**Biostatistics 311**

**Regression Methods in the Health Sciences**

Spring 2023

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

**Instructors:**  Nina Galanter (she/her), Ph.D. student in Biostatistics

Email: [galanter@uw.edu](mailto:galanter@uw.edu)

**Class Sessions:** Lecture: MWF, 12:30 – 1:20pm (HSE 214)

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

**Office Hours:** TBD

**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 I can find some to provide for you.

Class Communications**:** I 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 are to be posted to the Canvas Discussion Board. If you are not comfortable posting to the board, you may email me a question and I will post it anonymously. I 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 me via email. Please communicate respectfully to your classmates and to me, and let me know if there are ways classroom communication can be made more accessible to you. *I will respond to all emails sent between Monday morning and Friday at 5pm within 24 hours. I will respond to all weekend emails by the end of* *the next Monday.*

Grading**:** You will obtain at least the following grades if you complete the requirements below.

You will complete a draft project which will be graded using the same rubric as the final project. You are encouraged to communicate with the instructor about whether you are intending to complete the 2.0 requirements or 3.0 requirements so that I can better communicate with you about any concerns, however this is not required. It is completely fine to change your mind about your intended grade at any point during the quarter. Further details about assignments are found in the next section. If you don’t believe that these grade categories fit your situation, please contact the instructor.

##### 2.0 (Satisfactory)

* Complete and receive credit on 4 of 7 homework assignments and quizzes.
* Attend 7 of 10 discussion sections.
* Complete 7 of 10 quizzes.
* Complete all steps of the project
* Attend all the class presentations (unless excused)
* Complete the pollev questions for 21 of 27 lectures

2.2

* + All requirements for 2.0
  + Score “Demonstrates competence” on 1 of 5 components of the final report

2.4

* + All requirements for 2.0
  + Score “Demonstrates competence” on 2 of 5 components of the final report

2.6

* + All requirements for 2.0
  + Score “Demonstrates competence” on 3 of 5 components of the final report

2.8

* + All requirements for 2.0
  + Score “Demonstrates competence” on 4 of 5 components of the final report

##### 3.0

* Complete and receive credit on 6 of 7 homework assignments and quizzes.
* Attend 9 of 10 discussion sections.
* Complete 9 of 10 quizzes.
* Complete all steps of the project
* Attend all the class presentations (unless excused)
* Complete the pollev questions for 24 of 27 lectures
* Score “Demonstrates competence” on all 5 components of the project

3.2

* + All requirements for 3.0
  + Score “Demonstrates proficiency” on 1 of 5 components of the final report

3.4

* + All requirements for 3.0
  + Score “Demonstrates proficiency” on 2 of 5 components of the final report

3.6

* + All requirements for 3.0
  + Score “Demonstrates proficiency” on 3 of 5 components of the final report

3.8

* + All requirements for 3.0
  + Score “Demonstrates proficiency” on 4 of 5 components of the final report

4.0

* + All requirements for 3.0
  + Score “Demonstrates proficiency” on all 5 components of the final report

Assignments**:**

Homework: Homework assignments will be posted on the Canvas website one week

prior to the due date. They will be due Thursdays at 11:59pm PDT. 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. I have prepared a guide for how

to present your assignments which is available on our Canvas page.

Homework Grading and Revisions: Homeworks will be marked complete if you receive at least 80% of the points. After homework is graded, you will have a week to submit revisions to regain points if your homework was marked incomplete. To revise an incorrect answer, you must submit a couple sentences to a paragraph explaining your original reasoning/approach and why it was incorrect, and how to correct it in order to get the correct answer.

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

extension days (a day = 24 hours extension). 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).

No prior message to the instructor is required to use an extension day, however I would appreciate an email letting me know in advance if possible. If you have special circumstances requiring more extension days, please let me know.

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.

Quiz Grading and Revisions: Quizzes will be marked complete if you get 9 of 10 questions correct. Quizzes will be graded on Tuesday, and you will have 48 hours from Wednesday 12:00am PDT to Thursday 11:59pm PDT to complete quiz revisions, for the opportunity to earn credit on the quiz. To revise an incorrect answer, you must submit a couple sentences to a paragraph explaining your original reasoning/approach and why it was incorrect, and how to correct it in order to get the correct answer.

Academic Honesty Policy for Homeworks and Quizes: Students are encouraged to familiarize themselves with the academic honesty policies (see the section on Academic Integrity below). If there is evidence of academic dishonesty on homeworks and quizzes (homeworks or quizzes not written in your own words) all students involved will be given 0 on the assignment in question, without an opportunity to gain back the credit.

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. The project includes brief class presentations (tentatively 10 minutes excluding questions).

Pollev Questions: Each lecture (excluding final presentations) will include a series of poll everywhere questions. These will be marked complete if all are correct, the correct answers will be shown during lecture. You will have time to answer these and correct your answers during lecture, or you have until the next lecture to complete them based on the zoom recording.

