

Department of Epidemiology and Population Health

EPHD 310
Basic Biostatistics
[3 credits]

Course Syllabus
Fall Semester, Academic Year 2023-2024

Class time and Venue:

Lecture: Monday from 4:00 PM -5:40 PM in Van Dyck building, Auditorium

Labs:

B1: Tuesday from 1:30 PM -3:30 PM in room 103

B2: Wednesday from 10:00 AM -12:00 PM in room 203

B3: Thursday from 5:30 PM -7:30 PM in room 203

Course Instructors and Contact Details:

Dr. Miran Jaffa, Associate Professor of Biostatistics

Van Dyck Office 214

Extension: 4603

Email: ms148@aub.edu.lb

Office hours: by appointment or following the lecture/lab

Course Description:

This course is an introduction for graduate students to statistical techniques applied to health and biomedical related data. The objectives are twofold: *descriptive* and *inferential statistics*. This course will provide theoretical and applied foundation that are needed to: 1) Carry out statistical analyses appropriate for the data and the study design, 2) Deduce accurate inferences and conclusions that concern the study population, 3) Disseminate and interpret biostatistical results and conclusions in a proficient manner. At the end of this course students will be well rounded with the different analytical techniques that range from basic descriptive analysis, to mid-level analysis that distinguishes between different outcomes and applies the unadjusted tests suitable for the data under examination based on the study design and measurement scale, in addition to advanced modelling techniques using regression approaches linear, logistic and non-parametric methods.

Modes of Teaching

- **Lectures:** The instructor will explain using PowerPoint presentations new concepts each week. The students will have access to the presentations prior to the sessions, and they are required to bring hard copies to class so as they take notes. Lecture notes: Will be provided by the instructors via AUB Moodle
- **Labs:** Students will meet with the instructor in the computer lab to learn how to conduct statistical methodologies in order to analyze data using SPSS. Students will also apply the concepts covered in the lectures and practice what they have been taught that week by solving exercises with the instructor.
- **Midterms and Assignments:** Three midterms will be given to evaluate the students' comprehension of the covered material.
- **Grading:** The course will be numerically graded over a total score of 100, and the final course grade will be a letter grade as per AUB regulations.

Course learning Objectives

By the end of the course, students will be able to:

- LO1.** Explain the role of quantitative methods and sciences of biostatistics in describing and assessing a population's health.
- LO2.** Apply the appropriate descriptive techniques commonly used to summarize public health data.
- LO3.** Describe commonly used statistical probability distributions and corresponding estimated parameters.
- LO4.** Analyze quantitative data using common statistical methods for inference through computer based statistical software and manual computation.
- LO5.** Apply alternative statistical methodologies to commonly used statistical methods when assumptions are not met.
- LO6.** Interpret results of statistical analyses found in public health studies and biomedical sciences.
- LO7.** Apply ethical principles to data management and analysis.

Council on Education for Public Health (CEPH) Core Competencies and Foundational Public Health Knowledge (FLOs) mapped to EPHD 310

- **FLO3.** Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health
- **CC3.** Analyze quantitative data using biostatistics, informatics, computer-based programming and software, as appropriate
- **CC4.** Interpret results of data analysis for public health research, policy or practice

Essential Skills

- **Essential Skill 1: Critical Thinking/Analysis** (captured mainly in LO4 & LO5)
- **Essential Skill 2: Problem Solving** (captured mainly in LO2, LO4, & LO5)
- **Essential Skill 3: Public Health Ethics** (captured mainly in LO7)

Essential Skills are assessed through the assessment of the LOs that capture them.

Link to [PHEO Faculty Portal](#)

Course Learning Objectives mapped to CEPH competencies

Table 1. Mapping of course LO to CEPH competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7
FLO3. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health	X						X
CC3. Analyze quantitative data using biostatistics, informatics, computer-based programming and software, as appropriate		X	X	X	X		X
CC4. Interpret results of data analysis for public health research, policy or practice (addressed in						X	

Assigned Text Book and Readings (if applicable)

Required readings:

- Biostatistics; Wayne W. Daniel; 9th or 10th ed.
- Fundamentals of Biostatistics; Bernard Rosner; 5th ed.

