



# University of Maryland School of Public Health

## EPIB300 – Biostatistics for Public Health Practice

<b>Semester:</b>	Fall 2016	
<b>Section:</b>	0201, 0202 and 0203	
<b>Classroom and Time:</b>	PHY 4221 Tuesday 9:30am - 10:20am	
<b>Course webpage:</b>	See <i>ELMS Canvas</i>	
<b>Instructor:</b>	Dr. Raul Cruz-Cano	<b>Office Hours:</b> Th 10:30 a.m. - 11:30 a.m.
<b>Office:</b>	Room 1242E SPH Building	
<b>Phone:</b>	(301)405-0560	
<b>Email:</b>	raulcruz@umd.edu	
<b>TA:</b>	Yuruo Li	<b>Office Hours:</b> Friday 11:00am - 1:00pm
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<b>Phone:</b>		
<b>Email:</b>	yuruoli@umd.edu	

**Course Description:** This course is intended to provide students with comprehensive introduction to basic statistical concepts and procedures used in public health research. Through this course, students will be exposed to a variety of techniques to develop an understanding of how to appropriately approach data to answer public health research questions. The course focuses on applications and interpretations of statistical findings.

### Course Learning Objectives:

Upon completing this course, the student will be able to:

1. Understand the role of Biostatistics in biomedical research and public health.
2. Acquire the basic vocabulary to read and communicate about real world biostatistics.
3. Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.
4. Learn different types of studies, including Survey; Comparative Studies; Experimental Design; Observational Studies.
5. Become familiar with the basic concepts of probability, random variables and probability distributions.
6. Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.
7. Learn how to conduct simple linear regression and interpret it.

### Program Competencies Addressed in this Course:

The following competencies for the Master of Public Health with concentration in Biostatistics are addressed in this course:

1. Identify and describe core scientific concepts underlying disease prevention, environmental protection, and health promotion.
2. Synthesize scientific knowledge to formulate solutions to public health problems.
3. Identify and define public health problems from an interdisciplinary perspective.

### Required Texts and Other Readings:

Required: Elementary Statistics in Social Research, 12th Edition by Jack Levin, James Alan Fox, and David R. Forde, 2013 Pearson Publications, ISBN-13: 978-0-205-84548-4]

### Recommended:

- Statistics for Health Care Professionals: Working With Excel, 2nd Edition, James E. Veney, John F. Kros, David A. Rosenthal, ISBN: 978-0-470-39331-4, September 2009, ©2009, Jossey-Bass

**Additional Materials Required:** Scientific calculator.

### **Course Requirements and Expectations:**

Because statistics is not an easy subject, this course requires students to learn difficult concepts and demonstrate proficient application of the skills required by the Mathematics Fundamental Studies requirement. To be successful, students will need to be able to do some basic algebra and other basic mathematical operations. It is important to note that the material students will learn is cumulative. Thus, students want to be careful not to fall behind. Therefore, I have built in assignments and quizzes throughout the semester to ensure students are keeping up with the material.

### Lectures

Material covered on quizzes and exams will be presented during class. **Students are expected to attend every class.** If a student misses a class, he/she will be missing exposure to key concepts. PowerPoint slides will be available online; however, students will not be successful in the course, if they are not in class to hear the lectures and do the practice problems with classmates. The student will also be responsible for any announcements made during class.

### Quizzes

There might be multiple **pop quizzes** throughout the semester. They will be administered in class without notice and will be based on readings from the text.

### Homework Assignments

There are 12 homework assignments that correspond to chapters in the textbook. Late homework will NOT be accepted without a reasonable and advance notice. **Ensuring that all the pages of your homework stay together is responsibility of the student. The specific format required for the assignments will be discussed during the first day of class (problems in order, clear separation between one problem and the next, intelligible handwriting, must include name/assignment number/section, etc.)**

### Exams

There will be **three exams** during the semester, and they will be administered in class. Students will need to bring their own calculator to the exams. The content of the exam will be cumulative, but the emphasis will be on the materials not covered in the previous exams. **As a general rule, make-up exams and advance exams will NOT be given.** Exceptions to this rule are evaluated on a case-by-case basis. Students must submit the request before the exam takes place with valid supporting document.

### Course Website

Course announcements, lecture notes, data sets, homework assignments, and homework solutions will be distributed on the ELMS (Enterprise Learning Management System). Please check it on a regular basis. Lecture notes will be posted before class. You may wish to print these notes prior to each lecture and use them as an outline for taking notes during the class but keep in mind that the professor **might keep improving the class material until the last minute before class.** You can access the website by following these directions:

Direct your URL to <https://myelms.umd.edu/login>.  
Enter your Directory ID and Password.  
Click "Courses" on the ELMS home tab.  
Click "EPIB300: Biostatistics for Public Health Practice – Fall 2016".

