two more sections: "Tablet-friendly PDF" and "MyOpenMath: online course software".

OpenIntro Statistics

← CLICK TO THE LEFT TO SWITCH TEXTBOOKS →

OVERVIEW TEXTBOOK LABS VIDEOS TEACHERS FORUMS EXTRAS

TEXTBOOKS

OpenIntro Statistics  
3rd Edition  
2015, 436 pages

Extra Content

Ensure every student can access the course textbook.  
OpenIntro Statistics availability:

- FREE Download
- \$14.99 B&W paperback, Amazon (eligible for Prime)
- Bookstore and Reseller options (bulk orders)

Tablet-friendly PDF

MyOpenMath: online course software

I just saw today that the 4<sup>th</sup> edition is out. Cool! But my course packet references sections in the 3<sup>rd</sup> edition. I can send you a copy of the PDF for the 3<sup>rd</sup> edition if you can't find it.

8/16/2019 6:39:40 PM

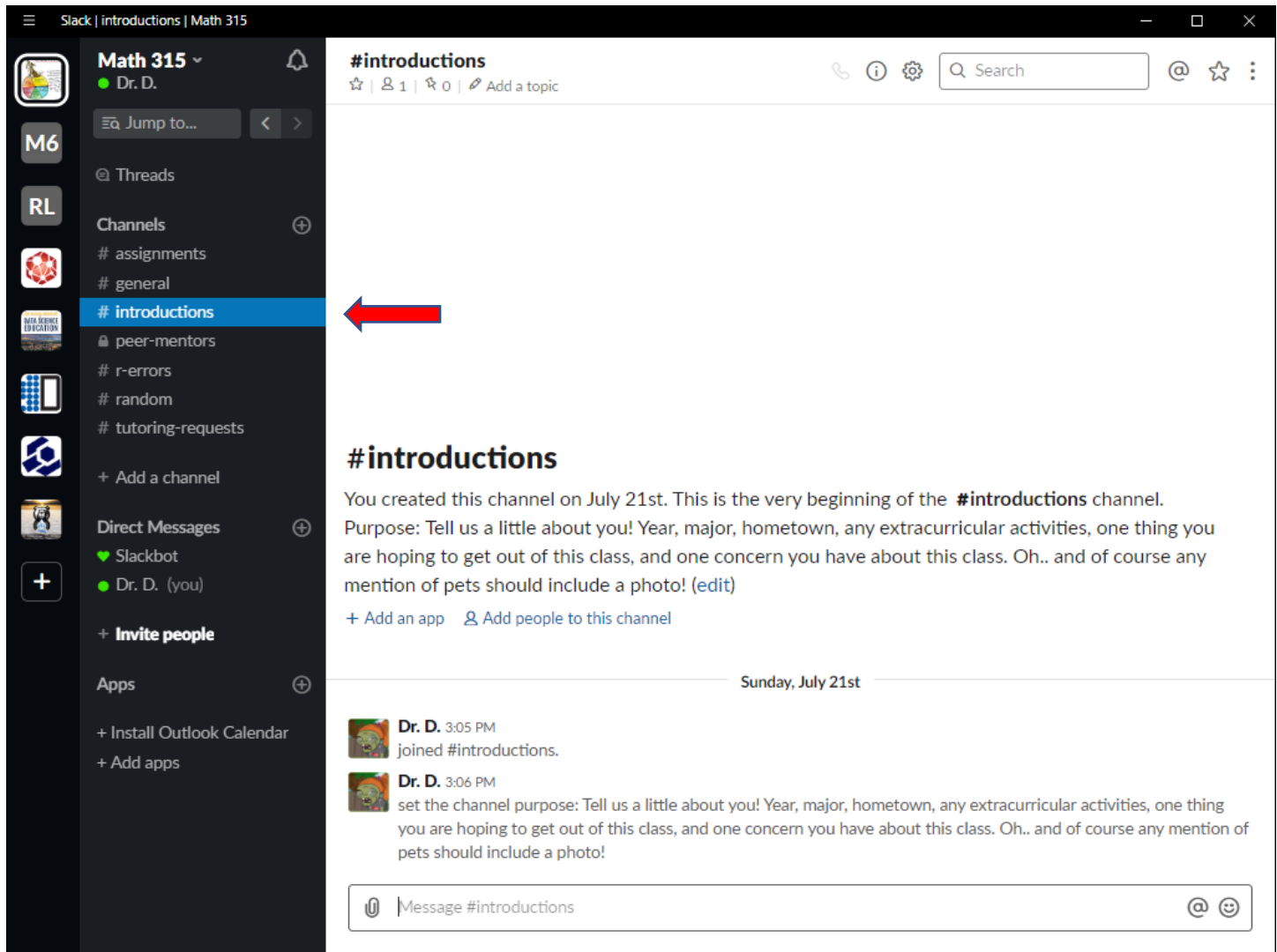
## Asynchronous discussion happens on Slack.

