Mel and Enid Zuckerman College of Public Health
University of Arizona

SYLLABUS
Biostatistics 576A Biostatistics in Public Health
FALL 2019

Time: Tuesday and Thursday 4:00 pm – 5:15 pm

Location:
Lectures: HSIB 306
Labs: HSIB 306 (STATA demonstration or laptop) - Amber
Drachman A319 (STATA desktops) - Shen
Drachman A116 (SAS/R demonstration or laptop) - Phil

Instructor: Denise J. Roe, Dr.P.H.
Professor, Epidemiology & Biostatistics
1933 University of Arizona Cancer Center
Telephone: (520) 626-2281
droe@email.arizona.edu

Office Hours: Wednesdays and Thursdays 2 pm – 3 pm
Drachman Hall A319
By appointment (email to schedule an appointment):
Directions to 1933 University of Arizona Cancer Center:
Enter the Cancer Center using the doors closest to the College of Medicine (south-west corner of the building)
At the end of the hallway turn left
Take the stairwell on the right down to the first floor
Exit the stairwell and turn left
Take the first right
Follow the signs to the Biometry Shared Service
My office is the next to last door on the right

Laboratory Instructors:
Amber Koslucher akoslucher@email.arizona.edu
Shen Liu shenliu@email.arizona.edu
Philip Jones pajones@email.arizona.edu
TA Office Hours:

<table>
<thead>
<tr>
<th>Day</th>
<th>Drachman A319</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>3:30 pm – 4:30 pm (Shen)</td>
<td>7:00 pm – 9:00 pm (Phil)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>2:00 pm – 3:00 pm (Amber)</td>
<td>7:00 pm – 9:00 pm (Shen)</td>
</tr>
<tr>
<td>Wednesday</td>
<td>10:00 am – 11:00 am (Phil)</td>
<td>7:00 pm – 9:00 pm (Amber)</td>
</tr>
</tbody>
</table>

Catalog Description: This course introduces biostatistical methods and applications, and will cover descriptive statistics, probability theory, and a wide variety of inferential statistical techniques that can be used to make practical conclusions about empirical data. Students will also be learning to use a statistical software package (STATA or SAS).

Course Prerequisites: One year of college-level mathematics

Course Objectives: During the course, students will:
- Identify the properties of given data sets, including the level of measurement for each variable
- Apply appropriate descriptive statistics to the data according to its measurement type
- Apply appropriate inferential statistics to the data according to its measurement type
- Formulate and test hypotheses
- Use a computer statistical software package (Stata, SAS or R) to accomplish these objectives
- Apply your statistical knowledge to the design of research studies, including selection of proper research design and determination of sample sizes necessary to show statistical significance
- Interpret and critique medical and scientific journal articles which frequently rely heavily on statistical procedures

Learning Outcomes (Competencies Obtained):

Program Competencies Covered (MPH Program Level):

Upon completion of the course, students will be able to:

Evidence-based Approaches to Public Health:
1. Apply epidemiological methods to the breadth of settings and situations in public health practice
2. Select quantitative and qualitative data collection methods appropriate for a given public health context
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate
4. Interpret results of data analysis for public health research, policy or practice

Communication:
19. Communicate audience-appropriate public health content, both in writing and through oral presentation
Biostatistics Concentration Competencies Covered (MPH/MS Programs):

Upon completion of the course, students will be able to:

Biostatistics MPH Competencies Covered:

1. Ability to select appropriate research designs to meet the needs of various studies, and be able to explain the limitations of implemented designs

Biostatistics MS Competencies Covered:

1. To demonstrate understanding of basic concepts of probability, random variation and commonly used statistical probability distributions
3. To suggest preferred methodological alternatives to commonly used statistical methods when assumptions are not met

Course Notes: A webpage has been created for this class using the Desire 2 Learn (D2L) interface. The course website contains the syllabus, lecture recordings, class notes, homework assignments and exams. Class announcements also will be posted on this site, so it is a good idea to check the site before each class to stay current.

To access the 576A website, login at: http://d2l.arizona.edu
- Click the ‘UA NetID’ Login.
- Enter your NetID and password, as you would to access your UA email account.

Under ‘My Courses’, click on: ‘BIOS 576A FA19 001’
- Announcements: This section contains any class announcements
- Content: Access the syllabus, class notes, homework assignments and exams.
- Lecture Recordings: All lectures will be recorded using the Panopto system. They are available shortly after the lecture is over. The recordings remain available throughout the course.

