56:824:702:01 Quantitative Methods I

Fall 2020, Tuesdays, 6:00pm to 8:50pm
Mixed Synchronous and Asynchronous
Syllabus

Note: *updated August 17, 2020*

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Office Hours: Mondays 5-7pm and by appointment *via Zoom*
Link for classes and office hours available on Sakai.

> Statistics are not magical. Nor are they always true – or always false. Nor need they be incomprehensible. Adopting a critical approach offers an effective way of responding to the numbers we are sure to encounter. Being critical requires more thought, but failing to adopt a critical mind-set makes us powerless to evaluate what others tell us.
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> – Joel Best, "Telling the Truth about Damned Lies and Statistics." *The Chronicle of Higher Education*, May 4, 2001.

Course Description

This course is designed to prepare students for advanced quantitative methodology courses required of doctoral students. The course begins at the beginning: by reviewing descriptive statistics and data presentation techniques. In preparation for the study of inferential statistics, the next section of the course covers the basics of probability. A solid grounding in probability is necessary to understand how and why statistical techniques work. Building on that foundation, the heart of the course is a rigorous introduction to statistical inference: sampling theory, confidence intervals, and hypothesis tests. The final section of the course is a basic introduction to regression analysis, with an emphasis on interpretation of regression results, using examples from recent research. (This course is part of a two-semester sequence; the second semester is Quantitative Methods II, which is a more advanced and detailed treatment of regression analysis and related topics.) The course has no prerequisites, other than basic math at the level of college algebra.

Organization.

Due to the Corona Virus situation, this class will be conducted fully online. Some material that would normally be presented as a lecture during class time will instead be pre-recorded. These will be linked on the class schedule. You should think of them as required readings and watch them before the scheduled class time. We will meet at the regular class time to review and discuss that material and to work through examples and problems.

Learning Objectives.

The main objective of the course is that students will develop a conceptual and practical understanding of how to learn from social science data; specifically:

- Students will deepen their understanding of how to calculate and interpret descriptive statistics;
- Students will gain experience using graphical techniques for data visualization;
- Students will learn the essentials of probability, including how to work with random variables and probability distributions (including the normal, binomial, and Poisson distributions);
- Students will learn the theory behind inferential statistics that supports drawing conclusions about a population based on a sample;
- Students will be able to apply that theory by calculating confidence intervals and conducting basic hypothesis tests;
- Students will be introduced to Ordinary Least Squares regressions

Textbooks. The primary textbook for this course is an open-source textbook that is freely available online: Saylor Academy. 2012. *Introductory Statistics*. I will link directly to the readings in this text via the online schedule. You may also download a copy of the entire book from the Readings tab at the course Sakai site.

Computing. This is a course about concepts, not software. Nevertheless, we will use software at times to reduce the computation burden. *Stata*, version 16, is the official software for the class, but any recent version of Stata will work nearly as well. *You do not need to buy Stata.* It is available on the Rutgers on-line system and on the computers in Robeson library. However, if you wish to use Stata on your own devices, a special discounted 6-month license is available to students through the "grad plan" for $48, though you may want to consider the annual or perpetual license, since Stata will be used in future courses. To order, please contact StataCorp directly: Phone: 800-782-8272 (Monday through Friday 8:00 to 5:00 Central Time) or order online at https://www.stata.com/order/new/edu/gradplans/student-pricing/. Be sure to ask for the "grad plan." If ordering online, use your Rutgers email address to verify affiliation with the university.

Note: if you are an R user, feel free to use R instead of Stata. However, I will not be teaching R in this class.

Miscellaneous. A *calculator* is a necessity. It does not have to be fancy and it does not need graphics or programming capabilities, but it is useful to have the following functions: $\ln(x)$, e^x, $x!$, and y^x (logarithms, exponents, factorials, and powers). Usually any calculator described as "scientific" will have these functions. Good choices are available for as little as $10. Even the built-in calculators will suffice. On an iPhone, open the calculator then turn the phone sideways to access the scientific function. On an Android phone, I believe you can access the scientific calculator from a menu within the calculator app.

