BIOSTATISTICS 600 - PRINCIPLES OF STATISTICAL INFERENCE
Spring 2017

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Course Description:
Bios 600 is an introductory course in probability and statistical inference in public health. This course serves as an introduction to the collection, summarization, analysis and presentation of data. Topics include experimentation, measurement, descriptive statistics, summary graphs, correlation, probability, confidence intervals, tests of hypotheses, 2-way tables, sample size calculations, diagnostic tests, chi-square distribution, survey sampling, nonparametric methods, correlation and linear regression.

Students will be able to evaluate straight-forward statistical usage in everyday life and their own public health discipline, especially in relevant research publications, and interact knowledgeably with statisticians in planning, conducting, analyzing, reporting and interpreting public health research.

Prerequisites:
- Students are required to have a basic understanding of <u>algebra</u> and <u>arithmetic</u>. This math competency can usually be demonstrated by a college-level algebra course or precalculus course. More information about math competency is available in the *"Quantitative Self-Test"* in the course documents in Sakai. This *Self-Test* contains math review questions and resources for math review. The *answer key* is also available in Sakai.
- Students must be familiar with a basic calculator.
- Students are not required to have experience in MS Excel, however familiarity with MS Excel is helpful. Excel tutorials will be provided. Coursework may be completed using other statistical software (such as SAS or R) if the student already has experience with this other software.
- No previous course work in probability and statistics is required.

Textbook:
Required: <u>Principles of Biostatistics</u> 2nd edition by Pagano and Gauvreau (purple book)
(Very Optional: <u>Student Solutions Manual for Principles of Biostatistics</u> by Pagano and Gauvreau)
The book is also available at most online bookstores like amazon.com. Students are responsible for obtaining the textbook within the first week of class.
(This textbook requirement is for Spring 2017 only. The textbook/edition requirement may change in future semesters.)

				SPRING 2016 SCHEDULE				
Unit	Book Chapter	# Lessons Required (# Lessons Optional)	Topic	Graded Assignment Format *(Unit Covered)*	Point Value	Graded Assignment Available Online (<u>NOON</u> Eastern Time)	Graded Assignment Due Date (<u>8 AM</u> Eastern Time)
1	Chapter 22	6	SAMPLING and SURVEYS	Short Test *(1)*	50	Thurs Jan 19	Tues Jan 24
2	Chapter 1,2,3	5	DESCRIPTIVE STATISTICS	**MIDTERM 1** *(1,2)*	200	Thurs Feb 2	Tues Feb 7
3	Chapter 6, 7.4	3	PROBABILITY and RANDOM VARIABLES	Short Test *(3)*	50	Thurs Feb 16	Tues Feb 21
4	Supplements	4	STUDY DESIGN and ETHICS	Short Test *(4,5)*	50	Thurs Mar 2	Tues Mar 7
5	Chapter 7.2, 14.1, 8	2	BINOMIAL DISTRIBUTION / SAMPLE MEAN DISTRIBUTION				
6	Chapters 9, 10, 11	4 (1)	INFERENCE, Part 1 (CI, Pvalues z tests and t-tests)	**MIDTERM 2** *(Comprehensive with focus on 3,4,5,6)*	300	Thurs Mar 23	Tues Mar 28
7	Chapter 14, 15.1, 6.5	3 (2)	INFERENCE II (binomial, proportions, 2-way tables and chi-square distribution)	Short Test *(7)*	50	Thurs Apr 6	Tues Apr 11
8	Chapters 17 and 18	4	LINEAR REGRESSION and CORRELATION	**FINAL EXAM** *(Comprehensive with focus on 7,8)*	300	Thurs Apr 27	Wed May 3
				TOTAL	1000		

The timing of each graded assignment provides some week<u>day </u>time and some week<u>end</u> time for completion across different weeks.   Therefore minimal scheduling accommodations should be needed.

Short Tests (50 points each) are comparable to "in-class *timed* multiple choice or short answer quizzes". They focus on specific unit(s) indicated.

Two Midterms and **Final Exam** are comparable to "take home tests" and are more comprehensive - covering more than one Unit.

