Syllabus
BIOST 518 / BIOST 515
Applied Biostatistics II / Biostatistics II
Winter 2018

Note: *Students are responsible for knowing all information provided on this syllabus. This syllabus is accurate as of the beginning of the course. Students are further responsible for any changes to this information as announced in class, posted on the web pages, or announced via email.*

Instructor:

Timothy A. Thornton, Ph.D.
Associate Professor of Biostatistics
Email: tathornt@uw.edu
Office Hours:
Monday 1:00-2:00 P.M.;
Wednesday 10:30 – 11:30 A.M.;
And by appointment.
Office: Health Sciences Building (HSB) F652

Teaching Assistants:

David Clausen
Email: dsc24@uw.edu

David Whitney
Email: davidw19@uw.edu

Zimeng (Parker) Xie
Email: pxie73@uw.edu

Office Hours for TAs: See Canvas Course Website for times and locations

Time and Place:

Lecture: MWF 9:30-10:20 A.M., HSB T747
Discussion 518 AA: M 8:30-9:20 A.M., HSB T478
Discussion 518 AB: W 8:30-9:20 A.M., HSB T531
Discussion 518 AC and 515 AA: F 8:30-9:20 A.M., HSB T473

Course Description:

This course provides an introduction to the principles and applications of regression methods for the statistical analysis of data. The course is designed for graduate students in public health who are already familiar with basic statistical concepts, including descriptive statistics, the components of statistical inference (p-values, hypothesis tests, confidence intervals, etc.), and concepts such as confounding and effect modification. Specific topics will include linear regression models, logistic regression models, and Cox proportional hazards regression models for censored data. We will learn how to handle covariates such as confounding variables, effect modifiers, and precision variables in the regression setting.

Learning Objectives

This course builds on the material of BIOST 517/514, and thus it is assumed that students who are taking the course are already familiar with the basic principles of descriptive and inferential statistics related to means, proportions, and survival estimates in one and two sample problems and the descriptive (and some inferential) statistics related to simple linear regression and correlation. It is also assumed that students have some familiarity with the most basic aspects of confounding and effect modification. At the end of BIOST 518/515, students should be able to:

1. Identify the type of question for which a regression analysis might be appropriate.

2. Perform suitable descriptive analyses of the data.

3. Develop a regression model and perform an analysis using statistical software, including

    a. definition of dependent and independent variables,

    b. appropriate choice of summary measure for modeling,

    c. appropriate choice of transformations,

    d. use of dummy variables where indicated,

    e. appropriate selection of variables to include in the model, and

    f. correct modeling of interactions as necessary.

4. State the statistical assumptions that are the basis for the conclusions of your analysis.

5. Present the results of your analysis to a statistically naive reader, including a full interpretation of all parameter estimates.

In this course, the philosophy and principles behind the statistical methods will be the focus rather than the formulas used to implement the methods. The course is targeted to students who want to be able to read biomedical research literature critically, as well as to students who will eventually be analyzing data as a part of their research.

Prerequisites: BIOST 517 / BIOST 514 or equivalent
Otherwise, permission of instructor.

Textbook (optional): There is no "official" textbook for this course; however, students may find the following text useful for this course: Vittinghoff, Glidden, Shiboski, McCulloch: *Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models, 2nd edition*. Springer. The electronic version of this textbook is available from the UW Library, and a link access the electronic textbook from the UW Library is provided on the Canvas course website in the online syllabus section.

Course Web site: Homework assignments and other course materials will be posted on the course's canvas web site. Go to http://canvas.uw.edu, login with your UW netid and select BIOST 518 or 515 from the Courses pulldown menu.

Software: R

The class will be taught using he R statistical software package. Weekly homework assignments will involve statistical analyses conducted using R. R is a freely available software package for which there are a suite of routines available that perform the analyses required for this class.

Lecture Notes

The course's canvas web site serves as an archive of homework, handouts, lecture notes, and datasets. Students should check the web page regularly for information. Lecture notes will be typically be made available on the course canvas website the day before class. For students' convenience, recordings of lectures will be posted when possible. However, this is not a distance learning class, and students are responsible for all material in lectures regardless of whether a recording is made available.

Electronic Discussion Board and Email

Occasionally, time-sensitive announcements will be emailed to the class through the class list serve provided by the registrar's office. This means that students need to regularly check the email account they used to register for the class.

