**Biostatistics 311**

**Regression Methods in the Health Sciences**

Spring 2022

**Structure:** 3 lectures/week (50 min); 1 discussion section/week (50 min)

**Instructors:** Taylor Okonek (she/her), Ph.D. student in Biostatistics

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Charlie Wolock (he/him), Ph.D. student in Biostatistics

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**Class Sessions:** Lecture: MWF, 12:30 – 1:20pm (HSE 216)

Discussion: Tuesday, 10:30 – 11:20am (HST 359)

**Office Hours:** Taylor: TBD\* (HST 359)

Charlie: TBD\* (HST 359)

\*or by appointment

**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 a 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. If you find yourself in need of additional resources please ask and we can find some to provide for you.

**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 context 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. *Instructors will not send same-day responses to messages sent after 8:00pm PDT.*

**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 .pdf document knit from R

Markdown and submitted electronically to the Canvas website by the due date. You are

welcome to work together on homework; however, your submitted assignment

(including R code) should be in your own words. Solution keys and individual feedback

will be provided. We have prepared a guide for how to present your assignments which

is available on our Canvas page. The lowest homework score will be dropped.

Late policy for homework: Throughout the quarter, you may use up to three homework

extension days. These three days may be divided up for homework assignments however you choose (for example: all three days for a single assignment, one day each for three separate assignments). In order to use your extension days, *you must message both instructors on Canvas prior to the homework due date* to inform them you plan to use an extension day. If you do not message the instructors prior to the homework due date, the extension days will not be counted, and your homework will be counted as late. Late homework receives no credit.

Quizzes: There will be weekly, open-note Canvas quizzes on Mondays. These quizzes are designed to ensure that you keep up with course material and can recall material from previous weeks. Each quiz will consist of 10 questions, 3 of which will be on information from previous weeks, and 7 of which will be on material from the most recent week of lectures. Questions will be a mix of multiple choice, True/False, and open response. Quizzes will be available from 12:01am PDT Monday until 11:59pm PDT Monday. Quizzes will be graded on Tuesday, and you will have 48 hours from Tuesday 11:59pm PDT to Thursday 11:59pm PDT to complete quiz revisions, for the opportunity to earn back up to 50% of the points you missed.

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. A project guidelines document will be provided to you the first week of the quarter. You will complete your project individually.

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 discussion section score will be based on completion of these assignments. To receive full credit for discussion section, you can miss at most one of the discussions.

Grading: The grading scheme is as follows:

Homework 30%

Quizzes 30%

Final Project 30%

Discussion Section 10%

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- (1.5-1.8) if you earn 65% of the total possible points.

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 lecture.

Computing: Computing in R is an important component of this course. You may borrow a computer for either short- or long-term use from the Student Technology Loan Program ([stlp.uw.edu](https://stlp.uw.edu/)). 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 individual; you will discuss approaches to the project with your classmates during discussion sections, but outside of class you may only discuss your project with 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 all credit for the assignment. Issues surrounding academic integrity will be handled in accordance with university policies.

Grading: We will 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.

**COVID-related Expectations:** Per UW policy, this class will be conducted in person. You should only register for this class if you can attend in person, or if you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by the SPH Office of the Dean that allows you to take the course remotely.

* Please [contact UW Disability Resources for Students (DRS)](https://depts.washington.edu/uwdrs/) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.
* If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. To further clarify, immunocompromised refers to individuals with no/critically weakened immune response to the vaccines. Immune compromised is not the same as underlying health concerns which may lead to a more severe response to COVID. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter.

All UW students are expected to complete their [vaccine attestation](https://www.washington.edu/coronavirus/vaccination-requirement/) before arriving on campus. [Per President Cauce’s message March 8,](https://www.washington.edu/coronavirus/2022/03/08/spring-quarter-classes-and-uw-mask-policies-message-to-uw-students/?utm_source=uwhp&utm_medium=tiles&utm_campaign=spring-quarter) following changes to state and local health policies, masks will become optional inside most University facilities starting March 28, the first day of spring quarter. Masks will continue to be required in clinical and other health-care settings and on public transportation, including UW shuttles. We strongly recommend wearing masks indoors during the first two weeks of spring quarter. Please monitor yourself daily for symptoms and stay home if you are sick. It’s also strongly recommended to get tested after travel. Refer to the [UW Face Covering Policy](https://www.ehs.washington.edu/covid-19-prevention-and-response/face-covering-requirements?_ga=2.102791810.305611696.1646677337-2095419026.1632253748) for the latest guidance and follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or [campus policy](https://www.washington.edu/coronavirus/2022/03/08/spring-quarter-classes-and-uw-mask-policies-message-to-uw-students/?utm_source=uwhp&utm_medium=tiles&utm_campaign=spring-quarter), you are responsible for notifying your instructors as soon as possible by email. **If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing** [**covidehc@uw.edu**](mailto:covidehc@uw.edu) **or calling 206-616-3344.**

