**STAT 101L: Data Analysis and Statistical Inference**

Fall 2020

**Section 1:** MW 5:15-6:30 PM (on Zoom); **Section 2:** TTH 12-1:15 PM (on Zoom)

*Please also check when your lab session will take place.*

**Instructor:** Jacob Smith (jacob.f.smith@duke.edu)

**Office Hours on Zoom:** Tuesday 1:30-3 PM, Thurs. 5:30-7 PM and by appointment.

I welcome you to come to office hours to discuss assignments, but also if you would like to discuss your experience as a college student at Duke, something in the news, or anything else.

**Head TA:** Emily Gentles ([emily.gentles@duke.edu](mailto:emily.gentles@duke.edu)).

**Office Hours on Zoom:** Thursday 10:15 AM to 12:15 PM (<https://duke/zoom/us/j/96160308004>)

**Office Hours for Other TAs**

|  |  |  |
| --- | --- | --- |
| TA | Office Hours | Zoom Room Link |
| Emre Yurtbay | Friday 7-9 AM | <https://duke.zoom.us/j/93572545868> |
| Michael Sarkis | Thursday 3-5 PM | <https://duke.zoom.us/j/91604890466> |
| Joe Mathews | Monday 4:45 PM-6:45 PM | <https://duke.zoom.us/j/93881819992> |
| Zeki Kazan | Thursday 7-9 PM | <https://duke.zoom.us/j/98581124126> |
| Daniel Deng | Friday 9 AM-11 AM | <https://duke.zoom.us/j/94420239798> |
| Evan Knox | Thursday 8PM- 10 PM | <https://duke.zoom.us/j/99358697266> |
| Richard Chen | Wednesday 5-7 PM | <https://duke.zoom.us/j/7203736993> |
| Molly Carson | Tuesday 12-2 PM | <https://duke.zoom.us/j/96447245675> |
| Nadia Innab | Monday 5-7 PM | <https://duke.zoom.us/j/97084166326> |
| Younis Mahmoud | Wednesday 3-5 PM | <https://duke.zoom.us/j/94539209219> |
| Carly Grossfield | Wednesday 2-4 PM | <https://duke.zoom.us/j/95395804920> |
| Thea Dowrich | Thursday 5-7 PM | <https://duke.zoom.us/j/94606933981> |
| Sophie Riegel | Friday 12-2 PM | <https://duke.zoom.us/j/96232678457> |
| George Lindner (Technology Office Hours) | Tuesday 5-6 PM  Friday 3:30-4:30 PM | <https://duke.zoom.us/j/8480240822> |

*You are welcome to go to the office hours of any TA.*

**Lab Sections**

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| --- | --- | --- |
| **Section** | **Graduate TA** | **Undergraduate TA** |
| M 10:15 AM | Emre Yurtbay  (emre.yurtbay@duke.edu) | Richard Chen  (richard.chen3@duke.edu) |
| M Noon | Michael Sarkis  (michael.sarkis@duke.edu) | Molly Carson  (molly.carson@duke.edu) |
| M 1:45 AM | Joe Mathews  (joseph.mathews@duke.edu) | Nadia Innab  (nadia.inab@duke.edu) |
| TH 8:30 AM | Emily Gentles  (emily.gentles@duke.edu) | Younis Mahmoud  (younis.mahmoud@duke.edu) |
| TH 10:15 AM | Zeki Kazan  (zekican.kazan@duke.edu) | Carly Grossfield  (carly.grossfield@duke.edu) |
| TH 3:30 PM | Daniel Deng  (di.deng@duke.edu) | Thea Dowrich  (thea.dowrich@duke.edu) |
| Asynchronous | Evan Knox  (evan.knox@duke.edu) | Sophie Riegel  (sophie.riegel@duke.edu) |

*All labs will be held in the Zoom room associated with that lab.*

**Course Description:** Introduction to statistics as a science of understanding and analyzing data. Themes include data collection, exploratory analysis, inference, and modeling. Focus on principles underlying quantitative research in social sciences, humanities, and public policy. Research projects teach the process of scientific discovery and synthesis and critical evaluation of research and statistical arguments. Readings give perspective on why in 1950, S. Wilks said, "Statistical thinking will one day be as necessary a qualification for efficient citizenship as the ability to read and write."

*As a quantitative social scientist, I am particularly excited to show you how I use data to answer questions on a variety of topics in political science and public policy. We will also discuss how social scientists and humanists in other fields use data in their research.*

**Course Goals and Objectives:** This course introduces students to the discipline of statistics as a science of understanding and analyzing data. Throughout the semester, students will learn how to make effective use of data in the face of uncertainty: how to collect data, how to analyze data, and how to use data to make inferences and conclusions about real world phenomena.

The course goals are as follows:

1. Recognize the importance of data collection, identify limitations in data collection methods, and determine how they affect the scope of inference.

2. Use statistical software to summarize data numerically and visually, and to perform data analysis.

3. Have a conceptual understanding of the unified nature of statistical inference.

4. Apply estimation and testing methods to analyze single variables or the relationship between two variables in order to understand natural phenomena and make data-based decisions.

