University of Pittsburgh | Graduate School of Public Health

BIOST 2011: Principles of Statistical Reasoning

Spring 2022
Mondays, 4:00 – 5:15 pm (class) and 5:20 – 5:55 pm (recitation)
Wednesdays, 4:00 – 5:15 pm (class)
A115 Public Health or Zoom

Instructional Team

Primary Instructor	Email	Office Hours
Jenna Carlson, PhD	jnc35@pitt.edu	Tuesdays 11 am – noon (Zoom) Fridays 11 am – noon (Zoom or A744 Public Health)

Teaching Assistants	Email	Office Hours (Zoom or A443 Public Health)
Henry Thorpe	HET29@pitt.edu	Wednesdays 1 pm – 2pm Fridays 3 pm – 4 pm
Thien Pham	QTP1@pitt.edu	Mondays 2:40 pm – 3:40 pm Wednesdays 2:40 pm – 3:40 pm
Alex Watts	ALW269@pitt.edu	Thursdays 10 am – 11 am

Course Delivery Model

This class will be remote (via Zoom) Monday, January 10th – Wednesday, January 26th. In-person class will resume on Monday, January 31st. There will be a Zoom option available throughout the term for students needing to stay home due to illness, etc. Please check-in with Dr. Carlson if you need to attend a class remotely. No student should plan to take this course remotely unless they have an approved disability accommodation and they have created a course plan with the instructor. The situation is constantly evolving, and we may change plans in the future. Thanks for your patience and flexibility as we try to provide the best and safest possible learning environment for all.

Course Meetings

These class sessions will be a mixture of didactic material and hands-on practice with example problems with feedback from the instructor and TAs. They are designed for active participation, not observation. Learning statistics is like learning a new language – it is done over time and with lots of practice! Reviewing course notes will *not* be sufficient to learn the material for this course. Thus, your participation in this class is strongly encouraged.

Textbooks

The course materials distributed through Canvas will be sufficient – no textbook is required. However, if you prefer to have a reference text, this course follows the notation of *Biostatistics for the Biological and Health Sciences, 2nd edition* (ISBN: 978-0-13-403901-5). I also recommend *Intuitive Biostatistics* [any edition] by Harvey Motulsky for extra guidance on understanding and interpreting statistical analyses.

For extra help with analysis software consider reviewing *Data Analysis with Stata* (ISBN: 978-1-78217-317-5), which can be read online for free through the University of Pittsburgh library (library.pitt.edu)

Software

Students will perform statistical analyses required for homework assignments using Stata. Download Stata through the Software Download Service (software.pitt.edu).

Course Website (Canvas)

Course materials will be distributed and turned in through course website (canvas.pitt.edu), which you can access by logging in with your Pitt user ID and password. Any announcements will be distribution through Canvas, so please make sure to update your notification preferences. If you need help logging in to Canvas, call the University Help Desk at 412-624-HELP [4357]. If you experience any issues using Canvas, you can click the Help button within Canvas, which includes 24/7 chat or telephone support. You may also find the following resources helpful in navigating Canvas:

Canvas Getting Started Guide
Canvas Student Tour Videos

Course Prerequisites, Description, and Goals

BIOST 2011 is an introductory applied biostatistics course, which introduces the concepts of statistical reasoning as applied to the study of public health problems. This course is designed for public health students that expect to primarily to be able to read and understand statistical procedures in the form of books, journal articles, reports, grants, etc. for public health students and health career professionals who will make use of statistical methods in research projects or in interpreting literature. The course will also give students the ability to perform some basic analyses. Students who intend to be professional research workers in public health areas requiring the daily application of quantitative procedures and statistics should consider taking BIOST 2041. The prerequisite is college level algebra.

The overall purpose of this course is to introduce students to basic probability and one and two sample procedures (point and interval estimation and hypothesis testing) for continuous and discrete distributions. Basic one and two sample nonparametric tests are also presented. An introduction to simple linear regression and one- and two-way ANOVA are also included. This broad goal includes use of statistical software to analyze data sets and answer research questions; recognition of situations when these procedures are and are not appropriate; and intuitive understanding of the rationale used in creating the statistical procedures presented.