Use this link to join the workspace: <https://math315-f19.slack.com/signup>

You must use your @mail.csuchico.edu email address to sign up.

This is for all outside of class communication. **I do not answer questions about coding over email.** We have an #r-errors channel specifically for debugging.

Part of Homework 01 is to post an introduction in the #introductions channel.



Once you join the workspace you can access the *web browser version* from the TOOLS menu on the course webpage (shown later).

But you must either download the desktop application, OR the phone application. Do not rely on remembering to log into the web version every day. You will miss important information and updates. This is where I send class-wide information and reminders.

# Statistical Software Analysis Program R – with R Studio Interface

## Option 1: R Studio Cloud

A preloaded, pre setup R & R Studio instance in the cloud! All ready and prepared just for you.

The disadvantage of this option is that this workspace is only available to you for the semester. R Studio cloud is in alpha stage and so *currently* free for all, but I have no idea when (or if) they will change their policy. You are also limited in the size of data sets you can analyze in the cloud.

Join the Math 315 Fall 19 workspace by using this link:

[https://rstudio.cloud/spaces/21783/join?access\\_code=HuGvuAuNnijUPNs74glsqDFDj4lOG0W7k2COL3vd](https://rstudio.cloud/spaces/21783/join?access_code=HuGvuAuNnijUPNs74glsqDFDj4lOG0W7k2COL3vd)

Once you join the workspace you can access from the TOOLS menu on the course webpage (shown later).

The screenshot shows the R Studio Cloud interface. On the left, a sidebar contains a 'Learn' section with several links: 'Guide', 'What's New', 'Primers', 'Cheat Sheets', and 'Feedback and Questions'. The 'What's New' link is highlighted with an orange box. The main content area is titled 'Math 315 Fall 19' and has tabs for 'Projects', 'Members', and 'Info'. Below the tabs, it says 'All Projects' and 'No Projects'. A 'New Project' button is visible in the top right corner of the main area.

To get started, click “New Project”

Rename your project with your username.

This will have a set of starting folder and files.

You will work in this R project all semester on homework and your analysis project.

Check out these resources!

Primers == walk through tutorials on how to do various things like graphing in R.

Cheat sheets == when you just can’t quite remember what that one function to do that thing was.

## Option 2: Install all necessary programs and packages on your laptop

This can be advantageous if you have a spotty internet connection, plan on taking Math 130, or plan on using R for other classes. This option provides you the most flexibility and ownership of your program.

Instructions can be found on the [HELP→ R Programming](#) page of the course website.

**MATH 315** SCHEDULE MATERIALS PROJECTS TOOLS PEER MENTORS **HELP** DR. D'S WEBSITE

Accessing R and R Studio  
Navigating data sets  
Useful functions  
Good Coding Practices  
Common error messages  
Seeking Additional Help

## Getting Help with Programming in R

Last Updated 2019-07-28 17:52:30

### Accessing R and R Studio

- Option 1: Download and install the programs on your computer.
  - Advantage is that you will always have access to these programs.
  - You will have more "ownership" of your program
  - Follow [these lecture notes](#) to walk you through the installation.
- Option 2: Use R Studio in the cloud.
  - Free account that you can access from any computer
  - Sign up link in the [assignments](#) channel description in [Slack](#).
  - Requires solid internet connection
  - Still in beta testing, but I have no major complaints yet.

