

Introduction to Biostatistics

EPBI 5002, Section 002
Spring 2020
3 Credits



College of Public Health

Instructor Information

Instructor: Jingwei Wu, Ph.D.
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Course Day: Monday, Jan 13th to May 4th

Course Time: 5:30pm-8:00pm
Course Location: STRC, Room 228

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Office Hours: Wed 1-3 pm (in person),
Sun 2-4 pm (Zoom online)
<https://temple.zoom.us/j/3737232642>

Course Prerequisites or Co-Requisites

N/A

Course Description

Students will review fundamentals of descriptive statistics, estimation, and hypothesis testing. More advanced influential methods will be introduced, including, but not limited to, regression and correlation and analysis of variance. At the conclusion of the course, students will be able to analyze real data sets and provide quantitative evidence to support scientific conclusions. The emphasis is on “doing” statistics utilizing sound statistical theory and relying on validated statistical software (SAS) to produce descriptive statistics and inferential analyses, and interpret the results.

The specific topics covered are outlined in the Course Schedule on the last page of this syllabus.

Course Technology Requirements

For those students who enrolled this course outside of main campus, you need to prepare to use Canvas, Zoom, headphones and microphone to take this class online. For all students who registered this course, we will use SAS to produce statistical output. SAS must be downloaded prior to the first day of class. Students need to follow “SAS License” under “Week 1 Module – Assignment” on Canvas course website to install and activate SAS. You will also need to check Canvas weekly or check email for regular announcements. All students are required to comply with Temple University’s Computer and Security Policy at <https://secretary.temple.edu/sites/secretary/files/policies/04.71.11.pdf>.

Course Format/Instructional Methods

Lecture / In-class Exercise / Student Presentation

On average, over the semester, this course will require approximately 9 hours of your time per week. Please plan to spend approximately 9 hours each week reading materials, completing assignments, and

watching assigned videos. These expectations are based on the premise that 1) this course is a 3 credit course that meets for 3 hours each week for 14 weeks and 2) Temple's policy on credit hours states that 1 semester credit is equivalent to 1 hour (50 minutes) of faculty instruction time per week for 15 weeks (inclusive of exam week) AND a minimum of 2 hours of out-of-class student work.

Course Objectives and Competencies

OVERALL COURSE OBJECTIVES

- To develop an understanding of probabilistic and statistical terminology.
- To learn how to appropriately apply statistical procedures in the public health environment.
- To learn how to interpret output from statistical computing packages to draw appropriate inferences, and to report results effectively.

#	LEARNING OBJECTIVE	DEGREE COMPETENCIES ADDRESSED	DIRECT/INDIRECT ASSESSMENT TOOL
1.	Describe the roles biostatistics serves in the discipline of public health	Integrate discussion of techniques, reasoning, and practice using real examples to drive the exposition	Quiz #1, #4, Mid-term
2.	Apply basic statistical methods for summarizing public health data and for inference	Conduct an independent research project, which includes: data extraction, research question proposal, state hypothesis, choose appropriate statistical approach, perform corresponding analysis, draw statistical conclusion, and present scientific interpretation and implementation	Student project and Final presentation
3.	Interpret and present results from the application of basic statistical techniques	<p>a. Distinguish among the difference measurement scales and based on these distinctions recognize the implications for selection of appropriate statistical methods</p> <p>b. Apply descriptive techniques commonly used to summarize public health data</p> <p>c. Recognize concepts of probability, random variation, and commonly used statistical probability distributions</p> <p>d. Apply common statistical methods for inference, including: estimation, confidence intervals, and hypothesis testing</p>	Quiz #1, #2, #3, #4, #5, #6, #7, #8, #9, SAS assignment #1, #2, #3, #4, #5, student project
4.	Ability to organize, interpret and effectively communicate public	a. Describe preferred methodological alternative to commonly used	Quiz #1, #2, #3, #4, #5, #6, #7, #8, #9,

	health concepts and research findings orally and in writing	statistical methods b. Develop written and oral presentations based on statistical analyses for both public health professionals and education lay audiences	SAS assignment #1, #2, #3, #4, #5, student project, mid-term exam, final-term exam
5.	Use appropriate software to conduct data analysis	Use SAS to perform descriptive and inferential analysis, and make proper interpretations based on the SAS output	SAS assignment #1, #2, #3, #4, #5, student project