Course Learning Objectives

At the conclusion of this course, a student should be able to:

C1. Select quantitative data collection methods appropriate for a given public health context (CEPH MPH Competency #2)
C2. Describe basic concepts of probability, random variation, and commonly used statistical probability distributions.
C3. Describe preferred methodological alternatives to commonly used statistical procedures when assumptions are not met.
C4. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
C5. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate. (CEPH MPH Competency #3)
    To include:
    - C5A. Apply descriptive techniques commonly used to summarize public health data.
    - C5B. Apply common statistical methods for inference.
    - C5C. Apply basic regression methodology.
    - C5D. Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
C6. Interpret results of data analysis for public health research, policy or practice. (CEPH MPH Competency #4)
C7. Explain quantitative methods and policy analysis research and evaluation methods to address health issues at multiple (individual, group, organization, community and population) levels (CEPH DrPH Competency #1)

Student Performance Evaluation

Students will be evaluated based on their performance in the following assessments. All assessments will be graded on a complete/incomplete basis.

Grading Scale

The grade system of this course is designed to reflect each student's mastery of the learning objectives. There are a total of 15 homework assignments (HW) and 15 quizzes. Thus, students will be graded using the following terms:

Final Grade	What you need to do to earn it *
F	Fail to meet the requirements for a D
D	Complete at least 6/15 HWs and 6/15 quizzes within 3 attempts
D+	Complete at least 7/15 HWs and 7/15 quizzes within 3 attempts
C-	Complete at least 8/15 HWs and 8/15 quizzes within 3 attempts
C	Complete at least 9/15 HWs and 9/15 quizzes within 3 attempts
C+	Complete at least 10/15 HWs and 10/15 quizzes within 3 attempts
B-	Complete at least 11/15 HWs and 11/15 quizzes within 3 attempts
B	Complete at least 12/15 HWs and 12/15 quizzes within 3 attempts
B+	Complete at least 13/15 HWs and 13/15 quizzes within 3 attempts
A-	Complete at least 14/15 HWs and 14/15 quizzes within 3 attempts
A	Complete all 15 HWs and 15 quizzes within 3 attempts
A+	Complete all 15 HWs and 15 quizzes with no revisions needed

* within 3 attempts means you are allowed to revise/correct each HW (except HW 15) and quiz up to 2 times within 14 days after the due date

Quizzes

There will be 15 quizzes throughout the semester. Each quiz will consist of 5 multiple choice questions emphasizing the conceptual understanding of the material from the week prior to the due date. Quizzes should be taken in Canvas by Sunday evening each week (11:59 pm Eastern Time on the due date). Quizzes are open note, open internet, but you must work independently. You are forbidden from working with any other person (regardless of whether they are in the class or not) on quizzes. To complete a quiz, a student must earn a score of 80% or better.

If you do not complete the quiz on the first attempt (i.e., your score is <80%), you can write quiz corrections to earn a "complete" for the quiz. To correct a quiz, write the correct answer for each missed question and include a detailed explanation to support the correct answer (i.e., why is that answer correct?). You can submit quiz corrections using a separate assignment link in Canvas (not the original quiz link) that will become available after the quiz due date. Students are permitted to confer with classmates on quiz corrections (as long as the work they submit is entirely their own) and are welcome to ask questions about them during TA or instructor office hours. Submitting a quiz correction does not guarantee a complete; submissions will be evaluated to ensure that the student has demonstrated sufficient understanding of the material to warrant a complete. You may submit up to 2 sets of corrections for each quiz.

These quizzes cannot be taken late without a compelling reason and supporting documentation. Contact Dr. Carlson for help with this. Students with disability accommodations are encouraged to work with the Testing Center to schedule quizzes (http://www.studentaffairs.pitt.edu/drs/).

Homework Assignments (HW)

There will be 15 HW assignments throughout the semester. HW assignments will consist of traditional data analysis problems, in which you must select the appropriate statistical method to use and perform analysis in Stata, and discussion questions in which you must comment on the statistical concepts relating to a prompt. Guidance with HW will be offered during class and recitation. HW assignments are due by Sunday evening (11:59 pm Eastern Time on the due

date). HW will be graded using a rubric that will be available in Canvas. To complete the HW you must achieve "meets expectations" or better for each criterion of the rubric.

If your first attempt on a HW submission does not earn a complete grade, you may revise it up to 2 times (3 total submissions). Any revisions must be completed within 14 days after the original quiz due date (regardless of grading time) and should be submitted using the same Canvas link as the original assignment. You may confer with classmates on revisions if the work you submit is entirely your own. You may also ask questions about them during TA or instructor office hours. Submitting a revision does not guarantee a complete grade; submissions will be evaluated to ensure that the student has demonstrated sufficient understanding of the material to warrant a complete grade.