Additional Suggested Instructions:

The course will also use an assortment of educational resources including: publications, reports, white papers, videos and case studies. All course readings, except for book chapters, will be posted on Moodle according to the weekly topic and reading schedule. It is the responsibility of students to access the Moodle and download/ print the course readings as per the weekly schedule.

Course requirements and Student evaluation:

Pre-requisites: There are no pre-requisites for this course.

Student Evaluation:

Table-2 Summary of students' assessments mapped to course learning objectives

	Learning Objectives						
	LO1	LO2	LO3	LO4	LO5	LO6	LO7
Midterm 1	X	X	X	X			X
Midterm 2				X	X	X	
Assignment 1	X	X					
Assignment 2			X	X			
Assignment 3				X	X		X

Table -3 Description of Assessment methods, Due Dates and Corresponding Learning Objectives

Assessment method	Date	Grade percentage
Midterm 1	<i>Monday Oct 16</i>	<i>44%</i>
Midterm 1 covers Lectures 1a, 1b 2,3 a, 3b, 4,5		
Midterm 2	<i>To be Decided by the Registrar's Office</i>	<i>44%</i>
Midterm 2 covers Lectures 6, 7a, 7b, 8a, 8b,9 +overall cumulative questions on lectures 1 to 5, date will be set by the Registrar's office		
Assignment 1	<i>Due: October 2</i>	<i>4%</i>
Covers Lecture 1a and 1b		
Assignment 2	<i>October 23</i>	<i>4%</i>
Lecture 2, 3a, 3b, 4, 5		

Assessment method	Date	Grade percentage
Assignment 3	Nov 20	4%
Lecture 6, 7a, 7b		
Policies and other General Notes:		

Academic Integrity/Dishonesty:

Copying and sharing lectures with others is totally forbidden. Copies can be made just for your personal use. Lectures and course material are the property of the professor and cannot be shared with others.

Sharing of Midterms with others is forbidden and falls under cheating and will have repercussions as per the code of conducts for students.

Cheating and plagiarism will not be tolerated. Review the Student Code of Conduct in your handbook and familiarize yourself with definitions and penalties. If you're in doubt about what constitutes plagiarism, ask your instructor because it is your responsibility to know. The American University of Beirut has a strict anti-cheating policy. Penalties include failing marks on the assignment in question, suspension or expulsion from University and a permanent mention of the disciplinary action in the student's records.

Class Rules and Regulations:

- Attendance is encouraged and students are encouraged to be available on time to attend the common lectures and training sessions/Labs.
- Students are expected to attend the section in which they are enrolled in.
- In class participation is encouraged.
- Questions and clarifications related to the covered material are always welcomed.

Special Needs:

AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you are encouraged to contact the Accessible Education Office: accessibility@aub.edu.lb; +961-1-350000, x3246; West Hall, 314.

Non-Discrimination-Title IX-AUB:

AUB is committed to facilitating a campus free of all forms of discrimination including sex/gender-based harassment prohibited by Title IX. The University's non-discrimination policy applies to, and protects, all students, faculty, and staff. If you think you have experienced discrimination or harassment, including sexual misconduct, we encourage you to tell someone promptly. If you speak to a faculty or staff member about an issue such as harassment, sexual violence, or discrimination, the information will be kept as private as possible, however, faculty and designated staff are required to bring it to the attention of the University's Title IX Coordinator. Faculty can refer you to fully confidential resources, and you can find information and contacts at www.aub.edu.lb/titleix.

To report an incident, contact the University's Title IX Coordinator Mitra Taouk at 01-350000 ext. 2514, or titleix@aub.edu.lb. An anonymous report may be submitted online via EthicsPoint at www.aub.ethicspoint.com.

