BIOST 508 A
Biostatistical Reasoning
for the
Health Sciences

Winter 2019
Syllabus

PREREQUISITES: EPI 511; or permission of the instructor

HOURS: Main class: M-W-F 9:30-10:20, HS T639

Discussions: Section AC: W 1:30-2:20, HS T478

Section AB: F 8:30-9:20, HS T635

INSTRUCTOR: Barbara McKnight, Ph.D.
Professor
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Office Hours: Mondays 10:30-11:30 am HS F 670
Thursdays 2:00-3:00 pm   HS F 670
or by appointment

TEACHING ASSISTANT: Ian Waudby-Smith
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Office Hours: Tuesdays, 2:30-3:30 pm HS T 360
Fridays , 2:30-3:30 pm   HS T 360

REQUIRED TEXT:	Baldi B, Moore DS. The practice of statistics in the life sciences. 4th Edition. WH Freeman; 2018. (3rd edition OK)
NOTES:	R modules and occasionally other notes will be posted to supplement textbook reading. Available on the class Canvas site.
RECOMMENDED BOOKS:	Dalgaard, Introductory Statistics with R, second edition, Springer, 2008. (available online through UW libraries).
	Moore and McCabe, Introduction to the Practice of Statistics, ninth edition, W.H. Freeman & Co, 2017 (reserve requested at HS library)
	Rosner: Fundamentals of Biostatistics, eighth edition, Duxbury, 2015. (reserve requested at HS library)
	VanBelle G, Fisher L, Heagerty P, Lumley T: Biostatistics: A Methodology for the Health Sciences, second edition, Wiley, 2004 (available online through UW libraries)
	McGuire and McGuire Teach yourself how to learn: strategies you can use to ace any course at any level. Stylus, 2018 (reserve requested at HS library)
	Oakley, Barbara: A Mind for Numbers: How to Excel at Math and Science (Even if you Flunked Algebra). Tarcher Perigree 2014. (available online through UW libraries
CLASS PREPARATION:	As preparation for each class session, approximately 20 - 25 pages of the textbook and (often) an R module will be assigned reading (weekly schedule available on the class Canvas site). A short online quiz will be made available before each class session to assess your preliminary mastery of this material and to be sure you are prepared for class activities. To receive credit, the online quiz must be completed by 8am on class days.
CLASS SESSIONS:	Class sessions will prioritize active learning strategies to help deepen your understanding of difficult concepts and to practice applying, interpreting and reporting the statistical methods. Transmittal of new material in class (ie lectures) will be kept to a minimum.
	In class, we will work on problems and worksheets individually and in groups, conduct discussions in groups, and report on answers or conclusions and ask questions in class. After individual and group work, you will sometimes be asked to respond to questions using an online audience response system (Poll Everywhere). After some types of work, you will be called upon at random to explain you or your group's answer or voice your group's question for class discussion. If you do not feel comfortable answering a particular question asked of you, you may pass, but I encourage you to try to answer as often as possible, as you will learn the most from doing this.
	The purposes of these activities are 1) to give you practice in the kind of thinking and application of course concepts that will be important skills for you as professionals, and 2) to give you faster feedback than can be given for weekly homework assignments, so that you learn more quickly.
	Please be assured that incorrect answers to class questions are as important as correct answers, since people without prior statistical training often have misconceptions, and these misconceptions enter into their thinking until they have had enough practice. If you don't yet understand something fully, there will likely be many others in the class who will benefit from thinking through how your answer can be improved, so a free-flowing discussion of answers and ideas in class will help everyone.
COMPUTER SOFTWARE:	We will be using the statistical package R (https://www.R-project.org.) with front end R Studio (https://www.rstudio.com/). Both are available at no cost for Windows, Mac and

Linux operating systems. Every student is required to have a laptop computer with these installed, and you are encouraged to install them yourself during the R bootcamp Monday or Tuesday night (ie before the first discussion section), when we will start to learn how to use them. Throughout the quarter, we will be using R and Rstudio for exercises in class and in discussion sections. If you do not own a laptop computer, you may borrow one for the quarter from the Student Technology Fee Loan Program (https://itconnect.uw.edu/service/student-technology-loan-program/).

