

Biostatistics 3110B

Multivariable Methods in Biostatistics

Department of Epidemiology and Biostatistics
January-April 2020

Time: Tuesday and Thursday 10:30 -11:30 am.

Location: MSB 190.

Lab Time: Thursday 11:30 am – 12:30 pm.

Lab Location: K7

Instructor: Yayuan Zhu, PhD.

E-mail: yayuan.zhu@uwo.ca Ext 86247

Instructor Office Hours (K218):

Tuesday 1:00 – 2:00 pm

Thursday 2:00 – 3:00 pm

TA: Cheng (Edward) Yu

Email: cyu368@uwo.ca

TA Office hours: by appointment

Phone Extension: NA

Course Information

This course is designed to provide students with a conceptual understanding of multivariable regression models most often encountered by epidemiologists and biostatisticians. These include multiple linear regression models for continuous outcomes, logistic regression models for binary outcomes, and Cox proportional hazard regression models for time-to-event data. Statistical methods for longitudinal studies may be also covered. Models will be discussed in the contexts of isolating the effect of a single predictor, understanding multiple predictors, and outcome predictions. Data analysis will be demonstrated primarily using Stata and/or R. By the end of this course, students should be able to (i) depict and characterize the associations among variables (ii) apply appropriate statistical methods to analyze data appearing in biomedical practice (iii) understand the underlying mechanisms of various statistical models (iv) implement statistical software to carry out analysis and interpret results.

Prerequisite

Biostatistics 3100A, Epidemiology 3200A or equivalent.

Unless you have either the requisites for this course or written special permission to enroll in it, you may be removed from this course and it will be deleted from your record. Undergraduate students may seek permission from the Undergraduate Chair and graduate students may do so through the Graduate Chair. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Course Syllabus (Tentative)

Week	Date	Topic	Text Chapter *
1	1.7	<ul style="list-style-type: none"> • Introduction 	1-2
	1.9	<ul style="list-style-type: none"> • Exploratory and Descriptive Methods 	
	1.9	Lab 1, no assignment	
2	1.14	<ul style="list-style-type: none"> • Basic Statistical Methods 	3
	1.16		
	1.16	Lab 2, assignment 1	
3	1.21	<ul style="list-style-type: none"> • Basic Statistical Methods (cont) 	3
	1.23	<ul style="list-style-type: none"> • Linear Regression 	4
	1.23	Lab 3, assignment 2	
4	1.28	<ul style="list-style-type: none"> • Linear Regression (cont) 	4
	1.30		
	1.30	Lab 4, assignment 3	
5	2.4	<ul style="list-style-type: none"> • Linear regression (cont) 	4
	2.6		
	2.6	Lab 5, assignment 4	
6	2.11	<ul style="list-style-type: none"> • Logistic Regression 	5
	2.13	<ul style="list-style-type: none"> • Midterm Test (probably 2 hours) 	
	2.13	No lab, no assignment	
7	2.18	Reading week (no lecture)	
	2.20	Reading week (no lecture)	
8	2.25	<ul style="list-style-type: none"> • Logistic Regression (cont) 	5
	2.27		
	2.27	Lab 6, assignment 5	
9	3.3	<ul style="list-style-type: none"> • Logistic Regression (cont) 	5
	3.5		
	3.5	Lab 7, assignment 6	
10	3.10	<ul style="list-style-type: none"> • Generalized Linear Models 	8
	3.12		
	3.12	Lab 8, assignment 7	
11	3.17	<ul style="list-style-type: none"> • Survival Analysis 	6
	3.19		
	3.19	Lab 9, assignment 8	
12	3.24	<ul style="list-style-type: none"> • Survival Analysis (cont) 	6
	3.26		
	3.26	Lab 10, assignment 9	
13	3.31	<ul style="list-style-type: none"> • Longitudinal Data Analysis 	7
	4.2	<ul style="list-style-type: none"> • Final Review 	
	4.2	No lab, assignment 9 due	

*Chapter numbers are referred to Vittinghoff et al. (2012).

Course Materials

Required: Vittinghoff, Glidden, Shiboski, McCulloch (2012) Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models (2nd ed). Springer.
(PDF available through Western library webpage)

Data examples and Stata codes can be downloaded from textbook website:
<http://www.biostat.ucsf.edu/vgsm>.

