

SOC 9007A · Advanced Multivariate Statistical Analysis

Fall Term 2019
The University of Western Ontario

Patrick Denice
Assistant Professor, Department of Sociology

Class Meetings:
Monday, 1:30–4:30pm
SSC 5235

Office Hours:
Tuesday, 2:00–4:00pm
SSC 5407

Course Description

Overview. This course builds on concepts you have learned in your introductory undergraduate or graduate statistics classes. We will cover some of the most common statistical techniques in the practice of quantitative sociology. These include multivariable linear regression, logistic regression, survival (event history) analysis, and fixed effects models. We will discuss when and how to use these techniques, as well as the assumptions we make when using them. We will also spend time discussing various pitfalls and extensions to these approaches, including outliers, nonlinearity, multicollinearity, and interaction terms. Throughout the course, we will talk about how to develop answerable research questions, how to select the best modeling strategy for that question, and how to interpret the results of quantitative analysis in light of our hypotheses.

We will apply these concepts in the computer lab. We will conduct data analysis using Stata, a commonly-used statistical software package. Throughout the lab, we will talk through basic issues that arise, including dealing with missing data; saving our data, code, and output; and making tables.

Finally, we will focus on writing about and presenting on a multivariable analysis of your choosing. A major component of being a quantitative social scientist is the ability to clearly communicate what you did, what you found, and why it matters. Your final project, which you should begin thinking about early on in the term, will consist of a paper and accompanying poster that includes the introduction, data and methods, findings, and discussion sections of an academic article.

Prerequisites. Students should have taken an introductory statistics course at the graduate level that covers descriptive statistics, probability, correlation, ANOVA, and linear regression.

Learning Outcomes

1. Understand the assumptions underlying linear regression, logistic regression, and survival analysis
2. Interpret key results from multivariable models
3. Conduct analyses using Stata

4. Read and critically evaluate published sociological research using the quantitative methods we cover
5. Communicate the results of your analyses

Course Materials

Readings. There is no required textbook that you must purchase for this course. Recommendations for reference books you might find useful are listed below. These texts will be on course reserve at Weldon Library.

- Agresti, Alan, and Barbara Finlay (2009). *Statistical Methods for the Social Sciences*, Fourth Edition. Pearson Prentice Hall.
- Allison, Paul D. (1998). *Multiple Regression: A Primer*. Pine Forge Press.
- Allison, Paul D. (2000). *Fixed Effects Regression Models*. SAGE Publications, Inc.
- Gordon, Rachel A. (2010). *Regression Analysis for the Social Sciences*. Routledge Press.
- Long, J. Scott (1997). *Regression Models for Categorical and Limited Dependent Variables*. SAGE Publications, Inc.
- Pampel, Fred C. (2000). *Logistic Regression: A Primer*. SAGE Publications, Inc.
- Cleves, Mario, William W. Gould, and Yulia V. Marchenko (2016). *An Introduction to Survival Analysis Using Stata*, Revised Third Edition. Stata Press.
- Miller, Jane E. (2005). *The Chicago Guide to Writing about Multivariate Statistics*. University of Chicago Press.

While readings from the above textbooks listed in the course schedule are optional (though highly recommended), the *empirical example readings*—sociological articles that use the techniques we learn—are mandatory. These will be available on OWL, and they are listed on the day by which you need to have read them. We will spend a portion of most class periods discussing how the methods are used in them.

Stata. Throughout the course, we will practice using the statistical package Stata. For class sessions that are marked with **Lab**, we will hold a portion of our class meeting in SSC 1000. We will always start class in our usual classroom—so report there first.

I'm not expecting you to have any prior experience with or knowledge of this particular program, but it would be helpful to have had some exposure to other statistical tools (e.g., SPSS, R, or even Excel). Students—particularly those with limited computer literacy—may find it useful to explore the opportunities provided by the Social Science Computing Lab as they get up to speed with Stata.

Students should have a computer account with SSNDS and should make sure they are able to login before our first computer lab session. In order to access Stata in the lab, students must: (1) have active Western accounts, and (2) have subscribed to “Western Identity Manager” and synchronized their passwords through the “Profile” tab. If you are having trouble gaining access, please call either the SSNDS main office (519-661-2152) or the ITS Help Desk (519-661-3800).

Course Evaluation

Problem Sets (45%). In statistics, as in life, practice makes habit. As such, there will be three (3) problem sets to provide you with the opportunity to practice what we learn—including what we do on Stata—in a relatively low-stakes environment. Completed problem sets must be handed in at the start of class on the date stated in the course schedule below. Students may work together, but each must turn in their own assignment.

Poster Presentation (20%). On the final day of class, each student will present a poster applying one or more of the techniques learned in class to their own research. Posters are used as an alternative to slide presentations in many fields—including sociology and demography. We will structure our final class day as a conference, and invite your fellow graduate students in sociology as well as faculty members. I'll provide more guidance on how to make your posters later in the term. The project can be on any topic students choose.

