EDUC 793: Introduction to Quantitative Methods in Educational Research
Fall 2024
Marsal Family School of Education
University of Michigan

Instructor	**Lab Instructor and Teaching Assistant**
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Class	**Labs**
███████████████████	███████████████████
	(students are only expected to attend the day for the section in which they enrolled)
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Student Office Hours (You're encouraged to come!)

Ecton	Gadd
Thursdays, 3:00 PM – 5:00 PM (drop in) or e-mail for appointment	Wednesdays, 11:00 AM–1:00 PM (drop in) or e-mail for appointment
School of Education Building, Room 2108E (across hall from main CSHPE office)	School of Education Building, Room 2108

Course Description

Quantitative methods are central to the study of education. Numbers help us understand the world as it is (or has been). Numbers help us identify goals that aren't being met and can highlight the ways in which our institutions may be falling short. Numbers can serve as incitements to action by defining and bringing attention to a problem. Numbers can add evidence to arguments aimed at pursuing different policies. In order to be the most effective researcher, advocate, policymaker, and practitioner, fluency with quantitative methods is one of the most powerful tools you can have in your toolkit.

Throughout this course, you will develop skills and knowledge that will serve you well, no matter your future relationship to quantitative research. You will learn foundational concepts in quantitative methods and will practice applying these questions to important questions. You will learn foundational skills and concepts in statistics and statistical coding that will allow you to conduct your own analyses of quantitative data. You will be able to communicate about quantitative research, including through data visualization. You will be able to intelligently read and consume quantitative research, and will be able to critique quantitative research as you consider how to evaluate and use quantitative research. Finally, you will be prepared for future advance quantitative methods training and work on quantitatively-focused research projects. No matter your future relationship with quantitative methods, you'll leave this course better able to engage in many different ways with quantitative data and research, a comparative advantage that will benefit you in almost any career path you may choose.

Course Objectives

By the end of this course, you should be able to:
- Understand key statistical concepts and methods commonly used in education research,
- Use statistical coding to analyze data,
- Intelligently consume and critique quantitative education research,
- Develop quantitative research questions and implement a quantitative research plan,
- Effectively communicate about quantitative research to relevant audiences, and
- Establish the groundwork to pursue future statistical coursework and research application.

Course Materials

- A **free** statistics text (*Introductory Statistics*): https://openstax.org/details/books/introductory-statistics-2e

- One of the most important components of this course is hands-on experience using analytical tools used in policy and policy-related research. We will use Stata as statistical software for much of our work in this class, and Stata will be required to complete assignments. For the best learning experience, I recommend that you purchase Stata and download it on your laptop before the second class session. A six-month student Stata license (Stata/BE) is available for $48: https://www.stata.com/order/new/edu/gradplans/student-pricing/. For this course, there is no need to purchase longer-term licenses, more advanced versions, or any add-ons from Stata. If cost is a barrier, Stata is available on the computers in the room used for our class lab sessions and in many other computer labs on campus. A virtual version of Stata is also available from UM ITS here (though students should be warned that virtual desktops can be clunky to use, especially if you're not used to similar platforms): https://its.umich.edu/computing/computers-software/virtual-sites. If you have any questions, concerns or issues with this, please let me know.

- All other course materials will be made available on the course Canvas website.

Course Requirements & Grading
- Problem Sets (3)   30%
- Midterm Exam   20%
- Final Exam   20%
- Policy Brief Consultation   5%
- Policy Brief   15%
- Policy Brief Presentation   10%

Problem Sets (30%)
- Problem sets are designed to provide you an opportunity to reinforce key concepts covered in class by using data. There are three problem sets, each worth 10 percent of your grade. The problem sets are designed to reinforce key concepts from the readings and lectures and provide an opportunity to work in Stata.
- For all assignments, writing clearly, showing and explaining your work, and providing the correct answers are all important.

- You are encouraged to work in groups of 4 or less; however, each person must submit their own write-up for a given problem set, and you should list any group members you've worked with when you turn in your problem sets.
- Problem sets will be posted in Canvas, and completed assignments should be posted to Canvas by the deadline indicated in the course schedule.