5. Model numerical response variables using a single or multiple explanatory variables.

6. Interpret results correctly, effectively, and in context without relying on statistical jargon.

7. Critique data-based claims and evaluate data-based decisions.

8. Complete a research project demonstrating mastery of statistical data analysis from exploratory analysis to inference to modeling.

**Structure of course:** This course will use an online flipped classroom format. Before each class session, there will be some readings and video lectures (see “Required Texts” below) to read and watch that focus on core statistical concepts or applications to social science/humanities research. Live Zoom sessions at the official time for your section will focus on working through problems together and in groups in breakout rooms, answering questions, and discussing practical applications of the statistical concepts for that day. I will not take attendance at Zoom sessions and I will provide a recording if you cannot attend. You should also enroll in a lab session. These sessions, led by graduate TAs partnered with an undergraduate TA, will provide guidance on how to use the statistical software environment *R*. As with the main session, I encourage you to attend if possible, but I will make a recording available if you cannot attend. This course is condensed into a shorter time-frame than a usual semester course, so it is important to keep up with course material. However, I understand that challenges may arise during the semester, so I urge you to reach out to me if you have any concerns.

**Course grades and assignments:**

* **Problem Sets:** 20% of final grade. *You will complete graded problem sets on an semi-weekly basis over the course of the semester. I will also suggest ungraded practice problems that will help practice the skills you will use on graded assignments. You are welcome to work with others on the problem sets, but must turn in separate assignments that are in your own words. There will be**7 problem sets and I will drop the lowest one at the end of the semester. There will also be an ungraded 8th problem set if you would like feedback on analysis of multiple regression before the project is due. All problem sets will be weighted equally.*
* **Labs:** 20% of final grade. *You will complete a graded assignment in RStudio/R Markdown after nearly every lab session (9 labs total). You are welcome to work with others on the labs, but must turn in separate assignments that are in your own words. I will drop the lowest lab grade from your final average in this category. All labs will be weighted equally.*
* **Take Home Midterm 1:** 12.5% of final grade. *This take-home exam will be released on Monday September 21 at 12 am and is due by 11:59 PM on Tuesday September 22. You may not collaborate with others on the exam, but have the entire 48 hours to work on it.*
* **Take Home Midterm 2:** 12.5% of final grade. *This take-home exam will be released on Wednesday October 21 at 12 am and is due by 11:59 PM on Thursday October 22. You may not collaborate with others on the exam, but have the entire 48 hours to work on it.*
* **Project:** 35% of final grade. *You will complete a project where you use real data to examine a topic of interest using linear regression analysis. As part of this project, you will participate in two workshops with peers in your lab section where you exchange drafts in advance and give each other feedback. Consistently exchanging papers after the set time for that paper will reflect negatively on your project grade. I will post more specific directions for the project by the start of September.*
  + **Proposal:** 5% of final grade. *A proposal for your paper is due by 11:59 PM Eastern on Friday October 9; you will have a workshop in lieu of lab this week and you should exchange drafts of your proposal with your group by 11:59 PM Eastern on Saturday October 3.*
  + **Lab Report:** 15% of final grade. *The final draft of your project is due by 11:59 PM Eastern on Friday November 13; you will have a workshop in lieu of lab this week and you should exchange drafts of your lab report with your group by 11:59 PM Eastern on Saturday November 7.*
  + **Blog Post:** 15% of final grade. *You will write a short blog post about your paper topic in the style of* [*The Monkey Cage*](https://www.washingtonpost.com/politics/2019/06/10/about-monkey-cage/) *or* [*The Upshot*.](https://www.nytimes.com/section/upshot) *We will discuss this genre of writing in class before it is due. This blog post is due at 11:59 PM on Monday November 16. You are welcome to exchange your post with others in the class for peer review, but this is not required.*

**Required Texts:**

* OpenIntro Statistics (4th Edition, 2019), by Diez, David, Mine Çetinkaya-Rundel, and Christopher Barr. (ISBN: 1943450072).
  + The textbook is available for free online [here](https://leanpub.com/openintro-statistics). A paper copy is also available from Amazon [here](https://www.amazon.com/OpenIntro-Statistics-Fourth-David-Diez/dp/1943450072).
* Coursera Videos: Recorded lectures related to course content are available from Coursera. These are [available](https://www.coursera.org/programs/duke-university-courses-gp9dy?authProvider=duke) to you at no additional cost as a Duke student. (They are also available for free on [YouTube](https://www.youtube.com/watch?v=8Z9A-g7JkJE&list=PL_onPhFCkVQj2gy3p-LFStuApNiWoQxsG).)
* Other readings are available on Sakai or online. Please let me know if a link to an online resource does not work.

**Statistical Software:**

This course will make use of the programming language *R* through the integrated development environment (IDE) *RStudio*. I have reserved Docker containers [here](https://vm-manage.oit.duke.edu/containers/rstudio) through OIT where you can access the software. You are also welcome to download [*R*](http://archive.linux.duke.edu/cran/) and[*RStudio*](https://rstudio.com/) for your own computer for free. In addition to the labs for this course, Statistical Science faculty teaching 100-level courses this semester made [tutorials](https://duke-learning-r.netlify.app/) on many different things you might be doing in R that are available to you as Duke students.