Working Outside of the Schedule

Materials including assignments will be posted as soon as they are available, so you may be able to work ahead if you need to. Sometimes, I mistakenly forgot to "publish" something on the Canvas page to make it visible to you, so if you think you should have access to something that isn't available, please send me a message.

If something comes up (e.g., you fall ill or need to care for someone in your household), please email me ASAP. We can work out a timeframe for completing the coursework based on your specific situation. I will try my best to be accommodating, but please do not take advantage of this. Working outside the preset course schedule creates extra work for me and the TAs and limits our availability to other students. Also, please note that I do not consider planned trips (vacations, conferences, etc.) to justify accommodations in the assignment due dates.

Late work policy

Late work is NOT accepted without prior approval (before the due date) from Dr. Carlson. Extensions on assignment deadlines may be granted for unforeseen, extenuating circumstances (family emergencies, severe illness, etc.).

Grading concerns

Students have 24 hours after graded work is returned to request a regrade. These requests must be emailed to Dr. Carlson and include an explanation for why the regrade is necessary. Please note: a regrade means the entire assessment will be graded again which may result in a lower grade.

Accommodation for Students with Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 140 William Pitt Union, 412-648-7890 as early as possible in the term.

Academic Integrity Statement

All students are expected to adhere to the school's standards of academic honesty. Cheating/plagiarism will not be tolerated. The Graduate School of Public Health's policy on academic integrity, which is based on the University policy, is available online in the Pitt Public Health Academic Handbook www.publichealth.pitt.edu/home/academics/academic-requirements. The policy includes obligations for faculty and students, procedures for adjudicating violations, and other critical information. Please take the time to read this policy.

Diversity Statement

Pitt Public Health Diversity Statement | Effective Academic Year 2021-22

The University of Pittsburgh Graduate School of Public Health considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Pitt Public Health is committed to creating and fostering inclusive learning environments that value human dignity and equity and promote social justice. Every member of our community is expected to be

respectful of the individual perspectives, experiences, behaviors, worldviews, and backgrounds of others. While intellectual disagreement may be constructive, no derogatory statements, or demeaning or discriminatory behavior will be permitted.

If you feel uncomfortable or would like to discuss a situation, please contact any of the following:
the course director or course instructor;

- the Pitt Public Health Associate Dean responsible for diversity and inclusion;
- the University's Office of Diversity and Inclusion at 412-648-7860 or
- https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form (anonymous reporting form)

Sexual Misconduct, Required Reporting and Title IX Statement

The University is committed to combatting sexual misconduct. As a result, you should know that University faculty and staff members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the University's Title IX office so that the victim may be provided appropriate resources and support options. What this means is that as your professor, I am required to report any incidents of sexual misconduct that are directly reported to me, or of which I am somehow made aware.

There are two important exceptions to this requirement about which you should be aware:

A list of the designated University employees who, as counselors and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: https://www.diversity.pitt.edu/civil-rights-title-ix/make-report/report-form

An important exception to the reporting requirement exists for academic work. Disclosures about sexual misconduct that are shared as part of an academic project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX office.

If you are the victim of sexual misconduct, Pitt encourages you to reach out to these resources:

Title IX Office: 412-648-7860
SHARE @ the University Counseling Center: 412-648-7930 (8:30 A.M. TO 5 P.M. M-F) and 412-648-7856 (AFTER BUSINESS HOURS)

If you have a safety concern, please contact the University of Pittsburgh Police, 412-624-2121.

Other reporting information is available here: https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/make-report

Copyright Notice

Health and Safety Statement

During this pandemic, it is extremely important that you abide by the public health regulations , the University of Pittsburgh's health standards and guidelines, and Pitt's Health Rules. These rules have been developed to protect the health and safety of all of us. Universal face covering is required in all classrooms and in every building on campus, without exceptions, regardless of vaccination status. This means you must wear a face covering that properly covers your nose and mouth when you are in the classroom. If you do not comply, you will be asked to leave class. It is your responsibility have the required face covering when entering a university building or classroom. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

If you are required to isolate or quarantine, become sick, or are unable to come to class, contact Dr. Youk as soon as possible to discuss arrangements.

