Biostatistics 311
Regression Methods in the Health Sciences
Spring 2018

Structure:	3 lectures/week (50 min); 1 discussion section/week (50 min)	
Instructors:	Kelsey Grinde, Graduate Student in Biostatistics Email: grindek@uw.edu	
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Class Sessions:	Lecture: MWF, 12:30 – 1:20 pm Discussion: Tuesday, 10:30 – 11:20 am	(SOCC 301) (SOCC 301)
Office Hours:	Wednesday, 2:00 – 4:00 pm or by appointment	(HSB H657)
Prerequisites:	Statistics at the level of Biostatistics 310. No prior programming experience required.	
Credits:	4, graded	
Course Website:	canvas.uw.edu	

Course Description: Introduction to regression methods for analysis of continuous, binary, and time-to-event (survival) data. Covers linear regression, logistic regression, and proportional hazards regression, all at an introductory level. Makes use of examples drawn from the biomedical and health sciences literature.

Learning Objectives: Upon completion of this course, students should be able to…

- Interpret numerical and graphical summaries of data that are relevant to medical and health sciences studies
- Interpret coefficients in linear, logistic, and proportional hazards regression models in the context of health outcomes
- Select an appropriate regression model based on scientific question and study design
- Describe the necessary assumptions for linear, logistic, and proportional hazards regression in the contexts of estimation and prediction
- Develop and interpret confidence intervals for model parameters
- Set up and carry out appropriate hypothesis tests for linear, logistic, and proportional hazards regression models
- Use linear and logistic regression models to make predictions

- Use diagnostic procedures and sensitivity analyses to investigate potential deviations from model assumptions
- Use the statistical software R to:
    - Read in data files
    - Calculate summary statistics and create appropriate graphical displays
    - Perform basic statistical inference procedures
    - Fit linear, logistic, and proportional hazards regression models

Course Website: All course materials (lecture notes, assignments, announcements, grades, etc.) will be posted on the course website at Canvas (canvas.uw.edu).

Additional Resources: There is no required textbook for this course. The following optional textbooks may be useful; relevant sections will be noted in each set of course slides. All three texts are freely available electronically through UW libraries.

- Dupont, WD. Statistical Modeling for Biomedical Researchers: A Simple Introduction to the Analysis of Complex Data. Cambridge (2009).
- Kleinbaum and Klein. Logistic Regression: A Self-Learning Text (Third Edition) Springer, New York 2010.
- Kleinbaum and Klein. Survival Analysis: A Self-Learning Text (Third Edition) Springer, New York, 2012.

Class Communications: We will communicate with you outside of class using the Canvas page, so please sign up to receive email notifications for the page. *Questions about course content or homework assignments should be posted to the Canvas Discussion Board*, not sent via email. We will monitor the discussion board regularly, and also strongly encourage you to reply to each other's questions. Concerns of a personal nature can be communicated with us via email, and in general *any emails should be sent to both instructors*. Please communicate respectfully to your classmates and to us, and let us know if there are ways classroom communication can be made more accessible to you.

Assignments and Grades:

Homework: Homework assignments will be posted on the Canvas website one week prior to the due date. They should be completed in a Word or .pdf document and submitted electronically to the Canvas website by the due date. You are welcome to work together on the homework; however, your submitted assignment (including R code, if applicable) should be in your own words. Solution keys and individual feedback will be provided. *Late homework will not be accepted, but your lowest homework score will be dropped.* We have prepared a guide for how to present your assignments which is available on our Canvas page.

Exams: There will be two in-class midterms and a final exam. These exams will not require math beyond basic arithmetic, but you may bring a calculator. Use of any electronic device with communication capacity is not allowed during exams.

Final Project: There will be a final data analysis project for which you will be given a dataset (or select your own, with approval from the instructors) and asked to develop an appropriate analysis plan, carry out the analysis, and write a short report. Projects will be introduced in our first discussion section. You will complete your project in small groups.

Course Participation: In class, you will sometimes be provided with a short activity or an index card with a question to answer. Please hand in your response, with your name on it, at the end of class. Your class participation score will be based on submission of these responses (credit/no credit). You may miss submitting at most two of the index cards for full class participation credit. Additionally, we will often have short check-ins during lecture. Please bring a spiral-bound notebook (or some other way of hand-writing notes) to class with you so that you can record your thoughts. *We also strongly encourage you to actively engage in asking and answering questions on the Canvas discussion board.*

Discussion Section: Discussion sections will consist of group activities, review of class material, discussion of group projects, and practice using R. You will be required to hand in a brief exercise (credit/no credit) at each discussion section. Your participation score will be based on completion of these assignments. To receive full credit for discussion section participation, you can miss participating in at most one of the discussions.