Additional Course Information

The College of Public Health supports and encourages diversity and inclusion. All students have the right to be addressed by the name and pronouns that they use for themselves. Please be sure to share your preferred pronoun and if you have a preferred name that you wish to be used in the class.

Course Materials

Introductory Statistics from OpenStax™. Print ISBN 1938168208, Digital ISBN 1947172050, www.openstax.org/details/introductory-statistics

Good news: your textbook for this class is available for free online! If you prefer, you can also get a print version at a very low cost.

Your book is available in web view and PDF for free. You can also choose to purchase on iBooks or get a print version OpenStax on Amazon.com.

You can use whichever formats you want. Web view is recommended -- the responsive design works seamlessly on any device. If you buy on Amazon, make sure you use the link on your book page on openstax.org so you get the official OpenStax print version. (Simple printouts sold by third parties on Amazon are not verifiable and not as high-quality.)

Also, there will be **weekly assigned videos** that you need to watch (provided and distributed by Annenberg Learner: Against All Odds: Inside Statistics).

All **weekly course related slides / SAS lab exercise** are prepared by instructor, so you need to review them before and after class.

Required Course Assignments

TAKE HOME QUIZZES

It will typically be due 1 weeks after it was assigned (due date noted on schedule). Must be submitted on time (no later than 11:59pm on due date) via Canvas for full credit. Late submissions (before noon of next day) may receive only up to 75% of a perfect score on the assignments (including take home quiz and SAS lab assignment). Any late submission after noon time of next day will not be graded, and no make-up assignment is allowed.

MIDTERM AND FINAL EXAMS

These are open-book, in-class exams. The Final is not cumulative - will cover topics from only the 2nd half of the semester. The exam dates are on the course schedule. If you need to be absent for any reason, you must inform the instructor in advance (not afterwards); otherwise you get a zero for the exam. A make-up exam may be possible, but that will depend on verifiable reasons beyond your control for missing the exam and whether you qualify for an “Incomplete” as your course grade.

COURSE PROJECT

Each student should attempt to develop a publication-worthy research project using SAS for the statistical analysis. This will require finding a real data set, which is consistent with either their personal interests or academic concentration: e.g.,

<https://archive.ics.uci.edu/ml/datasets.php?format=&task=reg&att=&area=&numAtt=&numIns=&type=&sort=nameUp&view=table>;

<http://www.stat.ufl.edu/~winner/datasets.html>;

<http://www.statsci.org/data/multiple.html>;

http://college.cengage.com/mathematics/brase/understandable_statistics/7e/students/datasets/mlr/frames/frame.html;

<http://guides.emich.edu/data/free-data>;

<https://www.statcrunch.com/5.0/shareddata.php?keywords=regression>

Please submit your proposal (idea, concept for the project) by email **no later than April 5th**. This has to be an independent project where you will have sole responsibility for creating a set of slides and giving an oral presentation in class. The project must use regression analysis with a continuous dependent variable and two explanatory (predictor) variables: one continuous and the other categorical. The presentation will be evaluated for background information, statement of aims and objectives (motivation for the research questions), and description of statistical methods: specification of null and alternative hypotheses, summary statistics, assumptions underlying the regression analysis, clear interpretation of the results and subsequent conclusions.

