

**University of Guelph**  
**College of Social and Applied Human Sciences**  
**Department of Sociology and Anthropology**  
**Sociology 6130: Quantitative Research**  
**January – April, 2007**

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**Course Objectives:**

The purpose of this course is to provide you with a practical experience of using statistics and computer software programs to analyze survey data. It is important for social researchers to know how to use a variety of regression techniques, including when they work and why they may not work under various conditions. In this course we will study general and generalized linear models in detail, including both statistical theory and practical applications.

The main objective of the lectures is to provide you with the tools needed to become a proficient researcher when working with survey data. The lectures will cover the following topics: bivariate and multiple regression, regression diagnostics, path analysis, regression with limited dependent variables, and regression in matrix. We will also devote some time working through the logic of ordinary least squares (OLS) and maximum likelihood estimation (MLE), the techniques most commonly used to obtain regression estimate for linear and generalized linear models. As well, we will confront issues that commonly arise when working with social surveys such as how to deal with missing data and large surveys involving complex sampling designs. It is very important that you attend lectures as I address material in a slightly different way than it is covered in the text(s).

It is assumed that students enter this course with a background in regression analysis (SOAN 3120). This course does not require a strong background in mathematics; however, students will be expected to perform simple matrix manipulations such as addition, subtraction, multiplication and division (i.e. calculating the inverse of a 2x2 matrix). For the last assignment, you will be required to calculate regression coefficients (by hand) in matrix form.

The primary statistical software package that will be used in this course is Stata. However, some comparative illustrations will involve SAS and SPSS.

**Required Text:** Hamilton, Lawrence C. (2006) Statistics with Stata (Updated for Version 9). Stata Press.

**Supplemental Texts (on reserve in the library):**

Achen, Christopher H. (1982) *Interpreting and using Regression*. Series: Quantitative Applications in the Social Sciences, No. 29. Thousand Oaks, CA: Sage Publications.

Allison, Paul D. (1999) *Multiple Regression*. Thousand Oaks, CA: Pine Forge Press. Coming Soon (this book has been ordered)

Berry, William D. (1993) *Understanding Regression Assumptions*. Series: Quantitative Applications in the Social Sciences, No. 92. Thousand Oaks, CA: Sage Publications.

Berry, William D. and Stanley Feldman. (1985) *Multiple Regression in Practice*. Series: Quantitative Applications in the Social Sciences, No. 50. Thousand Oaks, CA: Sage Publications.

Fox, John (1991). *Regression Diagnostics* Series: Quantitative Applications in the Social Sciences, No. 79. Thousand Oaks, CA: Sage Publications.

Lewis-Beck, Michael S. (1980). *Applied Regression: An Introduction*. Series: Quantitative Applications in the Social Sciences, No. 22. Thousand Oaks, CA: Sage Publications.

Kalton, Graham (1993) *Introduction to Survey Sampling*. Series: Quantitative Applications in the Social Sciences, No. 35. Thousand Oaks, CA: Sage Publications.

Menard, Scott (1995). *Applied Logistic Regression Analysis: Second Edition*. Thousand Oaks, CA: Sage Publications. Series: Quantitative Applications in the Social Sciences.

Schroeder, Larry D., David L. Sjoquist, and Paula E. Stephan. (1986). *Understanding Regression Analysis: An Introductory Guide*. Series: Quantitative Applications in the Social Sciences, No. 57. Thousand Oaks, CA: Sage Publications.

\* A detailed week-by-week summary of readings will be provided in class

**Evaluation:**

The midterm test is worth 30% and will cover all of the material (lecture and text) covered up until the test. The final research paper is worth 30%, and is due during the last week of classes. The final examination is worth 30% and will cover the text and lecture material for the whole term. Various assignments/participation will make up the remaining 10%.

**The Research Project:**

From beginning to end, this course is designed to prepare you to become proficient analyst of survey data. The most rewarding aspect of this course is the completion of the final research paper. For this project, you are responsible for investigating the

sociological literature to identify a research problem. Once familiar with the literature in a particular research area (or areas), you will then explore the variables in existing datasets (made available in the data resource library at Guelph) to see if you can effectively address the research problems that you have identified. Using the statistical techniques learned in class, you will then analyze your data, report your results, discuss your findings, and generate some conclusions. The result is a journal article length research paper between 25 and 30 pages, double spaced (including tables and appendices). Students in the past have presented their used this project to as preliminary research for their thesis. Some have also presented their research from this course at national and international sociology conferences.

Further information about the final project will be handed out during the term, and will also be provided on our course web page.