Exams (40%)
- This course will include a midterm exam and final exam, each of which is worth 20% of your grade. Both exams will be comprehensive; in other words, they will cover everything up to that point in class.
- Exams will include a combination of questions about the concepts learned in class, questions similar to problem sets in which students apply statistical concepts, and prompts in which students must use Stata to answer questions and produce analysis.
- Exams are to be completed independently and should **not** be discussed with anyone other than the instructor or lab instructor, but are open-notes, meaning students should feel free to consult, notes, the text, or online resources. More details will be provided to students in advance of each exam.
- The midterm exam will be completed at home (students will have multiple days to complete), and the final exam will be completed during the university-scheduled final exam time.

Final Project (30%)
- *Policy Brief Consultation (5%)*
  - Each student will meet with the instructor for a 20-minute consultation during the weeks of October 21, October 28, or November 4 (sign-ups for specific times will happen later in the semester). In advance of that meeting, students should submit an informal memo to help us make the best use of our consultation time. The memo should include:
    - Research question(s),
    - The data you plan to use (you should have this data available for the meeting in case we want to pull it up to look at),
    - A "sketched-out" version of at least one graph and at least one table that you might want to create with this data.
    - APA citations for at least 5 articles that you may want to cite/discuss in your policy brief (at least 3 must be from a peer-reviewed academic journal).
- *Policy Brief (15%)*
  - For their final project, each student will create a Policy Brief using their own analysis of data to answer a research question. This policy brief provides students an opportunity to showcase their ability in analyzing data, presenting findings, and explaining their analysis and findings in a readable way.
    - Each policy brief should be 8-10 pages, should include a brief review of relevant literature, a discussion of why the topic at hand is important/relevant, a description of the data, presentation of the results, and

a discussion about policy implications. Each policy brief must also include at least 1 table and 1 graph created in Stata.
- The instructor will provide students with a dataset they can use, but students are also free to use their own datasets from other sources they find and have permission to use. If students wish to use their own data, they must discuss and receive permission from the instructor *before* the midterm exam.
- Students can choose to work independently or with a partner (if working with a partner, students must let the instructor *before* the midterm exam).
- More details, including a rubric, will be provided to students by the time of the midterm exam.
- *Policy Brief Presentation (10%)*
  - Each student (or pair of students) will create a short (8-10 minutes) presentation on their final Policy Brief. This is an opportunity to share what you have found with your classmates, and practice presenting research, a skill that will be crucial throughout your careers.
    - More details, including a rubric, will be provided to students by the time of the midterm exam.

Collaboration Policy
- Please feel free to collaborate with your classmates on problem sets in groups of four or less, and to form study groups to review statistical concepts, as well as coding in Stata. One of the most enriching parts of graduate study is the opportunity to learn from and with your peers – I encourage you to take advantage of the opportunity to collaborate with each other!
- While working together on problem sets is encouraged, the work you turn in should be your own. Each student must write up their responses to any assignment in their own words. While getting help from others is an important part of the learning process, writing out your assignment in your own words is how you will know that you really understand.
- Students should not consult problem sets and solutions from previous semesters.

Labs
- Weekly lab sessions will play a key role in your learning this semester. It is expected that you attend lab each week, and topics covered in lab sessions will be important for your success in problem sets, exams, and the final project for this course.
- Labs will give you the chance to dive deeper into concepts covered in class sessions and to gain hands-on, practical experience applying the concepts from lectures. In particular, labs will allow you the chance to learn and practice Stata, a statistical coding tool.
- Labs will also provide time and space for you to work on your final project and to seek advice and support through the analytic process.

Late Assignment Policy
- Students should do their very best to adhere to assignment due dates. This helps both you and the professor 1.) keep on track with our work, 2.) not fall behind in the learning sequence, and 3.) identify any areas of confusion so that we can address them in a timely matter. Turning in assignments on time is also courteous to both the professor and to your fellow students.