**Please check your email daily BEFORE coming to class**. If we need to conduct class remotely because the instructor or a guest speaker is complying with UW policies and unable to attend in person, we will send all registered students an email with a Zoom link for remote instruction.

**Land Acknowledgment:** Washington State is [home](https://www.washingtontribes.org/the-tribes-of-washington/) to 29 federally recognized and five unrecognized tribes. The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

**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](mailto:DCinfo@uw.edu) is a resource for students with classroom climate concerns.

**Concerns:** If you have any concerns about the class or your instructors, please feel free to talk to or email 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 ([biostgp@uw.edu](mailto:biostgp@uw.edu)). If you still are not satisfied with the response, you may contact the Department of Biostatistics Chair ([bchair@uw.edu](mailto: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](mailto: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](http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/) (WAC 478-121). We expect you to know and follow the university’s policies on cheating and plagiarism, and the [SPH Academic Integrity Policy](http://sph.washington.edu/students/academicintegrity/). 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](http://www.washington.edu/cssc/) website.

**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](mailto: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.

**Religious Accommodations:** “Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/)](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/)](https://registrar.washington.edu/students/religious-accommodations-request/).”

**Inclusion and Diversity:**  Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, we are expected:

* To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender identity and expression, citizenship and immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
* To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
* To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program’s director.

**Pronouns:**We share our pronouns because we strive to cultivate an inclusive environment where people of all genders feel safe and respected. We cannot assume we know someone’s gender just by looking at them. So, we invite everyone to share their pronouns.

**Bias Concerns:** The Office of the Dean has a [student concern policy](https://sph.washington.edu/students/student-concern-policy), a faculty concern policy and standard HR procedures for staff concerns. Our 2018 climate survey states that most people in SPH do not report bias incidents because they do not know where to go. Students are encouraged to report any incidents of bias to someone they feel comfortable with, including instructors, advisers or department staff. They can email [dcinfo@uw.edu](mailto:dcinfo@uw.edu) for immediate follow up. Bias concerns can be anonymously and confidentially reported at this link: <https://sph.washington.edu/about/diversity/bias-concerns>. Data is collected by the Assistant Dean for EDI and the Director of Program Operations for Student and Academic Services and tracked for resolution and areas are identified for further training.

**Sexual Harassment:**Sexual harassment is a form of harassment based on the recipient’s sex that is characterized by:

* Unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature by a person who has authority over the recipient when:
  + Submission to such conduct is an implicit or explicit condition of the individual’s employment, academic status, or ability to use University facilities and services, or
  + Submission to or rejection of the conduct affects tangible aspects of the individual’s employment, academic status, or use of University facilities.
* Unwelcome and unsolicited language or conduct that creates an intimidating, hostile, or offensive working or learning environment, or has the purpose or effect of unreasonably interfering with an individual’s academic or work performance.

If you believe that you are being harassed, or have observed harassment, you can report it to SPH using the [bias concerns link](https://sph.washington.edu/about/diversity/bias-concerns). The University also has designated offices to help you: [SafeCampus](https://www.washington.edu/safecampus/); [Office of the Ombud](https://www.washington.edu/ombud/); [Title IX Investigation Office](https://www.washington.edu/titleix/report/); and [University Complaint Investigation and Resolution Office](https://www.washington.edu/compliance/uciro/).

**Tentative Course Schedule:**

3/28 – 4/1 Review of BIOST 310

4/4 – 4/8 Statistical inference, simple linear regression

4/11 – 4/15 Transformations, multiple linear regression

4/18 – 4/22 Multiple linear regression, precision variables and effect modification

4/25 – 4/29 Prediction, binary outcomes

5/2 – 5/6 Simple logistic regression

5/9 – 5/13 Multiple logistic regression, interpretation & prediction

5/16 – 5/20 Generalized linear models

5/23 – 5/27 Survival data, Cox proportional hazards

5/30 **Memorial day**

6/1 – 6/3 Special topics