**SO401: Quantitative Research Methods**

**Block 1, Fall 2023**

**Professor Wade Roberts**

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**Office Hours: M/T/H 12-1 and by appointment**

**COURSE DESCRIPTION**

This course is designed to develop, broaden, and advance your understanding of, and facility with, quantitative research methods, while relating those skills to the broader enterprise of sociology and sociological thinking. The material assumes your familiarity with the basics of quantitative research design (SO229 Sociological Research Design), including sampling, measurement, survey design, and basic quantitative tests (bivariate and inferential statistics). It also assumes your familiarity with the role of theory in guiding our causal narratives and investigations. I do not assume, however, that you enter this course fully *owning* these skills and insights. Thus, we will be revisiting those elements while adding many more to your repertoire.

While we are aiming to develop a solid understanding of the mathematics (i.e., probability theory) behind key inferential statistics and techniques, the primary emphasis throughout the course will be on applied social statistics, learning key tricks of the trade, and developing a high degree of proficiency in quantitative research and data analysis. These competencies will be informed by and related to a deep understanding of the sociological enterprise.

**LEARNING OUTCOMES AND GOALS**

* Understanding how quantitative research fit into the larger sociological enterprise; connecting sociological habits of thought, theory, and concepts to quantitative research design and analysis.
* Downloading and preparing existing/secondary datasets; Constructing your own dataset; Using core functions of Geographic Information System (GIS) software to construct data sets; be able to self-learn additional techniques in GIS;
* Using Stata statistical software to analyze quantitative data and present results effectively. You will learn to work with Stata code and make use of command scripts (do-files). Although the structure of Stata commands is unique to Stata, the skills and experience of working with code and scripts are transferrable to other programs commonly used in data analytics/science, such as SAS, R, or Python.
* Ability to translate concepts into valid and reliable measures; critically consider the implications of our measures for both validity and inclusion.
* Managing and manipulating variables (data wrangling) in Stata—constructing scale/composite measures out of multiple variables; collapsing categories; reverse/reordering values; etc.;
* Analyzing and presenting descriptive statistics through a variety of graphs and tables;
* Understanding the basics of probability theory and inferential statistics and how they apply to particular techniques. Understand current critiques of conventional statistics (NHST – null hypothesis statistical testing) and how we might remedy concerns through adjustments in how we present and report on results.
* Conducting a variety of bivariate analyses, including: comparison of means tests (e.g., t-tests and ANOVA); cross-tabulations and measures of association (e.g., Chi-Square); correlations and simple regression; as well as nonparametric alternatives to these techniques (e.g., Mann-Whitney; Kruskal-Wallis)
* Conducting various types of multivariate regression analyses, particularly OLS and logistic regression. These two types of regression are foundational and widely used. From here, you will find learning other types of regression (ordered logistic; negative binomial or poisson) to be easier.
* Dealing with common issues such as influential cases (outliers) and multicollinearity.
* Know how to communicate your results to diverse audiences. As part of this, data visualization – the ability to graphically represent your data and/or analyses – is an essential skill. Know when descriptive statistics, bivariate analyses, and multiple regression analyses are called for, considering the objective and the audience.
* Develop a broader quantitative literacy – an ability to critically interrogate and understand research, whether one’s own or that of others.
* Behind the scenes, you will develop trouble-shooting skills and your ability to self-learn. Additionally, you will develop your ability to be attentive to details. These are all skills whose value spans well beyond the world of quantitative research.

A basic assumption of this course is that proficiency in these elements cannot come about solely through reading. Ultimately, it is arrived at through reflection, discussion, practice, play, and application. In that regard, developing quantitative analysis skills is akin to learning a musical instrument or a foreign language. There is no substitute for immersion, repetition, and application. It’s important to bring a “growth mindset” to this course and learn to embrace troubleshooting the challenges you encounter. Additionally, perhaps more than in any other area of sociology, attention to detail is absolutely essential. The software respects perfection, not good intentions.