R is the primary statistical language used by academic statisticians and many data scientists, and it is provided free of cost to all. Although we will only be learning a few methods of statistical analysis in this introductory course, knowing R will help you extend your repertoire to more sophisticated statistical techniques in your professional life or later classes. R provides very flexible methods for creating professional-quality data visualizations, and documenting your analyses in R script files or R markdown files is an important way to assure that your analysis of data can be reproduced by others.

R MODULES: R modules explaining how to perform various tasks in R will be posted as the material becomes useful in class. The first 3 weeks of discussion section will be devoted to exercises for learning the basics in R and R markdown, and some discussion sections later in the quarter will also contain instruction and practice in R. All R modules will be available on the Canvas site.

CLASS WEBSITE: Class preparation quizzes, homework assignments, supplemental reading and R modules will be available on the class Canvas website. A class discussion board, maintained by Ian, will also be available there.

Files containing audio/video of each class session will be made available through a link on the Canvas website as soon as possible after class. Because of the active-learning nature of most class sessions, these will be of limited use, but if you miss class it is a good idea to review them to see what you have missed and be sure that you are aware of announcements made in class. Also, please be aware that occasionally the technology fails, so you should be prepared to ask a fellow student for his or her notes if you have to miss class.

If you must register late and need access to the Canvas site before you register, please email me with a request using your UW email address so I can use your uwnetid to give you access.

ACCESS & ACCOMODATION: 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 and plan for 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 uwdrs@uw.edu or 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.

BRING TO CLASS: To be able to participate in classroom exercises, please bring either a tablet or notebook and pen or pencil to class. Also, please bring a phone, tablet or laptop to each class to participate in Poll Everywhere polls, and when announced in advance, please bring a laptop to class. Please bring a laptop to all Discussion sections.

HOMEWORK:
Weekly homework (9 assignments, assigned starting week one, due starting week 2) will be due on Tuesdays at 5pm. Homework should be turned in as a **.pdf** file to the assignments part of the class canvas site.

I view the homework in this class as an important part of the process of your learning. Homework problems will be like in-class exercises, but they will contain questions that take longer to answer than we can accommodate in class. They provide practice at the kinds of thinking and application that are learning objectives of this course, and both homework and in-class exercises are examples of the types of problems you will be asked to solve on the midterm and the final exam. After the submitted homework is reviewed, Ian will provide comments on your homework and a homework key will be posted on the Canvas site.

You are encouraged to do the best work you can on HW problems as soon as possible after necessary material is covered in class. The best way to approach homework is to begin working on it the day it is assigned, and work on it some every day until it is due. That way you can take advantage of ideas that come to you "out of the blue" only a day or two after you have given serious thought to a problem. You will also learn more and are likely to spend less time overall on homework with this strategy than with a "sit down and do HW in one sitting" strategy.

It is fine to work together with others to solve HW problems and/or to ask Ian or me for answers to questions about how to do something in R, though you will learn the most if you have tried to answer the questions on your own before seeking this kind of help. Also, whether or not you obtain help, I expect that your written homework submissions give a summary of your personal choices and personal understanding of the answers, independent of others.

Homework will be marked 10 points if it represents a good faith effort to answer all parts of all questions and answers are substantially correct, 8 if all but one or two small parts of questions are answered with a good faith effort or there are substantive errors in the answer to one problem, and 5 if all but one or two small parts of questions are answered with a good faith effort but there are substantive errors in the answers to more than one problem. More incomplete homework will be scored zero.

Also, because the material in this course is sequential, it is important that you complete homework and turn it in on time, so that you are ready for the discussion and new material that follow it. Late homework will not be accepted. Homework not turned in or not accepted will be scored zero.

After homework comments and a HW key has been posted, it is important to look them over, and if there were shortcomings in any of the HW answers you submitted, a good strategy is to try to solve the problem again without consulting the key a few days after reading the key. After finishing this re-do, comparing your new answer to the key will help you determine whether you have learned how to do this type of problem or whether you need more practice by waiting a day or two and again trying your hand at the problem without consulting the key.

