

Course Syllabus

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INSTRUCTOR:

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Assistant Professor

The Comparative Health Outcomes, Policy, and Economics (CHOICE) Institute

School of Pharmacy

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[preferred form of contact: via Canvas or office hours]

TEACHING ASSISTANTS:

(office hours in the HSB Library by the computer labs)

Office hours

- [Andrew Humbert](https://www.biostat.washington.edu/people/andrew-humbert) [_\(https://www.biostat.washington.edu/people/andrew-humbert\)_](https://www.biostat.washington.edu/people/andrew-humbert) ahumbert@uw.edu
Tues 11:30-12:30pm
- [Maria Valdez](https://www.biostat.washington.edu/people/maria%20valdez%20cabrera) [_\(https://www.biostat.washington.edu/people/maria%20valdez%20cabrera\)_](https://www.biostat.washington.edu/people/maria%20valdez%20cabrera)
mariavc@uw.edu Tues, Thurs 1-2:30pm
- [Zora Yang](https://www.biostat.washington.edu/people/yezi%20%22zora%22-yang) [_\(https://www.biostat.washington.edu/people/yezi%20%22zora%22-yang\)_](https://www.biostat.washington.edu/people/yezi%20%22zora%22-yang)
zorayang@uw.edu Mon 1:30-3:30pm

LECTURE: Mon/Wed/Fr 9:30-10:20am

[_\(mailto:junhwang@uw.edu\)_](mailto:junhwang@uw.edu) Health Sciences Building, D209

Required **notes** available on Canvas (Please note: Printed copies will **not** be provided by instructor. Please print your own if you prefer paper copies.)

DISCUSSION SECTIONS:

AA: Tuesdays, 12:30-1:20pm

AB: Tuesdays, 2:30-3:20pm

AC: Wednesdays, 8:30-9:20am

Discussion sessions will start on Tuesday, Jan 8th 2019, and take place in the **HSB library computer lab classrooms A and B**.

To get to the computer lab, enter through the 3rd floor T-wing entrance to the Health Sciences Library. You should bring a USB drive to these sessions to save files and data.

The discussion sections are designed to support and enhance your understanding of the material covered in this course. Attendance is optional but highly recommended.

DISCUSSION AND ANNOUNCEMENT BOARDS: Links are on canvas page.

Discussion boards

- There will be 2 discussion boards:
 - Weekly discussion board for class topics, homework questions, and other general questions related to the course
 - 'Help with R' discussion board for R coding questions
- Any student in the class may post to the discussion boards
- TAs and instructor will monitor the boards and answer questions

Announcement board

- To be used by instructor and TAs only
- Students will be expected to check announcement board at least once a week
- We will post general announcements (e.g. providing information to help you prepare for your exams, etc)

COURSE DESCRIPTION: This course covers multiple linear regression, analysis of covariance, and one-way and two-way analysis of variance. We discuss model assumptions and interpretation, transformations, outlier detection, dummy variables, and variable selection procedures. Examples are drawn from the biomedical literature and we utilize the software R for statistical analyses.

COURSE LEARNING OBJECTIVES: Upon completing this course, students should be able to:

1. Describe how the scientific goals of analysis affect the strategy to select and use appropriate multiple regression models
2. Describe a coherent strategy for analyzing data using multiple regression models
3. Carry out the analysis of data using multiple regression models in R
4. Interpret the results of a multiple regression analysis to a statistically untrained colleague
5. Describe how well a multiple regression model fits the data
6. Examine multiple regression models and assess if there are important model violations
7. Describe how one and two-way analysis of variance and analysis of covariance are related to multiple regression analysis

PRE-REQUISITES: BIOST 511; or BIOST 514; or BIOST 517; or instructor's permission. Familiarity with R is assumed. You should be familiar with the following concepts: population, sample, random variable, statistical estimator, standard error of an estimator, confidence interval and hypothesis test. You should also be familiar with the following topics (these will be reviewed in class): simple linear regression models, logarithmic and exponential transformations, and the Normal and t distributions.

HOMEWORK:

- Weekly assignments, available Wednesday at noon (12pm), **due on the following Wednesday by 9:30am**. (Later in the quarter this may change, due to holidays and exams)
- Submitted and returned online using the course dropbox on Canvas
- Format should be .doc (.docx) or .pdf
- Except where we explicitly request it, no unedited computer output should be included in your answers to the homework questions.
- Lowest HW score will be dropped

Students need to provide evidence of their thought process on each question so that graders can tell that students made an effort. **Homework will be graded 10, 7, or 0 on a good-faith-effort basis** according to the following description:

- 10: A good-faith effort was made on all parts of all problems
- 7: A good-faith effort was made on all but minor parts of one or a few problems. Including unedited computer output will automatically result a maximum grade of 7.
- 0: At least one important part of one problem or minor parts of at least half of the problems did not receive a good-faith effort

Late homework will not be accepted. Homework not turned in will be scored zero.

The homework in this class is an important part of the learning process. We encourage students to work together or in small groups on the homework problems. A good strategy is for everyone in the group to work on the problems individually and then get together to discuss the more difficult ones. However, the final version you hand in should reflect your own interpretation and understanding. That is, support and assistance with developing answers is encouraged; copying answers is not (copied assignments will not receive credit).

DATA ANALYSIS PROJECT: Students will be provided with a dataset and 2-3 scientific questions.

- **In-resident students:** This will be a **group project**. Students will work together in groups of 3 students (groups formed at mid-quarter) to develop an analysis plan, implement the analysis plan, and prepare a short data analysis report. More details later in the quarter.
- **Distance learning students:** Please see details on Biost 512B canvas page.