Course Grading

Take Home Quizzes	25%
Course Project	10%
Lab Assignment	10%
Attendance	5%
Midterm Exam	25%
Final Exam	25%

Grading Scale

93-100 A	87-89 B+	77-79 C+	67-69 D+	0-59 F
90-92 A-	83-86 B	73-76 C	63-66 D	
	80-82 B-	70-72 C-	60-62 D-	

Each assignment will receive a numerical grade and be weighted in the calculation of a final numerical grade as indicated above.

- The highest and lowest take home quizzes will be excluded for the grading calculation
- All lab assignments will be used to calculate final grade
- Bonus points are given in both mid-term exam and final exam
- Final numerical grade is rounded to the nearest integer
- Please do not refer to the letter grade in Canvas as the default grading scales in Canvas does not reflect the weighting factors based on the chart below.

Policy on Attendance and Participation

Students are expected to attend and to participate actively in at least 80% of the class sessions. For this semester, there are 15 in-class sessions (including two exam dates and student project presentation date). Thus, if there are more than 3 absences for these 15 sessions, there will be a decrement in the attendance portion of the grade. Attendance will include regularly attending class, showing up promptly for class, and participating in class discussions. Each absence after missing 3 of the 15 sessions leads to a 10% (0.5 points) decrease in the proportion of attendance grade.

E-mail

To facilitate communication, the university requires you to have an e-mail account ending in @temple.edu (<https://secretary.temple.edu/sites/secretary/files/policies/04.74.11.pdf>). During the semester, I will try to return your e-mail within 36 hours unless I am out of the office or the university is closed. E-mails sent after noon on Fridays will generally not be returned until Monday—please plan accordingly. Please remember that e-mails regarding technological questions should be directed to Temple’s Help Desk at help@temple.edu.

Course Minimum Grade

The Graduate School requires a grade of B- as a passing grade in graduate courses and a 3.0 minimum GPA to graduate. For further questions, please see consult your Graduate Program Director.

Incomplete

A student will be eligible for a grade of “Incomplete” only if he/she/they: 1) has completed at least 51% of the work at a passing level, 2) is unable to complete the work for a serious reason beyond his or her control, and 3) files a signed agreement with the instructor outlining the work to be completed and the timeframe in which that work will be completed. The student is responsible for initiating this process and all signed incomplete forms must be sent to the Associate Dean for Academic Affairs prior to the start of study days in that semester. (<http://policies.temple.edu/PDF/41.pdf>).

Withdrawal from the Course

If a student wishes to withdraw from a course, it is the student’s responsibility to meet the deadline for the last day to withdraw within the current semester (www.temple.edu/registrar/documents/calendars/). Please consult the University policy on withdrawals (<http://policies.temple.edu/PDF/337.pdf>).

Statement on Academic Rights & Responsibilities

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty Academic Rights and Responsibilities (Policy #03.70.02), which can be accessed at <http://policies.temple.edu/PDF/99.pdf>

Academic Honesty

According to the University Student Code of Conduct, students must not commit, attempt to commit, aid, encourage, facilitate, or solicit the commission of academic dishonesty and impropriety including plagiarism, submitting class assignments or work prepared by someone other than the enrolled student, academic cheating in all its forms, and selling lecture notes or other information provided by an instructor without the instructor's authorization. Violations will result in a zero grade on the assignment, project, or exam (at minimum) and/or failing the course, and/or other sanctions as enumerated in the University Code of Conduct, which can be accessed at <http://studentconduct.temple.edu/policies>.

For a paper, assignment, or exam that is >10% of the course grade, the Departmental Academic Honesty Committee will be involved. Specifically, a faculty member who suspects that a paper, major assignment, or exam (>10% of the grade) has been plagiarized or that cheating has occurred, will report the incident immediately to the Departmental Academic Honesty Committee for evaluation. The committee will notify the student in writing within 3 business days from when the offense was reported, and the student will have 3 business days to respond in writing to the offense and organize a face-to-face meeting with the committee (at least 2 members will be present) and the faculty member to decide the best course of action (a zero on the assignment/failing the course or other sanctions as outlined in the University Code of Conduct). The offense will be documented in the student's file and shared with faculty members across the department to prevent future offenses.

