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Fall 2019

BIOS 7535- Data Analysis with SAS

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GEORGIA SOUTHERN UNIVERSITY
Jiann-Ping Hsu College of Public Health
Directed Study:
BIOS 7535- *Data Analysis with SAS*

Fall 2017

Instructor:	**Dr. Robert Vogel**
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Office Hours:	by appointment
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Class Meets:	TBA

Prerequisites: In order to take this class, a student should have completed PUBH 6541 (Biostatistics) and BIOS 7534 (Data Management with SAS).

Catalog Description: The class is designed to provide skill building and practical experience in using SAS to: create analysis data files; analyze data such as that found in typical biostatistical consulting problems; and assess the validity of analysis methodology assumptions. 3 credit hours.

Required Textbook: Applied Statistics and the SAS Programming Language, 5th edition. Ronald P. Cody and Jeffrey K. Smith. Pearson Prentice Hall (2006)

Other Resources:

1. SAS System for Linear Models, 3rd edition. Ranon C. Littell, Rudulf J. Freund, Philip C. Spector. SAS Institute (1991).
2. SAS for Mixed Models, 2nd edition. Ramon C. Littell, George A. Milliken, Walter W. Stroup, Russell D. Wolfinger, Oliver Schabenberger. SAS Institute (2006)

3. Logistic Regression Using the SAS System. Paul D. Allison. SAS Institute (1999).
4. Overdispersion Models in SAS. Jorge G. Morel, Nagaraj K. Neerchal. SAS Institute (2012).
5. Statistical Graphics in SAS. Warren Kuhfeld. SAS Institute (2010).

Master of Public Health
MPH Core Student Learning Outcomes (CORE)
1. Demonstrate proficiency and effectiveness in the communication of core public health principle and practices, both oral and written
2. Demonstrate proficiency in integration of the core public health discipline (Biostatistics, Epidemiology, Environmental Health, Health Policy/Management, and Social/Behavioral Science) in practice and research.
3. Demonstrate proficiency in problem solving, critical thinking, and public health leadership.

MPH Biostatistics Student Learning Outcomes (BIOS)
1. Construct a public health and biomedical research questions from ideas, conditions, and events that exist in a rural and urban community, region, state, and nation using critical thinking skills.
2. Design an experiment, survey or clinical trials pertaining to a public health and biomedical research questions in order to collect the data needed to meet objectives of public health research.
3. Select appropriate statistical tools, methodology alternatives and graphical descriptive to analyze and summarize public health and biomedical data.
4. Interpreted results of biostatistical analyses so that valid and reliable conclusions regarding a public health and biomedical research question may be drawn from the analyses.
5. Communicate biostatistical principles and concepts to lay and professional audiences through both oral and written communication.

MPH Concentration Competencies in Biostatistics
1. Provide the biostatistical components of the design of a public health or biomedical experiment by: clarifying the research objectives or questions; determining data and endpoints to be collected appropriate for the objectives; translating the objectives into biostatistical questions via hypothesis testing or confidence interval frameworks; determining the appropriate sample size; and writing the statistical analysis section of the experiment.
2. Apply appropriate statistical analysis methods using SAS to analyze both categorical and quantitative data.
3. 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 ensuring that results and conclusions are valid and reliable and address the research objectives.
4. Create a collaborative environment for working on written and oral reports and developing critical thinking skills.

5. Describe key concepts and theory underlying biostatistical methodology used in probability and inferential, analytical, and descriptive statistics

Performance-Based Objectives:

1. Demonstrate the understanding of using SAS to prepare data for statistical analysis of public health and biomedical data. (Activity 1)
2. Demonstrate the capabilities to compute statistical quantities such as descriptive statistics, distribution functions, and more complex statistics using SAS. (Activities 1, 2 and 3)
3. Conduct statistical inference through defining hypotheses to be tested, type I error, type II error, p-value, and proper interpretation of the final results by using SAS. (Activities 1, 2 and 3)
4. Perform simple and multiple regression, logistic regression, survival data analysis and interpret the statistical output from SAS to make proper inference. (Activities 1, 2 and 3)
5. Develop the skills of statistical computation, report writing, and oral presentations to effectively *communicate* biostatistical analysis of a public health study. (Activities 1, 2, 3 and 4)

Assessment of students Learning

Activity 1: Use course lectures and class discussions to explain how to use SAS codes to prepare data for statistical analysis of public health and biomedical data and how to analyze the data from public health, biomedical data using descriptive statistics, more complex statistics, statistical inference through defining hypotheses to be tested, type I error, type II error, p-value, proper interpretation of the final results, simple and multiple regression, logistic regression, and survival data analysis. Competence in basic terminology will be evaluated using two activities: (1) weekly homework (2) two equally weighted exams.

Activity 2: Use course lectures, class discussions and class exercises to illustrate calculation and interpretation of basic biostatistical measures, including but not limited to, probabilities, descriptive statistics, distribution functions, more complex statistics, statistical inference, estimation and hypotheses testing, type I error, type II error, p-value, simple and multiple regression, logistic regression, and survival data analysis using SAS. Competences will be evaluated using two activities: (1) weekly homework (2) two equally weighted exams.

Activity 3: Use course lectures, class discussions and real data projects to explain the basic applications of biostatistical principles using SAS, as well as the integration of these principles across the public health spectrum. Competence in ability to integrate concepts will be evaluated using two class projects using real data.

