

Introduction to Statistics for Health Applications

CH – 31

Fall 2017

Please email me if there are typos or unclear statements on this syllabus. I am happy to make corrections and repost the document.

Instructor

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Course Description

The goal of this course is to introduce students to the topic of statistics as it relates to public health and research in the health fields. It emphasizes the applications of statistics in the health fields and does not attempt to provide mathematical derivations of statistical equations. It does not require knowledge of calculus.

Students will learn to use the computer program Excel. Excel is available on the computers in Eaton Lab; students are not required to purchase a copy of the program. There are also new online resources for Tufts students through Lynda Campus (<https://it.tufts.edu/lyndacampus>) with online course materials to help students learn Excel and SPSS.

CH-31 covers a number of concepts that relate to *quantitative data analysis*. For students who wish to learn about *qualitative data analysis*, I recommend the new course, CH-99, taught by Dr. Shalini Tendulkar.

Prerequisites

There are no prerequisites for this course. All students in this course should be Community Health majors or should intend to declare CH as their major. Some students find that it helps to take epidemiology (CH-154) *before* enrolling in CH-31, others take both at the same time and find that the concepts are mutually reinforced, and others prefer to take CH-154 later. The choice is entirely individual.

Students looking for a more challenging statistics course are encouraged to consider courses such as CEE-156 and PH-205. CH-31 is taught at the introductory level. Students with substantial interests in biostatistics and epidemiology are encouraged to consider whether a slightly faster-paced course would better meet their needs.

Required Materials

1. TRIOLA, M. M. & TRIOLA, M. F. 2006. *Biostatistics for the Biological and Health Sciences*, Boston, Pearson.
2. Calculator – any type, but it *cannot* also be a phone/laptop/tablet/etc. (needs to be useable during quizzes and exams)

Please note that a copy of the course textbook will be on reserve at Tisch library. No student should feel obligated to purchase the textbook and I encourage sharing textbooks with friends, given the cost of higher education. Any tables/figures from the textbook that are needed for a quiz or exam will be given out as photocopies on the day of the quiz/exam.

Optional Materials

1. WHEELAN, C. J. 2013. *Naked Statistics: Stripping the Dread from the Data*, New York, W.W. Norton & Company.

To read the first pages of the book, see [Amazon](#) and click to “Look Inside” the book.

Grading

Please choose a grading plan for the final course grade by September 13, 2017 at 5pm (email me: karen.kosinski@tufts.edu). If I don't hear from you by that time, I will choose your grading plan. These plans cannot be changed after September 13th unless there are **extenuating circumstances** (see below). If you are not mastering the material and skills, email me to set up an appointment to talk about progress. I will work with you to identify study strategies and resources on campus that might be helpful. If you want to choose a grading plan with homework counting for 0%, email me; this will depend on the individual student's academic record.

	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5
Homework	7	10	10	15	15
Average of top $n - 1$ (of n) quiz grades	60	65	60	60	55
Cumulative Final Exam	33	25	30	25	30
Total %	100	100	100	100	100

Attendance

Attendance in class is required. Students who attend class regularly do better than their classmates on homework, quizzes, and the final exam. Attendance also answers most student questions about the material, which prevents me from having to teach the material one-on-one with individual students (I don't have time to do this). Missing class also slows down the rest of your classmates when you have questions about material that you missed.

If you miss class, please get notes from a friend and read the textbook chapter *before* emailing me with questions or to get help. You may miss a maximum of 2 classes over the course of the semester. If you miss more than 2 classes, I will ask you to check in with your alpha dean. Plan your missed classes very carefully if you know that you will need to miss class for a specific reason. Email me at the beginning of the semester about extenuating circumstances.

Homework

Nature of Assignments

Homework assignments may be from the textbook, created by me, or from some other source. They are designed to offer opportunities for practice with statistical concepts prior to quizzes and the final exam. Homework is intended to be a learning opportunity; for this reason, students will often be assigned problems that are either odd-numbered (solutions in the back of the textbook) or similar to odd-numbered problems.

Due Dates

Homework will typically be due on a weekly basis. Homework assignments must be submitted on time or they will not be accepted.

Revisions

Students may not revise and resubmit a homework assignment. The grade received on homework is final unless a grading error was made. Students are encouraged to meet with me well in advance of a deadline to discuss concerns with, questions about, or difficulties with a homework assignment. If it is not possible to make it to my office hours, please email me for an alternative meeting time. Questions about homework *may* not be answered by email unless they require only a brief, clarifying response. However, you are always welcome to send an email well in advance of the due date and I will try to answer it via email, if possible.