**Post-CC World/Career Preparedness**

As you carry out work in this class, it’s worth appreciating how various tasks contribute to the competencies you have been developing in your time at CC and that will serve you in the post-CC world. We will regularly highlight the connection between various tasks and the following kinds of competencies:

* Personal/professional effectiveness – accountability to self and others
* Teamwork – ability to collaborate and maximize team performance; individual preparation is critical to being an effective team member.
* Managing information/data – ability to obtain, interpret, use, and communicate information; translate data into insights
* Effective communication – articulate ideas and insights clearly and effectively; adjust communications to suit different audiences
* Technology – learn and leverage existing technologies to solve problems, complete tasks, and accomplish goals effectively
* Critical thinking – exercise sound reasoning to analyze information, make decisions, identify problems, and develop workable solutions; exploit variation for insight
* Cultural intelligence – value and respect diversity

**Attention to Detail**

Working with software such as Stata or ArcGIS Pro requires that you pay unfailing attention to detail. There is simply no room for error. Software programs like these aren’t as forgiving as your google search. The good news is this: if something isn't working, the problem is most likely you. Yes, that's good news, as it's often something small and it can fixed in short order. That said, one critical habit is to *think, plan, and understand before you act* (I recommend reverse engineering a project as part of this planning process). Racing through steps will only lead to frustration. A good rule to follow is to make sure you understand what a command does before you do it. The same applies to your write-up of your results. Words have very particular meanings in this area of sociology. Be precise and deliberate in your choice of words.

**Classroom Etiquette**

There is no “on time”; there is early and there is late. Show respect for the class. Also, we will break for nature at pre-determined times so that you can adjust your leaves as needed.

Bring your laptop to class every day (fully charged). You can darken your screen’s brightness to extend your battery life if needed. I’d also recommend having ear buds with you at all time just in case you need to watch/listen to a tutorial. Although you will have your laptop at the ready, do not let it distract you from the discussion at hand. Make use of it when it is called for. Otherwise set it aside and pay attention to what we’re talking about.

If you are sick (sneezing; coughing), please wear a mask in consideration of the collective.

**COURSE MATERIALS: READINGS AND SOFTWARE**

All required readings for the course are available on the course Canvas site. Material listed as “optional” truly is optional. Those particular readings are for those who benefit from instructional texts, rather than tutorial videos and Canvas Pages.

In this class we will be working with Stata as our primary software. Additionally, we will learn some basic functions in ArcGIS Pro. We will be accessing both programs through the use of CC's Academic Virtual Lab (aka VLab). The virtual lab allows you to use your own laptop to access and use software on a remote server from both on and off campus through the use of VMWare. You may find that accessing it through a browser is sufficient: view.coloradocollege.edu (and selecting html access).

We will be using the following network drives and folders in this class. Be sure to map them in the Vlab (set it to the S: drive) \\GISDataserv\students\ [contains a !!!SO401\_Fall23 folder].

**COURSE REQUIREMENTS**

**Participation and Applications**

You will be expected to have read and/or viewed (in the case of tutorials) any assigned or recommended material by the start of every day and be prepared to raise questions, address issues, and apply the material to course data or your own imagined projects. It is important that you also keep an eye out for Canvas announcements, as I often use them to reiterate key points from class or give you guidance on the next day's material. I will be assigning regular “tasks” for the next day and you should carry those out in addition to the readings. You should come to class with questions about your analyses and be prepared to share your questions and findings with the class or your designated group. Please don’t just go through the motions with respect to preparing for class. Give it serious attention, thought, and application.

I will not be grading application assignments; you can assess your own application work as we discuss it in class. I have found that the stress of a grade on early assignments and everyday tasks is actually counterproductive – it drains all the joy from the enterprise. We will, however, discuss the applications so that you can compare/contrast your own work to that of your colleagues. You will be submitting the outcomes of your tasks and I will be checking these as part of your participation in the class. Since you will be sharing your work and carrying out some tasks in a group throughout the block, I will also collect peer evaluations as part of your participation grade.

**Midterm Exam Projects –** There will be a project-based midterm exam focused on bivariate analyses.

**Final Exam Projects –** There will be a final project-based exam that focuses on multiple regression analyses. They will require that you interpret the prompts, understand the (and possibly prep) the data, and carry out an appropriate analysis (including write-up; do-files).

**Final Paper** – You will conduct an independent research project making use of a secondary data set or one compiled by you. It will consist of all of the regular elements of a quantitative research paper, only in brief form (plus a do-file). Given the need to complete this project in a relatively short timeline, I will be putting forward recommended data sets.