### **University Course Related Policies:**

#### Religious Observances:

The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the student's responsibility to inform the instructor in advance of any intended absences for religious observance.

#### Special Accommodations / Disability Support Services:

If you have a documented disability and wish to discuss academic accommodations for test taking or other needs, you will need documentation from Disability Support Service (301-314-7682). If you are ill or encountering personal difficulties, please let the instructor know as soon as possible. You can also contact Learning Assistance Services (301-314-7693) and/or the Counseling Center (301-314-7651) for assistance.

#### Academic Integrity:

The University's code of academic integrity is designed to ensure that the principle of academic honesty is upheld. Any of the following acts, when committed by a student, constitutes academic dishonesty:

- CHEATING: intentionally using or attempting to use unauthorized materials, information, or study aids in an academic exercise.
- FABRICATION: intentional and unauthorized falsification or invention of any information or citation in an academic exercise.
- FACILITATING ACADEMIC DISHONESTY: intentionally or knowingly helping or attempting to help another to violate any provision of this code.
- PLAGIARISM: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.

For more information see: <http://www.shc.umd.edu/code.html>.

The Honor Pledge is a statement undergraduate and graduate students should be asked to write by hand and sign on examinations, papers, or other academic assignments. The Pledge reads:

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.

### **Course Procedures and Policies:**

### Email – The Official University Correspondence:

Verify your email address by going to [www.my.umd.edu](http://www.my.umd.edu).

All enrolled students are provided access to the University's email system and an email account. All official University email communication will be sent to this email address (or an alternate address if provided by the student). Email has been adopted as the primary means for sending official communications to students, so email must be checked on a regular basis. Academic advisors, faculty, and campus administrative offices use email to communicate important and time-sensitive notices. Students are responsible for keeping their email address up to date or for redirecting or forwarding email to another address. Failure to check email, errors in forwarding email, and returned email (from "full mailbox" or "unknown user" errors for example), will not excuse a student from missing University announcement, messages, deadlines, etc. Email addresses can be quickly and easily updated at <http://www.my.umd.edu> or in-person at the Student Service Counter on the first floor of the Mitchell Building. For technical support for University email: [www.helpdesk.umd.edu](http://www.helpdesk.umd.edu) or call 301-405-1400.

### Absence Policy:

In accordance with University policy if you are absent for a single (1) lecture due to illness or some form of personal or family emergency, this absence will be considered "excused" and the instructor will accept a note from you attesting to the date of the illness/incident, along with an acknowledgement that the information is true. Whenever feasible, you should try to contact the instructor in advance.

Multiple or prolonged absences, and absences that prevent attendance at a major scheduled grading event (like an exam or test) will require written documentation from an appropriate health care provider/organization.

A link to pull information on the new policy covering absences from class can be found at <http://www.president.umd.edu/policies/v100g.html>.

### Course Evaluations:

The University, the School of Public Health, and the Department of Epidemiology and Statistics are committed to the use of student course evaluations for improving the student experience, course and curriculum delivery, and faculty instruction. Your evaluations help instructors improve their courses; help deans and department chairs decide on merit pay for faculty, renewal of contracts, and support tenure and promotion decisions; and help current and future students decide on classes. Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process.

CourseEvalUM will be open for you to complete your evaluations starting about two weeks prior to the last day of the term before exams begin. Please go directly to the website ([www.CourseEvalUM.umd.edu](http://www.CourseEvalUM.umd.edu)) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing online evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations. You can access results at [www.CourseEvalUM.umd.edu](http://www.CourseEvalUM.umd.edu), the same link you use to submit your evaluations. Click View Past Results instead.

### Inclement Weather / University Closings / Emergency Procedures:

In the event that the University has a delayed opening or is closed for an emergency or extended period of time, the instructor will communicate to students regarding schedule adjustments, including rescheduling of examinations and assignments due to inclement weather and campus emergencies.

### **Grading Procedures:**

Grades will be based on the exams, quizzes, and assignments.

Exams (20% Each Exam)	60%
Quizzes/Homework Assignments (Each will be equally weighted)	40%

If a student has questions or concerns about grade(s) and believes I should review the grade, the student should submit a written request over email that describes concerns in detail. This request must be submitted within one week of the date that the assignment is returned to him/her.

Please show all of your work (i.e., calculations) on homework, midterm exams and the final exam. If you provide the correct answer, but, do not show your work I will mark it as incorrect and give you no points. If you provide the incorrect answer, but, show in your calculations that you understood how to answer the question correctly, you will get partial credit. This partial credit will be entirely to the professor or grader discretion and indisputable.