Recommended:

- Acock, A. C. (2018). A gentle introduction to Stata (6th ed). Stata press.
- Braun, W. J., & Murdoch, D. J. (2007). A first course in statistical programming with R. Cambridge University Press.
- Kleinman, K., & Horton, N. J. (2014). SAS and R: Data management, statistical analysis, and graphics (2. ed). Boca Raton, FL: Chapman Hall/CRC.

Other references or resources:

- Bovas Abraham and Johannes Ledolter (2005), Introduction to Regression Modeling, Duxbury Press.
- Klein, John P., and Melvin L. Moeschberger (2006). Survival analysis: techniques for censored and truncated data (2nd ed). Springer Science & Business Media.
- Lawless, J.F. (2011). Statistical models and methods for lifetime data (2nd ed). John Wiley & Sons.
- Annette J. Dobson, Adrian G. Barnett (2008), An Introduction to Generalized Linear Models (3rd ed), CRC Press.
- Miguel A. Hernán and James M. Robins (2018), Causal Inference Book: <https://www.hsph.harvard.edu/miguel-hernan/causal-inference-book/>
- Quick-R: <https://www.statmethods.net/>

Methods of Evaluation

- 10% - Lecture and/or lab participation
- 35% - Weekly assignments (the best 7 out of 9 will be counted).
Due on Thursdays at 5pm
- 10% - Lab assignments, Due on Fridays at 5 pm
- 20% - **Midterm test (Feb 13 10:30 am – 12:30 pm at KB K203).**
- 25% - Final exam (date and room TBD)

Notes:

1. Late assignments without a valid documented reason (medical or bereavement) will be given a mark of zero (0).
2. For midterm test, non-programming calculators and one (1) page A4 double-sided notes (or formula sheets) are allowed.

3. For final exam, non-programming calculators and two (2) pages A4 double-sided notes (or formula sheets) are allowed.

Copyright Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws.

Policy on the Rounding and Bumping of Marks:

Across the Basic Medical Sciences Undergraduate Education programs and within the Department of Epidemiology & Biostatistics we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. **Final grades** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks **WILL NOT** be bumped to the next grade or GPA, e.g. a 79 will **NOT** be bumped up to an 80, an 84 **WILL NOT** be bumped up to an 85, etc. The mark attained is the mark you achieved and the mark assigned; requests for mark “bumping” will be denied.

Statement on Use of Cell Phone and Electronic Devices

The Schulich School of Medicine & Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School and the Department of Epidemiology & Biostatistics that any electronic devices, i.e., cell phones, tablets, cameras, or iPod are strictly prohibited. These devices **MUST** be left either at home or with the student’s bag/jacket at the front of the room and **MUST NOT** be at the test/exam desk or in the individual’s pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. Non-programmable calculators are only allowed when indicated by the instructor. The Department of Epidemiology & Biostatistics is not responsible for stolen/lost or broken devices.

Policy on Accommodation for Medical and Non-Medical Absences

For assignments worth 10% or more, refer to Western University’s Policy on Accommodation for Medical Illness: <https://studentservices.uwo.ca/secure/index.cfm>.

All non-medical absences must be approved in advance. In the case of an unexpected absence on compassionate grounds, documentation may be requested. If documentation is required by the instructor for either medical or non-medical academic accommodation, then such documentation must be submitted by the student directly to the appropriate Faculty Dean’s office and not to the instructor. It will be the Dean’s office that will determine if accommodation is warranted.

Statement on Academic Offences

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Support Services

As part of a successful student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your 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. Please check out the Faculty of Music web page <http://www.music.uwo.ca/>, and our own McIntosh Gallery <http://www.mcintoshgallery.ca/>. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>

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 or undergraduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.

Department & Faculty Offices

The Epidemiology & Biostatistics main office is located in K201 in the Kresge Building on Main campus.

For undergraduate academic counselling assistance, students will need to speak with the Bachelor of Medical Sciences Office: <http://www.schulich.uwo.ca/bmsc/general-counselling>.

Technology Requirements

You are responsible for all required course materials and announcements posted to the course's OWL website. Please ensure after the first class that when you log in you are able to access the course site. A copy of the course outline will be available on both OWL and the departmental website.