### **Tentative Class Schedule:**

Date:	Topic
Week 1	Introduction to the course. Overview of the statistical methods (including notation) used in this class. Concepts include: bivariate regression: slope, intercept, R-square, sum of squares, residuals.
Week 2	Regression continued. Topics include: Tests of statistical significance, regression estimated via ordinary least squares (OLS). Introduction to Stata
Week 3	Regression diagnostics. Topics include: normality, linearity, influential data, and heteroskedasticity. Diagnostic plots. Stata tutorial
Week 4	Multiple regression (with both continuous and categorical independent variables) – the general linear model. Stata tutorial
Week 5	In class test
Week 6	Multiple regression with interactions - Categorical by categorical - Continuous by categorical - Continuous by continuous Stata tutorial

Week 7	“Reading” Week
Week 8	Multiple regression with interactions continued. Introduction to path analysis Calculating total, direct, and indirect effects. Extensions of path models – structural equation (simultaneous equation) models.
Week 9	Reporting statistical output: Creating a research project Stata tutorial
Week 10	Regression analysis with limited dependent variables (generalized linear model framework). Topics include: data generating processes (probability distributions), link functions, logit and probit models, maximum likelihood estimation.
Week 11	Interpreting interactions in logistic regression. Extensions of the generalized linear model - Regression models with nominal (multinomial), ordinal, and count outcomes.
Week 12	Matrix algebra - addition, subtraction, and multiplication. Calculating regression estimates using matrix (see my matrix handout). Comparing estimation procedures (OLS versus Maximum Likelihood Estimation)
Week 13	Complex survey designs (stratified and cluster sampling designs) Survey weights, bootstrap weights, Stata’s svy commands Computer exercises and examples Review

**Dates to remember:**

Classes commence	January 8
Winter Break	February 19-February 23
Classes conclude on	April 5
Exams begin	April 9
Exams conclude	April 20

## **Please read the following...**

### **E-mail Communication**

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the university and its students.

### **When You Cannot Meet a Course Requirement...**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor [or designated person] in writing, with your name, id#, and e-mail contact. Where possible, this should be done in advance of the missed work or event, but otherwise, just as soon as possible after the due date, and certainly no longer than one week later. Note: if appropriate documentation of your inability to meet that in-course requirement is necessary, the course instructor, or delegate, will request it of you. Such documentation will rarely be required for course components representing less than 10% of the course grade. Such documentation will be required, however, for Academic Consideration for missed end-of-term work and/or missed final examinations. See the undergraduate calendar for information on regulations and procedures for Academic Consideration. ([http://www.uoguelph.ca/undergrad\\_calendar/c08/c08-ac.shtml](http://www.uoguelph.ca/undergrad_calendar/c08/c08-ac.shtml))

### **Drop Date**

The last date to drop one-semester Fall 2006 courses, without academic penalty, is **Monday, November 6<sup>th</sup>**. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar. ([http://www.uoguelph.ca/undergrad\\_calendar/c08/c08-drop.shtml](http://www.uoguelph.ca/undergrad_calendar/c08/c08-drop.shtml))

### **Copies of out-of-class assignments**

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### **Academic Misconduct**

The University of Guelph is committed to upholding the highest standards of academic integrity and enjoins all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. The University of Guelph takes a serious view of academic misconduct, and it is your responsibility as a student to be aware of and to abide by the University's policy. Included in the definition of academic misconduct are such activities as cheating on examinations, plagiarism, misrepresentation, and submitting the same material in two different courses without written permission from the relevant instructors. To better understand your responsibilities, read the Undergraduate Calendar. ([http://www.uoguelph.ca/undergrad\\_calendar/c01/index.shtml](http://www.uoguelph.ca/undergrad_calendar/c01/index.shtml)) for a statement of

Students' Academic Responsibilities; also read the full Academic Misconduct Policy ([http://www.uoguelph.ca/undergrad\\_calendar/c08/c08-amisconduct.shtml](http://www.uoguelph.ca/undergrad_calendar/c08/c08-amisconduct.shtml)). You are also advised to make use of the resources available through the Learning Commons (<http://www.learningcommons.uoguelph.ca/>) and to discuss any questions you may have with your course instructor, TA, or academic counsellor.

Instructors have the right to use software to aid in the detection of plagiarism or copying and to examine students orally on submitted work. For students found guilty of academic misconduct, serious penalties, up to and including suspension or expulsion, can be imposed. Hurried or careless submission of work does not exonerate students of responsibility for ensuring the academic integrity of their work. Similarly, students who find themselves unable to meet course requirements by the deadlines or criteria expected because of medical, psychological or compassionate circumstances should review the university's regulations and procedures for Academic Consideration in the calendar ([http://www.uoguelph.ca/undergrad\\_calendar/c08/c08-ac.shtml](http://www.uoguelph.ca/undergrad_calendar/c08/c08-ac.shtml)) and discuss their situation with the instructor and/or the program counsellor or other academic counsellor as appropriate.