Final letter grades will be assigned according to the following system:

A+ = 97+, A = 93-96.9999, A- = 90-92.9999  
B+ = 87-89.9999, B = 83-86.9999, B- = 80-82.9999  
C+ = 77-79.9999, C = 73-76.9999, C- = 70-72.9999  
D+ = 67-69.9999, D = 63-66.9999, D- = 60-62.9999  
F = below 60

Please show all of your work (i.e., calculations) on homework, midterm exams and the final exam. If you provide the correct answer, but, do not show your work I will mark it as incorrect and give you no points. If you provide the incorrect answer, but, show in your calculations that you understood how to answer the question correctly, you will get partial credit. This partial credit will be entirely to the professor or grader discretion and indisputable.

### **Emails and Canvas Messages:**

Due to the volume of emails that the professor receives, please use the subject line "EPIB300" whenever you send an email. If you do not get a response, it may have gone to junk mail so please check. For these reasons it is better if you communicate with me via Canvas messages. Do not reply to Canvas Announcements; your comments will be ignored.

### **Available Support Services:**

Learning Assistance Services offers the Academic Success Workshop series to help students become successful active learners. Workshops focus on helping students manage their time, and improve their approach to studying and learning in UMD.

Additional information about tutoring services available at the University of Maryland can be found at: <http://www.tutoring.umd.edu/> and <http://www.counseling.umd.edu/las/>

Additional Literature, Websites and Other Resources: There are numerous good statistical resources on the internet that can help you review topics covered in class.

**Course Outline / Course Calendar:**

<b>DATES</b>	<b>TOPIC</b>	<b>READING</b>	<b>HW DUE</b>
8/30/2016 - 9/1/2016	Introduction to Statistics	Chapter 1	
9/6/2016 - 9/8/2016	Health Data and Data Distributions	Chapter 2	HW#1
9/13/2016 - 9/15/2016	Measures of Central Tendency	Chapter 3	HW#2
9/20/2016 - 9/22/2016	Measures of Variability	Chapter 4	HW#3
9/27/2016 - 9/29/2016	Probability and The Normal Curve	Chapter 5	HW#4
10/4/2016 - 10/6/2016	Exam 1 (Chapters 1 - 4)		
10/11/2016 - 10/13/2016	Samples and Populations/ Confidence Intervals	Chapter 6	HW#5
10/18/2016 - 10/20/2016	Hypothesis Testing and T-tests: Independent Samples with Equal and Unequal Variance	Chapter 7-Part 1	HW#6
10/25/2016 - 10/27/2016	Hypothesis Testing and T-tests: Dependent Sample and Proportions	Chapter 7-Part 2	HW#7-Part 1
11/1/2016 - 11/3/2016	ANOVA	Chapter 8	HW#7-Part 2
11/8/2016 - 11/10/2016	Exam 2 (Chapters 5 - 7)		
11/15/2016 - 11/17/2016	Nonparametric Tests of Significance	Chapter 9	HW#8
11/22/2016 - 11/24/2016	Review Session/Thanksgiving Break		
11/29/2016 -	Correlation	Chapter 10	HW#9

12/1/2016			
12/6/2016 - 12/8/2016	Regression	Chapter 11	HW#10
12/15/2016 - <b>Special Time 8:00- 10:00am</b>	Exam 3 (Chapters 8- 10)		HW#11

\* This calendar is subject to change if the instructor deems it necessary, e.g. due to inclement weather or a lecture taking more than one session.

<b>Required Session Outline</b>	
<b>Session 1 Introduction to Statistics</b>	<b>8/30/2016 - 9/1/2016</b>
<p>Topics: Scientific Method, Ways to collect data, Types of Variables</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Learn different types of studies, including Survey; Comparative Studies; Experimental Design; Observational Studies.</i></li> </ul> <p>Required and recommended readings: Chapter 1</p> <p>Assignments – HW#1 due on 9/8/2016</p>	
<b>Session 2 Health Data and Data Distributions</b>	<b>9/6/2016 - 9/8/2016</b>
<p>Topics: Frequency distributions, proportions, cross-tabulations and graphic representations</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.</i></li> </ul>	

Required and recommended readings: Chapter 2	
Assignments – HW#2 due on 9/15/2016	
<b>Session 3 Measures of Central Tendency</b>	<b>9/13/2016 - 9/15/2016</b>
<p>Topics: Mean, Median, Mode</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.</i></li> </ul> <p>Required and recommended readings: Chapter 3</p> <p>Assignments – HW#3 due on 9/22/2016</p>	
<b>Session 4 Measures of Variability</b>	<b>9/20/2016 - 9/22/2016</b>
<p>Topics: Variance, Standard Deviation, IQR, Range, Box Plots</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.</i></li> </ul> <p>Required and recommended readings: Chapter 4</p> <p>Assignments – HW#4 due on 9/29/2016</p>	
<b>Session 5 Probability and The Normal Curve</b>	<b>9/27/2016 - 9/29/2016</b>
<p>Topics: Probability Distributions, Laws of Probability, Independence, Normal Distribution</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Become familiar with the basic concepts of probability, random variables and probability</i></li> </ul>	

