

Biostatistics-202420 Math 3301-001
Texas A&M University–San Antonio
Mathematics, College of Arts and Sciences
Fall 2024

Instructor: Albert Alvarado

Classroom: STEM 273

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Class Time: MW 12:30-1:45 PM

Office hours: MW 11 AM-12:15 PM

* If you need to meet outside of my office hours please talk to me before/after class or email me and I can make arrangements to meet with you.

Course Description and Materials

Description: For students in biology, health sciences, human sciences and wildlife science. Descriptive and inferential statistics, basic probability concepts, probability distributions, estimation, hypothesis testing, correlation, simple linear regression, principles of epidemiology, statistical vs. clinical significance and quasi-statistical methods. Prerequisite: MATH 1314.

Required ECourse Software: MyMathlab with Triola, M. M., Triola, M. F., & Roy, J. (2018). Biostatistics for the Biological and Health Sciences. Boston: Pearson. Instructions to acquire MyMathlab software in Blackboard.

Required Program: R Studio software. Follow Instructions under Course Content to download.

Required Calculator: A calculator is required and allowed on all exams. No cell phone will be allowed, and online math utilities (e.g., Desmos) are also not allowed. Specifically for this class a **TI 36 XPro or TI 83/84 calculators are recommended.**

Student Learner Objectives: Students will develop an understanding of the basic concepts of probability and statistics as applied in the Biological Sciences, be informed and critical readers of quantitative arguments, and apply simple statistical techniques. In particular, students who successfully complete the course will be able to

- Explain basic concepts of probability and statistics (e.g., randomness, probability models populations, sample, sampling distributions, central limit theorem)
- Summarize numeric data by computing descriptive statistics (e.g., mean, variance) and by creating tables and graphs
- Identify and/or interpret designing experiments
- Demonstrate an understanding and working knowledge of data descriptions and interpretation, sampling and descriptive statistics, correlation and least squares regression
- Compute various inferential statistics using both hand calculation (using calculators) and computer methods (e.g., Excel, SPSS, STATDISK)
- Calculate confidence intervals and draw inferences for distributions and proportions
- Perform hypotheses testing and draw conclusions from the results of hypothesis tests
- Apply Chi Square and non-parametric tests
- Perform analysis of variance

Evaluation of Student Performance: Students' grades will be based solely on his/her performance with the final course grade calculated as follows:

Homework:10%

Quiz: 10%

Project: 10%

Exams 1: 20%

Exam 2: 20%

Final Exam: 30%

TOPICS

1. Introduction To Statistics
 - 1-1 Statistical and Critical Thinking
 - 1-2 Types of Data
 - 1-3 Collecting Sample Data
2. Exploring Data With Tables and Graphs
 - 2-1 Frequency Distributions for Organizing and Summarizing Data
 - 2-2 Histograms
 - 2-3 Graphs That Enlighten and Graphs That Deceive
 - 2-4 Scatterplots, Correlation, and Regression
3. Describing, Exploring, And Comparing Data
 - 3-1 Measures of Center
 - 3-2 Measures of Variation
 - 3-3 Measures of Relative Standing and Boxplots
4. Probability
 - 4-1 Basic Concepts of Probability
 - 4-2 Addition Rule and Multiplication Rule
 - 4-3 Complements, Conditional Probability , and Bayes' Theorem
 - 4-4 Risks and Odds
 - 4-5 Rates of Mortality, Fertility, and Morbidity
 - 4-6 Counting
5. Discrete Probability Distributions
 - 5-1 Probability Distributions
 - 5-2 Binomial Probability Distributions
 - 5-3 Poisson Probability Distributions
6. Normal Probability Distributions
 - 6-1 The Standard Normal Distribution
 - 6-2 Real Applications of Normal Distributions
 - 6-3 Sampling Distributions and Estimators
 - 6-4 The Central Limit Theorem
 - 6-5 Assessing Normality
 - 6-6 Normal as Approximation to Binomial *
7. Estimating Parameters and Determining Sample Sizes
 - 7-1 Estimating a Population Proportion
 - 7-2 Estimating a Population Mean
 - 7-3 Estimating a Population Standard Deviation or Variance
 - 7-4 Bootstrapping: Using Technology for Estimates *
8. Hypothesis Testing
 - 8-1 Basics of Hypothesis Testing
 - 8-2 Testing a Claim About a Proportion
 - 8-3 Testing a Claim About a Mean
 - 8-4 Testing a Claim About a Standard Deviation or Variance
9. Inferences From Two Samples
 - 9-1 Two Proportions
 - 9-2 Two Means: Independent Samples
 - 9-3 Two Dependent Samples (Matched Pairs)
 - 9-4 Two Variances or Standard Deviations *
10. Correlation and Regression
 - 10-1 Correlation
 - 10-2 Regression
 - 10-3 Prediction Intervals and Variation
 - 10-4 Multiple Regression
11. Goodness of Fit And Contingency Tables
 - 11-1 Goodness of Fit
 - 11-2 Contingency Tables *
12. Analysis of Variance
 - 12-1 One Way ANOVA
 - 12-2 Two Way ANOVA