Public Health Education Office (PHEO): PHEO is established for the Faculty and Student portals as hubs for important information. PHEO can be accessed on the following link:

<https://sites.aub.edu.lb/fhspheo/news/>

Accessible Education Office (AEO):

The Accessible Education Office (AEO) coordinates academic accommodations and services for all eligible AUB students with disabilities (such as ADHD, learning difficulties, mental health conditions, chronic or temporary medical conditions, and others). If you have a disability for which you wish to request accommodations at the department, faculty or university level, please contact AEO as soon as possible. Once you register with our office, we will assist you in receiving appropriate accommodations and will liaise with your instructors and any related entity to best support your needs. AEO is located in West Hall room 314, and can be reached by phone at 1-350000 ext. 3246 or by email: accessibility@aub.edu.lb. Information about our services can be found at: <https://www.aub.edu.lb/SAO/Pages/Accessible-Education.aspx>

Writing:

Written communication is essential for communication, health education and behavioral science. You are expected to proofread and spell-check any written documents before submission. Points will be deducted from the grades for low quality writings. You are encouraged to contact AUB's Writing Center, located in Ada Dodge Hall, 2nd floor or West Hall, 3rd floor. Appointments can be booked online: <https://aub.mywconline.com/> over the phone (Ext. 4077) or by walking in.



Public Health Education Office

Please refer to the Public Health Education Office Student Portal

Detailed course outline:

Week	Title and Dates of Lecture/ Practical Sessions	Topic	Relevant Assignment (where your learning on this will be assessed)	Course learning objective LO covered in the lecture
Week 1 and Week 2	Lectures: Introductory Lecture: Introduction to Biostatistics and Biostatistics notations. Lectures 1a, 1b: Descriptive analysis and summary statistics. Weeks of Aug 28 and Sep 4	Introduction to biostatistics, role of biostatistics in public health and biomedical field. Basic definitions in biostatistics such as predictors, outcomes, population, sample, random sample, inferences, variables, random variables, and types of variables. Discussion of the methods for summarizing and describing data numerically and graphically: mean, median mode, variance, percentiles, frequency tables, graphs and charts, percent and valid percent. Lab Application on SPSS and by hand.	Midterm 1 Assignment 1	<i>LO 1, 2 LO 1, 2</i>
Week 3	Lecture 2: Introduction to most common continuous probability distributions: Normal, Standard Normal and Student's t distributions. Week of Sep 11	Normal distribution, Standard normal distribution, Student's t distribution and the corresponding percentiles using the tables for the standard normal and the t distributions.	Midterm 1 Assignment 2	<i>LO 3 LO 3</i>
Week 4 and Week 5	Lecture 3a: Estimation Lecture 3b: Hypothesis testing and paired t test for two dependent groups.	3a: Point and Confidence interval estimation of the population mean of normally distributed data. Hypothesis testing of the population mean of	Midterm 1 Assignment 2 Midterm 1 Assignment 2	<i>LO 3 LO 3 LO 4 LO 4</i>

Week	Title and Dates of Lecture/ Practical Sessions	Topic	Relevant Assignment (where your learning on this will be assessed)	Course learning objective LO covered in the lecture
	<p>Weeks of Sep 18 and Sep 25</p> <p>**Wed Sep 27 is a holiday. So students in this section can attend Tuesday Sep 26 from 1:30 to 3:30 pm; Or Thursday Sep 28 from 5:30 to 7:30</p>	<p>normally distributed data using CI method.</p> <p>3b: Introduction to hypothesis testing: critical, P-value and confidence interval methods. Matched study design and follow-up study design and hypothesis testing/inferences for two matched/dependent groups using paired t test.</p>		
Week 6 and Week 7	<p>Lectures 4 and 5: Independent t test for two independent groups.</p> <p>Weeks of Oct 2 and Oct 9</p>	<p>Hypothesis testing for two-groups inferences: Independent t test for independent study design with independent samples and equal variances, independent t test for independent samples with unequal variances: “Satterthwaite’s Method”, testing the equality of variances between two independent samples: The F Test, F distribution</p> <p>Sample size calculation</p>	<p>Midterm 1</p> <p>Assignment 2</p>	<p><i>LO 4, 7</i></p> <p><i>LO4</i></p>
Week 8	Midterm 1 Monday Oct 16	Midterm 1 covering Lectures 1a, 1b 2,3a, 3b,4,5		<i>LO 1, 2, 3,4,7</i>
Week 9	<p>Lecture 6: Multi-group hypothesis testing using ANOVA, and Correlations.</p> <p>Week of Oct 23</p>	Multi-groups inference using one-way analysis of variance (ANOVA) for normally distributed data and large sample sizes.	<p>Midterm 2</p> <p>Assignment 2</p>	<p><i>LO 4, 6</i></p> <p><i>LO4</i></p>