- I recognize that every so often, turning in an assignment on time may not be possible. As a general rule, if you turn in an assignment late, I will deduct 1/3 of a grade letter per day. For example, a grade that otherwise would have been an A but is 1 day late would become an A-; a grade that would have been an A- but is 1 day late would become a B+; and a grade that would have been an A- but is 2 days late would become a B.
- Unless otherwise discussed with the professor **in advance**, once the assignment has been returned and answers have been reviewed in class, I am unable to give late students credit for that assignment.
- My goal is to be as accommodating as possible when it comes to late assignments, particularly if there are special circumstances. My ask is that you please <u>communicate with the instructor as soon as possible</u> about this so that we can make reasonable accommodations.
- If there is an emergency circumstance, I intend to be flexible with this policy; please just communicate with the instructor when you are able and we can discuss appropriate options. In an emergency situation, please do NOT let concern about a late assignment serve as an additional stressor.

Class Attendance Policy
- In-class participation and discussion will be essential for learning, so **students are expected to attend class in person**.
- Given that participation and discussion in class are an important part of our learning this semester (as well as your grade), 1 percentage point will be deducted from a students' final grade for each unexcused absence.
- I understand that illness and emergency situations may arise. If you are not able to attend class for a legitimate reason, please e-mail me, and we will discuss opportunities for making up the missed time **without** any penalty to your grade. This may include a short memo reflecting on the topics covered in class or discussions with the professor about the missed material.
- Note that you do **not** need to tell me why you have to miss class; I trust your judgement in deciding what should be an excused absence, but you don't owe me any personal details about health, caregiving responsibilities, etc. (though please feel free to share if you feel comfortable and I can be helpful).
- For students who are guardians, I understand that sometimes schedules and arranging childcare can be difficult and unpredictable. If you need to bring a child to a particular class session so you can attend, please feel free to do so.

Use of Technology
If you're anything like me, concentrating on the task at hand can be difficult when your phone is in sight. In order to have the best learning experience for you and your classmates, please avoid using your cell phone when class is in session. Of course, if you need to step outside the classroom in case of an emergency to take a call, please feel free to do so. We will regularly be using laptops in class for data analyses, but please limit your laptop use to class purposes.

Recording of Lectures, Labs, and Other Class Activities Audio and/or video recording of class activities is prohibited, except as a pre-arranged accommodation for students with disabilities. Under

all other circumstances, you are prohibited from using recording equipment, including cellular phones, to make recordings of lectures, labs, or other class-related activities

Communicating With Me
Email (ecton@umich.edu) is the best way to communicate with me. To ensure my prompt reply, please indicate, please indicate "EDUC 753: subject" (for example: "EDUC 753: question about problem set #1") in the subject line of your email. My goal is to return emails within 24 hours (except for on weekends, when I attempt to stay away from email as much as possible). Please keep this in mind when planning ahead for your work. For example, if you send an email to the me late Friday evening for something due Sunday night, there's a good chance I won't see the email before you need a response. As such, it's always a good idea to plan ahead. Moreover, I encourage you to also take steps to set boundaries in your own work-life balance – some time away from email and work will make you healthier, happier, *and* more productive!

Religious Observation
This course observes University defined holidays. Because other days may be of more significance to you than a University-designated holiday, please inform me as soon as possible if a class day or due date for a class assignment conflicts with your observance of a holiday that is important to you. I will work with you to accommodate your needs.

Academic Integrity
CSHPE students are expected to comply with the Rackham Policy on Academic Integrity. Academic dishonesty includes, but is not limited to, falsifying or fabricating information, plagiarizing the work of others, facilitating or failing to report acts of academic dishonesty by others, submitting work done by another as your own, submitting work done for another purpose to fulfill the requirements of a course, or tampering with the academic work of other students. If you are unsure what constitutes a violation of academic integrity, please come talk with me.

In this class, AI tools such as ChatGPT or U-M GPT may be helpful in trying to learn a subject, so you are allowed to consult AI tools while learning or seeking to better understand a concept from class. However, an important purpose of this class is for you to learn how to comprehend, create, communicate, and critique quantitative analysis on your own. As such, these tools should **not** be used to help draft, create, or modify any assignments (including the problem sets, final project, or exams). Use of AI tools in assignments for this class will constitute plagiarism and be treated as such.