Even if you are comfortable installing programs, review the linked lecture notes to set some preferences for all of our sanity's sake!!

You will be following a lesson 02 in Math 130

Installing programs

Interacting with R  
Installing Packages  
Seeking help  
Where to get help

## Lesson 02 - Introduction to your new tools

Last Updated 07-10-2019

### Learning Objectives

After completing this lesson learners will be able to:

- Use R and R Studio on their personal computer.
- Describe the purpose of the RStudio Script, Console, Environment, and Plots panes.
- Organize files and directories for a set of analyses as an R Project, and understand the purpose of the working directory.
- Execute simple commands in the console
- Use the built-in RStudio help interface to search for more information on R functions.
- Demonstrate how to provide sufficient information for troubleshooting with the R user community.

### Installing programs

If you need additional help getting things installed or checking your installation please come to Community Coding (shown later) or office hours.

## Bringing all materials into one place - The Course Website (Bookmark this)

<https://norcalbiostat.github.io/MATH315/>

The landing page shows announcements for the week.

MATH 315
SCHEDULE
MATERIALS
PROJECTS
TOOLS
PEER MENTORS
HELP
DR. D'S WEBSITE

### Math 315 homepage

This is the course website for **Applied Statistical Methods 1** course taught by **Dr. Robin Donatello** in Fall 2019. This landing page is used for posting of regular announcements and information for students of the class.

#### 08-26-2019: Welcome to Fall 19!

- This course website contains all materials except the textbook for this class. Be sure to familiarize yourself with the organization. You will be here a lot. Bookmark this page.
- Specifically click on and explore items in the top navigation bar.
- Take this survey to help choose when I should hold Office Hours: <https://forms.gle/6ZTSfrJ2WbyKMfk39>
- We will use Slack to facilitate outside of class discussion, and to replace emails.
  - Use the link under 'Tools' in the navigation bar of this page to go to our Slack workspace, make an account using your @mail.csuchico.edu email address.
  - You must download either the desktop app, or the phone app, or both. Do not rely on the browser based version.

### Schedule – Overview tab

The schedule gives you a week/topic level overview of what we'll be covering that week. It has links to the corresponding video, course packet section, quiz links for each section, links to assignments, and due dates.

MATH 315
SCHEDULE
MATERIALS
PROJECTS
TOOLS
PEER MENTORS
HELP
DR. D'S WEBSITE

### Schedule

Last Updated: Sun Jul 28 9:10:58 PM

OVERVIEW DETAILS CALENDAR

Unless specified otherwise, all assignments are due at midnight on the due date listed.

Topic	PDS Chapter	Course Packet	Quiz	Assignments
<b>Week 1 (08/25)</b>				
Introduction to the class		Intro	Quiz 1 (Due 8/29) [Sec 01] [Sec 02]	hw01_introduction (Due 9/2)
Working with R and R Studio				
Statistics in the service of science	1			
Populations vs Samples, bias, representation	2			
Explanatory vs Response				
<b>Week 2 (09/01)</b>				
Data types	2 (7 min)		Quiz 2 (Due 9/3) [Sec 01] [Sec 02]	hw02_rq_formulation* (Due 9/8, PR 9/11)
Data architecture and codebooks	2 (12 min)			

## Schedule - Detailed Weekly View

This view gives you a detailed list of weekly learning objectives, how to prepare, and some notes on what we'll be covering each day.

OVERVIEW

DETAILS

CALENDAR

Click each link to expand or contract the details for that week.

### Week 1: Getting Started with data

### Week 2: Choosing a Research Project

#### Learning Objectives

- Distinguish between categorical and continuous data types
- Formulate a testable research hypothesis
- Differentiate between primary and secondary research sources
- Properly cite relevant research

#### How to prepare

- Watch PDS Video 2 and 3
- Optional but helpful: [Video on developing a research topic that interests you](#)
- Read: How to read a journal article
- Read: Conducting a literature review

#### Monday overview

- Labor day - Campus closed

#### Wednesday overview

- Week 2 group quiz
- How data is stored in spreadsheets
- Formulating testable hypothesis

#### Friday overview

- Learn more about your topic area by conducting a literature review.
- What is already known, what questions have not yet been explored?
- The idea is to find an area where you can contribute to new research.
- You will learn how to conduct a literature review without burning yourself out or getting lost

### Week 3: Working with Data

### Week 4: Describing Data

This is mostly flipped classroom. YOU are responsible for the initial learning outside of class.