**GRADING**

Applications/participation/evals 20%

Midterm Exam Projects 20%

Final Exam Projects 30%

Final Project 30%

A = Excellent work that reflects superior understanding, creativity, or skill. Responses

are well articulated and coherent, showing complete “ownership” of the technique

and interpretation of results.

B = Good work that reflects a high level of understanding, creativity, or skill.

C = Adequate work that indicates a modest readiness to continue study in the field.

Indicates a need to boost one’s commitment to the course.

D = Marginal work, only minimally adequate, raising serious question about one’s

commitment to the class and readiness to continue in the field.

NC = Failing work, clearly inadequate, and unworthy of credit.

**ACADEMIC INTEGRITY**

The Honor Code defines academic integrity by three interrelated criteria – honesty, integrity, and fairness. All students are expected to uphold these standards in this course. Honesty: We pledge to engage in and present their coursework honestly. We pledge never to attempt to misrepresent our work and never to mislead the instructor or fellow students about their work. Integrity: We pledge to act with integrity in our coursework. We pledge never to attempt to submit work that does not result from our own effort or that omits or improperly acknowledges the work of others relied upon in the submission. Fairness: Students pledge to work fairly in this course. We pledge never to attempt to gain an impermissible advantage over fellow students, by violating the Honor Code, including harming other students’ academic work.

Examples of violations include, but are not limited to, making use of another student’s data, code, or writing. Additionally, artificial intelligence should only be used when explicitly permitted by the instructor and in those cases proper attribution should be included.

Any violations of the code will be reported and will result in either the loss of the grade on the exam or assignment at issue, or in a failing grade for the course.

**Accessibility**

Colorado College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any disability-related barriers to learning in this course, please discuss your concerns and/or approved accommodation with me. I would like us to discuss ways to ensure your full participation in the course. Additionally, if you have not already done so, please connect with Accessibility Resources, the office responsible for coordinating accommodations and services for students with disabilities: accessibilityresources@coloradocollege.edu, 719-227-8285, Armstrong 219

**Mental Health Resources**

If you orsomeone you know is struggling, you can find supportive campus and community resources at <https://www.coloradocollege.edu/other/wellness/mental-health/index.html>

The Wellness Resource Center also provides support for students <https://www.coloradocollege.edu/other/wellness/>

You can also connect with these Confidential campus resources:

* Counseling Center: counselingcenter@coloradocollege.edu; 719-389-6093 (After-hours, dial 2 to be connected with a licensed mental health counselor)
* Campus Advocate; Sexual Assault Response and Support: cluna@coloradocollege.edu; 719-227-8101; After-hours Advocate On-call: 719-602-0960
* [24/7 Mental Health Support](https://www.thevirtualcaregroup.com/coloradocollege/) for Students: Free, unlimited access to therapists and on demand counseling 24 hours a day, seven days a week, 365 days a year including holidays
* Chaplain: kholbrook@coloradocollege.edu; 719-389-7986
* [Thriving Campus](https://nam04.safelinks.protection.outlook.com/?url=http%3A%2F%2Fcoloradocollege.thrivingcampus.com%2F&data=05%7C01%7Cechan%40coloradocollege.edu%7C4d064b90880f45829b7e08db6c34ee3f%7Ccfc7b13c12964387b3085de08fd13c99%7C0%7C0%7C638222746815068518%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=vgpbu5pt9LFlPJzbVFiCjfpQtAhvHtdKGJ9mGaqqkpE%3D&reserved=0): Colorado College offers a database of off campus therapists and prescribers in Colorado that can be accessed either by telehealth or in person. You do not need to log in, just follow the link and you can seek different types of providers through their series of filters.

**Civil Rights and Title IX**

Colorado College is committed to fostering a safe and welcoming environment for all students, staff, and faculty. We strive to create an environment free of unlawful discrimination, harassment, or retaliation on the basis of race, ethnicity, caste, religion, national origin, sex, gender, marital status, disability, veteran status, age, genetic information, or any other status protected by law.