**Statistics 101 Course Policies**

**Attendance:** I will not take attendance at live sessions, but you should watch recordings of any sessions that you miss. I encourage you attend, but you will not be penalized if you cannot.

**Submission of Assignments**: You will submit all written assignments through either Sakai or *Gradescope*. You will submit labs and the assignments for the project on Sakai, while you should complete the exams and problem sets through *Gradescope*.

**Contact Policy and Office Hours:** Students are encouraged to attend office hours or contact me via email with any questions about the course. I am also available by appointment if one is unable to meet during the times listed on the syllabus.

Please feel free to contact me over email as well. I will respond promptly and will do my best to respond the same day to emails; however, I may not always be able to provide an immediate response to a late evening email sent the day before an assignment is due. If you have a broad question about course content, I encourage you to post it on the class Piazza discussion forum on the Sakai page.

TAs will also hold office hours and are available over email.

When you arrive in the main office hours Zoom room for the member of the teaching team you wish to speak to please put your name on this [Google doc](https://docs.google.com/spreadsheets/d/1Wldj1LTd7bRYjfI-Jv6jIQqoH1tb_imyIipMCeVBOFI/edit#gid=0), indicate which problem/item you have a question about, and please wait for your turn to be invited into a breakout room. Students with questions on the same problem may be invited in together. If you would like to talk one-on-one about something specific to you, please write “individual question” or email to set up an appointment.

**Diversity and Mutual Respect:** It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity and in alignment with [Duke's Commitment to Diversity and Inclusion](https://provost.duke.edu/initiatives/commitment-to-diversity-and-inclusion). Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

Furthermore, I would like to create a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities. To help accomplish this:

* If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. If you prefer to speak with someone outside of the course, your academic dean is an excellent resource.
* I (like many people) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

**Late Work:** Deadlines are given in Eastern Time (so Duke time), but I realize that some of you may be in different time zones. Please try to get in assignments in by the proper time, but I will be flexible. If you think you may need an extension on any assignment, please do not hesitate to reach out. This has always been my policy, but it is especially critical during the current crisis. This is a stressful time; I do not want this class to add to your stress unnecessarily. The reason for an extension does not have to be a COVID-related; I will not ask you to explain or to present any documents. Please do try to let me know as far ahead as possible, but I recognize that this will not always be possible.

Generally, unless I have approved a deadline extension in advance, assignments are due according to the deadlines specified, including date and time. Late penalties begin 1 minute after an assignment is due. If an assignment is due at 5 PM Wednesday, the late penalty from 5:01 PM Wednesday through 5 PM Thursday is 5 percentage points (e.g., a 100 would become a 95, a 90 would become an 85). An assignment submitted between 5:01 PM Thursday to 5 PM Friday would lose 10 percentage points. A late lab or problem set will not be accepted more than four days (i.e., 96 hours) late without a valid excuse. All take-home exams should be submitted by the end of the 48-hour window unless you have spoken in advance with the instructor about other arrangements. All work is due by 11:59 PM on November 16th unless a valid excuse is approved by the instructor.

*It is very important that students exchange drafts on time for group workshops. Consistently exchanging drafts after the set time for that assignment will reflect negatively on final lab report grades.*

**Integrity:** Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. Cheating on exams and quizzes, plagiarism on homework assignments and projects, lying about an illness or absence and other forms of academic dishonesty are a breach of trust with classmates and faculty, violate the [Duke Community Standard](https://studentaffairs.duke.edu/conduct/about-us/duke-community-standard), and will not be tolerated. Such incidences will result in a 0 grade for all parties involved as well as being reported to the [Office of Student Conduct](https://studentaffairs.duke.edu/conduct). Additionally, there may be penalties to your final class grade. Please review [Duke's Academic Dishonesty policies.](https://studentaffairs.duke.edu/conduct/z-policies/academic-dishonesty)

**Grades:** Due to the unusual circumstances facing us this semester, this course will be graded S/U this semester. Grades above a 70% (i.e., a C- or higher) will receive a S and grades below a 70 will receive a U.

On August 14, Arts and Sciences sent out a later clarifying S/U grading. From this email, please note:

“There are several things you should know about the Executive Committee’s decision:

* The change for these courses is to a mandatory S/U grading basis, so no student in these S/U courses will be able to opt into receiving a letter grade.
* As a special provision of this decision, courses converted to S/U under this policy will satisfy the requirements of any major, minor or certificate program as well as T-Reqs and other requirements for graduation.
* Any S/U courses you take this fall will not count toward the number of S/Us allowable per year or upon graduation.
* S/U grades are not factored into your GPA, and will not count toward Latin Honors.
* No decision has been made in regards to S/U grading for Spring 2021, and any extension of this policy would follow further review by the Trinity Arts & Sciences Council this fall.”

I take grading seriously and am happy to discuss why you received a grade on any assignment during office hours or an appointment at a mutually workable time. Regrade requests must be made within two class days of when the assignment is returned, and must be submitted in writing or using the regrade request in *Gradescope*. These will be honored if points were tallied incorrectly, or if you believe your answer is correct but it was marked wrong. No regrade will be made to alter the number of points deducted for a mistake. There will be no grade changes after the end of the semester.