IMPORTANT POLICIES AND RESOURCES

Academic Accommodations for Persons with Disabilities: Texas A&M University-San Antonio is committed to providing all students with reasonable access to learning opportunities and accommodations in accordance with The Americans with Disabilities Act, as amended, and Section 504 of the Rehabilitation Act. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Support Services in the Central Academic Building, Suite 210, or at (210) 784-1335 or visit <https://www.tamusa.edu/index.html> or email us at dss@tamusa.edu. Disabilities may include, but are not limited to, attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability-related needs with Disability Support Services and their instructors as soon as possible.

Academic Learning Center: The Academic Learning Center provides free course-based tutoring to all currently enrolled students at Texas A&M University-San Antonio. Students wishing to work with a tutor can make appointments through the Brainfuse online tutoring platform. Brainfuse can be accessed in the *Tools* section of Blackboard. You can contact the Academic Learning Center by emailing tutoring@tamusa.edu, calling (210) 784-1307, or visiting the Central Academic Building, room 202.

Counseling/Mental Health Resources: As a college student, there may be times when personal stressors interfere with your academic performance and/or negatively impact your daily functioning. If you are experiencing emotional difficulties or mental health concerns, support is available to you through the Student Counseling Center (SCC). To schedule an appointment call 210-784-1331 or visit Madla 120. All mental health services provided by the SCC are free and confidential (as the law allows). The Student Counseling Center provides brief individual and group therapy, crisis intervention, consultation, case management, and prevention services.

Crisis support is available 24/7 by calling the SCC at 210-784-1331 (after-hours select option '2'). For more information and self-help resources, please visit www.tamusa.edu/studentcounseling

Emergency Preparedness: JagE Alert is Texas A&M University-San Antonio's mass notification. In the event of an emergency, such as inclement weather, students, staff and faculty, who are registered, will have the option to receive a text message, email with instructions and updates. To register or update your information visit: <https://tamusa.bbcportal.com/>.

More information about Emergency Operations Plan and the Emergency Action Plan can be found here:

<https://www.tamusa.edu/about-us/campus-information/safety/university-police-department/documents/emergency-operations-plan.pdf> and <https://www.tamusa.edu/about-us/campus-information/safety/university-police-department/documents/emergency-action-plan.pdf>

Download the SafeZone App for emergencies or call (210) 784-1911. Non-Emergency (210) 784-1900

Financial Aid and Verification of Attendance: According to the following federal regulation, 34 CFR 668.21: U.S. Department of Education (DoE) Title IV regulation, a student can only receive Title IV funds based on Title IV eligibility criteria which include class attendance. If Title IV funds are disbursed to ineligible students (including students who fail to begin attendance), the institution must return these funds to the U.S. DoE within 30 days of becoming aware that the student will not or has not begun attendance. Faculty will provide the Office of Financial Aid with an electronic notification if a student has not attended the first week of class. Any student receiving federal financial aid who does not attend the first week of class will have their aid terminated and returned to the DoE. Please note that any student who stops attending at any time during the semester may also need to return a portion of their federal aid.

