Mel and Enid Zuckerman College of Public Health  
University of Arizona  

SYLLABUS  
Biostatistics 576A Biostatistics in Public Health  
FALL 2020  
3 Units  

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

Location:  
Lectures:  Zoom (online)  
HSIB 306 (in person when feasible)  
Labs:  Zoom online (STATA) – Shen Liu  
Zoom online (SAS) – Xingyi Yang  
Zoom online (R) – Drew Baldwin  

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:  
Tuesdays and Thursdays 2 pm – 3 pm  
Zoom (online)  
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:  
Drew Baldwin  
drewbaldwin@math.arizona.edu  
Shen Liu  
shenliu@email.arizona.edu  
Xingyi Yang  
oxingyiyang92@email.arizona.edu
TA Office Hours:

<table>
<thead>
<tr>
<th>Day</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>7:00 pm – 9:00 pm (Shen Liu)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>7:00 pm – 9:00 pm (Drew Baldwin)</td>
</tr>
<tr>
<td>Wednesday</td>
<td>7:00 pm – 9:00 pm (Xingyi Yang)</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, SAS or R).

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
2. 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](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 FA20 001-2’

- 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.
- Zoom links are included in the Calendar

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.
   - **State the results for each problem using a complete sentence.**
   - 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 1</td>
<td>Tuesday, October 6</td>
<td>Chapters 1 - 6</td>
</tr>
<tr>
<td>Exam 2</td>
<td>Thursday, November 5</td>
<td>Tuesday, November 10</td>
<td>Cumulative with emphasis on Chapters 7 – 10</td>
</tr>
<tr>
<td>Final</td>
<td>Tuesday, December 8</td>
<td>Tuesday, December 15</td>
<td>Cumulative with emphasis on Chapters 11 – 12</td>
</tr>
</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%.

Signatures
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 6</td>
<td>300</td>
</tr>
<tr>
<td>Exam 2</td>
<td>November 10</td>
<td>300</td>
</tr>
<tr>
<td>Final</td>
<td>December 15</td>
<td>300</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1000</td>
</tr>
</tbody>
</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>
</tr>
</thead>
<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>
</tr>
</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>8/25</td>
<td></td>
<td>General Overview and Introduction to Statistical Packages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/27</td>
<td>9/1</td>
<td>Descriptive Statistics</td>
<td>Ch. 2</td>
<td>9/3</td>
</tr>
<tr>
<td>9/3</td>
<td>9/8</td>
<td>Probability</td>
<td>Ch. 3</td>
<td>9/10</td>
</tr>
<tr>
<td>9/10</td>
<td>9/15</td>
<td>Discrete Probability Distributions</td>
<td>Ch. 4</td>
<td>9/17</td>
</tr>
<tr>
<td>9/17</td>
<td>9/22</td>
<td>Continuous Probability Distributions</td>
<td>Ch. 5</td>
<td>9/24</td>
</tr>
<tr>
<td>9/24</td>
<td>9/29</td>
<td>Estimation</td>
<td>Ch. 6</td>
<td>10/1</td>
</tr>
<tr>
<td>10/1</td>
<td></td>
<td>Exam 1 Review</td>
<td>Ch. 1 – 6</td>
<td></td>
</tr>
<tr>
<td>10/1</td>
<td>10/6</td>
<td><strong>Exam 1 Available</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/8</td>
<td>10/13</td>
<td>Hypothesis Testing: One-Sample Inference</td>
<td>Ch. 7</td>
<td>10/15</td>
</tr>
<tr>
<td>10/15</td>
<td>10/20</td>
<td>Hypothesis Testing: Two-Sample Inference</td>
<td>Ch. 8</td>
<td>10/22</td>
</tr>
<tr>
<td>10/22</td>
<td>10/27</td>
<td>Nonparametric Methods</td>
<td>Ch. 9</td>
<td>10/29</td>
</tr>
<tr>
<td>10/29</td>
<td>11/3</td>
<td>Hypothesis Testing: Categorical Data</td>
<td>Ch. 10</td>
<td>11/5</td>
</tr>
<tr>
<td>11/5</td>
<td></td>
<td>Literature Examples of Hypothesis Testing</td>
<td>Ch. 7 – 10</td>
<td></td>
</tr>
<tr>
<td>11/5</td>
<td>11/10</td>
<td><strong>Exam 2 Available</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/12</td>
<td>11/24</td>
<td>Regression and Correlation Methods</td>
<td>Ch. 11</td>
<td>12/1</td>
</tr>
<tr>
<td>11/26</td>
<td></td>
<td><strong>No Class – Happy Thanksgiving</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/1 Zoom</td>
<td>12/8</td>
<td>Multisample Inference</td>
<td>Ch. 12</td>
<td>12/9</td>
</tr>
<tr>
<td>12/8 Zoom</td>
<td></td>
<td>Literature Examples of Regression and Multisample Inference Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/8</td>
<td></td>
<td><strong>Final Available</strong></td>
<td>Ch. 11 – 12</td>
<td></td>
</tr>
<tr>
<td>12/15</td>
<td></td>
<td><strong>Final Due</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**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, SAS or R.

STATA (must be purchased or used via the website: vcat.arizona.edu)
- 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; SAS University and SAS OnDemand for Academics are 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 6:30 am - 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. Masks and social distancing are required.

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:** (New this semester) STATA will be available via the website: vcat.arizona.edu
This link is available only for UA individuals with a NetID.

To buy STATA, you can order online at the following link:

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

STATA 16 is available. 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.

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

SAS also has a free “SAS OnDemand for Academics” version of the SAS package. It is a cloud-based program so you do not need to download anything to your computer. However, since it is cloud-based it may be slower during times of high demand. Here are the steps for using it:

1. As a first step, please create your account for SAS OnDemand for Academics. To register, visit https://odamid.oda.sas.com and click on Register for an account.
3. Look for the Enroll in a course link in the "Enrollments" section near the bottom of the page. Click this link to start the enrollment.
4. Enter the course code: f45fa61d-4c40-4487-8e8c-ac0d6b9885bd
5. Submit the form.
6. Confirm that this is the correct course and then click the button to finish enroling.

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

Classroom Behavior Policy: (In-person classes only) To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Communications: You are responsible for reading emails sent to your UA account from your instructor and the announcements that are placed on the course web site. Information about readings, news events, 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](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 campuses and in its vehicles. The official policy can be found at: [http://policy.arizona.edu/ethics-and-conduct/smoking-and-tobacco-policy](http://policy.arizona.edu/ethics-and-conduct/smoking-and-tobacco-policy)

University-wide Policies link: Links to the following UA policies are provided here: [https://academicaffairs.arizona.edu/syllabus-policies](https://academicaffairs.arizona.edu/syllabus-policies)

- Absence and Class Participation Policies
- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement
Class Attendance/Participation: Class attendance (via Zoom or in person) 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.

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.