Avoiding Plagiarism

All students are expected to meet standards of academic honesty, which includes proper citation of sources, use of quotations when appropriate, and proper paraphrasing and putting writing into your own words when not in quotations. If you have questions on whether you have cited appropriately, please visit the writing center (<https://www.temple.edu/class/programs/writing/index.html>).

Faculty in the Department of Epidemiology and Biostatistics regularly use Turnitin, software linked through Canvas that evaluates student products for plagiarism.

In Canvas, the 'Turnitin' score provides guidance but it does not highlight all incorrect citations. Students should strive to have a 'Turnitin' score of less than 20%. See the following websites for additional information about proper paraphrasing and citation:

<https://writing.wisc.edu/handbook/assignments/quoting/sources/>

<https://columbiacollege-ca.libguides.com/apa/paraphrase>

https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/in_text_citations_the_basics.html

<https://www.plagiarism.org/article/how-to-paraphrase>

See the Temple Library Resources section in the Syllabus for additional information.

Disability Disclosure Statement

Any student who has a need for accommodation based on the impact of a documented disability should contact Disability Resources and Services (DRS), Ritter Annex 100, (215) 204-1280 or 215-204-1786 (TTY) or drs@temple.edu, to make arrangements. Students requesting accommodations should meet with the instructor as soon as possible after the start of classes to discuss their needs and to provide

documentation from DRS. Accommodations are not retroactive.

Counseling Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These concerns or stressful events may lead to diminished academic performance and ability to participate in daily activities. Counseling services are available to assist you. Please refer to the Tuttleman Counseling Center at <https://www.temple.edu/temple-students/health-and-wellness/health-and-counseling>

Sexual Misconduct

Temple University is committed to providing a learning and working environment that emphasizes the dignity and worth of every member of its community, free from discriminatory conduct. Sexual harassment in any form or context is contrary to this commitment and will not be tolerated. Please refer to the University policy on sexual harassment at: <http://policies.temple.edu/PDF/366.pdf> Additional resources related to sexual harassment and ways in which to report an incident can be found at: <http://sexualmisconduct.temple.edu/>. Please be aware that under Title IX of the Education Amendment of 1972, I am required to disclose information about sexual misconduct to the [University's Title IX Coordinator](#).

Permission to Record

Due to the potentially sensitive nature of the material discussed in class, recording of lectures and guest speakers is not permitted without express permission of the faculty member. Recording of lectures as a disability accommodation is permitted, but individual students should speak with the course instructor in advance so that it can be done appropriately and respectfully of those participating in class discussion. Students may not reproduce, sell or otherwise distribute any recorded materials for purposes other than educational reasons.

Library Resources

Students may request appointments with Librarians, who can provide targeted assistance at all stages of an assignment- individual or small group appointments are available. Easy access to program specific resources may be found in Library research guides <http://guides.temple.edu/hsl>. There are multiple campus libraries available to students. The Health Sciences site highlights resources typically used by those in the health professions – go to the Health Sciences Libraries through this link: <https://library.temple.edu/hsl>. You may also connect with a library through the online chat function for assistance: <https://library.temple.edu/hsl/ask>.

Continuity of Instruction in Event of Emergency

Students are to register for the TUAAlert System to be made aware of University closures due to weather or other emergency situations. Please go here to register: <http://www.temple.edu/safety/>. In the event of an emergency, class materials/instructions will be provided via Canvas or Zoom. Registered students will be alerted to any alternate testing or submission of assignment requirements from the instructor via email.

General Policies

All University (www.temple.edu/grad/policies/index.htm) and College of Public Health policies will be upheld. The *Graduate Student Handbooks* for the College of Public Health details College expectations: (<https://cph.temple.edu/student-handbooks>).

Course Schedule

Jan. 27th **Last day to drop the course**

Mat. 18th **Last day to withdraw from the course**

Course schedule below may be subject to change with advanced written notification.