Empirical Research Paper (35%). Students will also turn in a paper outlining their research questions, contribution, data and analytical approach, findings, and conclusions. Research papers are due on **Monday, December 16, at 10:00am**. As with the poster component, I'll provide much more detail on what the research paper entails and how it will be evaluated in the first few weeks of the term. Students should, however, be thinking about their topic and data early on.

A Note About Attendance: Because you cannot actively engage with the materials and your colleagues if you are not here, in order to receive a passing grade students are expected to attend at least 80% of the class meetings for this course. This requirement will only be waived in exceptional circumstances with documentation. While attendance is not an explicit part of the evaluation breakdown, you will see your final grade lowered if you miss an excessive number of class sessions. Please inform me as soon as possible if you are unable to attend a class for medical or personal reasons.

How to Contact Me

I can be reached via email at pdenice@uwo.ca. Students are also encouraged to come to office hours, to set up an appointment, or to approach me before or after class.

How to Get Important Information

You will find course content and announcements posted to our OWL website. I will also announce any upcoming deadlines or changes to the course schedule in class. If you miss a class, check with a classmate for any notes or other materials.

Important Policies

Assignment Deadlines. Students must submit their assignments by the date and time stated in the course outline and on the OWL website. Late assignments will be penalized 10% for each day they are late. Any assignment not received within 5 days of the due date will not be accepted, except in the event of a documented medical or family emergency. If a student anticipates an issue with an assignment, they are recommended to speak to the professor as early as possible to make alternative arrangements.

Plagiarism. Students must write their assignments in their own words. Whenever students take an idea from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major scholastic offence (the Scholastic Offence Policy can be viewed in the Western Academic Calendar).

All required assignments may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (www.turnitin.com).

Standards of Professional Behaviour. It is the responsibility of all members of the Department of Sociology to adhere to and promote standards of professional behaviour that support an effective learning environment. These include:

- Respect for others both in and out of the classroom through words and actions (be professional, fair, and respectful in interactions with people on-line and in-person; understand and respect differences among classmates and colleagues; avoid disrupting the learning environment; respect others' expectations of confidentiality and privacy).
- Active engagement in learning and commitment to quality (being prepared for classes; participating and listening actively to other; using technology and social media appropriately, striving to do your best). Take responsibility for your own learning by: relating course content and projects to your own professional interests; monitoring your own understanding; seeking clarification and assistance when necessary.
- Personal integrity (following through on commitments; doing one's own work).

Students should also be aware of the UWO Student Code of Conduct found at: <https://www.uwo.ca/univsec/pdf/board/code.pdf>.

Laptops and Other Electronics/Phones in Class. I encourage you to take notes without a computer if you are able. If you need a laptop to take notes during class, please refrain from browsing the internet, texting, or going on social networking sites such as Facebook or Twitter. Students who disrupt their colleagues' learning through the use of their laptop or tablet will be told to put away their device, and they will not be permitted to use it for the remainder of the class. Be sure that all cell phones are silenced and put away at the beginning of class.

Recording Devices. Recording devices may not be used in this class. If you require a recording device for medical, accessibility, or other reasons, please see me.

Lectures and Other Course Materials. Any materials created by the instructor (e.g., notes, hand-outs, summaries, slide decks, assignments, exams, etc.) are protected by copyright law and may not be copied or distributed in any form without the explicit permission of the instructor. Any non-authorized use of these materials constitutes an academic offence.

Scholastic Offences. Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence (www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

Accommodation. Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are encouraged to register with Student Accessibility Services, a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both SAS and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction. For more information, see <http://www.sdc.uwo.ca/ssd/>.

Completion of Course Requirements. Course requirements must be completed by the end of the term in which the course is offered (Fall–December 31; Winter–April 30, Summer–August 31). Only in exceptional circumstances may a student take additional time to complete the course requirements. In such a case, the student must first meet with the Graduate Chair to request permission to carry the incomplete. Medical documentation, where required, will be kept on file in the Sociology graduate program office. More details regarding incompletes are outlined in the Graduate Handbook: http://www.sociology.uwo.ca/graduate_handbook/course_information.html.

Accessibility Options. Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111, x82147 for any specific question regarding an accommodation. Information regarding accommodation of exams is available on the Registrar’s website: www.registrar.uwo.ca/examinations/accommodated_exams.html.

Mental Health. Students in emotional/mental distress should refer to Mental Health@Western (http://uwo.ca/health/mental_wellbeing/index.html) for a complete list of options how to obtain help.

Health and Wellness. As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. The Wellness Education Centre (lower level UCC) assists students in finding mental health and other related resources best suited to their needs (<http://se.uwo.ca/wec.html>). Western’s School of Graduate and Postdoctoral Studies’ Living Well website provides tips for thriving at grad school and other helpful information (http://grad.uwo.ca/current_students/living_well/index.html).