<u>**STUDENT HONOR CODE:**</u>

Graded assignments (Short Tests/Midterms/Final) must be completed without the assistance of any other person. Students must not consult any other person (taking this course or not taking this course, other than the instructor) about <u>any</u> test material or graded assignment. Students must not consult tests from previous semesters. Any suspicion of violation of the Honor Code is serious and <u>will</u> be taken to the Honor Court.

Honor Court sanctions for academic misconduct can include receiving a zero for the assignment, failing the course and/or suspension from the University. Students <u>in this course</u> in previous semesters have been suspected of academic misconduct and have been prosecuted by the Honor Court on <u>many</u> occasions. Students have been found <u>guilty</u> of academic misconduct <u>in this instructor's sections of this online course</u> and serious penalties have been imposed for that misconduct.

If a student has any question about whether their actions could be considered a violation of the Honor Code, the student should contact the instructor before engaging in the behavior. Each graded assignment will have painfully explicit instructions about these expectations. Students will be required to sign an Honor Code statement on each graded assignment indicating that the student has neither given nor received unauthorized help.

For more information on the UNC Honor Code and the Honor Court see honor.unc.edu.
In brief: Don't Cheat.

<u>**SCHEDULING ISSUES /LATE TESTS:**</u>

This course is not a "work at your own pace" design. Students are expected to complete assignments when they are due. Because each graded assignment includes weekday and weekend time across two different weeks, <u>most scheduling conflicts can and **should** be avoided</u>. If a student cannot complete the assignment during the time period that it is assigned because of an unavoidable conflict (such as a documented death in the immediate family, hospitalization (planned or emergency), life event such as birth or marriage), arrange with the instructor to complete the assignment early, if possible. Making special arrangements may be possible for students *who are otherwise keeping up with the course*.

If a student has significant lingering technical problems, or will be out of town on business for an extended time, that student may ask the professor for special arrangements in due dates BEFORE the assignment becomes available. Such requests are handled on a case-by-case basis. No extensions will be given for reasons such as busy at work or home or did not have time to complete assignment. Asking for an extension in turning in an assignment on or after the assignment due date is unacceptable except for a situation like a serious emergency or sudden serious illness – which will require documentation. If a student will be without internet access (such as traveling) for more than a week –or has known commitments that may prevent them from submitting more than one assignment on time (scheduled surgery, life event, etc), this semester may not be the best semester to enroll in this course. Students are encouraged to enroll in the course during a semester when they will have reliable, timely internet access and are able to complete the assignments on time.

The penalty for turning in an assignment late without permission is a 20% deduction will be imposed for each day (or portion of a day) that the assignment is late, up to two days. After two days, the score will be zero. For example, if a test is due Tuesday at 8 AM, if the student turns in the test Tuesday at 8:05 AM, the score will have a 20% deduction. If the test is turned in Wednesday at 8:05 AM, the score will have a 40% deduction. If the test is turned in Thursday at 8:05 AM, the score is 0.

Part of the instructor's job is to set in place a system that encourages student success. Keeping up with the material and submitting graded assignments on time is expected and an important component in student success. [Another reason for having a strict policy about submitting tests on time is in fairness to your classmates…. answer keys and comments cannot be distributed until everyone has submitted their tests. Prompt feedback is another important component in student success and learning.]

ASSIGNMENT OF COURSE LETTER GRADES:

Graduate	[95.0-100)	H
Students:	[80.0-95.0)	P
	[75-80.0)	L
	<75	F

While the cut-off point between an "H" and "P" may appear high, in past semesters at least one third of students had course averages ≥ 95.   The high averages in this course are likely explained by the tests being straightforward and "open book," and the students being motivated. Students can easily calculate their course average at any time (as "Total Points Earned"/"Total Points Possible"). Students will also be given the distribution of the class scores after each test so the student knows where their scores rank in relation to the entire class.

No undergraduate scale is given because this course should not have any undergraduate students enrolled.