To access the recorded lectures you must use Firefox or Chrome or Safari as the browser when you log into D2L. Internet Explorer will not work.

The 8th Edition is available for purchase in the AHSC bookstore or from the publisher or other online sites. Alternatively, you may rent a hard copy or purchase electronic access from the publisher. The link is:


The link for the book companion site is:

http://www.cengage.com/cgi-wadsworth/course_products_wp.pl?fid=M20b&product_isbn_issn=9781305268920&token=9AE29419C1268A54CA68E32085062519410D57EECD1582449D0D980B44D9EDFCAB5D7594F170D4043A192E004D101E5706E71DD63BDA74735DF87FD02D55051CA62B438359CBF68
The book companion site includes:

- Data Set Descriptions (.doc)
- Data Sets (required for homework)
- Study Guide (includes a summary of each chapter with additional problems and solutions)

If you would like to borrow the book please send Dr. Roe an email.

Course Requirements:

1. Review the notes before class and bring questions with you to the lecture

2. Homework
   - The homework assignment for each chapter is included in the notes with the due date.
   - The homework will be discussed in the lab before the homework is due. This is an opportunity to check that you have the correct answers if you work through the homework before the lab.
   - **Late homework assignments will not be accepted.** Homework must be turned in during class on the due date or via the appropriate assignment folder by midnight. Please make sure that you submit the homework to the correct assignment folder.
   - Scoring: Each question is worth two points. Partial credit (one point) will be given if an honest attempt at the problem was made even without the correct answer. No credit (zero points) is given if the problem was not attempted.
   - Format: The homework can be typed or handwritten. Circle or highlight numeric answers that you calculate by hand. Remember to show your work so that the grader can give partial credit for a wrong answer. Bold, highlight, or otherwise emphasize those results that are obtained as computer output. Only include the correct computer output.
   - **Staple** your homework answers. Remember to put your name on the front page at least.
   - Answers are posted on the D2L website by noon the day after the assignment is due. Please check the D2L site when your homework is returned to make sure that you understand the answers if you did not receive full credit.
   - Keep copies of all of your homework so that you can study for the exams while your submitted work is being graded by the TA.
   - You can drop your lowest two homework scores. It is best to reserve these for times that you are unexpectedly out of town, cannot turn in the homework due to illness, or your computer crashes with your homework on it.
   - Please do not ask if you can turn in your homework late. The policy of dropping your lowest two scores was designed to protect you if the submission of your homework is delayed.

3. Take-Home Examinations

<table>
<thead>
<tr>
<th>Exam</th>
<th>Date Distributed</th>
<th>Date Due</th>
<th>Lectures and homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Thursday, October 3</td>
<td>Tuesday, October 8</td>
<td>Chapters 1 - 6</td>
</tr>
<tr>
<td>Exam 2</td>
<td>Thursday, November 7</td>
<td>Tuesday, November 12</td>
<td>Cumulative with emphasis on Chapters 7 – 10</td>
</tr>
<tr>
<td>Final</td>
<td>Tuesday, December 10</td>
<td>Tuesday, December 17</td>
<td>Cumulative with emphasis on Chapters 11 – 12</td>
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</tbody>
</table>
• Exams will include problems similar to the homework, interpretation of results from published papers, and selection of the most appropriate statistical analysis approach.
• You will need to use STATA or SAS or R to complete the exams.
• All exams must be turned in no later than midnight on the date due to the D2L assignments folder.
• For each exam, all students must sign the following statement (first page of the exam):

I have not discussed any aspects of this exam with other class members, former class members, other students, or faculty. I understand that if there is evidence that I have violated these restrictions, my grade on the exam will be reduced by 50%.

Signature | Printed Name | Date

4. Extra Credit
• No extra credit is available for the course

Grading Scale/Student Evaluation and Policies:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Due Dates</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework (Ch 2 – Ch 12)</td>
<td>See course schedule below</td>
<td>100 (each chapter weighted the same, even if length differs)</td>
</tr>
<tr>
<td>Exam 1</td>
<td>October 8</td>
<td>300</td>
</tr>
<tr>
<td>Exam 2</td>
<td>November 12</td>
<td>300</td>
</tr>
<tr>
<td>Final</td>
<td>December 17</td>
<td>300</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1000</td>
</tr>
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</table>

Description of each Assessment and Competencies Covered by the Assessment

Homework: Homework assignments build statistical analysis skills

Exams 1 and 2 and Final: MPH Competencies and Biostatistics Competencies listed above

Final grades are based on the following point system:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percent</th>
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<tbody>
<tr>
<td>A</td>
<td>90% - 100%</td>
</tr>
<tr>
<td>B</td>
<td>80% - 89%</td>
</tr>
<tr>
<td>C</td>
<td>70% - 79%</td>
</tr>
<tr>
<td>D</td>
<td>60% - 69%</td>
</tr>
<tr>
<td>E</td>
<td>59% or less</td>
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</tbody>
</table>

Grades will not be curved. The instructor reserves the right to revise this scale, if necessary.
**Course Schedule:** Any changes to the following schedule will be announced in lecture or the D2L site. You are responsible for obtaining information on any changes, even if you miss class.