Course Schedule and Objective Mapping

Week	Class Dates		Description	Assessments	Course Objectives	Assessment Due Date (by 11:59 PM on date)	Revision Deadline (by 11:59 PM on date)
Week 1	1/10	1/12	Course Logistics, Basic Principles	Quiz, HW	N/A	Sunday, January 16, 2022	Sunday, January 30, 2022
Week 2	1/17 *no class*	1/19	Basic Principles continued	Quiz, HW	C1, C4	Sunday, January 23, 2022	Sunday, February 6, 2022
Week 3	1/24	1/26	Descriptive Statistics	Quiz, HW	C5A, C6, C7	Sunday, January 30, 2022	Sunday, February 13, 2022
Week 4	1/31	2/2	Probability; The Normal Distribution	Quiz, HW	C2	Sunday, February 6, 2022	Sunday, February 20, 2022
Week 5	2/7	2/9	One Categorical Variable (CI for a Proportion)	Quiz, HW	C1, C5, C6, C7	Sunday, February 13, 2022	Sunday, February 27, 2022
Week 6	2/14	2/16	One Quantitative Variable (CI for a Mean)	Quiz, HW	C1, C5, C6, C7	Sunday, February 20, 2022	Sunday, March 6, 2022
Week 7	2/21	2/23	Intro to Hypothesis Testing, Statistical Significance, and P-values	Quiz, HW	C1, C5, C6, C7	Sunday, February 27, 2022	Sunday, March 13, 2022
Week 8	2/28	3/2	Two-Sample T	Quiz, HW	C1, C5, C6, C7	Sunday, March 6, 2022	Sunday, March 20, 2022
	3/7 *no class*	3/9 *no class*	*Spring Break*				
Week 9	3/14	3/16	Chi-Squared Tests	Quiz, HW	C1, C5, C6, C7	Sunday, March 20, 2022	Sunday, April 3, 2022
Week 10	3/21	3/23	Paired Data (Paired T and McNemars)	Quiz, HW	C1, C5, C6, C7	Sunday, March 27, 2022	Sunday, April 10, 2022
Week 11	3/28	3/30	ANOVA	Quiz, HW	C1, C5, C6, C7	Sunday, April 3, 2022	Sunday, April 17, 2022
Week 12	4/4	4/6	Linear Regression	Quiz, HW	C1, C5, C6, C7	Sunday, April 10, 2022	Sunday, April 24, 2022
Week 13	4/11	4/13	Logistic Regression	Quiz, HW	C1, C5, C6, C7	Sunday, April 17, 2022	Friday, April 29, 2022
Week 14	4/18	4/20	Nonparametric Procedures	Quiz, HW	C1, C3, C6, C7	Sunday, April 24, 2022	Friday, April 29, 2022
Week 15	4/25	4/27 *no class*	Putting it all together	Quiz, HW	C1, C3, C4, C5, C6, C7	Friday, April 29, 2022	Friday, April 29, 2022 (for Quiz 15 only)

HW Assignment Rubric

This is an example of the rubric used to grade HW assignments. There may be some differences for each HW assignment, depending on what is required to assess the learning objectives for that week's material. Please refer to Canvas for the specific rubric for each assignment.

Criteria	Ratings		
Methods	**Exceeds Expectations** Clear and appropriate use of statistical methods to address research question, choice of method is justified, description of methods is clear and accurate	**Meets Expectations** Mostly appropriate use of statistical methods to address research question, description of methods is clear and accurate with minor exceptions	**Needs Improvement** Inappropriate use of statistical methods to address research question and/or description of methods is unclear or inaccurate
Stata Use	**Exceeds Expectations** Analyses conducted in Stata match described methods, output is formatted in a way that is easy to read	**Meets Expectations** Analyses conducted in Stata match described methods with minor exception, Stata output may be formatted in a way that readable but not ideal	**Needs Improvement** Analyses conducted in Stata do not match described methods, output is incomplete or unreadable
Results	**Exceeds Expectations** All requested results are reported in detail without mistakes; results are consistent with methods and use of statistical software	**Meets Expectations** All requested results are reported; may be small mistakes; results are consistent with methods and use of statistical software with minor exceptions	**Needs Improvement** Minimal results are reported; may be inconsistent with methods and/or use of statistical software
Conclusions and Statistical Thinking	**Exceeds Expectations** Conclusions are consistent with the results, are worded in the context of problem, appropriate statistical terms are use without error	**Meets Expectations** Conclusions are consistent with the results, minimal context is missing, appropriate statistical terms are use with minor exception	**Needs Improvement** Conclusions are sometimes inconsistent with the results, some context is missing, statistical terms are misused
Organization and style	**Exceeds Expectations** Assignment is easy to read and follow, content is well organized, writing is effective and coherent	**Meets Expectations** Assignment is easy to read and follow with some minor exceptions, content is organized, writing is somewhat effective but has some mistakes	**Needs Improvement** Layout of document is confusing at times and/or writing is sometimes unclear