

Course Syllabus**Biostatistics I, CTS 527/NUTR 206
Fall 2022****Course Director: Angie Mae Rodday, PhD, MS**E-mail: arodday@tuftsmedicalcenter.org

Office hours: During or immediately after lecture session on Monday; by appointment

Contact: The best way to contact me is via email. I am typically available Mon-Fri 8:30am-5pm (ET) and will try to respond within 1-2 days.

Lab Instructor: Tanya Karagiannis, PhD, MSEmail: tkaragiannis@tuftsmedicalcenter.org

Office hours (R/RStudio related): During lab session on Wednesday; by appointment

Contact: The best way to contact me is via email. I am typically available Mon-Fri 8:30am-5pm (ET) and will try to respond within 1-2 days.

Lab Instructor & Teaching Assistant: Ben Koethe, MPHEmail: bkoethe@tuftsmedicalcenter.org

Office hours (homework/RStudio related): During lab session on Wednesday; by appointment

Contact: The best way to contact me is via email. I am typically available Mon-Fri 8:30am-5pm (ET) and will try to respond within 1-2 days.

Course Information:

Credit/s: 2.5 credits for CTS527; 3 credits for NUTR206

Grading Option: A-F

Required or Elective: Required

Prerequisites: none

Course Contact Hours, Meeting Schedule, and Location:

This course has lecture/discussion and lab components and meets from September 7 to December 19, 2022. This course will be held in person. Zoom will be available for students who are geographically distant, or who require remote access due to illness or research-related events (e.g., conferences). You may request permission from faculty to record a session if you cannot attend a class due to illness or research-related events (e.g., conferences).

Lecture/Discussion: Mondays 2:30-4:30pm (ET) (Bring laptop)
MEB 507. Exceptions: **TBD** on 10/31. MEB 221 on 11/7.

R/RStudio Lab: Wednesdays 3-5pm (ET) (Bring laptop)
MEB 316

Refer to CTS Weekly for any additional changes in schedule or location

Brief Course Description:

This course introduces the basic principles and applications of statistics, as they are applied to problems in health and nutrition research. The emphasis is on developing an understanding of the assumptions,

limitations, practical considerations and critical thinking in the use of statistical methods in health and nutrition research.

Learning Objectives:

At the conclusion of the course students should be able to:

1. Understand the process of statistical investigation of data used in the health professions.
2. Apply the steps of statistical inference:
 - select appropriate statistical tests for their hypothesis,
 - use computers to explore data and perform statistical tests,
 - interpret results and computer output for commonly used statistical procedures.
3. Use statistical software (R/RStudio) to explore and analyze data.

Course Texts and Materials:

- *Principles of Biostatistics*, by Pagano and Gauvreau. Second Edition (Cengage Learning). Required.
 - Free electronic version available through Tufts Library.
 - Available for purchase at Amazon.
- *Introductory Statistics with R (Statistics and Computing)*, by Peter Dalgaard. Second Edition (Springer). Suggested.
 - Free electronic version available through Tufts Library.
- Lecture notes, lab material, videos, additional readings, and other material will be posted on Canvas.

Assignments and Grading:

ASSIGNMENTS	GRADING WEIGHT
Participation	10%
Discussion board (n=10)	10%
Homework (n=5)	30%
Quizzes (n=2)	30%
Final Project	20%
Total:	100%

Participation:

The following components contribute to participation in lecture and lab: attendance, asking and answering questions, and engaging in class discussions and activities.

Discussion Board:

The weekly Canvas discussion board will include prompts based on lectures, readings, or other statistical topics. Students should post based on these prompts; they may also respond to other student's posts. Common themes will be discussed in the Monday's sessions. Discussion board posts are due by 5pm on Sundays. Throughout the semester, there are 13 discussion board posts, but only 10 need to be completed for full credit. Of note, some of the discussion board posts are mandatory because they are required for an in-class activity. Students are encouraged to do all posts, or at least do the readings associated with all posts.

Homework:

Homework assignments will be posted in the Assignment section of Canvas; most questions will be from the course textbook (Pagano and Gauvreau). Typically homework will be assigned on Wednesday and due the following Friday at 5pm (upload to Canvas). Although you may work with other students on homework assignments, your handed-in assignments must represent your own work.