I will still calculate your exact percentage and what it would map to if we were calculating letter grades on the usual scale. If you would like me to write a letter for future applications detailing your specific grade at the end of the semester, please let me know and I am happy to do this if you give me the required permission. This percentage is set and unless you think I made a calculation error, I will not entertain “grade” inquires. These are not the same as official letter grades and will not be listed on transcripts.

**Statistics 101 Support & Resources**

**Emergency Notification:** In an emergency, there are several ways that the University will contact you. Two are detailed below. Campus emergency procedures are described here: <http://emergency.duke.edu>.

Text Messaging: An alert message may be sent to the mobile devices of Duke community members who register for a new text messaging system. Sign up for [Duke Alert](https://emergency.duke.edu/text_msg/) text messages or learn more about text messaging at Duke.

LiveSafe Mobile App: Notifications may be sent through the [LiveSafe Mobile app](https://emergency.duke.edu/notified/livesafe/#:~:text=Duke%20LiveSafe%20is%20a%20mobile,the%20Duke%20University%20Police%20Department.) to notify members of the Duke community of emergency situations. The free mobile app, available through the Apple App Store and Android App Store, offers real-time, two-way communication between Duke community members and the Duke University Police Department.

**Voting Resources:** If you are eligible to vote, I encourage you to participate in this year’s election. Based on a 1979 Supreme Court decision, college students may vote at *either* their college or their previous home address (but not both). If you would like to talk about anything related to that (or November’s) election, feel free to talk to me about it in office hours. North Carolina polls are open from 6:30 am to 7:30 PM on Election Day; you can send in an application to vote by mail already and in-person early voting begins on October 15 and ends on October 31. The voter registration deadline in North Carolina is October 9th unless you choose to register and vote in person at an early voting location during early voting.

**Course Accessibility:** Students who may need special accommodations in this class are encouraged to contact the Student Disability Access Office (<http://www.access.duke.edu/students/index.php>) as soon as possible to ensure that I can implement such accommodations in a timely fashion. I also encourage you to speak to me individually if you have trouble with this process, as I am glad to help with the process if I can.

**Counseling and Psychological Services (CAPS):** Each of you will face some level of challenge during your time at Duke – whether it be a challenge like procrastination, or a more profound challenge that impairs your ability to function. The CAPS staff includes psychologists, clinical social workers, and psychiatrists experienced in working with college-age adults. Information about their services and workshops is available here: <http://studentaffairs.duke.edu/caps/about-us>.

**The Academic Resource Center:** The ARC provides academic support and programming for all Duke undergraduates. Their services include one-on-one consultations and peer tutoring, and they work alongside the Student Disability Access Office to serve students with diagnosed learning disabilities. Their programs include opportunities for students to study together in structured groups ("learning communities"), as well as workshops offered throughout the semester. Further information and resources are available on their website. <http://duke.edu/arc/index.php>.

**The Center for Sexual and Gender Diversity:** This center provides education, advocacy, support, mentoring, academic engagement, and space for lesbian, gay, bisexual, pansexual, transgender, transsexual, intersex, questioning, queer and allied students, staff, and faculty at Duke. The Center for Sexual and Gender Diversity also serves and supports Duke alumni/ae and the greater LGBTQ community. Further information and resources are available on their website. <https://studentaffairs.duke.edu/csgd>.

*This syllabus has been adapted from previous Statistics 101, Statistics 210, and Writing 101 syllabi. Particularly, I would like to recognize Kelly Moran, Victoria Ellison, Maria Tackett, Márcia Rego, Denise Comer, and Simon Hoellerbauer. The syllabus may be added or modified during the semester and students will be notified in advance of any such change taking effect.*

**Schedule of Readings and Assignments**

**Monday August 17/Tuesday August 18: Data Collection & Observational Studies**

**Watch:**

* The [Introduction video](https://www.coursera.org/learn/probability-intro/lecture/UbGdZ/introduction). (~3 mins.)
* The [Data Basics video](https://www.coursera.org/learn/probability-intro/lecture/Q0zu3/data-basics). (~5 mins.)
* The [Observational Studies & Experiments video](https://www.coursera.org/learn/probability-intro/lecture/Qw8iF/observational-studies-experiments).(~5 mins.)

**Read:**

* OIS Chapter 1, Sections 1.1, 1.2, and start of 1.3 (pp. 9-23; stop after reading section 1.3.2).
* Smith, Jacob. 2016. “Cherie Berry put her picture in every North Carolina elevator. Here’s how that affected her reelection.” *Washington Post Monkey Cage Blog*. <https://www.washingtonpost.com/news/monkey-cage/wp/2016/04/14/cherie-berry-put-her-picture-in-every-north-carolina-elevator-heres-how-that-affected-her-reelection/> (Available on Sakai).