Accommodations for Students with Disabilities and/or Learning Needs
Please see me if you require accommodations to support your learning. My goal is to make this the best possible learning experience, so please let me know if there are steps I can take to support your learning. The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact Services for Students with Disabilities https://ssd.umich.edu/; 734-763-3000 or ssdoffice@umich.edu). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience.

Mental Health and Student Well-Being
During their academic careers, students experience stressors and issues ranging from academic concerns to personal crises (including, but not limited to alcohol/drug use, anxiety, depression, difficulty eating/sleeping, family worries, loss/grief, sexual assault, or strained relationships). These mental health concerns and/or personal events may affect your well-being and lead to diminished academic performance and ability to fully engage with those around you. Below you will find some resources that are available to you. If I can be helpful to you in this regard, please let me know. And, if the source of your stress is academic, we can find solutions together. Seeking help is a courageous thing to do for yourself and those who care about you.

For personal concerns, U-M offers the following resources:
● Well-being for U-M Students website – searchable list of many more campus resources
● Wolverine Wellness - confidential; 734-763-1320; provides Wellness Coaching and more
● University Health Service (UHS) - 734-764-8320; clinical services include nurse advice by phone, day or night
● Counseling and Psychological Services (CAPS) – The School of Education has an embedded CAPS counselor, Nicole Holtzman. You can email her directly at nicholtz@umich.edu. You can also reach out to Laura Monschau, the CAPS Counselor in Rackham (734-764-8312; lauralm@umich.edu). You can also call 734-764-8312; for after-hours urgent support, call and press 0.
● Office of Student Conflict Resolution - 734-936-6308; offers multiple pathways for resolving conflict
● Office of the Ombuds - 734-763-3545; students can raise questions and concerns about the functioning of the university.
● Sexual Assault Prevention and Awareness Center (SAPAC) - confidential; 734- 764-7771 or 24-hour crisis line 734-936-3333; addresses sexual assault, intimate partner violence, sexual harassment, and stalking
● Spectrum Center - 734-763-4186; support services for LGBTQ+ students
● Trotter Multicultural Center - 734-763-3670; intercultural engagement and inclusive leadership education initiatives

<p style="text-align:center"><u>**Course Schedule**</u></p>

Note that this schedule is subject to change at the instructor's discretion. Any schedule updates will be communicated in class and on the course Canvas website.

Most weeks, students will be expected to read material from the course text, Introductory Statistics, as well as an empirical paper. These empirical papers are currently TBA in order for the instructor to choose articles aligned with student interests following the beginning of semester survey. These papers will be posted on the course Canvas website.

The materials contained in the readings below will be covered during the corresponding class session, so students should plan to read the readings before the class session in which they are listed.

Week of August 27

<u>Topic</u>:   Course introduction: The Value of Quantitative Data in Education Research

         Types of Data in Education Research

<u>Reading</u>:   Ecton & Wofford, "Using Quantitative Research for Student Success"

Week of September 3

<u>Topic</u>:   Describing and visualizing data

         Introduction to Stata

<u>Readings</u>:   *Introductory Statistics* Chapter 1 (Introduction, 1.1, & 1.3)

         Introductory Statistics Chapter 2 (Introduction, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

         Introductory Statistics Chapter 3 (Introduction, 3.1, 3.2, 3.3)

         Learning by Earning by Degrees (2024), report by Georgetown University Center on Education and the Workforce (Canvas)

Week of September 10

<u>Topic</u>:   Examining relationships between data

<u>Readings</u>:   *Introductory Statistics* Chapter 12 (Introduction, 12.1, & 12.2)

         Empirical Readings TBA

Week of September 17

<u>Topic</u>:   Sampling, Normal Distribution and Uncertainty

<u>Readings</u>:   *Introductory Statistics* Chapter 1 (1.2),

         Introductory Statistics Chapter 4 (Introduction, 4.1, 4.2, & 4.3)

         Introductory Statistics Chapter 5 (Introduction)

         Introductory Statistics Chapter 6 (Introduction, 6.1, & 6.2)

