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Spring 2015

BIOS 6136 - Topics of Inference in Biostatistics II

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Georgia Southern University
Jiann-Ping Hsu College of Public Health

BIOS 6136: Topics of Inference in Biostatistics II

Spring 2015

*A statistician is a person who stands in a bucket of ice water, sticks their head in an oven
and says "on average, I feel fine!"*
- K. Dunnigan

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Time: Tuesday & Thursday, 3:30 – 4:45 PM
Location: Info Technology Bldg 2203
Office Hours: Thursday 10:00-11:00am and Wednesday 9am-12pm; 3pm-4pm; other times by appointment.

Prerequisites: BIOS 6135

Course Description (taken from 2012-13 Course Catalog): The course will introduce large sample theory, such as law of large numbers and the central limit theorem; sampling distributions of estimators; the basis for inferences derived from hypothesis testing and confidence intervals; and simulation methods. Emphasis will be placed on how these techniques are used in biostatistical problems and applications using examples from the pharmaceutical industry.

Required Textbook: Morris H. DeGroot, Mark J. Schervish (2002) *Probability and Statistics*, 4th Edition. Addison Wesley. ISBN 0-321-50046-6

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

1. The large sample properties such as the law of large numbers and the central limit theorem. (competency 2,5,11),
2. Bayes estimation, Maximum likelihood estimation and its properties (competency 2,3,5),
3. Sampling distributions of estimators (competency 2,3,5),
4. Testing hypotheses (competency 2,3,5), and
5. Simulation (competency 2,5).

Grading Scheme and due day:

Homework: 30%

Midterm: 30% (competency 2,3,4,5)

Final Exam: 40% (competency 2,3,4,5)

Note: 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.

Grading Scale:

A	90 - 100%
B	80 - 89%
C	70 - 79%
D	60 - 69%
F	0 - 59%

Exams: There will be 2 exams: a Midterm (Thursday, October 18), and a Final (Thursday, December 13 between 12:30 – 2:30 PM – taken from the university’s Fall 2012 Final Exam Schedule). Each exam will be administered in class. Although each exam may be cumulative, the primary material covered on a current exam will consist of material covered since the previous exam.

Homework: Homework accounts for 30% of your course grade. The following table lists assignments for each chapter to be covered throughout the class. Assigned problems will be collected for grading.

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. Furthermore, on submitted assignments it is possible that only randomly selected problems will be graded. In this instance, your maximum possible homework grade for that assignment will be based only on those selected for grading. Finally, if any additional problems are added to assigned or suggested problems, sufficient notice will be provided. I will cheerfully address any homework questions during office hours.

Overview of the Content to be Covered During the Semester:

Week	Topic	Readings	Assignment
1-2	Ch6: Large random samples	Chapter 6: ASA	TBA
3-5	Ch7: Estimation	Chapter 7: A.S.A.	TBA
6-8	Ch8: Sampling distributions of estimators	Chapter 8: A.S.A	TBA
9-11	Ch9: Testing hypotheses	Chapter 9: A.S.A.	TBA
12-14	Ch12: Simulation	Chapter 12: 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 26
Final Examination: May 7, 3-5PM

Academic Misconduct: **"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 students 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 Deans level will ensure that the students work is evaluated in an appropriate manner.

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.