Writing, Language, and Digital Composing Center: The Writing, Language, and Digital Composing Center supports graduate and undergraduate students in all three colleges as well as faculty and staff. Tutors work with students to develop reading skills, prepare oral presentations, and plan, draft, and revise their written assignments. Our language tutors support students enrolled in Spanish courses and students composing in

Spanish for any assignment. Our digital studio tutors support students working on digital projects such as eportfolios, class presentations, or other digital multimedia projects. Students can schedule appointments through JagWire under the Student Services tab. Click on “Writing, Language, and Digital Composing Center” to make your appointment. The Center offers face-to-face, synchronous online, and asynchronous digital appointments. More information about what services we offer, how to make an appointment, and how to access your appointment can be found on our website at <https://bit.ly/WLDCCenter>.

Meeting Basic Needs: Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students (DOS@tamusa.edu) for support. Furthermore, please notify the professor if you are comfortable in doing so. This will enable them to provide any resources they may possess.

Military Affairs: Veterans and active-duty military personnel are welcomed and encouraged to communicate, in advance if possible, and special circumstances (e.g., upcoming deployment, drill requirements, disability accommodations). You are also encouraged to visit the Patriots’ Casa in-person room 202, or to contact the Office of Military Affairs with any questions at military.va@tamusa.edu or (210)784-1397.

Religious Observances: Texas A&M University-San Antonio recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes for regular session classes.

The Six-Drop Rule: Students are subject to the requirements of Senate Bill (SB) 1231 passed by the Texas Legislature in 2007. SB 1231 limits students to a maximum of six (6) non-punitive course drops (i.e., courses a student chooses to drop) during their undergraduate careers. A non-punitive drop does not affect the student’s GPA. However, course drops that exceed the maximum allowed by SB 1231 will be treated as “F” grades and will impact the student’s GPA.

Statement of Harassment and Discrimination: Texas A&M University-San Antonio is committed to the fundamental principles of academic freedom, equality of opportunity and human dignity. To fulfill its multiple missions as an institution of higher learning, A&M-San Antonio encourages a climate that values and nurtures collegiality and the uniqueness of the individual within our state, nation, and world. All decisions and actions involving students and employees should be based on applicable law and individual merit. Texas A&M University-San Antonio, in accordance with applicable federal and state law, prohibits discrimination, including harassment, on the basis of race, color, sex, religion, national origin, age, disability, genetic information, veteran status, sexual orientation, gender identity, gender expression, or pregnancy/parenting status. Individuals who believe they have experienced harassment or discrimination prohibited by this statement are encouraged to contact the appropriate offices within their respective units.

Texas A&M University-San Antonio faculty are committed to providing a safe learning environment for all students and for the university as a whole. If you have experienced any form of sex- or gender-based discrimination or harassment, including sexual assault, sexual harassment, domestic or dating violence, or stalking, know that help and support are available. A&M-San Antonio’s Title IX Coordinator can support those impacted by such conduct in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. The university strongly encourages all students to report any such incidents to the Title IX Coordinator. Please be aware that all A&M-San Antonio employees (other than those designated as confidential resources such as counselors and trained victim advocates) are required to report information about such discrimination and harassment to the university. This means that if you tell a faculty member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty member must share that information with the university’s Title IX Coordinator (titleix@tamusa.edu, 210-784-2061, CAB 439K). If you wish to speak to a confidential employee who does not have this reporting requirement, you can contact the Student Counseling Center at (210) 784-1331 or visit them in Madla 120.

Pregnant/Parenting Students: Texas A&M-San Antonio does not require a pregnant or parenting student, solely because of that status or issues related to that status, to (1) take a leave of absence or withdraw from their degree or certificate

program; (2) limit the student's studies; (3) participate in an alternative program; (4) change the student's major, degree, or certificate program; or (5) refrain from joining or cease participating in any course, activity, or program at the University. The university will provide reasonable accommodations to pregnant students that would be provided to a student with a temporary medical condition and that are related to the health and safety of the student and the student's unborn child. These could include maintaining a safe distance from substances, areas, and activities known to be hazardous to pregnant individuals and their unborn child; excused absences because of illness or medical appointments; modified due dates for assignments; rescheduled tests/exams; taking a leave of absence; and being provided access to instructional materials and video recordings of lectures for excused absences, if these would be provided to any other student with an excused absence. Pregnant/parenting students are encouraged to contact the Title IX Coordinator with any questions or concerns related to their status (titleix@tamusa.edu; 210-784-2061; CAB 439K).