Date	Topics	Assignments
Week 1 (1/13)	Statistics, data and sampling, Displaying data with graphs <ul style="list-style-type: none"> • Warm-up introduction • Course overview • key terms, sampling methods, experimental design • Graphs for categorical / numerical variables, examining data distributions <u>Readings:</u> <ul style="list-style-type: none"> • IS Chapter 1: Sampling and Data • IS Chapter 2: Descriptive Statistics <u>Videos:</u> <ul style="list-style-type: none"> • AL: What Is Statistics? • AL: Census and Sampling • AL: Samples and Surveys • AL: Designing Experiments • AL: Stemplots • AL: Histograms and Distributions 	Quiz 1 (1, 2) DUE: 1/26
Week 2 (1/20)	Martin Luther King Jr. Day, NO CLASS	
Week 3 (1/27)	Displaying data with numbers, density curves and normal distributions <ul style="list-style-type: none"> • Quiz review • Examining data distributions, measuring center and spread for quantitative data, the five-number summary, numerical summary for qualitative data • Density curves, normal distributions <u>Readings:</u> <ul style="list-style-type: none"> • IS Chapter 2: Descriptive Statistics • IS Chapter 6: The Normal Distribution <u>Videos:</u> <ul style="list-style-type: none"> • AL: Measures of Center • AL: Boxplots • AL: Standard Deviation • AL: Normal Curves • AL: Normal Calculations • AL: Check Assumptions of Normality 	Quiz 2 (2, 6) DUE: 2/2
Week 4 (2/3)	Randomness and Probability <ul style="list-style-type: none"> • Quiz review • Randomness and probability, probability models, probability rules, random variables, means and variances of a discrete random variables <u>Readings:</u> <ul style="list-style-type: none"> • IS Chapter 3: Probability Topics 	Quiz 3 (3, 4) DUE: 2/9

	<ul style="list-style-type: none"> IS Chapter 4: Discrete Random Variables <p><u>Videos:</u></p> <ul style="list-style-type: none"> AL: Introduction to Probability AL: Probability Models AL: Random Variables <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> Basic SAS: SAS dataset, reading data into SAS, save SAS permanent dataset 	
Week 5 (2/10)	<p>Sampling Distribution</p> <ul style="list-style-type: none"> Quiz review Key terms, sampling distribution, sampling distribution of a sample mean, binomial distributions sampling distribution of a count, sampling distribution of a sample proportion <p><u>Readings:</u></p> <ul style="list-style-type: none"> IS Chapter 4: Discrete Random Variables IS Chapter 7: The Central Limit Theorem <p><u>Videos:</u></p> <ul style="list-style-type: none"> AL: Binomial Distribution AL: Sampling Distribution <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> Interpretations based on SAS procedures: MEANS, FREQ, UNIVARAITE, SGPLOT 	<p>Quiz 4 (4, 7)</p> <p>DUE: 2/16</p>
Week 6 (2/17)	<p>Introduction to Inference</p> <ul style="list-style-type: none"> Quiz review Statistical inference, confidence interval, tests of significance, power of a significance test <p><u>Readings:</u></p> <ul style="list-style-type: none"> IS Chapter 8: Confidence Intervals IS Chapter 9: Hypothesis Testing with One Sample <p><u>Videos:</u></p> <ul style="list-style-type: none"> AL: Confidence Intervals AL: Tests of Significance <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> Creating new variables using mathematical expressions / functions in SAS 	<p>Quiz 5 (8, 9)</p> <p>SAS Lab 1</p> <p>DUE: 2/23</p>
Week 7 (2/24)	<p>REVIEW FOR MIDTERM</p> <ul style="list-style-type: none"> Quiz review Mid-term review 	
Week 8 (3/2)	Spring Break, NO CLASS	
Week 9 (3/9)	MIDTERM EXAM	<p>SAS Lab 2</p> <p>DUE: 3/15</p>
Week 10 (3/16)	<p>Inference for Distributions</p> <ul style="list-style-type: none"> Mid-term exam review Inference for the mean of a population, comparing two means, inference for one-way analysis of variance <p><u>Readings:</u></p> <ul style="list-style-type: none"> IS Chapter 8: Confidence Interval IS Chapter 9: Hypothesis Testing with One Sample IS Chapter 10: Hypothesis Testing with Two Samples IS Chapter 13: F Distribution and One-Way ANOVA <p><u>Videos:</u></p> <ul style="list-style-type: none"> AL: Small Sample Inference for One Mean 	<p>Quiz 6 (8, 9, 10, 13)</p> <p>DUE: 3/22</p>