*distributions.*

Required and recommended readings: Chapter 5

Assignments – HW#5 due on 10/13/2016

**Session 6 Exam 1**

**10/4/2016 - 10/6/2016**

Topics: Chapters 1-4

**Session 7 Samples and Populations/ Confidence Intervals**

**10/11/2016 - 10/13/2016**

Topics: Samples, Populations, Standard Error of the Sample Mean, Confidence Intervals

Learning Objectives for Session [*Relevant Program Competencies from page 1 of syllabus: #1, #2, #3*]

- *Understand the role of Biostatistics in biomedical research and public health.*
- *Acquire the basic vocabulary to read and communicate about real world biostatistics.*
- *Become familiar with the basic concepts of probability, random variables and probability distributions.*
- *Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.*

Required and recommended readings: Chapter 6

Assignments – HW#6 due on 10/20/2016

**Session 8 Hypothesis Testing and T-tests - Part 1**

**10/18/2016 - 10/20/2016**

Topics: Independent Samples with Equal and Unequal Variance

Learning Objectives for Session [*Relevant Program Competencies from page 1 of syllabus: #1, #2, #3*]

- *Understand the role of Biostatistics in biomedical research and public health.*
- *Acquire the basic vocabulary to read and communicate about real world biostatistics.*
- *Become familiar with the basic concepts of probability, random variables and probability distributions.*
- *Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.*

Required and recommended readings: Chapter 7 (only pages 219-243)

Assignments – HW#7 – Part 1 due on 10/27/2016	
<b>Session 9 Hypothesis Testing and T-tests - Part 2</b>	<b>10/25/2016 - 10/27/2016</b>
<p>Topics: Dependent Samples and Proportions</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Become familiar with the basic concepts of probability, random variables and probability distributions.</i></li> <li>- <i>Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.</i></li> </ul> <p>Required and recommended readings: Chapter 7 (only pages 244-262)</p> <p>Assignments – HW#7 – Part 2 due on 11/3/2016</p>	
<b>Session 10 ANOVA</b>	<b>11/1/2016 - 11/3/2016</b>
<p>Topics: ANOVA, Tukey’s Honesty Significant Difference</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Become familiar with the basic concepts of probability, random variables and probability distributions.</i></li> <li>- <i>Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.</i></li> </ul> <p>Required and recommended readings: Chapter 8</p> <p>Assignments – HW#8 due on 11/17/2016</p>	
<b>Session 11 Exam 2</b>	<b>11/8/2016 - 11/10/2016</b>
<p>Topics: Chapters 5 - 7</p>	

<b>Session 12 Nonparametric Tests of Significance</b>	<b>11/15/2016 - 11/17/2016</b>
<p>Topics: One-way and Two-way Chi-Square test, Median Test</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Become familiar with the basic concepts of probability, random variables and probability distributions.</i></li> <li>- <i>Become familiar with commonly-used statistical methods for inference, including both estimation and hypothesis testing.</i></li> </ul> <p>Required and recommended readings: Chapter 9</p> <p>Assignments – HW#9 due on 12/1/2016</p>	
<b>Session 13 Review/thanksgiving Break</b>	<b>11/22/2016 - 11/24/2016</b>
<p>Topic N/A</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- [<i>List learning objectives</i>]</li> </ul> <p>Required and recommended readings: N/A</p> <p>Assignments – N/A</p>	
<b>Session 14 Correlation</b>	<b>11/29/2016 - 12/1/2016</b>
<p>Topics: Pearson Correlation, Partial Correlation</p> <p>Learning Objectives for Session [<i>Relevant Program Competencies from page 1 of syllabus: #1, #2, #3</i>]</p> <ul style="list-style-type: none"> <li>- <i>Understand the role of Biostatistics in biomedical research and public health.</i></li> <li>- <i>Acquire the basic vocabulary to read and communicate about real world biostatistics.</i></li> <li>- <i>Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.</i></li> </ul> <p>Required and recommended readings: Chapter 10</p> <p>Assignments – HW#10 due on 12/8/2016</p>	

**Session 15 Regression**

**12/6/2016 - 12/8/2016**

Topics: Linear Regression, Predictions

Learning Objectives for Session [*Relevant Program Competencies from page 1 of syllabus: #1, #2, #3*]

- *Understand the role of Biostatistics in biomedical research and public health.*
- *Acquire the basic vocabulary to read and communicate about real world biostatistics.*
- *Learn to identify and summarize common types of variables (e.g. continuous, discrete, categorical) using descriptive statistics and graphs.*
- *Learn how to conduct simple linear regression and interpret it.*

Required and recommended readings: Chapter 11

Assignments – HW#11 due on 12/15/2016