Teamwork & Group Work

Students in CH-31 may work with other students on homework assignments but they must (a) personally understand all homework solutions that are submitted and (b) personally carry out all calculations submitted as part of their homework. If a student chooses to work with others, **they must list the names of their collaborators** on the cover sheet of their homework submission and *clearly* indicate their own name. Every student must submit their own copy of the homework (i.e. no group or team submissions).

Quizzes

Approximately nine quizzes will be given during the semester. These quizzes will be given for roughly each chapter of the textbook and are not cumulative. They are designed to assess retention of course material and ability to perform statistical tests and calculations. There will be no make-up opportunities for quizzes. Quizzes will typically be given at the beginning of a class period and will last for ~20 to ~40 minutes.

Cumulative Final Exam

A cumulative final exam will be given during finals week. For this exam, students will be allowed to bring a “cheat sheet” and a calculator. Students are expected to demonstrate an understanding of material that was learned at any point during the full semester. The format and level of difficulty of the questions on the Final Exam will be very similar to those on the Quizzes taken throughout the semester, but final exam will last longer.

Associated Readings

Readings that correspond to each class period are listed below. Students may choose to read these book sections or not, depending on their level of comfort with the material. Students are responsible for all content in any assigned reading, regardless of whether or not the content is explicitly covered during a class session.

I recommend that students read the assigned section *before* attending class. I also recommend that students develop a list of questions from the reading that they can then bring to class for clarification.

Class Notes

I will post the majority of the course notes on Trunk, but there is no guarantee that a given set of notes will be posted. Students are responsible for taking their own notes during class unless they have a compelling reason for someone else to do so (email me). No student is required to share her or his notes if she/he does not wish to do so. Students who miss 3 or more class sessions are asked not to use notes from other students; doing so constitutes cheating.

Miscellaneous

Extra Credit

Extra credit opportunities are not provided.

Plagiarism & Cheating

Plagiarism is using someone else's *words, ideas, or phrases* in one's own work and representing it as one's own or failing to use quotation marks to indicate copied text. It is discussed further in a handbook called [Academic Integrity @ Tufts](#), issued by the Dean of Students. As required by Tufts University, students who plagiarize will be automatically reported to the appropriate academic dean.

For this course, cheating is defined as the following: (a) **consulting** technology or other people during a quiz or exam; (b) **accessing** a phone, tablet, or other device during a quiz or exam; (c) representing homework as one's own work when in fact it is the work of others and there is no acknowledgement; (d) using a homework assignment completed by any other person for studying – however, it's okay to work *with* another student to check your own mistakes/calculations on problems you answered incorrectly on your own homework; and/or (e) using notes taken by another student if you have missed 3 or more class sessions. Any student who cheats will be reported to the appropriate academic dean for cheating. Do not keep your cell phone in your pocket during exams. Do not keep it in an open pocket of your bag. Do not have it anywhere near you while taking the exam.

As much as I dislike taking the following precaution, students will not be allowed to leave the classroom during a quiz or exam. A note from a healthcare provider will be required for any student expecting any sort of emergency during the quiz/exam. Please plan appropriately. Among the hundreds of students I have taught, this issue arises *very rarely*, but when it does, it is often under very questionable circumstances and I find it necessary to spell out this policy in writing. I apologize for the inconvenience to all students who would never consider cheating.

Students with Disabilities

Students who require accommodations as a result of a documented disability should register with the Disability Services Office at the beginning of the semester. Students who require accommodations should call the Student Services Desk at 617-2000 to arrange an appointment with Disability Services.

Questions about Grades

Feel free to contact me about any concerns you have about your **overall grade** in CH-31. Do not feel as though you need to wait until your grades are *consistently* lower than you would like; email me for an appointment to discuss them as soon as you feel concerned. I am always happy to work with students to ensure that they achieve at the highest possible level.

You may have questions about a grade earned on a **particular assignment**. If questions arise, please wait until 24 hours have passed between receiving the grade and asking questions about it. If you do have questions about a grade, ask for clarification about the grade *within two weeks of earning the grade*. You must request the clarification in writing via email (NOT before or after class).

Extenuating Circumstances

Extenuating circumstances arise and may take a number of different forms; they ARE grounds for special consideration for quizzes, exams, and homework assignments. Examples of extenuating circumstances are the following: a death in the immediate family; death of a close friend/loved one; illness that is documented by a health care practitioner (for quizzes, the health personnel must state that a student is too ill to take an exam); ongoing health concerns that will cause a student to miss multiple class sessions (e.g. cancer treatment, sickle-cell anemia treatment, etc.).

