Math 263: Introduction to Statistics and Biostatistics
Section 007, TR 12:30-1:45PM, TR, ENGR 308
Spring 2015

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Course Overview *Statistics* is the field of study involving (1) the collection, summarization, and analysis of data; and (2) the drawing of inferences about a population from the examination of a sample of the population.

Biostatistics is the application of statistics to biological and medical questions. Biostatistics uses much the same core sets of concepts and principles as does applied statistics in general. The substance-matter knowledge that the biostatistician must learn in order to be successful is biomedical. Biostatistics underlies the process of medical research, playing a key role in each step of scientific inquiry from the research bench to the hospital bedside to the community. Biostatistics is concerned with the development and proper application of methods for study design, data measurement, data generation, and data analysis, these latter methods being used to help understand biomedical data by quantifying variation and/or separating signal from noise. An intellectually stimulating feature of biostatistics is that its fundamental elements of data and variation are ubiquitous, being found in the areas of cell regulation, gene expression, genetic susceptibility, pharmacokinetics, response to therapy, assessment of medical treatments and new technology, adherence to guidelines, and program evaluation. [1]

Biostatisticians are in great demand in academia, industry, and government. The responsibilities of biostatisticians span the entire scientific process. They assist in the design and interpretation of studies, and usually have primary responsibility for implementing protocols for data management, data analysis, and quality assurance. More generally, the increasingly complex, interdisciplinary, and data-intensive nature of medical research has caused, and will continue to cause, the demand for persons trained in biostatistics to increase. The supply of biostatisticians is currently inadequate, and is not rising quickly enough to keep pace with demand. The imbalance between supply and demand is particularly acute for outstanding biostatisticians that combine excellent quantitative training with the communication skills necessary to succeed in the medical environment. [2]

Course Objectives This course will provide an introduction to selected central topics in statistical concepts and reasoning. Specific topics include tools for describing central tendency and variability within data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; issues of sample size in study designs; random sampling and other study types. While a certain level of mathematical understanding is required to successfully apply statistics, the emphasis in this course is on understanding concepts.

Upon completion of this course, you will be able to:

[1] http://biostat.duke.edu/master-biostatistics-program/faqs#What_is_biostatistics_
[2] http://biostat.duke.edu/master-biostatistics-program/faqs#What_types_of_career

- Recognize and give examples of different types of data arising in various fields
- Interpret difference in data distributions via visual displays
- Calculate standard normal scores and resulting probabilities
- Calculate and interpret confidence intervals for population means and proportions
- Interpret and explain a p-value
- Perform a two-sample t-test and interpret the results; calculate a 95% confidence interval for the difference in population means
- Select an appropriate test for comparing two populations on a continuous variable
- Understand and interpret results from Analysis of Variance (ANOVA), a technique used to compare means among more than two independent populations
- Choose an appropriate method for comparing proportions between two groups; construct a 95% confidence interval for the difference in population proportions
- Describe different kinds of studies
- Use a graphing calculator and spreadsheet software to perform statistical testing, create relevant graphs, and interpret output related to various tasks covered in this course.

Textbook The textbook for this course is *Introduction to the Practice of Statistics, 8^{th} edition* by Moore and McCabe. The text is required and is available either in hard copy at the bookstore or as an e-book bundled with WebAssign (the e-book is less expensive than the hard copy).

WebAssign WebAssign will be used to complete both online homework assignments and to post course grades, and is required. A subscription to WebAssign is included in the price of the hard copy book, or you can purchase WebAssign (which includes an e-book!) separately. To register for WebAssign, go to webassign.net, click the log in button and enter the class key:

arizona 7192 3905

Note: you must do this even if you have used WebAssign for another course. There is a 14 day (from the first day of class) grace period before you must either purchase or submit an access code for the class. I will drop your lowest 3 WebAssign grades at the end of the semester.