<table>
<thead>
<tr>
<th>Lecture Date</th>
<th>Lab Date</th>
<th>Topic</th>
<th>Rosner</th>
<th>Homework Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27</td>
<td></td>
<td>General Overview and Introduction to Statistical Packages</td>
<td>Ch. 1</td>
<td></td>
</tr>
<tr>
<td>8/29</td>
<td>9/3</td>
<td>Descriptive Statistics</td>
<td>Ch. 2</td>
<td>9/5</td>
</tr>
<tr>
<td>9/5</td>
<td>9/10</td>
<td>Probability</td>
<td>Ch. 3</td>
<td>9/12</td>
</tr>
<tr>
<td>9/12</td>
<td>9/17</td>
<td>Discrete Probability Distributions</td>
<td>Ch. 4</td>
<td>9/19</td>
</tr>
<tr>
<td>9/19</td>
<td>9/24</td>
<td>Continuous Probability Distributions</td>
<td>Ch. 5</td>
<td>9/26</td>
</tr>
<tr>
<td>9/26</td>
<td>10/1</td>
<td>Estimation</td>
<td>Ch. 6</td>
<td>10/3</td>
</tr>
<tr>
<td>10/3</td>
<td></td>
<td>Exam 1 Review</td>
<td>Ch. 1 – 6</td>
<td></td>
</tr>
</tbody>
</table>
| **10/3**     | **10/8**| Exam 1 Available  
Exam 1 Due (no class) | | |
| 10/10        | 10/15   | Hypothesis Testing: One-Sample Inference | Ch. 7 | 10/17 |
| 10/17        | 10/22   | Hypothesis Testing: Two-Sample Inference | Ch. 8 | 10/24 |
| 10/24        | 10/29   | Nonparametric Methods | Ch. 9 | 10/31 |
| 10/31        | 11/5    | Hypothesis Testing: Categorical Data | Ch. 10 | 11/7 |
| 11/7         |         | Literature Examples of Hypothesis Testing  
Exam 2 Review | Ch. 7 – 10 | |
| **11/7**     | **11/12**| Exam 2 Available  
Exam 2 Due (no class) | Ch. 7 – 10 | |
| 11/14        | 11/26   | Regression and Correlation Methods | Ch. 11 | 11/28 |
| 11/19        | 11/21   |         |        | |
| **11/26**    | **11/28**| No Class – Happy Thanksgiving | | |
| 12/3         | 12/10   | Multisample Inference | Ch. 12 | 12/11 |
| 12/5         |         | Literature Examples of Regression and Multisample Inference  
Review | | |
| **12/10**    |         | Final Available | Ch. 11 – 12 | |
| **12/17**    |         | Final Due | | |
**Statistical Software:** You will need to use STATA or SAS or R to be able to complete the analyses required for the course. STATA and SAS will be emphasized during the lectures. R code also will be available. Labs will be specific to STATA or SAS/R.

STATA (must be purchased or used in the computer labs)
- Command line based – you put in the correct command and get an answer
- Easier to learn
- Appropriate for a wide variety of statistical analyses
- User-added programs are available

SAS (SAS 9.4 must be purchased or used in the computer labs; SAS University is free)
- Used more often in the pharmaceutical industry and in most local and state public health departments
- Data input and manipulation uses a DATA step
- Statistical analysis uses PROC steps
- Steeper learning curve
- Superior data management capabilities than STATA

R (free download)
- Wide variety of statistical and graphical techniques
- Well-designed publication-quality plots
- Widely used for those developing statistical methodology

Select one of the packages for most of your homework and exams and attend the appropriate laboratory section.

A set of modules for learning STATA and SAS are on the D2L site. All students enrolled in the course have access to these modules. Instructions to open the modules are on the D2L site.

A one-unit course “Introduction to Statistical Analysis using STATA” (BIOS 503) is available to those students who view all of the tutorials and complete an on-line exam for each module. You will need to register for the course to have access to the on-line exams and to receive credit for the course.