Grading: The grading scheme is as follows:

Midterm Exam 1	10%
Midterm Exam 2	10%
Final Exam	25%
Homework	25%
Final Project	20%
Class Participation	5%
Discussion Section Participation	5%

At the end of the course, we will convert your percentage to the UW 0.0-4.0 scale. Final course grades will be calculated based on the guidelines linked below. At minimum, you will get an A (3.9-4.0) if you earn at least 95% of the total possible points, an A- (3.5-3.8) if you earn between 90% and 95% of the total possible points, and a C- (1.8) if you earn 65% of the total possible points. We may end up being more lenient than this, but this provides a minimum guarantee.

Guidelines: http://depts.washington.edu/grading/practices/guidelines.html.

Course Policies:

Laptops: You will be expected to have access to a laptop during discussion sections (see Computing section below). However, you will not generally need access to a computer during lectures. *If you primarily take notes on a laptop and choose to bring a laptop to class, please sit in the back of the room so that your screen does not distract other students (this request does not apply to tablets that lie flat on a desk).*

Computing: Computing in R is an important component of this course**.** You may borrow a computer from UW Libraries either on a short-term basis each week (http://www.lib.washington.edu/ougl/learning-spaces) or for the duration of the quarter (http://uwstlp.com/public/home) as needed. Please see us if this expectation will cause trouble for you, and we can work out a solution.

Collaboration: You are encouraged to work together on homework assignments, but the final write-up should be done individually. The course project will be a group project; you will discuss approaches to the project with your group and other classmates during discussion sections, but outside of class you may only discuss your project with your group members and the instructors.

Academic Honesty: Students are encouraged to familiarize themselves with the academic honesty policies (see the section on Academic Integrity, below). If you hand in work that is not written in your own words, you will at minimum lose all credit for the problem, and at maximum we will not give you any credit for the assignment. Issues surrounding academic integrity will be handled in accordance with university policies.

Grading: You may expect us to have assignments graded in a timely fashion. If you have questions or concerns about the grading, see us. We reserve the right to change or not change the grade.

Classroom Climate: The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. DCinfo@uw.edu is a resource for students with classroom climate concerns.

Concerns: If you have any other concerns about the class or your instructors, please feel free to talk or write to us at any time during the quarter. If you are not comfortable talking with us or not satisfied with the response that you receive, you may contact the Department of Biostatistics Associate Director of Academic Affairs (biostp@uw.edu). If you still are not satisfied with the response, you may contact the Department of Biostatistics Chair (bchair@uw.edu). You may also contact the Graduate School at G-1 Communications Building, by phone at 206-543-5139 or by email at raan@uw.edu.

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 478-121). 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.

Links for the policies and resources mentioned above:

- Student Contact Code: http://www.washington.edu/cssc/for-students/student-code-of-conduct/
- SPH Academic Integrity Policy: http://sph.washington.edu/students/academicintegrity/
- Community Standards and Student Conduct website: http://www.washington.edu/cssc/

Access and Accommodation: Your experience in this class is important to us. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to us 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.

Tentative course schedule: Due dates, exam dates, and a tentative schedule of topics are listed below. Timing of course topics and assignment due dates may change at our discretion as the course progresses; any changes will be communicated in a timely manner.

Date	Topic	Work Due
3/26	Syllabus and motivation	
3/28	Study design, descriptive statistics	
3/30	Probability distributions, Central Limit Theorem	HW1
4/2	Confidence intervals, hypothesis tests	
4/4	Simple linear regression	
4/6	Coefficient interpretation	HW2
4/9	Transformations of outcomes and predictors	
4/11	Multiple linear regression	
4/13	Confounders and precision variables	HW3 & Project Proposal
4/16	General notes and effect modification	
4/18	Effect modification	
4/20	Prediction	HW4
4/23	***Midterm exam***	(Exam)
4/25	Regression assumptions and diagnostics	
4/27	Overview of linear regression	Statistical Analysis Plan
4/30	Binary outcomes	
5/2	Simple logistic regression	
5/4	Multiple logistic regression, prediction	HW5
5/7	Case-control studies	
5/9	Logistic regression in case-control studies	
5/11	***Midterm exam***	(Exam)
5/14	Right-censored data	
5/16	Hazard and hazard ratio	
5/18	Cox proportional hazards model	HW6 & Project Draft 1
5/21	Cox proportional hazards model	
5/23	Adaptive trial design in HIV prevention studies	
5/25	Regression methods in statistical genetics	HW7
5/28	*No class (Memorial Day)*	
5/30	Special topic: TBD	
6/1	Overview and review	Final Project
6/7	***Final exam (8:30am – 10:30am)***	(Exam)