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Spring 2015

BIOS 6332 - Experimental Design in Biostat

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Georgia Southern University
Jiann-Ping Hsu College of Public Health

BIOS 6332: Experimental Design in Biostat

Spring 2015

Instructor: Jingjing Yin
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Grading Assistant: Reine Zerbo (kz00201@georgiasouthern.edu)
Time: Monday, Wednesday 1:25pm-2:40pm
Location: IT Building 2201
Office Hours: Monday and Wednesday 3:00pm-5:30pm and by appointment

Prerequisites: A minimum grade of “B” in BIOS 6331 and a minimum grade of “B” in BIOS 6135.

Course Description: This course introduces the methods for analyzing biomedical and health related data using ANOVA methods. The course will involve one-way and two-way ANOVA with fixed or/and random effects and sample size/power calculation. And Logistic and Poisson regression models will also be addressed. The students will learn how to apply SAS procedures PROC POWER, PROC GLM, PROC MIXED, PROC GENMOD and PROC GLIMMIX and interpret the results of analysis. Emphasis will also be placed on the development of critical thinking skills.

Textbook:

Required: *Applied Regression Analysis and Other Multivariable Methods, 5th edition, Kleinbaum, Kupper, Nizam and Rosenberg. Duxbury Press, Belmont California.*

Supplementary: *Applied Linear Statistical Models, 5th edition, Kutner, Nachtsheim, Neter, and Li*

The lectures will often follow the general organization of the text, but with some differences in emphasis and detail. Students will be responsible for **whatever material is covered in the lectures**, whether or not it is treated in the text.

Programmatic Goals/ Competencies:

At the completion of the M.P.H. degree programs all Biostatistics students will be able to:

- Construct a public health and biomedical research question from ideas, conditions, and events that exist in a rural and urban community, region, state, and nation using critical thinking skills.
- Identify objectives of a public health and biomedical research question.
- Express objectives in the appropriate biostatistical framework such as hypothesis testing, estimation, and prediction.
- Evaluate objectives of a public health research question to ensure the appropriate type of data is collected for analysis.
- Design an experiment or survey pertaining to a public health and biomedical research question in order to collect the data needed to meet objectives of public health research.
- Apply appropriate statistical tools and software in order to analyze data.
- Demonstrate use of Statistical Analysis System (SAS) to input, manage, merge, export, and conduct analysis on public health and biomedical data.
- Analyze data using appropriate categorical analysis techniques to obtain valid and reliable results.
- Analyze quantitative data using appropriate biostatistical methods such as simple and multiple regression and clinical trial methodology.
- Develop a protocol for conducting a clinical trial.
- Describe key concepts and theory underlying biostatistical methodology used in probability and inferential, analytical, and descriptive statistics.
- Interpret results of biostatistical analyses so that valid and reliable conclusions regarding a public health and biomedical research question may be drawn from the analyses.
- Develop written and oral reports to communicate effectively to research investigators pivotal aspects of a study, including its design, objectives, data, analysis methods, results, and conclusions.
- Create a collaborative environment for working on written and oral reports and developing critical thinking skills.

Course Objectives: At the end of this course, students will be able to thoroughly understand and explain the following concepts (among others):

1. Understand fundamental matrix algebra such as matrix addition, subtraction, multiplication, transpose, inverse, linear dependence, etc. Also understand the expectation, variance and distribution of the random matrix and quadratic forms.
2. Apply one-way, two-way and multi-way ANOVA models (both cell mean and effects models) and understand testing and estimation of linear contrasts of parameters. Apply linear mixed/random effect models.
3. Apply correction methods for multiple testing and comparisons to control for the type I error rate.
4. Apply logistic and poisson regression models for categorical or discrete outcomes with fixed or random predictors applying generalized estimating equations and generalized mixed effect model.
5. Plan for power and sample size for different types of study designs.
6. Develop written reports and orally present the data analysis to effectively communicate to research investigators pivotal aspects of a study, including study objectives, variables of interest, appropriate ANOVA analysis methods and regression models, results, and conclusions.

Topics and Schedules: (subject to change)

Chapter	Topic
Week 1: Preview	Matrix and quadratic forms
Week 2: Preview	(Only Wed) One sample and two-sample testing
Week 3: Chapter 17	One-way ANOVA; Linear contrasts
Week 4: Aside	Multiple testing and comparison
Week 5: Chapter 18	Randomized Blocks
Week 6: Chapter 19	Balanced two-way ANOVA: equal cell; One-way ANOVA presentation
Week 7: Chapter 20	Unbalanced two-way ANOVA: unequal cell; Multiple testing correction presentation
Week 8: Aside	Review for Mid-term; Multifactor ANOVA
Week 9: Review	Multifactor ANOVA (cont); Mid-term is on Wednesday
Week 10: NA	No class (spring break)
Week 11: Chapter 22	Logistic regression; Two-way ANOVA presentation

Week 12: Chapter 23	Advanced logistic regression
Week 13: Chapters 25-26	Linear mixed effects model
Week 14: Aside	Generalized linear mixed effects model
Week 15: Chapter 27	Sample size and power calculation
Week 16: Review	Review for Final;

Grading Scheme:

Homework: 25% (competency 1-5)

Presentation: 25% (competency 1-6)

Midterm: 25% (competency 1-3)

Final Exam: 25% (competency 1-5)

Grading Scale:

A 90 - 100%

B 80 - 89%

C 70 - 79%

D 60 - 69%

F 0 - 59%

Homework: Assignments are to be handed in **by the end of the lecture the day it is due**, unless otherwise announced in class. **Late homework will not be accepted** unless advanced permission was given by the instructor under extraordinary circumstances (e.g., serious illness/accident, death in the family, etc.).

