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BIOS 7131 - Survival Analysis

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Georgia Southern University
Jiann-Ping Hsu College of Public Health

BIOS 7131 – Survival Analysis
Spring 2015

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Prerequisites: BIOS 6131 and BIOS 6531

Course Description: This course introduces statistical methods for analyzing data collected on the time to an event, referred to as survival data, in medical research and other health-related fields. Emphasis will be placed on the application of the methodology and computational aspects rather than theory. The students will learn how to apply SAS procedures to data and interpret the results.

Required Textbook: David W. Hosmer, Jr., Stanley Lemeshow, and Susanne May (2008). *Applied Survival Analysis.* Second Edition. Wiley

Reference Textbook: *Design and Analysis of Clinical Trials with Time-to-Event Endpoints (2009)* [Peace, KE (Ed.)]. Chapman & Hall/CRC Biostatistics Series; ISBN: 9781420066395.

M.P.H. Biostatistics Concentration Competencies

1. 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.

2. Identify objectives of a public health and biomedical research question.

3. Express objectives in the appropriate biostatistical framework such as hypothesis testing, estimation, and prediction.

4. Evaluate objectives of a public health research question to ensure the appropriate type of data is collected for analysis.

5. 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.

6. Apply appropriate statistical tools and software in order to analyze data.

7. Demonstrate use of Statistical Analysis System (SAS) to input, manage, merge, export, and conduct analysis on public health and biomedical data.

8. Analyze data using appropriate categorical analysis techniques to obtain valid and reliable results.

9. Analyze quantitative data using appropriate biostatistical methods such as simple and multiple regression and clinical trial methodology.

10. Develop a protocol for conducting a clinical trial.

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

12. 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.

13. 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.

14. Create a collaborative environment for working on written and oral reports and developing critical thinking skills.

M.P.H. Biostatistics Core Competencies*:* Upon graduation a student with an M.P.H. should be able to…

1. Describe the roles biostatistics serves in the discipline of public health, with particular emphasis on rural health.

2. Describe basic concepts of probability, random variation and commonly used statistical probability distributions.

3. Differentiate between biased and unbiased public health studies based on design and sampling specifications.

4. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.

5. Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.

6. Apply appropriate methodological alternatives to commonly used statistical methods when assumptions are not met.

7. Demonstrate the use of numerical and graphical descriptive techniques commonly used to summarize public health and biomedical data.

8. Apply common statistical methods such as conducting significance tests and calculating confidence intervals for inference.

9. Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.

10. Demonstrate the use of a statistical software package to enter, clean, manage, and analyze public health and biomedical data.

11. Interpret results of statistical analyses found in public health and biomedical studies, including those obtained from output using a statistical software package.

12. Develop written and oral presentations that effectively communicate statistical results to both public health professionals and educated lay audiences.

13. Create a collaborative environment for working on written and oral reports and developing critical thinking skills.

14. Recognize appropriate situations for consulting a biostatistician for his/her assistance and expertise with the design and analysis of a study and interpretation of study results.

Course Objectives: At the completion of this course the student will be able to:

- Distinguish survival type data from other data types (competency 4;
- Perform relevant aspects in preparing and analyzing data from a clinical trial, which include "intention to treat analysis," interim analysis, and randomization (competency 4,5,6,7,8,9,10,11);
- Determine the product limit estimate (competency 4,5,6,7);
- Construct life tables (competency 4,5,6,7);
- Construct survival curves (competency 4,5,6,7);
- Perform non-parametric methods for comparing survival curves competency 4,5,6,7,8);
- Discuss the relation between density functions, survival functions, and hazard functions (competency 4,8,9);

- Construct regression models for survival analysis (competency 4,5,6);
- Construct Cox proportional hazard models and estimates (competency 4,5,6,10,11,12,13,14);
- Validate proportional hazard models (competency 6,7,8,14);
- Perform parametric survival modeling (competency 4,5,6,10,11);
- Evaluate treatment effectiveness and prognostic factors (competency 10,11) and
- Construct cause-specific hazards in the presence of prognostic factors (competency 5,6).

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

Midterm Exam   …….…………………….   140 points (35%)
(competency 4,5,6,7,8,9,10,11)
Final Exam   …….……………………   140 points (35%)
(competency 4,5,6,7,8,9,10,11,12,13,14)

Assignments   ……….……………….   120 points (30%)
_____

Total Possible Points   400 points (100%)
_____

The midterm will be administered in class. It covers first 4 chapters.

The final exam includes a take-home project and a presentation of a paper. The paper can be a review of an area in survival analysis. You should select the paper related to survival analysis by yourself and tell the instructor as soon as possible since you can't select the same papers that have already been selected. The score for presentation is based on if present and answer the questions clearly or not, and the questions you ask for other students' presentation.

Grading Scale: The following point scale will be utilized in grading:

360-to-400 points (90%)   A

320-to-359 points (80%)   B

280-to-319 points (70%)   C

240-to-279 points (60%)   D

A cumulative total of 239 points or less will be considered as failing.

For calculation of your final grade, all grades above will be included.

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.

Overview of the Content to be Covered During the Semester:

Week	Topic	Readings	Assignment
1	Introduction to regression modeling of survival data	Chapter 1: Applied Survival Analysis	Page 13: Problem 1 Parts a-through d
2-3	Descriptive methods for survival analysis	Chapter 2: A.S.A.	Page 65: Problems 1, 5 and 12
4-5	Regression models for survival data	Chapter 3: A.S.A	Page 90: Problem 1 Parts a-through-f
6-7	Interpretation of a fitted proportional hazards model	Chapter 4: A.S.A.	Page 130: Problem 1 Parts a-through-k
8	Model development	Chapter 5: A.S.A.	Page195: Problem 2.
9-10	Assessment of model adequacy	Chapter 6: A.S.A.	Page 205: Problem 1 &2
11-12	Extensions of the proportional hazards model	Chapter 7: A.S.A.	Page 240: Problem 1 (a & b)
13-14	Parametric regression models	Chapter 8: A.S.A.	TBA

Samples of your work may be reproduced for search purposes and/or inclusion in the professor's teaching portfolio. You have the right to review anything selected for use, and subsequently ask for its removal.

Instructional Methods: Class meetings will be a combination of lecture, class discussion, and computer software demonstration. Written homework assignments and examinations constitute the basis of student evaluation.

Exam Schedule and
Final Examination: Midterm Examination: March 25, 2014
Final Examination: May 6, 3-5PM, 2014

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* (http://students.georgiasouthern.edu/judicial/SCC_08-09.pdf).

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.

Class Participation & Etiquette: Attendance, attention, and participation are expected for each class! I believe it is important to foster student-teacher and student-student interactions within class, so you will discover that I will ask questions to you throughout the class. 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. Otherwise, I do not round final numerical grades to the nearest letter.

On a final note of etiquette, please turn off all cell phones during class, since ring tones are disruptive to others.

Important Dates to Remember:
https://docs.google.com/a/georgiasouthern.edu/file/d/0BxNAGJ9mw9c3cFpaUEJnRkFOelU/edit

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 plagarism 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."