Doing these preparation steps is critical.



## Schedule – Calendar

This view shows you a Google Calendar view of topics and due dates. The dates on this calendar should be consistent with the weekly schedule overview. If there are discrepancies, please let me know.

OVERVIEW

DETAILS

CALENDAR

For those of you that like the calendar view of your schedule. Due to schedule adjustments during the semester these dates may not match exactly with the schedule. In those cases please bring any discrepancies to my attention via Slack.

### Math 315



These Sunday quizzes are on material FOR THAT UPCOMING WEEK.


If you don't follow the preparation steps (read notes, watch videos) you won't do well on these exams.

## Materials


MATERIALS ▾

This page contains links to all the lecture videos, homework files, additional lecture notes as needed, and readings.

## Homework



hw01_orientation	html	pdf	
hw01_orientation_template			Rmd
hw02_personal_codebook	html	pdf	
hw03_lit_review	html	pdf	
hw04_data_management	html	pdf	
hw05_univ_graphing_template			Rmd
hw06_biv_graphing_template			Rmd
hw08_bivariate_inference_template			Rmd
hw09_moderation_template			Rmd
hw10_regression_template			Rmd



Homework instructions are available as HTML or PDF.

The link to the homework found on the overall schedule page links to the same HTML page as shown here.

For Homework that is to be completed in R Markdown I have provided homework template files for you to use.

If you are using R Studio Cloud, the first HW01 template is pre-loaded for you.

If you will be using your own laptop, you will have to download these files and put them into your MATH315 folder.

## Reading Materials

Adventures in R (Tippmann 2015)
Advice from prior Math 315 students
Analyzing exam errors
Example_Research_Plan_from_Add_Health
How to Read a Journal Article
Importance of sharing code (Nature 2014)
Journals unite for reproducibility (Nature 2014)
Learning Your First Job (Leamnson 2002)
MAI and academic achievement in college students (Young, Fry, 2008)
Metacognition Awareness Inventory
RAD_course_notes_F19
sample_exam_1
Self Regulated Learning Questions (Neilson)
Thou Shalt Be Reproducible in Psychology (Mair 2016)
Why you should care about reproducible research (Blog post Revolution R 2011)

**DO NOT RUN CODE FILES FROM YOUR BROWSER.**

*For sanity's sake you must put them into your class folder before you open them in R studio.*

Long read, but informative for your mindset going into this class. Themes emerge that you should pay attention to and be mindful about if you want to get an "A" grade in here.

These are part of Homework 1

## How to turn in homework - Google Drive

Open to only those in our class, and available through the TOOLS folder on the course website

Specifically, your campus email will be provided access to this folder during week 1.

The screenshot shows the Google Drive interface. At the top, the breadcrumb path is "My Drive > Teaching > Math 315 Fall 19". Below this, there is a list of folders, each with a person icon. The folders are: 01 Introduction, 02 Research Question Formulation, 03 Data Management, 04 Univariate Graphics, 05 Bivariate Graphics, 06 Research Proposal, 07 Foundations for Inference, 08 Bivariate Inference, 09 Moderation, 10 Regression, Poster prep (slides), Project poster draft, Quizzes, Group quiz link (with a group icon), and Peer Review Rotation (with a group icon). The "Name" column is sorted ascending.

The screenshot shows a dark grey dropdown menu titled "TOOLS". It contains four items: "R STUDIO CLOUD" with a code icon, "GOOGLE DRIVE" with a Google Drive icon, "SLACK (CLASS DISCUSSIONS)" with a Slack icon, and "ZOOM (VIDEO CONFERENCE)" with a Zoom icon.

This is where you will be turning in all of your non-quiz homework.

Under the HELP tab on the course website there are more instructions for how to submit homework, how to do peer review, and what I'm looking for when grading.