Calculator You are required to have, and know how to use, a graphing calculator that can do statistical calculations such as correlation and linear regression. Some exam questions will require the use of such calculator functions. During exams, each student must have their own calculator. In class, I will be using the TI-84, but essentially any graphing calculator will do.

Class Attendance Attendance is expected and is obviously in your best interest. You are responsible for all information provided in class and on the course web page. I will pass around a sign-in sheet every class period, but only as a way to track student performance - no grade is assigned to attendance. If I notice that habitual absence is correlated with poor performance, you will receive a concerned email from me. During class, please refrain from using your various electronic addictions - you're paying to attend class, not check your instwiterfacegrambooktrist.

Exams There will be three midterms in the course, tentatively scheduled for **February 5th, March 3rd and April 16th.** The final exam will be in our regular classroom, during the time scheduled by the university, which is **Wednesday, May 13th from 1-3PM.** Unless there are extenuating circumstances, a missed exam or missed final will result in a score of zero. Makeup exams will only be given at my discretion - please email well in advance if you think you may miss an exam. If you earn a higher score on the final exam than on one of your midterms, your lowest nonzero midterm score will be replaced by your final exam score.

Quizzes We will have occasional in-class quizzes - about one per week, except exam weeks and the first week. The goal of a quiz is to serve as a checkpoint for your understanding, not as a high-stakes grading trap. Thus, I allow students to re-submit quizzes for regrading up to two times, with a time limit of 2 weeks from the day they are handed back. Note: you can only re-submit a quiz if you took it in class the day it was given ('you must be present to win!'). In addition, I will drop your lowest quiz score.

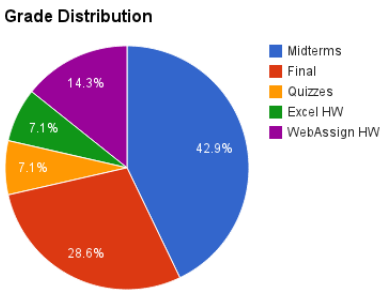
Excel Homework In addition to WebAssign homework, we will also have a total of 8 Excel-based assignments which require both computer generated output and written work. The assignments and data sets will be posted on the course website, but the assignment must be handed in as a hard copy. I will drop your lowest Excel assignment grade, and late assignments will not be accepted without prior approval.

Course Grades Each midterm is worth 100 points (300 total) and the final exam is worth 200 points. The Excel assignments and quizzes are worth 50 points each and the WebAssign assignments are worth another 100 points, for a total of 700 overall points available in the course. At the end of the semester, your overall percentage is calculated as

$$P = 100 \cdot \frac{\text{Total points earned}}{700}$$

Then, grades will be assigned according to the following scale:

A	$90 \leq P \leq 100$
B	$80 \leq P \leq 89.9$
C	$70 \leq P \leq 79.9$
D	$60 \leq P \leq 69.9$
E	$0 \leq P \leq 59.9$



Drop Dates The drop dates for this course are **January 28th** (last day to drop without a W) and **March 31st** (last day to drop with a W through UAccess).

Incompletes The grade of I (incomplete) will be given if **all** the following conditions are met:

1. The student has completed all but a small portion of the required work.
2. The student has scored at least 50% on the work completed.
3. The student has a valid reason for not completing the course on time.
4. The student agrees to make up the material in a short period of time.
5. The student asks for the incomplete before grades are due, 48 hours after the final exam.

University Policies Students are expected to be familiar with and abide by the University of Arizona's Code of Academic Integrity, Student Code of Conduct, and Official Student Email Policy. These policies will be strictly enforced, and any student found to be in violation will be appropriately sanctioned.

Students with Disabilities If you anticipate issues related to the format or requirements of this course, please contact me to discuss ways to ensure your full participation in the course. If you determine that formal disability-related accommodations are necessary, it is very important that you be registered with Disability Resources (621-3268, drc.arizona.edu). You should notify me of your eligibility for accommodations as soon as possible. You and I can then plan how to coordinate your accommodations.