POLL EVERYWHERE:
Starting Friday, we will be using the Poll Everywhere audience response system (https://itconnect.uw.edu/learn/tools/polleverywhere/) in class. Please go to the site, click on "Poll Takers: Set Up Your Account and Log In", and set up your account if you do not already have one. Please note that for your Poll Everywhere account to be maintained and integrated with Canvas, the email address you supply Canvas must be your UW email address.

There will be two types of Poll Everywhere questions asked in class: pre-questions that help us determine how much you know about a topic before we cover it, and regular questions, that help us determine how well you have mastered material we have covered.

EXAMS: Two exams will be given this quarter: a midterm exam during the class session on February 15 and a final exam on March 20.

DATA ANALYSIS PROJECT: As a culminating experience that will help you integrate the material in this course, you will complete a data analysis project using methods we will be covering this quarter. We will begin early by considering possible sources of bias and variability in data like the data for your project during class discussions and on homework; in-class exercises and homework assignments throughout the quarter will give you practice and feedback in the skills needed for successful completion of the project with new data. The project itself will be turned in in two parts: a Data Analysis Plan due Friday Feb 22 and a Data Analysis Report due Fri Mar 15.

LEARNING OBJECTIVES: Learning objectives for the course are listed in the separate Learning Objectives document posted on the "First Day" module on the Canvas site.   Course learning objectives are organized by the relevant CEPH Foundational Public Health Knowledge Learning objectives and MPH Foundational Competencies of which they form a part.

SCHEDULE: One additional documents, available in the "First Day" module on the Canvas site, gives tentative information about the schedule for the topics we will cover this quarter. The "Weekly Schedule" document gives a brief summary of plans for topics to be covered each week, activities that will take place in class and in discussion section, and the types of problems that will be assigned that week on Homework or the Data Analysis Project; course learning objectives that will be evaluated are listed for each planned assignment. In addition, in each week's module on Canvas, the "Reading" document will give a day-by-day reading assignment from the textbook and R modules for the week; for each class day, this reading is the material you will be asked questions about on the pre-class online quiz.

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.

Please note that all of the following count as academic misconduct: using a cellphone or other communication device during an exam, talking or sharing answers during an exam, copying others' homework assignments.

EMAIL: Barbara is happy to answer email questions when she has time, but cannot always promise prompt responses. Attending office hours or posting to the Discussion Board is usually the most expedient way to get answers.

LEARNING ENVIRONMENT: I take seriously my role as an advocate for your learning in this class.   In addition to providing information, assignments and activities that I hope will support your learning, I will do my best to help us maintain the classroom as a supportive learning environment that respects diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion and culture. If you have a concern, I encourage you to communicate it to me. Please let me know ways to improve the effectiveness of the course for you personally, or for other students.   If you make a request and you do not feel my response has been adequate, please contact the chair of the department at bchair@uw.edu.

To maintain a respectful and welcoming classroom environment, I ask that we all commit to showing respect to each other both inside and outside of class

TA CONCERNS:	If you have any concerns about your TA, Ian Waudby-Smith, please see him about these concerns as soon as possible. If you are not comfortable talking with Ian or not satisfied with the response that you receive, you may contact the Department of Biostatistics Associate Director of Academic Affairs (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). 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.

COURSEWORK:

Weekly Homework:	Due Tuesdays starting Jan 15, 5pm Pacific Time on the Canvas site in .pdf format
Poll Everywhere Response:	Almost every class session.
Midterm Exam:	Friday, February 15, in class
Data Analysis Project:	Part I due Feb 22; Part II due March 15, both on Canvas in .pdf format.
Final Exam:	Wednesday, March 20, 8:30-10:20 am. No calculator will be needed or allowed.

GRADING:

Numerical course grades will be based on the midterm exam (30%), final exam (30%), data analysis project (20%), homework (after dropping lowest score) (15%), and class preparation quizzes (5%, after dropping the lowest 20% of scores).

Although this summary of submitted course work will result in a numeric score on a 100 point scale, there is no automatic formula for converting the point summary to the 4.0 course grade system. Typically, students in my classes whose total is 90 points or above receive a 3.9 or 4.0 grade, and students whose total is around 65 receive 3.0, but this may vary slightly as the conversion from points to class grade will depend on the difficulty of the assignments, quizzes and exams I set for the course this year. I do not grade on a curve: all students can receive a high grade with strong work.