For scheduled events such as family weddings and academic conferences that conflict with quizzes or the final exam, please let me know immediately when the event is and what assignments you will miss. These absences will still count against your max. 2 absences for the semester. Please do not plan to leave campus early at the end of the semester and miss the final exam.

Technology Policies

I ask that students not use laptops, tablets, phones, or other types of technology (outside of a calculator) during class periods. These are distracting to other students and do not create a positive learning environment. Please let me know via email if this policy presents a hardship.

Conceptual Course Objectives

1. Introduce students to statistical concepts of major importance
2. Promote critical thinking skills by requiring that students understand, practice, and apply statistical tests in a health context
3. Improve the ability of students to read the peer-reviewed literature in the health sciences, particularly with respect to common statistical tests
4. Present an overview of statistical concepts that will be relevant for students seeking to conduct research in the future
5. Provide students with a forum to practice exploratory data analysis

Course Competencies

1. Describe the potential roles of bias, confounding and chance as possible explanations for findings.
2. Describe basic concepts of probability, random variation, and commonly used statistical probability distributions (normal, *Student's t*, binomial, Poisson).
3. For quantitative data, distinguish among different measurement scales/levels of data and the implications for selection of statistical methods to be used based on data characteristics.
4. Apply descriptive techniques that are commonly used to summarize public health data (e.g., frequencies, means, range).

5. Apply common statistical methods of inference.
6. Present quantitative data in tables and graphs using the clearly understandable and generally accepted formats.
7. At a basic level, describe basic features, strengths and weaknesses of study designs; this is mainly covered in CH-154.

Course Schedule (*subject to change*)

Date	Day	Quiz	Topic	Associated Reading
9/6	Wed		Course overview, data types, experimental design	pp. 4 - 18
9/11	Mon		Frequency distributions, data visualization	pp. 25 - 40
9/13	Wed		Measures of central tendency, measures of variation	pp. 42 - 65
9/18	Mon	Quiz 1	Z scores and relative measurements, exploratory data analysis (start)	pp. 69 - 83
9/20	Wed		Exploratory data analysis (finish), probability (start)	pp. 92 - 107
9/25	Mon		Probability (finish), addition rule, multiplication rule, conditional probability, Bayes' Theorem	pp. 109 - 125
9/27	Wed		RR and OR, factorials, combinations, permutations	pp. 127 - 134 & 141 - 147
10/2	Mon	Quiz 2	Random variables, binomial distribution	pp. 158 - 179
10/4	Wed		Binomial distribution (finish), Poisson data	pp. 182 - 184
10/9	Mon		NO CLASS - INDIGENOUS PEOPLES' DAY	
10/11	Wed		Normal distribution (start)	pp. 192 - 210
10/16	Mon	Quiz 3	Normal distribution (finish)	pp. 192 - 210
10/18	Wed		Sampling distributions and estimators, Central Limit Theorem (start)	pp. 212 - 219 & 221 - 229
10/23	Mon		Central Limit Theorem (finish), normal approximation of binomial	pp. 231 - 239
10/25	Wed	Quiz 4	Quantile-Quantile plots, confidence intervals, estimating population proportions	pp. 241 - 246 & 256 - 268
10/30	Mon		Estimating pop. mean with sigma unknown, estimating pop. variance	pp. 284 - 294 & 297 - 305
11/1	Wed		Hypothesis testing, type I and II errors (start)	pp. 316 - 334
11/6	Mon	Quiz 5	Type I and II errors (finish), testing claims about proportions	pp. 337 - 344
11/8	Wed		Testing claims about mean with sigma unknown	pp. 353 - 360
11/13	Mon		Testing claims about standard deviations and variances	pp. 364 - 367
11/15	Wed	Quiz 6	Inferences about proportions and means from independent samples	pp. 378 - 396
11/20	Mon		Inferences from matched pairs, ORs and RRs; comparing variation in two samples	pp. 400 - 418
11/22	Wed		NO CLASS - THANKSGIVING BREAK	
11/27	Mon		Correlation (start)	pp. 428 - 448
11/29	Wed	Quiz 7	Correlation part II (finish), regression (start)	pp. 428 - 448
12/4	Mon		Regression (finish), variation and prediction intervals	pp. 449 - 460
12/6	Wed		Multiple regression	pp. 464 - 470 & 472 - 480
12/11	Mon	Quizzes 8 & 9	Quizzes 8 & 9 (9 is optional)	
12/19	Tue		Final Exam - Occurs in the E Block for Final Exams (3:30 - 5:30pm)	