Western provides several on-campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western’s Campus Recreation Centre. Numerous cultural events are offered throughout the year. Also, we encourage you to check out the Faculty of Music web page (<http://www.music.uwo.ca/>, and our own McIntosh Gallery (<http://www.mcintoshgallery.ca/>).

Disputing a Grade. Students who wish to dispute an assignment, exam, or course grade must

write a one-page explanation justifying why their work should be re-evaluated. Work will not be re-evaluated on the basis that students were sick or feeling stressed when completing the assignment. Please be advised that a student's mark may go up or down upon re-evaluation.

Extraordinary Circumstances. The content and/or evaluation of this course is subject to change in the event of extraordinary circumstances beyond the University's or instructor's control.

Course Schedule

Please note: Readings and assignments must be completed prior to class on the date listed. This schedule is subject to change over the course of the term in order to meet the needs of the class. Any changes will be announced in class and/or through our OWL course website.

Sept. 9: Introduction

- 📖 *Empirical reading:* Lindner, A. M., Lindquist, M., and Arnold, J. (2015). “Million Dollar Maybe? The Effect of Female Presence in Movies on Box Office Returns.” *Sociological Inquiry* 85(3): 407-428.

Sept. 16: Linear Regression

- 📖 *Methods reading:* Gordon, ch. 1–6
- 📖 *Empirical reading:* Feliciano, C., and Lanuza, Y. (2017). “An Immigrant Paradox? Contextual Attainment and Intergenerational Educational Mobility.” *American Sociological Review* 82(1): 211-241.

🏢 Lab in SSC 1000

Sept. 23: Linear Regression (model fitting, interaction terms)

- 📖 *Methods reading:* Gordon, ch. 7 & 8
- 📖 *Empirical reading:* Schieman, S., Schafer, M. H., and McIvor, M. (2013). “The Rewards of Authority in the Workplace: Do Gender and Age Matter?” *Sociological Perspectives* 55(3): 75-96.

🏢 Lab in SSC 1000

Sept. 30: Logistic Regression (1)

- 📖 *Methods reading:* Gordon, ch. 9–11; Long, ch. 3; Pampel
- 📖 *Empirical reading:* Lunn, A., and Kornrich, S. (2018). “Family Investments in Education During Periods of Economic Uncertainty: Evidence from the Great Recession.” *Sociological Perspectives* 61(1): 145-163.

Oct. 7: Logistic Regression (2)

- 📖 *Methods reading:* Long, ch. 4
- 📖 *Empirical reading:* Rosenfeld, J. (2010). “Economic Determinants of Voting in an Era of Union Decline.” *Social Science Quarterly* 91(2): 379-396.

🏢 Lab in SSC 1000

📝 Problem Set 1 due

Oct. 14: *Thanksgiving*

- *No class*

Oct. 21: **Multinomial and Ordered Logistic Regression**

📖 *Methods reading:* Long, ch. 5 & 6

📖 *Empirical reading:* Wynn, A. T. (2017). “Gender, Parenthood, and Perceived Chances of Promotion.” *Sociological Perspectives* 60(4): 645-664.

Oct. 28: **Poisson Models of Counts**

📖 *Methods reading:* Long, ch. 8

📖 *Empirical reading:* van Dyke, N., and Soule, S. A. (2002). “Structural Social Change and the Mobilizing Effect of Threat: Explaining Levels of Patriot and Militia Organizing in the United States.” *Social Problems* 49(4): 497-520.

🏢 Lab in SSC 1000

Nov. 4: *Reading Week*

- *No class*

Nov. 11: **Event History Analysis (1)**

📖 *Methods reading:* Clark et al. (2003). “Survival Analysis Part I: Basic Concepts and First Analysis.” *British Journal of Cancer* 89: 232-238.

📝 Problem Set 2 due

Nov. 18: **Event History Analysis (2)**

📖 *Methods reading:* Bradburn et al. (2003). “Survival Analysis Part II: Multivariate Data Analysis—An Introduction to Concepts and Methods.” *British Journal of Cancer* 89: 431-436.


📖 *Empirical reading:* Ampaw, F. D., and Jaeger, A. J. (2012). “Completing the Three Stages of Doctoral Education: An Event History Analysis.” *Research in Higher Education* 53(6): 640-660.


🏢 Lab in SSC 1000

Nov. 25: **Causality; Fixed Effects**

📖 *Methods reading:* Allison (2000)

📖 *Empirical reading:* Dahlin, E. (2019). “Are Robots Stealing Our Jobs?” *Socius: Sociological Research for a Dynamic World*.

 Lab in SSC 1000

 Problem Set 3 due

Dec. 3: *Poster Session*

Final paper due: Monday, December 16, at 10:00am