	<ul style="list-style-type: none"> • AL: Comparing Two Means • AL: One-Way ANOVA 	
Week 11 (3/23)	<p>Data Relationship</p> <ul style="list-style-type: none"> • Quiz review • Associations between variables, scatterplots, correlation, regression line, least-square regression, two-way tables • Student project proposal <p><u>Readings:</u></p> <ul style="list-style-type: none"> • IS Chapter 12: Linear Regression and Correlation <p><u>Videos:</u></p> <ul style="list-style-type: none"> • AL: Scatterplots • AL: Fitting Lines to Data • AL: Correlation • AL: Two-Way Tables • AL: The Question of Causation <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> • Make appropriate mean inference based on SAS procedure: TTEST, GLM 	<p>Quiz 7 (12)</p> <p>SAS Lab 3</p> <p>DUE: 3/29</p>
Week 12 (3/30)	<p>Inference for Simple Regression</p> <ul style="list-style-type: none"> • Quiz review • Inference for simple linear regression, categorical explanatory variables in regression, analysis of variance for regression, inference for correlation <p><u>Readings:</u></p> <ul style="list-style-type: none"> • IS Chapter 12: Linear Regression and Correlation 	<p>Project proposal</p> <p>DUE: 4/5</p>
Week 13 (4/6)	<p>Inference for Multiple Regression</p> <ul style="list-style-type: none"> • Quiz review • Inference for multiple linear regression, interaction regression model <p><u>Readings:</u></p> <ul style="list-style-type: none"> • IS Chapter 12: Linear Regression and Correlation <p><u>Videos:</u></p> <ul style="list-style-type: none"> • AL: Inference for Regression <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> • Interpretations about correlation and linear models based on SAS procedure: CORR, SGSCATTER, GLM 	<p>Quiz 8 (12)</p> <p>SAS Lab 4</p> <p>DUE: 4/12</p>
Week 14 (4/13)	<p>Inference for Proportions</p> <ul style="list-style-type: none"> • Quiz review • Inference for a single proportion, comparing two proportions, goodness of fit, inference for two-way tables <p><u>Readings:</u></p> <ul style="list-style-type: none"> • IS Chapter 8: Confidence Interval • IS Chapter 9: Hypothesis Testing with One Sample • IS Chapter 10: Hypothesis Testing with Two Samples • IS Chapter 12: The Chi-Square Distribution <p><u>Videos:</u></p> <ul style="list-style-type: none"> • AL: Inference for Proportions • AL: Inference for Two-Way Tables <p><u>In-Class SAS Exercise:</u></p> <ul style="list-style-type: none"> • Interpretations about association between categorical variables based on SAS procedure: FREQ 	<p>Quiz 9 (8, 9, 10, 12)</p> <p>SAS Lab 5</p> <p>DUE: 4/19</p>
Week 15	PROJECT PRESENTATIONS	

(4/20)		
Week 16 (4/27)	PROJECT PRESENTATIONS REVIEW FOR FINAL • Quiz review • Final exam review	
Week 17 (5/4)	FINAL EXAM	

IS: **Introductory Statistics** from OpenStax™.

AL: **Against All Odds: Inside Statistics** from Annenberg Learner.