A one-unit course “Introduction to Statistical Analysis using SAS” (BIOS 504) is available to those students who view all of the tutorials and complete an on-line exam for each module. You will need to register for the course to have access to the on-line exams and to receive credit for the course.

**Computer Labs:** Stata and SAS are available for public use at two locations:

Drachman Hall Computing Lab: Drachman A319, open weekdays, from 8-5. Please bring your own paper for printing.

Arizona Health Sciences Library Computer Lab: AHSC 2150, open every day 6am-midnight. These computers are behind the information/reference desk on the main floor. The first couple of banks of machines is not part of the lab, but is rather used for lit searching, etc. The lab is the ‘walled off’ section of computers behind the first couple of banks. You may print output here for a fee. Note that these are public facilities, and may or may not be crowded on a given day.
Students must register to use the AHSC Library Computer Lab at the Library Information Desk. A University of Arizona Catcard is required.

**Purchasing STATA or SAS:**

**STATA:** You can order online at the following link:

http://stata.com/order/new/edu/gradplans/student-pricing

STATA 16 became available this summer. If you order using the link you will receive STATA 16. STATA/IC 16 can be purchased at an academic rate of $48 for a 6-month license, $94 for a one-year license and $225 for a perpetual license. After you purchase STATA you will be given directions on downloading and installing the package, with the necessary activation key.

STATA/IC 15 is available in the classroom and lab. It is appropriate for virtually all analyses except for very large datasets with an extremely large number of variables.

PDF versions of the manuals can be accessed from the Help Tab within STATA. There is no need to purchase the manuals.

**SAS:** SAS 9.4 can be ordered from the U of A BookStore. The cost is $99 per year. The link with the necessary information is: http://uabookstore.arizona.edu/technology/stulicense.asp

SAS also has a free “University Edition” of the SAS package. The link with the necessary information is: http://www.sas.com/en_us/software/university-edition.html

Students who plan to use SAS in the workplace should learn SAS 9.4 as the “University Edition” is not available outside the University.

**R:** You can download R at the following link:

https://www.r-project.org/

**Tips for Succeeding in the Course:**

1. Attend class or view the Panopto lecture
2. Read the lecture notes before class
3. Ask questions about the notes and textbook in class
4. Do your homework and exams early
5. Check your homework answers against the answer key
6. Turn your homework, Exam 1, Exam 2 and Final in on time
7. Ask questions until you understand the material
Communications: You are responsible for reading emails sent to your UA account from your professor and the announcements that are placed on the course web site. Information about readings, news, your grades, assignments and other course related topics will be communicated to you with these electronic methods. The official policy can be found at: https://www.registrar.arizona.edu/personal-information/official-student-email-policy-use-email-official-correspondence-students

UA Smoking and Tobacco Policy: The purpose of this Policy is to establish the University of Arizona’s (University) commitment to protect the health of University faculty, staff, students, and visitors on its campuses and in its vehicle. The official policy can be found at: http://policy.arizona.edu/ethics-and-conduct/smoking-and-tobacco-policy

University Course Policies: (please see the following URL): https://academicaffairs.arizona.edu/syllabus-policies

Class Attendance/Participation: Class attendance and/or reviewing the Panopto recorded lectures is strongly encouraged, but not required. If a student misses class, they are responsible for meeting all course deadlines, and for working with other students, the TA and the instructor (during office hours) to catch up.

Academic Integrity: All students are expected to do their own work. For homework, feel free to ask each other questions about concepts and procedures. However, when it comes time to complete the homework to turn in, do that on your own. Duplicate homework will be considered a breach of academic integrity. No communication between students of any sort is allowed during exams or the final.

Classroom Behavior: Students are expected to be respectful of the instructor/TAs and other students at all times (including limited talking, no reading newspapers, etc.). Cell phones should be in the mute or vibrate position. If you must take an emergency call during class, please leave class quietly to speak with the caller (do not leave and return more than once as this disrupts the rest of the class). Please do not text during class. Students may use their laptops during class only for course related material.

Plagiarism: What counts as plagiarism?
- Copying and pasting information from a web site or another source, and then revising it so that it sounds like your original idea (beware of Wikipedia).
- Doing a homework assignment with a friend and then handing in separate assignments that contain the same ideas, language, phrases, etc.
- Paraphrasing a passage without citing it, so that it looks like your own.
- Hiring another person to do your work for you, or purchasing a paper through any of the on- or off-line sources.

Syllabus Changes: Information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.