CC’s Office for Civil Rights and Title IX is available to provide resources and discuss options for addressing concerns if someone experiences discrimination or harassment based on their identity, including incidents of sexual misconduct, stalking, and dating/domestic violence. All CC employees, including faculty, who become aware of such concerns are required to share the information with the Office for Civil Rights and Title IX. This allows the office to reach out to individuals who reportedly experienced harm to offer resources and an opportunity to meet.

There is no requirement to meet with the office after a report is made. If you would prefer to meet with a confidential resource, there are several campus options: If your concerns are related to sexual or gender-based discrimination or harassment, you may contact the Sexual Assault Response Coordinator (SARC) at sarc@coloradocollege.edu or 719-227-8101. For the after-hours on-call SARC Advocate, call 719-389-6093. The Counseling Center can be reached at Counselingcenter@coloradocollege.edu or 719-389-6093. The Chaplain can be reached at (719) 389-6638.

**Pledge of Respect**

The Colorado College community is dedicated to the advancement of knowledge and the development of integrity. In order to thrive and excel, this community must preserve the freedom of thought and expression of all its members of this community, we pledge our respect for the standards of the community and for the rights and well‐being of all its members. As a member of the Colorado College community, I pledge that: I will respect the dignity and essential worth of all individuals. I will promote a culture of respect throughout the college community. I will respect the privacy, property, and freedom of others. I will not tolerate bigotry, discrimination, violence, or intimidation of any kind. I will practice personal, professional, and academic integrity and expect it from others. I will promote the diversity of opinions, ideas, and backgrounds which are the lifeblood of the college.

**Schedule**

**NOTE:** The following schedule is subject to change on short notice. Much depends on the pace of the class. Circumstances may dictate that we alter the schedule as needed. The listed materials also do not include tasks that will be regularly assigned via Canvas announcements and are considered to be part of your regular participation in the course.

**Monday, August 28: Introduction to the Course**

* Page: “Getting Started”
* Page: “The Four Domains”
* Page: “The Process – Navigating the Forests, Groves, and Trees”

**Tuesday, August 29: Sociological Thinking and Quantitative Research**

* Page: “Quantitative Research Questions – Tips on How to Approach”
* Urdan, Ch. 1 “Introduction to Social Science Research Principles and Terminology”
* Page: “Kinds of Measures/Variables”
* Page: “Common Elements/Structure of a Quantitative Paper”
* Example Student Research:
	+ Hansen, “Sexual Assault as a ‘Social Fact’: A Cross-Campus Analysis”
	+ Gonzalez, “The Racialized Roots and Repercussions of Pain Prescriptions: A County-Level Analysis of the Evolving Opioid Epidemic”
	+ Burnham, “Orange Is the New Black: An Analysis of Obama-to-Trump Voters”

**Wednesday, August 30: Do-Files, Data Wrangling, and Descriptive Statistics/Graphs**

* Page: “Do-Files and Logs”
* Page: “Cleaning and Prepping Data”
* [Data Management and Prep Commands and Tutorials](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#data_mgmt_prep)
* Page: “Composite Construction Using Cronbach’s Alpha”
* Urdan, Ch 2 “Measures of Central Tendency”
* Urdan, Ch. 3 “Measures of Variability”
* Page: “Univariate Descriptive Statistics and Graphs”
* [Descriptive Statistics and Graphs Tutorials](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#Descriptive_Graphs)
* *Optional Resources:*
	+ *Acock, Ch. 1 “Getting Started”*
	+ *Acock, Ch. 2 “Entering Data”*
	+ *Acock, Ch. 3 “Preparing data for analysis”*
	+ *Acock, Ch. 4 “Working with commands, do-files, and results”*
	+ *Acock, Ch. 5 “Descriptive Statistics and Graphs”*

**Thursday, August 31: Inferential Statistics**

* Page: “Inferential Statistics – Old and New Regimes”
* Amrhein et al., “Retire Statistical Significance”
	+ Further (optional) reading: Amrhein et al., “The Earth Is Flat (p > 0.05)”
* DeCaro, “Student’s Guide to Inferential Statistics”
* Urdan, Ch. 4 “The Normal Distribution”
* Urdan, Ch. 5 “Standardization and z-scores”
* Urdan, Ch. 6 “Standard Errors”
* Urdan, Ch. 7 “Statistical Significance, Effect Size, and Confidence Intervals
* Page: “Determining which test is appropriate”