Quizzes:

There will be two quizzes throughout the semester. Quizzes will be open-book and open-note format. Students must work independently, but may ask faculty clarifying questions. Calculators are allowed.

Final Project:

Students will complete a “real world” data analysis project and write-up. Additional details on the project will be provided later in the semester. The final written project will be due at 5pm on Monday, 12/19/22.

Expectations:

- Attend all classes and statistical computing labs
- Read assigned materials prior to class.
- Actively participate in class discussions and the online discussion board.
- Demonstrate an understanding of the use of statistics on assignments, quizzes, and projects.
- Demonstrate the ability to use statistical programming in analyzing data with R/RStudio.

Penalties for late or incomplete assignments:

Late assignments are generally not accepted. Reach out to the instructors as soon as possible with any unavoidable, extenuating circumstances (e.g., illness).

Remediation Policy:

Remediation is generally not offered. Reach out to the instructors if you think you are at risk of failing the course.

Course and Assignment Schedule:

WEEK	TOPIC OR CLASS TITLE	ASSIGNMENTS	READING
Week 1, 9/7	Lecture: Introduction -Introduce course, syllabus, expectations -Introduce biostatistics -Define variables and summary statistics	-Discussion post (mandatory)	P&G Ch 1-3
	Lab: Introduce R (Ben K) -Objects in R -Read in data in R		
Week 2, 9/12	Lecture: Probability & Probability Distributions -Explain rules of probability -Diagnostic testing -Explain probability distributions	-Discussion post -HW1 assigned (9/14)	P&G Ch 6 & 7
	Lab: (Tanya K) -Summarize data -Calculate probabilities from distributions		
Week 3, 9/19	Lecture: Estimation & Confidence Intervals -Sampling distribution of the mean -Confidence intervals	-Discussion post -HW1 due (9/23)	P&G Ch 8 & 9
	Lab: (Tanya K - remote) -Confidence intervals -Data manipulation		
Week 4, 9/26	Lecture: Hypothesis Testing -Study design (optional-review slides independently) -Hypothesis testing	-Discussion post (mandatory)	P&G Ch 10
	Lab: (Tanya K) -Functions, packages, and libraries -Data manipulation		
Week 5, 10/3	Lecture: Comparing Means -T-test -ANOVA	-Discussion post -HW2 assigned (10/5)	P&G Ch 11 & 12
	Lab: (Ben K) -T-tests		
Week 6, 10/10	No class on Monday (10/10) for Indigenous People Day	-Discussion post -HW2 due (10/14)	

	Lab: (Ben K) -ANOVA		
Week 7, 10/17	Quiz 1 on 10/17 Lab on 10/19 cancelled		
Week 8, 10/24	Lecture: Non-parametric tests -Wilcoxon signed rank, Wilcoxon rank sum, Kruskal-Wallis -Missing data Lab: (Ben K) -Non-parametric tests	-Discussion post -HW3 assigned (10/26)	P&G Ch 13
Week 9, 10/31	Lecture: Inference on Proportions, part 1 -Contingency tables and tests (Chi-square test, Fisher exact test, McNemar test) Lab: (Tanya K) -Tests for proportions	-Discussion post -HW3 due (11/4)	P&G Ch 14 & 15
Week 10, 11/7	Lecture: Inference on Proportions, part 2 -Measures of association -Mantel Haenszel Lab: (Tanya K) -MH test -OR function	-Discussion post -HW4 assigned (11/9)	P&G Ch 16
Week 11, 11/14	Lecture: Correlation -Correlation -Introduce final project Lab: (Tanya K) -Correlation	-Discussion post (mandatory) -Final project assigned (11/14) -HW4 due (11/18)	P&G Ch 17
Week 12, 11/21	Quiz 2 on 11/21 No lab on 11/23		
Week 13, 11/28	Lecture: Linear Regression, part 1 -Introduction to linear regression Lab: (Ben K) -Linear regression	-Discussion post (mandatory) -HW5 assigned (11/30)	P&G Ch 18
Week 14, 12/5	Lecture: Linear Regression, part 2 -Multiple linear regression Lab: (Ben K) -Multiple linear regression	-Discussion post -HW5 due (12/9)	P&G Ch 19
Week 15, 12/12	Lecture: Linear Regression, part 3 -Model fit Lab: (Ben K) -Model fit		
Week 16, 12/19	No Lecture or Lab	-Final project due (12/19)	

This schedule is subject to modifications at the discretion of the course director.