*Please read syllabus before the first day of class.*

**Wednesday August 19/Thursday August 20: Sampling**

**Watch:**

* The [Sampling and sources of bias video](https://www.coursera.org/learn/probability-intro/lecture/Y96uT/sampling-and-sources-of-bias) (~8 mins.)
* The [Experimental design video](https://www.coursera.org/learn/probability-intro/lecture/Jyc3t/experimental-design) (~3 mins.)
* The [Random Sample Assignment video](https://www.coursera.org/learn/probability-intro/lecture/N6gE8/spotlight-random-sample-assignment) (~4 mins.)

**Read:**

* OIS Chapter 1, Sections 1.3 & 1.4 (pp. 22-38).
* Cassino, Dan. 2016. “How Today’s Political Polling Works.” *Harvard Business Review.* <https://hbr.org/2016/08/how-todays-political-polling-works> (Available on Sakai).

*Please fill out Qualtrics survey by 11:59 pm on August 20th. (Will send out early in first week of classes.)*

***Lab 1 due at 11:59 PM on Friday August 21.***

**Monday August 24/Tuesday August 25: Exploratory Data Analysis**

**Watch:**

* The [Visualizing Numerical Data video](https://www.coursera.org/learn/probability-intro/lecture/9kRJf/visualizing-numerical-data) (10 mins.)
* The [Measures of Center video](https://www.coursera.org/learn/probability-intro/lecture/AM0o6/measures-of-center) (4 mins.)
* The [Measures of Spread video](https://www.coursera.org/learn/probability-intro/lecture/t9Wbk/measures-of-spread) (6 mins.)
* The [Robust Statistics video](https://www.coursera.org/learn/probability-intro/lecture/ssktR/robust-statistics) (1 min.)
* The [Transforming Data video](https://www.coursera.org/learn/probability-intro/lecture/eQa2U/transforming-data) (3 mins.)

**Read:**

* OIS Chapter 2, Section 2.1 (pp. 41-61).
* Ha, Robbie, Peilin La, and Alejandro Ortega. (Faculty Lead Astrid Giugni, Project Manager Jessica Hines, Ph.D.) 2017. *Visualizing Suffering: Tracking Photojournalism and the Syrian Refugee Crisis.* [Watch the Room 351 Video](https://bigdata.duke.edu/projects/visualizing-suffering-tracking-photojournalism-and-syrian-refugee-crisis) and [Read the Executive Summary](https://bigdata.duke.edu/sites/bigdata.duke.edu/files/site-images/Team7ExecSummSlides.pdf).

**Wednesday August 26/Thursday August 27: More EDA- Intro to Statistical Inference & Lab 2**

**Watch:**

* View the [Exploring Categorical Variables video](https://www.coursera.org/learn/probability-intro/lecture/vEjt0/exploring-categorical-variables) (8 mins.)
* View the [Introduction to Inference video](https://www.coursera.org/learn/probability-intro/lecture/e6IzY/introduction-to-inference) (12 mins.)

**Read:**

* OIS Chapter 2, Sections 2.2 & 2.3 (pp. 61-76).
* Bunyasi, Tehama Lopez and Candis Watts Smith. 2019. *Stay Woke: A People’s Guide to Making All Black Lives Matter.* Chapter 1, pages 29-40. (Available on Sakai, please read sections labeled, “Education,” “Employment,” and “Income and Wealth.”)

***Problem Set 1 Due on Thursday August 27- Submit on Gradescope by 11:59 PM.***

***Lab 2 Due on Friday August 28- Submit on Sakai by 11:59 PM.***

**Monday August 31/Tuesday September 1: Probability and Conditional Probability**

**Watch:**

* The [Introduction video](https://www.coursera.org/learn/probability-intro/lecture/07vL4/introduction) (5 mins.)
* The [Disjoint Events + General Addition Rule video](https://www.coursera.org/learn/probability-intro/lecture/qaYwc/disjoint-events-general-addition-rule) (9 mins.)
* The [Independence video](https://www.coursera.org/learn/probability-intro/lecture/D1m0l/independence) (9 mins.)
* The [Probability Examples video](https://www.coursera.org/learn/probability-intro/lecture/GqcO0/probability-examples) (9 mins.)
* The [Disjoint vs. Independent video](https://www.coursera.org/learn/probability-intro/lecture/PSXBC/spotlight-disjoint-vs-independent) (2 mins.)

**Read:**

* OIS Chapter 3, Section 3.1 (pp. 81-94).

**Wednesday September 2/ Thursday September 3: Bayes Theorem/Bayesian Inference & Lab 3**

**Watch:**

* The [Conditional Probability video](https://www.coursera.org/learn/probability-intro/lecture/fN6Kh/conditional-probability) (12 min.)
* The [Probability Trees video](https://www.coursera.org/learn/probability-intro/lecture/QE3kX/probability-trees) (10 min.)
* The [Bayesian Inference video](https://www.coursera.org/learn/probability-intro/lecture/qYbZQ/bayesian-inference) (14 min.)
* The [Examples of Bayesian Inference video](https://www.coursera.org/learn/probability-intro/lecture/AWtbY/examples-of-bayesian-inference) (7 min.)

**Read:**

* OIS Chapter 3, Section 3.2 (pp. 95-112)
* Lee, Mike and Benedict King. *The Conversation.* “Bayes’ Theorem: the maths tool we probably use every day, but what is it?” (Available online at <https://theconversation.com/bayes-theorem-the-maths-tool-we-probably-use-every-day-but-what-is-it-76140>.)

