Syllabus
BIOST 514 / BIOST 517
Applied Biostatistics I / Biostatistics I
Autumn 2019

Note: *Students are responsible for knowing all information provided on this syllabus. This syllabus is accurate as of the beginning of the course. Students are further responsible for any changes to this information as announced in class, posted on the canvas website for the course, or announced via email.*

Instructor:
Timothy A. Thornton, Ph.D.
Associate Professor of Biostatistics
Email: tathornt@uw.edu
Office Hours:
> Monday 1:00-2:00 P.M.;
> Wednesday 10:30-11:30 A.M.;
> And by appointment.

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Teaching Assistants:
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Office Hours for TAs: See Canvas Course Website for times and locations

Time and Place:
Lecture: MWF 9:30-10:20 A.M., HSB T435
Discussion 517 AA: Monday 8:30-9:20 A.M., HSB T639
Discussion 517 AC: Tuesday 8:30-9:20 A.M., HSB T359
Discussion 517 AB: Wednesday 11:30-12:20 P.M., HSB T639
Discussion 514 AA and 514 BA: Friday 8:30-9:20 A.M., HSB T498

Course Description:

This course provides an introduction to applied statistics, with an emphasis on medical and epidemiological data. The course is designed for graduate students in public health and medical fields. The major topics covered are data summary, introduction to statistical inference including "simple" (i.e. one-covariate) regressions, and statistical testing. The role of these in scientific applications is stressed throughout.

Learning Objectives

At the end of BIOST 514/517, students should be able to:

1. Demonstrate an organized approach to the analysis of data collected to answer a scientific question.
2. Refine a scientific question into a statistical framework. This includes:
    - identifying the response variable and an appropriate summary measure of that variable
    - Identifying the predictor of interest.
    - Identifying potential confounding variables in a dataset
    - Identifying any unmeasured confounders and describing the potential impact of unmeasured confounding
    - Identifying precision variables
    - Identifying scientific questions that translate to effect modification
3. Perform descriptive analyses of data. This includes:
    - Identifying and computing appropriate summary statistics
    - Identifying and constructing appropriate graphical displays

    The above apply to both univariate and multivariate descriptive analysis.
4. Define the sampling distribution of a statistic.
5. Compute parameter estimates using statistical software and standard error estimates
6. Compute confidence intervals for population parameters of interest.
7. Interpret confidence intervals correctly and identify incorrect interpretations of confidence intervals.
8. Implement hypothesis tests
    - Compute test statistics and p-values using statistical software.
9. Interpret p-values correctly and identify incorrect interpretations of p-value.
10. Make statistical inference about a population based on data from a random sample of that population.
11. State the assumptions required for the validity of conclusions from a data analysis.
12. Present the results of a data analysis to a statistically naïve reader, including a complete and accurate interpretation of parameter estimates.
13. Identify situations where statistical hypothesis testing is appropriate and inappropriate.

Prerequisites:

Students are expected to have completed a course in second year algebra, and to be conversant with graphs, linear equations, e, natural logarithms, and summation notation. Students who may find this course's presentation too fast or technical are encouraged to consider the Biostat 511/512/513 sequence instead, or Biost 508.

Textbook (optional): There is no "official" textbook for this course; however, students may find the following textbooks useful for this course:

- Van Belle, Fisher, Heagerty, Lumley: Biostatisics: *A Methodology for the Health Sciences*, 2nd edition. Wiley
- Vittinghoff, Glidden, Shiboski, McCulloch: *Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models, 2nd edition*. Springer.

  Electronic versions of these textbooks are available from the UW Library.

Course Web site: Homework assignments and other course materials will be posted on the course's canvas web site. Go to http://canvas.uw.edu, login with your UW netid and select BIOST 517 or 514 from the Courses pulldown menu.

Software: R

The class will be taught using the R statistical software package. Weekly homework assignments will involve statistical analyses conducted using R. R is a freely available software package for which there are a suite of routines available that perform the analyses required for this class. Students should download R along with the more user-friendly front-end, RStudio. These software packages are available for free at https://www.r-project.org/ and https://www.rstudio.com respectively. Rstudio requires R to be installed, so both software packages need to be downloaded.

Lecture Notes

The course's canvas web site serves as an archive of homework, handouts, lecture notes, and datasets. Students should check the web page regularly for information. Lecture notes will be typically be made available on the course canvas website the day before class. For students' convenience, recordings of lectures will be posted when possible. However, this is not a distance learning class, and students are responsible for all material in lectures regardless of whether a recording is made available.

Electronic Discussion Board and Email

Occasionally, time-sensitive announcements will be emailed to the class through the class list serve provided by the registrar's office. This means that students need to regularly check the email account they used to register for the class.

The class canvas site contains an electronic "Discussion Board." The board will be used for announcements from the instructional team and questions from the students. **If a student has a question about the course,** his/her best options are to come to office hours, raise the question in Discussion section, or post the question to the Discussion Board. *Email is not used for questions about course material.* The discussion board can be used to discuss any topic related to biostatistics or course material, or to ask R computing questions. Students are encouraged to *answer* as well as ask questions on the discussion board.

Homework:

Homework problems requiring a typewritten solution will be due approximately weekly. These assignments will consist of applications of statistical methods to real data analyses, and will tend to focus on the theory underlying the methods covered in class.

Students may consult with each other, the instructor, and the TAs during office hours on homework. However, the work that is handed in should reflect only that student's work. That is, obtaining help from other students in order to learn the METHODS of solution is allowed, but copying another student's answer is NOT.

Homework will be submitted online on the canvas website. Homework should be submitted as a **pdf** or **Microsoft Word compatible file (e.g., .doc or .docx)**.

Due to the size of the class, **late homework is not accepted (even for good reasons).** Because of this strict policy, the lowest homework grade will be dropped when computing course grades.

A solution key will be provided on Canvas after the homework is graded. It is not possible to provide a comprehensive evaluation of every student's weekly homework, so students should study the homework keys and compare them to their own work. Material in these keys is part of the course material and may appear on exams, even if it has not been covered in lecture.

Discussion Section:

Discussion section will be used for multiple purposes: learning R, discussing and expanding on course material, additional topics, and actively applying methods to datasets. Students may be required to conduct a first-pass analysis of specified datasets prior to Discussion Section.

Exams

There will be an in-class midterm exam midway through the quarter and a final exam during finals week. Exams are closed book. Bring a pencil, eraser, and calculator to the exams.
- **Midterm Exam**: Wednesday, 10/30/19, 9:30 – 10:20 A.M. in HSB T435
- **Final Exam**: Wednesday, 12/11/19, 8:30 – 10:20 A.M. in HSB T435

Grading: Numerical grades will be based on the following:

Homework:	30%
Midterm Exam:	30%
Final Exam:	40%

Acknowledgement

Some course material is inspired and developed by previous instructors, in particular Professors Scott Emerson, Katie Kerr, and Ken Rice.

<u>Academic Integrity</u>

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.

(For printed syllabi, below are the URLs for the text that is hyperlinked above:

UW Student Conduct Code (WAC 478-120)
http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/
SPH Academic Integrity Policy
http://sph.washington.edu/students/academicintegrity/
Community Standards and Student Conduct
http://www.washington.edu/cssc/)

Disability Statement

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 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.

Diversity Statement:

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, students 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.

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/). 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/).

Land Acknowledgment:

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.