**Friday, September 1: Comparison of Means Tests (t-test and ANOVA)**

* Urdan, Ch. 9 “T-Tests”
* Page: “The T-Test – Comparison of Means Test”
* [T-test tutorials](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#ttests)
* *Acock, Ch. 7 “Tests for one or two mean”* ***(optional)***
* Urdan, Ch. 10
* Page: “ANOVA – Comparison of Means Test”
* [ANOVA tutorials](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#anova)
* *Acock, Ch. 9 “Analysis of variance”* ***(optional)***
* Page: “Graphing Results” (relevant section)

**Monday, September 4: Cross-Tabulation and Correlation/Simple OLS Regression**

* Urdan, Ch. 14 “The Chi-Square Test of Independence”
* Page: “Cross-Tabulations and Chi-Squared Test of Significance”
* [Cross-tabulation and Chi-squared test (tutorials)](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#crosstabs_chisq)
* *Acock, Ch. 6 “Statistics and graphs for two categorical variables”* ***(optional)***
* Page: “Graphing Results” (relevant section)
* Urdan, Ch. 8 “Correlation”
* Urdan, Ch. 13 “Regression” (pp. 145-151)
* Allison, Ch. 5 “How Does Bivariate Regression Work”
* Page: “Correlation and Simple Regression”
* [Correlation and Simple Regression tutorials](https://www.coloradocollege.edu/academics/dept/sociology/stata-video-tutorials.html#correlation_simplereg)
* *Acock, Ch. 8 “Bivariate correlation and regression”* ***(optional)***
* Page: “Graphing Results” (relevant section)

**Tuesday, September 5: Flex Class Session**

**Wednesday, September 6: Midterm Projects Due at 5:00 pm (no class)**

**Thursday, September 7: RnR**

**Friday, September 8: Multiple OLS Regression – Interpretation and Write-up**

* Urdan, Ch. 13 “Regression”
* Allison, Ch. 1 “What Is Multiple Regression”
* Allison, Ch. 2 “How Do I Interpret Multiple Regression Results?”
* Allison, Ch. 9 “How Is Multiple Regression Related to Other Statistical Techniques?”
* Page: “Multiple Regression – The Basics”
* Page: “Multiple OLS Regression”
* *Acock, Ch. 10 “Multiple Regression”* ***(optional)***
* Page: “Graphing Results”
* Evans and Rauch, “Bureaucracy and Growth: A Cross-National Analysis”
* Example Student Research (revisit):
	+ Hansen, “Sexual Assault as a ‘Social Fact’: A Cross-Campus Analysis”
	+ Gonzalez, “The Racialized Roots and Repercussions of Pain Prescriptions: A County-Level Analysis of the Evolving Opioid Epidemic”

**Monday, September 11: Multiple Logistic Regression – Interpretation and Write-up**

* Acock, Ch. 11 “Logistic Regression” (this one is worth reading)
* Page: Multiple Logistic Regression
* Page: Graphing Results
* Bergesen and Herman, “Immigration, Race, and Riot: The 1992 Los Angeles Uprising”
* Example Student Research (revisit):
	+ Burnham, “Orange Is the New Black: An Analysis of Obama-to-Trump Voters”

**Tuesday, September 12: Multiple Regression – Assumptions, Issues, and Concerns**

* Allison, Ch. 3 “What Can Go Wrong with Multiple Regression?”
* Allison, Ch. 6 “What Are the Assumptions of Multiple Regression?”
* Allison, Ch. 7 “What Can Be Done about Multicollinearity?”
* Page: “Multiple OLS Regression – Model Assumptions and Other Concerns”
* Page: “Multiple Logistic Regression – Weighted Sample and Diagnostics”

**Wednesday, September 13: Multiple Regression – Research Questions, Modeling, Interpretation, and Write-up**

* Page: Mediation in OLS Regression
* Page: Moderation in OLS Regression
* Page: Mediation in Logistic Regression
* Page: Moderation in Logistic Regression

**Thursday, September 14: Flex Class Session**

**Friday, September 15: Final Exams Due at 5:00 pm (no class)**

**Monday, September 18: Work Day and Consultations**

**Tuesday, September 19: Work Day**

**Wednesday, September 20: Final Paper Due at Noon**