UNIVERSITY AND GSBS POLICY

Diversity, Equity, and Inclusion for all Tufts Community Members:

It is our commitment that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender, sex, sexuality, disability, age, socioeconomic status, ethnicity, race, and

culture. Please let us know ways to improve the course for you personally or for other students or student groups.

Modified from: [University of Iowa College of Education](#)

Religious Accommodations

Both university policy and Massachusetts law provides that students unable to attend classes, participate in required course or lab activities, or take a scheduled examination because of religious observance will be provided with reasonable opportunity to make up the course work without adverse effects. The University's Religious Accommodations Policy is available at <https://oeo.tufts.edu/wp-content/uploads/ReligiousAccommodationPolicy.pdf>. Students requiring an accommodation should contact the course director prior to the requested dates to work out suitable accommodations.

Decolonization

The course director and lecturers acknowledge the damage done to BIPOC communities by generations of systemic racism within academia. The director also acknowledges that this is a particularly difficult time to be students, and that the political, medical, economic and personal stresses that have been amplified in the past few years disproportionately affect already marginalized students. This course enthusiastically supports the University's stated anti-racist goal (<https://gsbs.tufts.edu/news/2021/03/deans-message-february-22-2021>) and in pursuit of this, will abide by the following policies.

1. The director and lecturers will seek and use course resources that are inclusive of race, socio-economic standing, gender, sexuality, disability, immigration status, English language learning status, and first-generation status.
2. Microaggressions, along with any other racist remarks, actions or behaviors will not be tolerated.
3. Students experiencing challenges are encouraged to reach out to Dan Volchok (daniel.volchok@tufts.edu) or individuals whom they feel comfortable talking to and discuss solutions.

Students are encouraged to reach out to the course director with any suggestions for adjustments or further course guidelines.

Course Expectations

In addition to the course specific late work and remediation policies detailed above, students, course director and lecturers acknowledge the following:

1. The director accepts responsibility to notify students early if expectations regarding learning, attendance or participation are not being met.
2. The course director will make themselves available by multiple avenues of communication and if needed, will work with students to find mutually convenient times to meet.
3. Opportunities may be available, upon request, to retake missed or late work. If a student falls behind, the director may provide opportunities for that student to catch up. If a student is struggling to understand the material, the course director will work with the student on strategies to better understand the material.
4. Mistakes are expected and respected, and the director will make conscious efforts to prevent them from biasing their opinion of students. The director acknowledges that graduate level biological science material is difficult, and the best way to learn it is by engaging at the limits of your knowledge. If done well, this inevitably will lead to mistakes being made.

University Policies:

- **Sexual Misconduct Policy:** Tufts is committed to providing an education and work environment that is free from sexual misconduct. If you or someone you know has been harassed or assaulted, please contact Dan Volchok, the GSBS Sexual Misconduct Reporting Liaison, at 6-6767 or daniel.volchok@tufts.edu. He can help you find appropriate resources and discuss your options. Anonymous reporting is available through the Tufts anonymous Incident Report Form: (https://tuftsuniversity.ethicspointvp.com/custom/tuftsuniversity/oeo/form_data.asp). Students may also

obtain free confidential counseling through Talk One2One at 1-800-756-3124. Campus police may be contacted at 6-6911.

- ***Americans with Disabilities Act Policy:*** Tufts University is committed to providing reasonable accommodations for qualified individuals with disabilities. If you are interested in seeking accommodations in courses or in a laboratory setting, please contact Dan Volchok, the GSBS Disability Officer, at 6-6767 or at daniel.volchok@tufts.edu.
- ***Tufts Information Stewardship Policy*** outlines the actions all members of the Tufts community are expected to follow when working with institutional data and systems (<https://it.tufts.edu/ispol>).
- ***Academic Conduct:*** All students are responsible for compliance with all academic standards and policies, including plagiarism and academic integrity, as outlined in the Graduate School of Biomedical Sciences Student Handbook (<https://gsbs.tufts.edu/studentLife/StudentHandbook>).
- ***Disclosing Conflicts of Interest:*** The course director and lecturers, including guest lecturers, are expected to disclose any significant financial interests or conflicts of interest that might undermine, appear to undermine, or have the potential to undermine the objectivity of their lecture content and assigned reading materials.

Revised July 2022