<u>Assignment</u>: Problem set #1 due on Monday, Sept 16 at 6:00 PM

Week of September 24

<u>Topic</u>:   Inference, Hypothesis Testing, and Statistical Significance

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Readings: *Introductory Statistics* Chapter 7 (Introduction, 7.1, 7.2, 7.3)

                   Introductory Statistics Chapter 8 (Introduction, 8.1, 8.2, 8.3)

                   Introductory Statistics Chapter 9 (Introduction, 9.1, 9.2, 9.3, 9.4, 9.5)

                   Empirical Reading TBA

Week of October 1

Topic: Statistical Tests

                   Introduction to Causal Inference

Readings: *Introductory Statistics* Chapter 10 (Introduction, 10.1, 10.2, 10.3, 10.4, 10.5)

                   Introductory Statistics Chapter 11 (Introduction, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6)

                   Introductory Statistics Chapter 13 (Introduction, 13.1, 13.2, 13.3, 13.4)

                   Methods Matter (Murnane & Willett): "Designing Research to Address Causal Questions"

Week of October 8

Topic: Introduction to Regression

Readings: *Introductory Statistics* Chapter 12 (Introduction, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6)

                   Mastering 'Metrics (Angrist & Pischke) Chapter 1: "Regression"

Assignment: Problem set #2 due on Monday, Oct. 7 at 6:00 PM

Week of October 15 – Fall Study Break – No Class

Week of October 22

Topic: Regression II

Readings: *Mostly Harmless Econometrics* (Angrist and Pischke) Chapter 3: "Making Regression Make Sense"

                   Empirical Readings TBA

Assignment: Problem set #3 due on Friday October 25 at 6:00 PM.

Week of October 29

Topic: Reviewing and Critiquing Quantitative Research

Readings: *Common Sense Evidence* (Gordon & Conaway) Chapter 3: "Determine How Relevant and Convincing the Research Is"

                   Empirical Readings TBA

Assignment: Policy Brief consultations memos due before your consultation with instructor (to be scheduled individually sometime in late October or early November).

Week of November 5

Topic: Election Day – No Class Meeting (I encourage you to engage in civic participation today, whether voting, volunteering, or doing some service to your community!)

We will also be scheduling 20-minute Policy Brief Consultation between the instructor and students to discuss final projects. Before this meeting, you should know your research question(s) and the data you plan to use, and you should have this data available for the meeting. You should also bring a "sketched-out" version of at least one graph and at least one table that you might want to create with this data.

Readings: None (But this is a good time to read for your Policy Brief!)

Assignment: Midterm Exam due on Monday, November 4 at 6:00 PM (exam will be released previous week)

Week of November 12

Topics: Data Visualization and Communication

Reading :   *Common Sense Evidence* (Gordon & Conaway) Chapter 6: "Interpret and Share Your Evidence"

             Empirical Reading TBA

Week of November 19

Topics: Quasi-Experimental Methods

             Quantitative Data Sources for Education Research

Readings: Empirical Readings TBA

Week of November 26

Topics: Critical Quantitative Research

             Limitations of Quantitative Research

Readings: Ecton & Dougherty, "Heterogeneity in High School Career and Technical Education"

             Winkler & Wofford, "Trends and Motivations in Critical Quantitative Educational Research: A Multimethod Examination Across Higher Education Scholarship and Author Perspectives"

             Watch at least one of the following webinar records from SREE Critical Perspectives in Quantitative Methods series: (1) Introduction, Historical Origins and Future Possibilities (Velez, Garcia, and Garvey), (2) All Else Being Equal (When It's Not Equal): Applying Theories on Race in Quantitative Models and Research, or (3) Racial and Ethnic Identities and Administrative Data (Baker & Viano)

Week of December 3

Topics: Final presentations

             Course Wrap-Up and Making Sense of Your Relationship to Quantitative Research

Assignments: Final Policy Brief and Presentation due before class begins

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Week of December 10

No class on December 10 – Study Days

Assignments: Final Exam – Thursday, December 12 (4:00-6:00 PM)