***Problem Set 2 Due on Thursday September 3- Submit on Gradescope by 11:59 PM.***

***Lab 3 Due on Friday September 4- Submit on Sakai by 11:59 PM.***

**Monday September 7/ Tuesday September 8: Normal and Binomial Distributions**

**Watch:**

* The [Normal Distribution video](https://www.coursera.org/learn/probability-intro/lecture/M71Nv/normal-distribution) (17 mins.)
* The [Evaluating the Normal Distribution video](https://www.coursera.org/learn/probability-intro/lecture/snzoA/evaluating-the-normal-distribution) (2 mins.)
* The [Working with the Normal Distribution video](https://www.coursera.org/learn/probability-intro/lecture/mwnU6/working-with-the-normal-distribution) (5 mins.)
* The [Binomial Distribution video](https://www.coursera.org/learn/probability-intro/lecture/kJ07f/binomial-distribution) (17 mins.)
* The [Normal Approximation to Binomial video](https://www.coursera.org/learn/probability-intro/lecture/2sosk/normal-approximation-to-binomial) (14 mins.)
* The [Working with the Binomial Distribution video](https://www.coursera.org/learn/probability-intro/lecture/yef4b/working-with-the-binomial-distribution) (9 mins.)

**Read:**

* OIS Chapter, Section 4.1 and start section 4.3 (pp. 133-143 & 149-157).

**Wednesday September 9/ Thursday September 10: Variability in estimates and CLT & Lab 4**

**Watch:**

* The [Introduction video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/EXe3o/introduction) (4 mins.)
* The [Introduction to Inference for Categorical Variables video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/ruAZK/introduction) (3 mins.)
* The [Sampling Variability and CLT for Proportions video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/oJxbr/sampling-variability-and-clt-for-proportions) (15 mins.)

**Read:**

* OIS Chapter 5, Section 5.1 (pp. 170-180).

***Problem Set 3 Due on Thursday September 10- Submit on Gradescope by 11:59 PM.***

***Lab 4 Due on Friday September 11 at 11:59 PM- Submit on Sakai by 11:59 PM.***

**Monday September 14/Tuesday September 15: Confidence Intervals**

**Watch:**

* The [Confidence Interval for a Proportion video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/nK388/confidence-interval-for-a-proportion) (9 mins.)
* The [Confidence Interval (for a mean) video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/DA30M/confidence-interval-for-a-mean) (11 mins.)
* View the [Accuracy vs. Precision video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/QTajX/accuracy-vs-precision) (7 mins.)
* View the [Required Sample Size for a ME video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/QPEXw/required-sample-size-for-me) (4 mins.)
* View the [CI (for a mean) examples video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/txXVo/ci-for-the-mean-examples) (5 mins.)

Read:

* OIS Chapter 5, Section 5.2 (pp. 181-188)
* Mercer, Andrew. 2016. “5 key things to know about the margin of error in election polls.” Pew Research Center. Available at <https://www.pewresearch.org/fact-tank/2016/09/08/understanding-the-margin-of-error-in-election-polls/>.

**Wednesday September 16/ Thursday September 17: Midterm 1 Review**

*No additional reading- study for exam.*

*I will be available in the Zoom Room during the normal class time to answer questions.*

***Lab 5 Due on Friday September 18 at 11:59 PM- Submit on Sakai by 11:59 PM.***

**Monday September 21/ Tuesday September 22: Midterm 1**

***Midterm available on Gradescope from 12 am on September 21 to 11:59 PM on September 22.***

***No lab today.***

**Wednesday September 23/ Thursday September 24: Hypothesis Tests**

**Watch:**

* The [Hypothesis Test for a Proportion video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/VAo5K/hypothesis-test-for-a-proportion) (9 mins.)

**Read:**

* OIS Chapter 5, Section 5.3 (pp. 189-201).
* Denworth, Lydia. 2019. “The Significant Problem of P-Values.” *Scientific American.* (Available on Sakai.)

**Monday September 28/ Tuesday September 29: Inference for a Single Proportions & Lab 5**

**Watch:**

**Read:**

* OIS Chapter 6, Section 6.1 (pp. 208-216).

***Problem Set 4 Due on Tuesday September 29- Submit on Gradescope by 11:59 PM.***

**Wednesday September 30/ Thursday October 1: Inference for Comparing Two Proportions**

**Watch:**

* The [Estimating the Difference Between Two Proportions video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/kI4Ma/estimating-the-difference-between-two-proportions) (17 mins.)
* The [Hypothesis Test for Comparing Two Proportions video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/vMH7n/hypothesis-test-for-comparing-two-proportions) (13 mins.)
* The [Small Sample Proportions video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/B7mb4/small-sample-proportions) (10 mins.)
* The [Examples video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/w7VQF/examples) (4 mins.)
* The [Comparing Two Small Sample Proportions video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/rUhQw/comparing-two-small-sample-proportions) (5 mins.)

**Read:**

* OIS, Chapter 6, Section 6.2 (pp. 217-228).