Week	Title and Dates of Lecture/ Practical Sessions	Topic	Relevant Assignment (where your learning on this will be assessed)	Course learning objective LO covered in the lecture
		Correlations Pearson's and Spearman's for two continuous variables.		
Week 10 and Week 11	<p>Lecture 7a: Hypothesis Testing for Categorical Data in independent study design: Chi-square and fisher exact test</p> <p>Lecture 7b: Hypothesis Testing for categorical data for dependent matched study design</p> <p>Weeks of Oct 30, and Nov 6</p>	<p>Hypothesis testing for categorical data with independent study design: Two-group hypothesis testing for binomial proportions for independent study design using Chi-Square Test and Fisher's Exact Test for categorical data with large and small sample sizes respectively.</p> <p>Hypothesis testing for categorical data with dependent matched study design: Two-sample test for binomial proportions for matched-pair data: McNemar's Test. (Binomial data) and The Kappa statistic.</p>	<p>Midterm 2</p> <p>Assignment 2</p>	<p><i>LO 5, 6</i></p> <p><i>LO5</i></p>
Week 12 and Week 13	<p>Lecture 8a: Linear Regression</p> <p>Lecture 8b: Logistic Regression</p>	<p>Simple and multiple linear regression for normally distributed outcomes: Estimation of slopes point and confidence interval, hypothesis testing, inferences, interpretation of slope and its confidence interval, predictions, coefficient of determination.</p> <p>Simple and multiple logistic regression: odds ratio (OR) estimation point and</p>	<p>Midterm 2</p>	<p><i>LO 4, 6</i></p>

Week	Title and Dates of Lecture/ Practical Sessions	Topic	Relevant Assignment (where your learning on this will be assessed)	Course learning objective LO covered in the lecture
	<p>Weeks of Nov 13 and Nov 20</p> <p>**Wednesday Nov 22 is a holiday so students in this lab session can attend the Lab on Tuesday Nov 21 from 1:30-3:30; or Thursday Nov 23 from 5:30 to 7:30</p>	<p>confidence interval, interpretation of OR and its confidence interval, hypothesis testing, inferences, risk factor versus protective factor.</p>		
Week 14	<p>Lecture 9: Nonparametric Testing</p> <p>Week of Nov 27</p>	<p>Nonparametric data analysis: Describing these methods as alternatives to commonly used approaches when assumptions such as normality and large sample sizes are not met. Tests to be covered include: Wilcoxon Signed-Rank Test, Wilcoxon Rank-Sum Test (or Mann-Whitney U Test), Kruskal Wallis.</p>	Midterm 2	<i>LO 5, 6</i>
Classes end Thursday Dec 1 then Week of the final exams period	<p>Midterm 2 Date decided upon by the Registrar's Office</p>	<p>covers Lectures 6, 7a, 7b, 8a, 8b,9 +overall cumulative questions on lectures 1 to 5.</p>		<i>LO 4,5, 6</i>

Appendix I. Reinforced – Introduced CEPH competencies

Introduced competencies: the competency is introduced at a basic level. Instruction and learning activities focus on basic knowledge, skills and entry-level complexity. The competency is **not assessed**

Reinforced competency: The competency is reinforced with feedback; students demonstrate the outcome at an increasing level of proficiency (above the introductory stage). Instruction and learning activities concentrate on enhancing and strengthening existing knowledge and skills, as well as expanding complexity. The competency is **not assessed**

Core Competencies	Introduced	Reinforced
CC2. Select quantitative and qualitative data collection methods appropriate for a given public health context	Partially introduced	
CC3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	X	
CC4. Interpret results of data analysis for public health research, policy or practice	X	

EPHD competencies	Introduced	Reinforced
EBCC4: Demonstrate ability to write software codes in order to manage and analyze health data through the use of multiple statistical software	X	
EBCC5: Apply inferential statistics and advanced statistical approaches such as regression modelling to analyze complex health related data	X	
EBCC6: Interpret and communicate statistical findings in oral and written format	X	
EBCC7: Review, synthesize and communicate published epidemiological findings in oral and written format	X	
EBCC9: Analyze Health related data using advanced statistical techniques and software packages	X	