EPIB 651: Biostatistics II

Semester: Spring 2015
Classroom and Time: 0307 SPH Building / Wednesday 4:00 PM – 6:45 PM
Instructor: Shuo Chen, Ph.D.
Office: 2234M SPH Building
Office Hours: Wednesday 2:00PM – 4:00 PM
Phone: 301-405-6421
Email: shuochen@umd.edu

Required Texts and Other Readings:
Required:

Recommended:

Course Description:
This course provides an introduction to important statistical methods used in public health research, including nonparametric hypothesis testing, ANOVA, simple and multiple regression, logistic regression, and an introduction to categorical data analysis. For each topic, examples and SAS/R programming codes are provided to assist the students in obtaining hands-on experience for real public health problem solving.

Course Learning Objectives:
Upon completing this course, the student will be able to:
1. Choose appropriate methods, models, parameters and hypotheses for a variety of problems related to simple and multiple linear regression, and logistic regression.
2. Run SAS/R programs and interpret outputs from these programs.
3. Check assumptions underlying the regression models.
4. Use related statistical tables.

SAS is available in most computer labs.

Course Requirements:

Homework:
There will be five homework assignments in this class, and each of them will be due at the beginning of the due date class. Late homework will NOT be accepted without a reasonable and advance notice. Students have two weeks to finish each homework.
Final project:
Students should analyze one example data set with the tools learned from this class. The project is graded based on: data analysis strategy: data exploratory analysis, statistical modeling, model diagnostic and validation; results explanation; and class presentation.

Exams:
Exams will be in class, closed book and closed note. The content of the exam will be cumulative, but the emphasis will be on the materials not covered in the previous exams. For the midterm, you are allowed to bring one page of letter-size formula sheet; for the final exam, you are allowed to bring one page of letter-size formula sheet. You also need to bring a calculator to facilitate the computation.

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. No post-exam request will be considered except the student is hospitalized during the exam period.

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. You can access the website by following these directions:

- Direct your URL to https://elms.umd.edu/.
- Enter your Directory ID and Password.
- Click “Course Sites” on the ELMS home tab.
- Click “EPIB651_shuochen: EPIB651 Sec - 0101 Spring 2015: Biostatistics II”.

Course Policies:

Email – The Official University Correspondence:
Verify your email address by going to 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 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) 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, the same link you use to submit your evaluations. Click View Past Results instead.

Grading Procedures:
Grade of this course will be determined as follows:
• Homework: 10%
• Midterm Exam: 30%
• Final Project: 25%
• Final Exam: 35%

Course Outline / Course Calendar:

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<th>Tentative Course Outline *</th>
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* This is a tentative schedule, and the actual materials covered in each lecture might not be exactly the same.

Required Session Outline

**Session 1**

Topic: Review basic statistics

Learning Objectives for Session 1 [Relevant Program Competencies: #1, #3, #7, #8, #9]
- Descriptive statistics
- Statistical inferences: central limit theorem, confidence interval, hypothesis tests.
- Distributions, sample, population, parameter.
- Statistical programming

**Session 2**

Topic: ANOVA

Learning Objectives for Session 2 [Relevant Program Competencies: #2, #3, #4, #5, #7, #8]
- One-way ANOVA: general concepts.
- Inferences on main effects.
- Multiple comparisons
### Session 3

**Topic:** SLR  

**Learning Objectives for Session 3** [Relevant Program Competencies: #2, #3, #4, #7]
- introduction to covariance and correlation;  
- Method of least squares Hypothesis tests on parameter estimates;  
- Simple Linear Model  
  
  **Reading:** Chapter 4, 5, 6

**Homework 1**  

### Session 4

**Topic:** SLR inferences  

**Learning Objectives for Session 4** [Relevant Program Competencies: #2, #3, #4, #7]
- confidence intervals for parameter estimates and predicted values;  
- the assumptions for regression;  
- regression diagnostics;  
- regression ANOVA table.  

**Homework 2**  

**Reading:** Chapters 6

### Session 5

**Topic:** MLR  

**Learning Objectives for Session 5** [Relevant Program Competencies: #2, #3, #4, #7]
- Multiple regression: Introduction, general concepts, hypothesis tests;  
- confidence intervals for parameter estimates and predicted values;  
- SAS programming;  
- regression ANOVA table.  

**Reading:** Chapters 8, 9

### Session 6

**Topic:** Dummy Variables  

**Learning Objectives for Session 6** [Relevant Program Competencies: #2, #3, #4, #7]
- Comparing regression results for two or more groups;  
- dummy variables, coding schemes;  
- interactions.
- SAS programming

Reading: Chapters 12

Homework 3

**Session 7**

Topic: Model selection

Learning Objectives for Session 7 [Relevant Program Competencies: #2, #3, #4, #7]
- Multiple regression diagnostics;
- selecting the best regression equation;
- forward, backward, stepwise regression.

Reading: Chapters 16

**Session 8**

Topic: Model diagnostics

Learning Objectives for Session 8 [Relevant Program Competencies: #2, #3, #4, #7]
- Multicollinearity,
- model validation strategy;
- power and sample size calculation for regression,
- catch-up and review

**Session 9**

Topic: Midterm exam

**Session 10**

Topic: Contingency table 1

Learning Objective for Session 9 [Relevant Program Competencies: #2, #3, #4, #7]
- Categorical data testing,
- two-sample test for Binomial proportions,
- contingency table,
- Fisher’s exact test,
- McNemar’s test for matched pair data

Reading: Chapter9

**Session 11**

Topic: Contingency table 1

Learning Objectives for Session 11 [Relevant Program Competencies: #2, #3, #4, #5, #7, #8, #9]
- chi-square test for RxC contingency table,
- kappa statistics,
- multiple 2x2 tables,
- Mantel-Haenszel method

**Session 13**
Topic: Logistic Regression 1

Learning Objective for Session 13 [Relevant Program Competencies: #2, #3, #4, #5, #7]
- Logistic Regression: odds ratios;
- logistic regression model,
- maximum likelihood estimation.

Reading: Chapter 21 22

Session 14

Topic: Logistic Regression 2

Learning Objective for Session 14 [Relevant Program Competencies: #2, #3, #4, #5, #6, #7, #8, #9]
- Logistic regression: analysis strategy,
- CIs for odds ratios,
- prediction and interpretation issues.

Reading: Chapter 21 22

Homework 5

Session 15

Topic: Class Presentation

Learning Objectives for Session 15 [Relevant Program Competencies: #1, #2, #3, #4, #5, #6, #7, #8, #9, #10]
- Nonparametric methods
- sign test, Wilcoxon signed-rank test,
- Wilcoxon rank-sum test,
- Spearman correlation

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<tr>
<th>Assessment Activity</th>
<th>Learning Objectives Assessed with the Activity</th>
<th>Relevant Program Competencies</th>
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Critical University 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:
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.

Inclement Weather / University Closings:
In the event that the University 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. Official closures and delays are announced on the campus website (http://www.umd.edu) and snow phone line (301-405-SNOW), as well as local radio and TV stations.

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