***Lab 6 Due on Friday October 2 at 11:59 PM- Submit on Sakai by 11:59 PM.***

***Exchange project proposals with group by 11:59 PM on Saturday October 3.***

**Monday October 5/ Tuesday October 6: Inference with t-distribution**

**No lab assignment this week; feel free to use that time for group workshop.**

**Watch:**

* The [Introduction to Inference for Numerical Variables video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/xtUR0/introduction) (4 mins.)
* The [Sampling Variability and CLT video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/lkQnZ/sampling-variability-and-clt) (20 mins; okay to skip around, some of this is similar to what we discussed for the CLT for proportions)
* The [t-distribution video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/FlRrd/t-distribution) (7 mins.)
* The [Inference for a mean video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/qs7Ml/inference-for-a-mean) (9 mins.)

**Read:**

* OIS Chapter 7, Sections 7.1 and 7.2 (pp. 251-266).
* Clarke, Andrew. 2010. *The Blue Dog Coalition: Impact of a Single Issue Caucus from the 104th to 110th Congress.* Read Chapter 1, pp. 1-12. (Available on Sakai, pages labeled at bottom right of page.)

***Problem Set 5 Due on Tuesday October 6- Submit on Gradescope by 11:59 PM.***

**Wednesday October 7/ Thursday October 8: Inference for comparing two means + Power**

**Watch:**

* The [Inference for comparing two independent means video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/wkwlZ/inference-for-comparing-two-independent-means) (8 mins.)
* The [Inference for comparing two paired means video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/k5zhM/inference-for-comparing-two-paired-means) (9 mins.)
* The [Power video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/kdnQf/power) (11 mins.)

**Read:**

* OIS, Chapter 7, Sections 7.4 & 7.5 (pp. 267-284).
* Clarke, Andrew. 2010. *The Blue Dog Coalition: Impact of a Single Issue Caucus from the 104th to 110th Congress.* Read Chapter 3, pp. 39-60, section labeled “The Source of Preference.” (Available on Sakai, pages labeled at bottom right of page.)

***Project Proposal Due at 11:59 PM on Friday October 9- Submit Word file or pdf and data on Sakai.***

**Monday October 12/ Tuesday October 13: Chi-Square Test**

**Watch:**

* The [Chi-Square GOF Test video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/OO6iS/chi-square-gof-test) (14 mins.)
* The [Chi-Square Independence Test video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/LEIm3/the-chi-square-independence-test) (11 mins.)

**Read:**

* OIS Chapter 6, Section 6.3 (pp. 229-239).
* Clarke, Andrew. 2010. *The Blue Dog Coalition: Impact of a Single Issue Caucus from the 104th to 110th Congress.* Read Chapter 3, pages 61-75, section labeled “Representation on Prestige Committees.” (Available on Sakai, pages labeled at bottom right of page.)

**Wednesday October 14/ Thursday October 15: ANOVA & Bootstrapping**

**Watch:**

* The [Comparing more than two means video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/TI3DD/comparing-more-than-two-means) (6 mins.)
* The [ANOVA video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/KoTvZ/anova) (9 mins.)
* The [Conditions for ANOVA video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/hSgp3/conditions-for-anova) (2 mins.)
* The [Multiple comparisons video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/6wfP3/multiple-comparisons) (6 mins.)
* The [Bootstrapping video](https://www.coursera.org/learn/inferential-statistics-intro/lecture/u3k1n/bootstrapping) (8 mins.)

**Read:**

* OIS, Chapter 7, Section 7.5 (pp. 285-298).
* DelPonte, Alessandro, Andrew W. Delton, Rueben Kline, and Nicholas A. Seltzer. 2017. “Passing it Along: Experiments on Creating the Negative Externalities of Climate Change.” *Journal of Politics* 79(4): 1444-1448.

***Problem Set 6 Due on Thursday October 15- Submit on Gradescope by 11:59 PM.***

***Lab 7 Due on Friday October 16- Submit on Sakai by 11:59 PM.***

**Monday October 19/ Tuesday October 20: Midterm 2 Review; No lab this week.**

***No additional reading- study for exam.***

**Wednesday October 21/ Tuesday October 22: Midterm 2**

**Monday October 26/ Tuesday October 27: Intro to Bivariate Regression**

**Watch:**

* The [Introduction video](https://www.coursera.org/learn/linear-regression-model/lecture/UcKYt/introduction) (~1 min.)
* The [Correlation video](https://www.coursera.org/learn/linear-regression-model/lecture/QP6Mw/correlation) (~9 mins.)
* The [Residuals video](https://www.coursera.org/learn/linear-regression-model/lecture/FpKWn/residuals) (~2 mins.)
* The Least Squares Line video (~12 mins.)
* The [Conditions for Linear Regression video](https://www.coursera.org/learn/linear-regression-model/lecture/MKPvv/conditions-for-linear-regression) (~10 mins.)

**Read:**

* OIS Chapter 8, Sections 8.1 and start of 8.2 (pp. 305-321).