The course canvas web page contains an electronic discussion board. The board will be used for announcements from the instructional team and questions from the students. If a student has a question about the course that might be of interest to other students, s/he should post the question to the electronic discussion board rather than e-mailing an instructor or T.A. If the question is urgent, then the student may e-mail the instructor or T.A. in addition to posting on the discussion board. The discussion board can be used to discuss any topic related to biostatistics or course material, or ask computing questions. Students are encouraged to answer as well as ask questions on the board.

Homework:

Homework problems requiring a typewritten solution will be due approximately weekly. These assignments will consist of applications of statistical methods to real data analyses. Students in BIOST 515 may have additional problems assigned. These problems will tend to focus on the theory underlying the methods covered in class. These latter problems can be worked by enterprising BIOST 517 students as extra credit. Homework will be handed in and returned online on the canvas website. Homework should be submitted as a **pdf** or **Microsoft Word compatible file** (e.g., .doc or .docx). R Markdown can be used for doing homework assignments. **Late homework will not be accepted (exceptions only in the most dire circumstances).**

Students may consult with each other, the instructor, and the TAs on homework. However, the work that is handed in should reflect only that student's work. That is, obtaining help from other students in order to learn the METHODS of solution is allowed, but copying another student's answer is NOT.

Discussion Section:

Discussion section will be used for multiple purposes: discussing and expanding on course material, additional topics, and actively applying methods to datasets. Students may be required to conduct a first-pass analysis of specified datasets prior to Discussion Section.

Data Analysis Project:

A Data Analysis project will be due at the end of the quarter. It will be an analysis of data using the methods we discuss in class, summarized in a formal written report. Students will be organized into small groups for completing the project. More information about the project will be provided during the quarter.

Grading: Numerical grades will be based on the following:

Homework:	25%
Midterm Exam:	25%
Final Exam:	30%
Data Analysis Project/Report:	20%

Acknowledgement

Some course material is inspired and developed by previous instructors, in particular Professors Scott Emerson and Katie Kerr.

Tentative Course Outline

The following is a ***tentative outline*** of the topics to be covered during the quarter. We reserve the right to modify this outline as conditions require.

Date	Lecture Topics	Turn In
1/3	Overview of course structure, Intro to Regression Setting	
1/5	General Framework of Regression Models	
1/8	Classical Linear Regression Theory	
1/10	Linear Regression: Reparameterization	
1/12	Linear Regression Extensions: Allowing for Heteroscedasticity	HW#1
1/15	**Martin Luther King Holiday – No Class**	
1/17	Transformations of Response and Predictors: Part 1	
1/19	Transformations of Response and Predictors: Part 2	HW#2
1/12	Regression for binary outcomes: Intro to Logistic Regression	
1/24	Logistic Regression	
1/25	Case-Control and Cohort Designs: Odds and Risk Ratios	HW#3
1/29	Poisson Regression: Count Data and Inference about Rates	
1/31	Introduction to Multiple Linear Regression	
2/2	Multiple Linear Regression	HW#4
2/5	Joint Testing of Multiple Regression Parameters	
2/7	Modeling Effect Modification: Interactions	
2/9	**MIDTERM EXAM**	
2/12	Adjusting for Confounding Variables	
2/14	Covariate Adjustment for Improved Precision	
2/16	Generalized Multiple Regression	HW#5
2/19	**Presidents' Day Holiday – No Class**	
2/21	Regression with Categorical Predictors: Dummy Variables	
2/23	Proportional Hazards Regression: Part 1	HW#6
2/26	Proportional Hazards Regression: Part 2	
2/28	Flexible Modeling of Associations: Polynomial Regression	
3/2	Linear Splines	HW#7
3/5	Regression with Dependent Data within Clusters	
3/7	Prediction	
3/9	Overview and Review for Final Exam	HW#8 and Final Project

Final Exam: Wed 3/14/18 8:30 – 10:20 A.M. in HSB T747

Disability Statement

Access and Accommodations: Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

Academic Integrity

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

(For printed syllabi, below are the URLs for the text that is hyperlinked above:

UW Student Conduct Code (WAC 478-120)
http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/
SPH Academic Integrity Policy
http://sph.washington.edu/students/academicintegrity/
Community Standards and Student Conduct
http://www.washington.edu/cssc/)