The screenshot shows a dark grey dropdown menu titled "? HELP". It contains four items: "SYLLABUS", "PEER MENTORS", "SUBMITTING HOMEWORK" (which is highlighted in a light yellow color), and "R PROGRAMMING".

We'll talk about this [Peer Review Rotation Spreadsheet](#) as Homework 02 gets closer to being due.

## Weekly Quizzes

Preparation quizzes are done on the night *prior* to the topic being discussed in class. This being a flipped class and all, you are responsible for watching the video and learning the initial content outside of class. This quiz is a “check” to see what you have learned so far. I will check the scores that next morning and we’ll fill in some gaps during the next class period. You’ll have another chance to do a Group quiz at that point to re-earn a few points back.

When you’re ready to take the quiz, click on the link in the class schedule for your class meeting time.

Week 2 (09/01)				
Data types	2 (7 min)		Quiz 2 (Due 9/3) [Sec 01] [Sec 02]	hw02_rq_formulation* (Due 9/8, PR 9/11)
Data architecture and codebooks	2 (12 min)			

You will be required to login to your Chico State google account before taking the quiz (this is so you get credit!)

These quizzes are administered through Google Forms and will look something like this:

### This is a test quiz!

Your email address (rdonatello@mail.csuchico.edu) will be recorded when you submit this form.  
Not you? [Switch account](#)

Do you like Cilantro?

☐ No

☐ It's gross

☐ Heck no

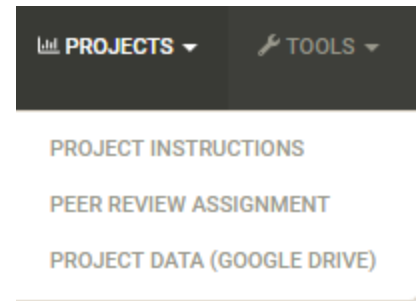
☐ What is cilantro?

## Research Data

You will be conducting original research on topics that interest you. You will use data that is already collected but be warned – it is not pre-cleaned up data! That is part of the journey in this class is how to be the boss of your data!

Under the Projects tab on the course website you'll find a link to the Project Data

This takes you to a Google Drive where you will find **ten** data sets for you to choose from.



My Drive > Teaching > Data ▾		
Name ↑	Owner	Last modified
Antibiotic resistance in cattle	me	3:53 PM me
Forest caterpillar ecology experimen...	me	Feb 5, 2019 me
Housing prices in Saratoga	me	Aug 15, 2019 me
MarsCrater	me	Feb 5, 2019 me
National Epidemiologic Survey on AI...	me	Feb 5, 2019 me
National Longitudinal Study of Adole...	me	Feb 5, 2019 me
Newly Licensed Registered Nurse Su...	me	Feb 5, 2019 me
Online College Social Life Survey	me	Aug 15, 2019 me
Outlook on Life Survey	me	Feb 5, 2019 me
School crime	me	Aug 15, 2019 me
Fall 19 Research Topics	me	Aug 15, 2019 me



Be sure to read the documentation in each folder to get to learn a little about the data sets you have available.

You will be paired up with individuals who are interested in the same research topic as you to do the project

Sign up for the data set you want to work on in this spreadsheet. Spots are limited for each data set.

You do not have to have a clearly defined research question to sign up for a data set, but you have to have something that indicates you have looked at the data & given it some thought.

## Getting Help

- List of resources can be found at [https://norcalbiostat.github.io/MATH315/help\\_R.html](https://norcalbiostat.github.io/MATH315/help_R.html)
- Ask in the #assignment Slack channel
- Ask for tutoring in the #tutoring-request channel
- Visit the Math tutoring lab on the 4<sup>th</sup> floor
- Come to office hours. TBD – Help me decide! <https://forms.gle/6ZTSfrJ2WbyKMfk39>
- Go to the **Contact** page of my personal website and book an appointment with me <http://www.norcalbiostat.com/>

## Community Coding!

You are required to come at least once as part of your grade. I encourage you to commit to coming to work on your research project and homework at least 10 times in the semester and get 1 unit. Enroll in Math **290-02**. Hours available TWR 2-4pm, YOLO 206