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. If you miss a discussion section, you can email the instructor for the opportunity to make up the credit.

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 me 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 done individually; 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.

Grading: I will have assignments graded in a timely fashion. If you have questions or concerns about the grading, see me. I reserve the right to change or not change the grade.

Illness Protocols and Safety**:**

If you feel ill or exhibit respiratory or other symptoms, you should not come to class. Seek medical attention if necessary and notify your instructor(s) as soon as possible by email.

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

**Additional recommendations include:**

1. [**Get boosted with the updated COVID-19 vaccines**](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-ku4dK1F60Qwx5sVB9F2zPf2PtjPbEQN0oAXWTw4xyUlayD-3Dn6tkPV-b9qYPVKN_s=)****.**** These vaccines are available at clinics and pharmacies, as well as [through UW Medicine](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-rZLyUV3OKyCGDzGK2pj5QyxQq14YnSJSLWoEiG_BskVghbuDCoOCaDQZDj1HhDtQ28=) and local health agencies.
2. [**Get your annual flu shot**](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-p8AShT60UfuTPp6L1-t9MeMiS8rrCJoY1HdFNMDUpsMKUh95VFz6lNtjkf3R2dEH3M=)****.****
3. ****Wear a high-quality mask in indoor public spaces and while traveling. Masks are strongly recommended the first two weeks of spring quarter.**** High-quality masks help protect against a range of respiratory viruses, and are [available for free in locations on each UW campus](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-vvPawo32qTEDivNHXudxfJ86KNJ7wSFb24jzmDKknFXp_Icn7BOiAk0vTZcfssVCQY=).
4. ****Take a coronavirus test if you have symptoms or have been exposed.** Rapid antigen tests are widely available for** [free at on-campus locations linked here](https://www.washington.edu/coronavirus/testing/?mkt_tok=NTI3LUFIUi0yNjUAAAGIkoz8-lh4rJkVTP0uu0x9Qjo03it8Dqjcg-b8MMF3oVqsuHG2uoxdCV_LSqQ4pXPG_I3dC3Pl76N-P0Pk7a0LzK9p8iT0fsJ4PvzXS155og). The [Husky Coronavirus Testing](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-vzM5PdwrHbUB_QiTo_vUCpaMHj5R4-EPxZHeHpW885q6tKNP_evGy-Nqcx025qjyxc=) voluntary research study is also available for UW students.
5. [**Activate WA Notify on your phone**](http://we.discover.uw.edu/NTI3LUFIUi0yNjUAAAGIkoz8-pPDyiN6Gl5YTqHyjmQA3y8d4y3WLT-C66__TuWe9QeeuVV_YE2asMhxcqxv8m4XSZM=) to receive exposure notifications and so that you can anonymously let others know of their exposure if you test positive.

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

Land Acknowledgment**:** (adapted from UW SPH and UWRA) Washington State is [home](https://www.washingtontribes.org/the-tribes-of-washington/) to 29 federally recognized and five unrecognized tribes. We at the University of Washington live and work on the unceded land of the Coast Salish people, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

Concerns and Feedback**:** If you have any concerns about the class or your instructor, please feel free to talk to or email me at any time during the quarter. *You can submit anonymous feedback via* [*this link*](https://forms.office.com/Pages/ResponsePage.aspx?id=W9229i_wGkSZoBYqxQYL0g7W0FrGqoFPhHMvHiJj1u5UM1hERFA4UUZDTkFCSTJLUFk4UVZBT000Ni4u). If you are not comfortable talking with me 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 me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented 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), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at [disability.uw.edu](https://depts.washington.edu/uwdrs/).

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/).

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, 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.

Classroom Climate**:** The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to overcome systemic racism by creating an environment that reflects community and mutual caring, while we ally with others in combating all forms of social oppression. This is a work in progress, as transformation is rarely a fully-completed project.

We are co-creators of our learning environment. It is our collective responsibility to develop a supportive learning environment for everyone.  Listening with respect and an open mind, striving to understand others’ views, and articulating your own point of view will help foster the creation of this environment.  We engage our differences with the intent to build community, not to put down the other and distance our self from the other.  Being mindful to not monopolize discussion and/or interrupt others will also help foster a dialogic environment.

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 via the online form found here: <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:

1. 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.
2. 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**:**

3/27 – 3/31 Review of BIOST 310

4/3 – 4/7 Statistical inference, simple linear regression

4/10 – 4/14 Transformations, multiple linear regression

4/17 – 4/21 Multiple linear regression, precision variables and effect modification

4/24 – 4/28 Prediction, binary outcomes

5/1 – 5/5 Simple logistic regression

5/8 – 5/12 Multiple logistic regression, interpretation & prediction

5/15 – 5/19 Generalized linear models

5/22 – 5/26 Survival data, Cox proportional hazards

5/29 **Memorial day (university holiday, no classes)**

5/31 – 6/2 Project Presentations