Please describe and justify your answers with detailed reasoning, an answer with merely a final number receives no credit even it is correct. If SAS or R is used, please attach the commented code at the end of the homework, which I should be able to run and reproduce your results.

You may work together or individually on these assignments, however each student must submit his/her own assignment and state with whom he/she worked, if applicable. What does 'working together' mean? You are welcome to solve problems and discuss explanations in groups, however it is not acceptable to submit assignments with identical wordings and explanations. I will cheerfully address any homework questions during office hours. Emailing me about homework questions is not referred, but if you do, please allow me one business day to respond.

Approximate Schedule of In-class Exams:

MIDTERM: Wednesday, March 11th, 2015

FINAL EXAM: Final exam week

NO make-ups for any missed exam

Academic Integrity: Students are expected to follow guidelines outlined in the *Student Conduct Code 2010-11* policy regarding academic dishonesty. Any student found in violation of academic honesty will receive a grade of 'F' for the course. It is the student's responsibility to familiarize him/herself with the student policies and expectations set forth in the *GSU Student Conduct Code 2010-11*

Attendance Policy: Due to the nature and structure of this course, class attendance is of utmost importance. You are responsible for any material covered or distributed in class, including any announcements made in class, whether or not you are present. Furthermore, federal regulations require attendance be verified prior to distribution of financial aid allotments. Attendance will not be recorded after this initial period. However, if you are going to miss one class, it is recommended that you notify me prior to the start of the class so that I could help you to make up for the lecture you have missed.

Class Participation & Etiquette: Attendance, attention, and participation are expected for each class! Note that although class participation is not a formal part of your course grade, I will use it as a factor if your final grade is on the border between two letter grades.

On a final note of etiquette, please do not text or use your cell phones during class, and silent your cell phones since ring tones are disruptive to others. If you have to use the cell phone, you may leave the classroom so that you do not interrupt others. And please do not chat or make noises while the instructor or your classmate is talking.

Disclaimer: The contents of this syllabus are as complete and accurate as possible. The instructor reserves the right to make any changes necessary to the syllabus and course material. The instructor will make every effort to inform you of changes as they occur. It is the responsibility of the student to know what changes have been made in order to successfully complete the requirements of the course.

Plagiarism

"According to the Academic Dishonesty Policy of GSU, Plagiarism includes (but is not limited to):

- A. Directly quoting the words of others without using quotation marks or indented format to identify them.
- B. Using published or unpublished sources of information without identifying them.
- C. Paraphrasing material or ideas without identifying the source.
- D. Unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic material.

If you are accused of plagiarism by a JPHCOPH, the following policy, as per the Judicial Affairs website (<http://students.georgiasouthern.edu/judicial/faculty.htm>) will be enforced:

PROCEDURES FOR ADJUDICATING ACADEMIC DISHONESTY CASES

First Offense - In Violation Plea

1.If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is a first violation of academic dishonesty. The incident will be reported via the following website:
<http://students.georgiasouthern.edu/judicial/faculty.htm>

2. If it is a first violation, the professor should talk with the student about the violation. If the student accepts responsibility in writing and the professor decides to adjudicate the case, the following procedures will be followed:

a.The student will be placed on disciplinary probation for a minimum of one semester by the Office of Judicial Affairs.

b.The student will be subject to any academic sanctions imposed by the professor (from receiving a 0 on the assignment to receiving a failing grade in the class).

c.A copy of all the material involved in the case (Academic Dishonesty Report Form and the Request For Instructor to Adjudicate Form) and a brief statement from the professor concerning the facts of the case and the course syllabus should be mailed to the Office of Judicial Affairs for inclusion in the student's discipline record.

First Offense - Not In Violation Plea (student does not admit the violation)

If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is the first or second violation of academic dishonesty. The student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case. If the student is found responsible, the following penalty will normally be imposed:

a.The student will be placed on Disciplinary Probation for a minimum of one semester by the Office of Judicial Affairs.

b.The student will be subject to any academic sanctions imposed by the professor.

Second Violation of Academic Dishonesty

If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, and if it is determined this is the second violation, the student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case.

If the student is found responsible, the following penalty will normally be imposed:

a.Suspension for a minimum of one semester or expulsion.

b.The student will be subject to any academic sanctions imposed by the professor.

NOT RESPONSIBLE FINDING

When a student is found not responsible of academic dishonesty, the work in question (assignment, paper, test, etc.) would be forwarded to the Department Chair. It is the responsibility of the

Department Chair to ensure that the work is evaluated by a faculty member other than the individual who brought the charge and, if necessary, submit a final grade to the Registrar. For the protection of the faculty member and the student, the work in question should not be referred back to the faculty member who charged the student with academic dishonesty.

In the case of a Department Chair bringing charges against a student, an administrator at the Dean's level will ensure that the student's work is evaluated in an appropriate manner.

CONFIDENTIALITY

In accordance with provisions of the Family Educational Rights and Privacy Act of 1974 and the Georgia Open Records Act, any information related to a violation of academic dishonesty or the outcome of a judicial hearing regarding academic dishonesty, is prohibited and must be treated as confidential by members of the faculty."