**Wednesday October 28/ Thursday October 29: Outliers and Inference for Bivariate Regression & Lab Session 7**

Watch:

* The [Prediction and Extrapolation video](https://www.coursera.org/learn/linear-regression-model/lecture/aHBzs/prediction-and-extrapolation) (~4 mins.)
* The [R2 Video](https://www.coursera.org/learn/linear-regression-model/lecture/lMej8/r-squared) (~4 mins.)
* The [Regression for Categorical Explanatory Variables Video](https://www.coursera.org/learn/linear-regression-model/lecture/FdxeN/regression-with-categorical-explanatory-variables) (6 mins.)
* The [Outliers in Regression](https://www.coursera.org/learn/linear-regression-model/lecture/10xAG/outliers-in-regression) Video (~7 mins.)
* The [Inference in Linear Regression](https://www.coursera.org/learn/linear-regression-model/lecture/icLpS/inference-for-linear-regression) Video (~12 mins.)

Read:

* OIS, Chapter 8, Finish Section 8.2 and Sections 8.3 and 8.4 (pp. 322-337).

***Problem Set 7 Due on Thursday October 29- Submit on Gradescope by 11:59 PM.***

***Lab 8 Due on Friday October 30 at 11:59 PM- Submit on Sakai by 11:59 PM.***

**Monday November 2/ Tuesday November 3: Multiple Regression I- Inference**

**Watch:**

* The [Inference for Multiple Linear Regression](https://www.coursera.org/learn/linear-regression-model/lecture/Pg7rK/inference-for-mlr) Video (~12 mins.)

**Read:**

* OIS, Chapter 9, Section 9.1 (pp. 343-352).
* Abramowitz, Alan. 2016. “Will Time for Change Mean Time For Trump?” *PS: Political Science and Politics* 49(4): 659-660. (Available on Sakai; will update this for a 2020 article if Abramowitz writes one.)
* Clarke, Andrew. 2010. *The Blue Dog Coalition: Impact of a Single Issue Caucus from the 104th to 110th Congress.* Read Chapter 3, pages 76-80, section labeled “Blue Dog Association with Fiscal Conservatism” (Available on Sakai, pages labeled at bottom right of page.)
* Abramowitz, Alan. 2020. “It’s the Pandemic, Stupid! A Simplified Model for Forecasting the 2020 Presidential Election.” *Sabato’s Crystal Ball* (Available online at <http://centerforpolitics.org/crystalball/articles/its-the-pandemic-stupid-a-simplified-model-for-forecasting-the-2020-presidential-election/>.)

**Please note: Tuesday November 3 is Election Day; NC polls are open from 6:30 am to 7:30 PM if you choose to vote in person. If you have any questions about early voting in NC or another state, please feel free to ask me!**

**Wednesday November 4/ Thursday November 5: Multiple Regression and the 2020 Election**

*No additional reading; we will run regression models in class using data from the election and talk about the results! Please note that the entire class with not focus on the presidential election— there are lots of elections!*

***Optional Practice Problem Set Due on Thursday November 5- Submit on Gradescope by 11:59 PM; this will not be graded. If you would like to get feedback on your understanding of multiple regression as you work on the project, you are welcome to submit this short problem set.***

***Lab 9 Due on Friday November 6 at 11:59 PM- Submit on Sakai by 11:59 PM.***

***Please exchange lab reports with group by 11:59 PM on Saturday November 7.***

**Monday November 9/ Tuesday November 10: Multiple Regression II- Model Selection and Diagnostics & Case Study.**

**No lab assignment this week; feel free to use that time for group workshop.**

**Watch:**

* The [Model Selection](https://www.coursera.org/learn/linear-regression-model/lecture/pR8Mi/model-selection) Video (~11 mins.)
* The[Diagnostics for Multiple Linear Regression](https://www.coursera.org/learn/linear-regression-model/lecture/quxtC/diagnostics-for-mlr) Video (~8 mins.)

**Read:**

* OIS Chapter 9, Sections 9.2 & 9.3 (pp. 353-362).
* Smith, Jacob and Jonathan Spiegler. 2020. “Explaining Gun Deaths: Gun Control, Mental Illness, and Policymaking in the American States.” *Policy Studies Journal* 48(1): 235-256.
* Spiegler, Jonathan and Jacob Smith. 2018. “More mental health care alone will not stop gun violence.” *The Conversation.* (Available online at <https://theconversation.com/more-mental-health-care-alone-will-not-stop-gun-violence-94201>.)

**Wednesday November 11/ Thursday November 12: Multiple Regression Case Study and Other Types of Regression**

**Read:**

* Benjamin, Andrea, Ray Block Jr., Jared Clemons, Chryl Laird, and Julian Wamble. 2020. “Set in Stone? Predicting Confederate Monument Removal.” *PS: Political Science and Politics* 53(2): 659-660. 237-242.
* Clarke, Andrew J. 2020. “Party Sub-Brands and American Party Factions.” *American Journal of Political Science.* Available as an Early View article. (Available on Sakai.)

***Lab reports due on Sakai on Friday November 13 at 11:59 PM.***

**Monday November 16: Extra Office Hours/Work Session for Blog Post- No Lab**

***Monkey Cage-Style Blog Post Due on Sakai at 11:59 PM on November 16*.**

**No Final Exam.**