Texas A&M-San Antonio has also designated the Title IX Coordinator as the liaison officer for current or incoming students who are the parent or guardian of a child younger than 18 years of age. The Title IX Coordinator can provide students with information regarding support services and other resources.

Students' Rights and Responsibilities: The following statement of students' rights and responsibilities is intended to reflect the philosophical base upon which University Student Rules are built. This philosophy acknowledges the existence of both rights and responsibilities, which is inherent to an individual not only as a student at Texas A&M University-San Antonio but also as a citizen of this country.

Students' Rights

1. A student shall have the right to participate in a free exchange of ideas, and there shall be no University rule or administrative rule that in any way abridges the rights of freedom of speech, expression, petition and peaceful assembly as set forth in the U.S. Constitution.
2. Each student shall have the right to participate in all areas and activities of the University, free from any form of discrimination, including harassment, on the basis of race, color, national or ethnic origin, religion, sex, disability, age, sexual orientation, or veteran status in accordance with applicable federal and state laws.
3. A student has the right to personal privacy except as otherwise provided by law, and this will be observed by students and University authorities alike.
4. Each student subject to disciplinary action arising from violations of university student rules shall be assured a fundamentally fair process.

Students' Responsibilities

1. A student has the responsibility to respect the rights and property of others, including other students, the faculty and administration.
2. A student has the responsibility to be fully acquainted with the published University Student Rules found in the Student Handbook, Student Code of Conduct, on our website, University Catalog and to comply with them, as well as federal, state, and local laws.
3. A student has the responsibility to recognize that student actions reflect upon the individuals involved and upon the entire University community.
4. A student has the responsibility to recognize the University's obligation to provide an environment for learning.
5. A student has the responsibility to check their university email for any updates or official university notification.

We expect that students will behave in a manner that is dignified, respectful, and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

Students are expected to exhibit a high level of honesty and integrity in their pursuit of higher education. Students engaging in an act that violates the standards of academic integrity will find themselves facing academic and/or disciplinary sanctions. Academic misconduct is any act, or attempt, which gives an unfair advantage to the student. Additionally, any behavior specifically prohibited by a faculty member in the course syllabus or class discussion may be considered as academic misconduct. For more information on academic misconduct policies and procedures please review the Student Code of Conduct.

No Use of Generative AI Permitted

This course assumes that all work submitted by students will be generated by the students themselves, working individually or in groups. Students should not have another person/entity do the writing of any portion of an assignment for them, which includes hiring a person or a company to write assignments and/or using artificial intelligence (AI) tools like ChatGPT. Use of any AI-generated content in this course qualifies as academic dishonesty and violates Texas A&M-San Antonio's standards of academic integrity.

Important Dates:

January 16	First day of class
March 11-17	Spring Break – No classes
March 29	Study Day – No classes
April 13	Last day to drop with an automatic “W”
April 20	Last day to drop a course or withdraw from the University
April 29	Last day of classes
April 30	Study Day – No classes
May 1-7	Final exams

The complete academic calendar is available online: <https://www.tamusa.edu/academics/academic-calendar/index.html>

Note that you are required to read the Chapters that we are covering for the week.

WEEK	CHAPTER	TOPICS
1 Aug 26	1	Introduction, Types of Data
2 Sep 2	2	Exploring Data With Tables and Graphs
3 Sep 9	3	Describing, Exploring, And Comparing Data
4 Sep 16	4	Set Theory And Probability
5 Sep 23	Review	EXAM 1 Wednesday September 25th
6 Sep 30	4	Set Theory And Probability
7 Oct 7	5	Discrete Probability Distributions
8 Oct 14	6	Normal Probability Distributions
9 Oct 21	6	Normal Probability Distributions
10 Oct 28	Review	EXAM 2 Wednesday October 30th
11 Nov 4	7	Estimating Parameters and Determining Sample Sizes
12 Nov 11	8	Hypothesis Testing One Sample
13 Nov 18	9	Hypothesis Testing Two Sample Thanksgiving Break
14 Nov 25	10	Correlation and Regression
15 Dec 2	11	Goodness of Fit and Analysis of Variance Final Review
16 Dec 9	Final	Final Exam Wednesday December 11th (10-11:50 AM)

NOTE: The instructor reserves the right to make changes to the syllabus as needed. If changes are made, you will be notified of the changes in class, posted on Blackboard, or by your university e-mail address