Activity 4: Competence in written and oral communication to the lay professional audience will be evaluated using two final projects written report and oral presentation evaluation.

Course Plan:

Week 1	Review SAS DATA Step, SAS Syntax for Procedures, basic data description (Proc Means, Proc Univariate, Proc Freq, Proc Chart, Proc Plot, Proc Gchart: chapter 1 and 2, Cody) assignment: page 19: 1.4; page 64: 2.2, 2.4, 2.6, 2.12
Week 2	Analyzing Categorical Data (Proc Freq, Proc Format: Chapter 3, Cody) assignment: page 114: 3.2, 3.4, 3.10, 3.20
Week 3	Working with Date and Longitudinal Data (Date functions, Lag functions, Proc Means and Proc Summary: Chapter 4, Cody) assignment: page 154: 4.4, 4.6, 4.8
Week 4-5	Correlation and Regression (Proc Corr, Proc Reg, Proc Gplot, featuring diagnostic options and selection methods: Chapter 5 and Chapter 9, Cody and Chapter 1 of SAS System for Linear Models) assignment: page 179: 5.4, 5.6, page 315: 9.6
Weeks 5	T-tests and Nonparametric Comparisons (Proc Ttest, Proc Npar1way: Chapter 6, Cody) assignment: page 196: 6.2, 6.6
Week 6-7	Analysis of variance and covariance and contrasts (Proc Anova, Proc GLM, Proc Varcomp, Proc Nested, Proc Mixed, Chapter 7, Cody; Chapters 2-6, SAS system for Linear Models; Chapters 1-4 and Chapter 7 SAS for Mixed Models) Assignment page 231: 7.2, 7.4, 7.10 and others as needed.
Week 8-9	Repeated Measures Designs (Proc GLM, Proc Mixed, Chapter 8, Cody; Chapter 8 SAS System for Linear Models, Chapter 5 SAS for Mixed Models) Assignment: page 278: 8.2, 8.4,8.6, 8.8 and others as needed.
Week 10-11	Logistic Regression (Proc Logistic, Proc Genmod, Proc Glimix, Chapter 9, Cody, Chapters 1-7 Logistic Regression using the SAS System) Assignment: page 317: 9.8, 9.10, 9.12 and others as needed
Weeks 12-14	SAS Graphics The how to book for SAS/Graph Software and Statistical Graphics in SAS

Instructional Methods:
Class meeting will be a combination of lecture, class discussion and active participation. PowerPoint presentations (you can find and download from Folio) will be used in the lecture portion of this course. Prior to each lecture, the student is encouraged to complete the recommended reading and actively participate in the class discussion. In this way, it is hoped that the learner will be better prepared to successfully accomplish the learning objective of each lecture experience.

Exam Schedule and Final Exam:
First exam (30%) on October 22, 2015 (Activities 1 & 2)
Homework (40%) (Activities 3 & 4)
Final Examination (30%): December 10, 2015; 12:30 pm -2:30 pm (Activities 1 & 2)

Grading: Weighting of assignments for purposes of grading will be as follows:

In class Exam (Activities 1 & 2)	30%
Final Exam (Activities 1 & 2)	30%
Assignments and Final Project (Activities 1, 2, 3 and 4)	40%
	_____
	100%
	_____

The following point scale will be utilized in grading:

[90%-100%]	A
[80%-90%)	B
[70%-80%)	C
[60%-70%)	D
[0%-60%)	F

Your grades *__will not__* be posted. All exams and assignments will be graded and returned promptly so that students may accurately calculate their grades at any point in time during the semester.

There are times when extraordinary circumstances occur (e.g., serious illness, death in the family, etc.). In such circumstances, and/or if you need additional time to satisfactorily complete any course requirement, please consult with the instructor within a reasonable amount of time. *Nota Bene:* Extensions are not guaranteed and will be granted solely at the discretion of the instructor.

NO EXTRA CREDIT PROJECTS WILL BE ASSIGNED!

Academic Misconduct: As a student registered at this University, it is expected that you will adhere to only the strictest standards of conduct. It is recommended that you review the latest edition of the *Student Conduct Code* book, as well as the latest *Undergraduate & Graduate Catalog* to familiarize yourself with the University's policies in this regard. Your continued enrollment in this course is an implied contract between you and the instructor on this issue; from this point forward, it is assumed that you will conduct yourself appropriately.

Academic integrity relates to the appropriate use of intellectual property. The syllabus, lecture notes, and all materials presented and/or distributed during this course are protected by copyright law. Students are authorized to take notes in class, but that authorization extends only to making one set of notes for personal (and no other) use. As such, students are not authorized to sell, license, commercially publish, distribute, transmit, display, or record notes in or from class without the express written permission of the instructor.

Academic Handbook: Students are expected to abide by the Academic Handbook, located at http://students.georgiasouthern.edu/sta/guide/. Your failure to comply with any part of this Handbook may be a violation and thus, you may receive an F in the course and/or be referred for disciplinary action.

University Calendar for the Semester: The University Calendar is located with the semester schedule, and can be found at: http://www.collegesource.org/displayinfo/catalink.asp.

Attendance Policy: Federal regulations require attendance be verified prior to distribution of financial aid allotments. Attendance will not be recorded after this initial period.

One Final Note: 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 students 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.