COURSEWORK:

- **Weekly Homework Assignments:** Due Wednesday at 9:30am

- **Midterm Exam:** Monday, February 11th (in class, 50 minutes) (closed book; one one-sided 8.5 x 11 inch sheet of information allowed)
- **Data Analysis Report:** Due at 9:30 am, Wednesday, March 13th (To be assigned mid-quarter)
- **Final Exam:** Wednesday, March 20th (in class 8:30-10:20am) (closed book; one double-sided 8.5 x 11 inch sheet of information allowed)

GRADING: Numerical class grades will be based on:

- Homework (20%) (after dropping lowest HW score)
- Data analysis report (20%)
- Midterm exam (30%)
- Final exam (30%)

TEXTBOOKS:

*** indicates book is available for download through UW Libraries website

Recommended Textbooks:

- Baldi, B and Moore DS. The Practice of Statistics in the Life Sciences, 4th edition. H. Freeman & Co., 2018. **Reserved at the Health Sciences Library.**
- **Note:** You can use the 3rd edition of this book instead, if you already own it. I will post readings from both the 3rd and 4th editions.

Chapters 26-28 can be downloaded from:

<http://www.macmillanlearning.com/Catalog/studentresources/ppls3e#>
under 'Companion Chapters'

- ***Vittinghoff E, Glidden DV, Shiboski SC, McCulloch CE. Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models, 2nd edition. Springer, 2012. **Download [here](https://link-springer-com.offcampus.lib.washington.edu/book/10.1007%2F978-1-4614-1353-0)** [_\(https://link-springer-com.offcampus.lib.washington.edu/book/10.1007%2F978-1-4614-1353-0\)](https://link-springer-com.offcampus.lib.washington.edu/book/10.1007%2F978-1-4614-1353-0) (Note: If you are off UW campus, you will need to log in with your UW netID to download for free).
- ***Dupont, WD. Statistical Modeling for Biomedical Researchers, 2nd edition. Cambridge, 2009. **Download [here](https://ebookcentral-proquest-com.offcampus.lib.washington.edu/lib/washington/detail.action?docID=412800)** [_\(https://ebookcentral-proquest-com.offcampus.lib.washington.edu/lib/washington/detail.action?docID=412800\)](https://ebookcentral-proquest-com.offcampus.lib.washington.edu/lib/washington/detail.action?docID=412800) (Note: If you are off UW campus, you will need to log in with your UW netID to download for free).

Optional Textbooks (Additional Readings):

- ***van Belle G, Fisher L, Heagerty P, Lumley T. Biostatistics: A Methodology for the Health Sciences, 2nd edition. Wiley, 2004. Download [here](http://onlinelibrary.wiley.com/book/10.1002/0471602396) [_\(http://onlinelibrary.wiley.com/book/10.1002/0471602396\)](http://onlinelibrary.wiley.com/book/10.1002/0471602396).
- Ramsey FL and Schafer DW. The Statistical Sleuth: A course in Methods of Data Analysis, 2nd edition. Duxbury, 2002.
- Kleinbaum DG. Applied Regression Analysis and Other Multivariable Methods, 5th edition. Cengage Learning, 2013.
- Rosner B. Fundamentals of biostatistics, 6th Thomson-Brooks/Cole, 2006.
- Moore DS and McCabe GP. Introduction to the Practice of Statistics, 7th edition. W.H. Freeman & Co., 2010.
- Weisberg Applied linear regression, 4th edition. John Wiley & Sons, Inc., 2013.

SOFTWARE: You will need access to a software package that can do descriptive statistics, graphics, basic hypothesis testing and linear regression. This includes most common statistical packages. The standard software package for the class will be R, which is free and can be downloaded using links at: <http://www.r-project.org/> [\(http://www.r-project.org/\)](http://www.r-project.org/). R is also available on the machines in the Health Sciences Library computer lab.

Examples presented in class and discussion sections will be analyzed using R. Some of these use the R package 'uwIntroStats'. Tutorials for downloading R and the package, and tutorials for simple commands can be found at the [R resources page](#).

We note that you are not required to use R. You can use other statistical packages. Some support will be provided to those who elect to use Stata. Note, however, that we will not be able to provide support for other statistical packages.

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 [\(mailto:uwdrs@uw.edu\)](mailto:uwdrs@uw.edu) or [disability.uw.edu](http://depts.washington.edu/uwdrs/) [\(http://depts.washington.edu/uwdrs/\)](http://depts.washington.edu/uwdrs/). 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](http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/) [\(http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/\)](http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/) (WAC 478-120). 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/) [\(http://sph.washington.edu/students/academicintegrity/\)](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/) [\(http://www.washington.edu/cssc/\)](http://www.washington.edu/cssc/) website.

LEARNING ENVIRONMENT: To provide a supportive learning environment, I ask your commitment to showing respect to each other and to your instructors both inside and outside of class by avoiding behavior that might be offensive or distracting to others.

If you have any concerns about the class or your TA, please see the TA about these concerns as soon as possible. If you are not comfortable talking with the TA or not satisfied with the response that you receive, you may contact the Department of Biostatistics Associate Director of Academic Affairs (biostgp@uw.edu [\(mailto:biostgp@uw.edu\)](mailto:biostgp@uw.edu)). If you

are still not satisfied with the response that you receive, 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>).

Course Summary:

Date	Details
Wed Jan 16, 2019	 Homework 1 (https://canvas.uw.edu/courses/1254114/assignments/4610130) due by 9:30am
Wed Jan 23, 2019	 Homework 2 (https://canvas.uw.edu/courses/1254114/assignments/4622359) due by 9:30am
Wed Jan 30, 2019	 Homework 3 (https://canvas.uw.edu/courses/1254114/assignments/4628541) due by 9:30am