Grading and Requirements:

Problem Sets: The only sure way to learn the material presented in this course is to work on problems that reinforce the readings and lectures. Thus, there will be a short problem set due almost every week (see the schedule below for exact due dates). They will be graded fairly leniently, so it is more important that you make an attempt to answer and less important that you get it exactly correct. Except in unusual circumstances, *late problem sets will not be accepted* because the correct timing of the work is important in the learning process and because the answers will be discussed in class. However, *the lowest two problem set grades will be dropped*, allowing students some flexibility and margin for error.

Tests: There will be two tests, one on Oct. 27 covering material in the first half of the course and another on Dec. 8 covering the material in the second half. The tests are *open-book, open-note*. A calculator is a necessity, hopefully one with which you are familiar. Mark your calendar now, because in fairness to other students, I cannot create make-up tests or reschedule tests for any one person.

Grades will be assigned as follows: Letter grades will be determined based on the overall course average, rounded to the nearest whole number. Only certain letter grades are available for graduate course work at Rutgers-Camden. The translation of a numeric grade to a letter grade will be done as follows:

A	90-100
B+	85-89
B	80-84
C+	75-79
C	70-74
F	0-69

In determining the course average, assignments will be weighted as follows:

Problem sets (lowest 2 dropped)	40 percent
Midterm exam	25 percent
Final exam	30 percent
Participation	5 percent

At any point in the semester, you can see your current course grade in Sakai based on the graded work up to that point. You can also figure out what grade you need on the final exam to get any specific final grade.

Course & Instructor Policies

Late Work. Problem sets will not be accepted late, because the answers are discussed in class on the day they are due. Due to a medical emergency or other valid reason, you may be excused from turning in a problem set. In such cases, the grade will be computed based on the remaining problem sets. Consult me *in advance of the due date*, if at all possible, if such a contingency should arise.

Calculator. A calculator is a virtual necessity for this class. However, any basic "scientific" calculator will do. The following functions are necessary: square root, y^x, e^x, and ln(x). Such calculators can often be obtained for under $10 and there are free smart phone apps. (The built in iPhone calculator has everything you need, but *turn the phone sideways to access the scientific functions*. I am told Android phones also have the same functions.) You will not need graphing capability or programmability.

Attendance. I will use Zoom for the synchronous class sessions. I ask that you activate your video and live your microphone unmuted, so you can ask questions and participate actively. Having said that, attendance in the synchronous sessions is optional. However, be advised that you are responsible for any material covered in synchronous sessions. To be honest, if you don't attend the sessions, you are unlikely to learn the material well because that is where we will do the applications and probe how these techniques are actually used and interpreted in journal articles. You are also responsible for any announcements made during the synchronous sessions. If you do need to miss a class, be sure to consult with a fellow student to learn what transpired.

Disability Services. Any student in need of classroom accommodations due to disabilities should contact the Director of Disability Services, Erin G. Leuthold, as soon as possible. She may be reached at (856) 225-2717, erin.leuthold@rutgers.edu, or at the Rutgers-Camden Learning Center, Armitage Hall, Room 231. No accommodations can be made without the explicit approval of the Office of Disability Services. More information is available here:

https://success.camden.rutgers.edu/disability-services

Academic Integrity Notice. *Given that you are in a Ph.D. program, I expect complete adherence to the University's standards for academic integrity. While collaboration is encouraged on problem sets, there can be no collaboration on the take-home examinations. Similarly, students must scrupulously avoid plagiarism on the final paper. The penalty I request in cases of academic dishonesty is a grade of zero (0) for the examination or assignment in question, although the final penalty is determined by the responsible university official. A grade of zero on an exam or final paper could easily lead to failing the course. In addition, the incident is reported to the Dean of Students for disposition and becomes a part of the student's record.*