Successful completion of the course is the goal! Since the implications for "L" or "F" grades are severe, students are urged to drop the course rather than receive an "F" or "L". Students are requested to contact the instructor if their average drops below a 75 (starting after the First Midterm following Unit 2) in order to discuss options: *a plan for improvement !* or the option of dropping the course. The course material <u>does</u> get harder as the course progresses so passing grades at the beginning of the semester are not a guarantee of passing the course.

INCOMPLETE GRADE:
To be eligible for an Incomplete grade, a student needs to have completed 60% or more of the course and be passing the course (with a "P" or better) at the time the Incomplete is assigned. An Incomplete will only be given if the student is unable to complete the work due to a qualifying event (severe illness, death of close family member, …) .   Before the grade of "IN" will be assigned, the student and the instructor must develop a plan/time line for the successful completion of the required work. Students have a maximum of one year to complete the course after receiving an "IN" grade.   It is the student's responsibility to contact the instructor to make up the work.   If a student misses the drop deadline and has not successfully completed at least 60% of the course, the student will not be eligible for an Incomplete and will receive an "F" for the course.

REUSE OF MATERIALS:
The materials in this course website are only for the use of students currently enrolled in the course for purposes associated with this course. Materials should not be retained or further disseminated.
For example, journal articles or electronic copies of tutorials should not be retained after the course is completed. Please don't transmit or post materials from this course; materials are for student personal use only during one semester. Please don't share materials (such as tests and homework) with any other individuals including students who may take the course in the future – doing so is considered an honor code violation in this course.

GLOBAL TOPICS:
As part of their study of biostatistics, students will be exposed to a variety of global public health topics. In effort to enrich students' understanding of global public health issues, global content will be incorporated in a variety of ways, including "Global Health Activities", readings, lecture examples and test examples.

For the purposes of this course, global content will be defined as "health problems that transcend national boundaries, that may be influenced by circumstances or experiences in other countries, and that are best addressed by cooperative actions, and solutions," whether they occur in developing countries, countries in advanced transition, or industrialized countries. *Source: Institute of Medicine, America's Vital Interest in Global Health, Washington DC, National Academies Press, 1997.*

Within many units, Global Health Activities will be used to highlight important statistical concepts using

examples and journal articles centered on global health topics. Watch for this symbol, ,to indicate that global content is being incorporated.

COURSE EVALUATIONS:
The course evaluations are enormously important, and students are expected to complete the online course evaluation at the end of the semester. Students are reminded of the importance of completing the course evaluation.

LEARNING MATERIALS:
Tutorials: (Required) The tutorials are a series of narrated PowerPoint slides. Print out the tutorial slides and transcript (under a button labeled "Transcript") at the beginning of each tutorial to facilitate taking notes on the slides. Feel free to repeat or pause slides as needed.

Online 'self-quizzes' are provided in Sakai immediately after many, but not all, of the tutorials to reinforce the main ideas from the tutorial. These self-quizzes are *not graded*; rather, they simply provide immediate feedback of understanding of the lecture material. IMPORTANT: Students are **REQUIRED** to listen to the tutorial, not just read the slides and transcript. The transcript is provided, but **does not eliminate** the need for actively listening to the tutorial.

Reading: (Required) Most readings are in the textbook. Both the readings and the online tutorials are important for student understanding, and they work together. The timing (reading before tutorial vs. tutorial before reading) is not as important as just doing both. Other readings, such as journal articles, will appear in some units.

Homework Exercises: (Required) Assigned homework exercises (from the textbook, other resources or the and Global Activities handouts) are *not graded and not collected* but are enormously important. Many answers to the hw problems will be provided on the assignment sheet or available through the TA. [Some solutions (not just the answer, but the worked-out solution) appear in the (very optional) Student Solutions Manual for Principles of Biostatistics. Students are not required to buy this study guide.] The Teaching Assistant can also provide worked solutions with explanations via email for students with questions. Solutions to the Global Activities handouts are posted in Sakai. More info in the FAQs.

OPTIONAL MATERIALS:

CD/Getting the Data for HW: (Not required) The CD provided with the textbook contains additional information such as the datasets needed for homework problems. The CD contains many of the data sets that are referenced in the textbook as Excel files for homework problems, so *students don't need to type in the (large) homework data sets*. A listing of many of the data sets is available at the back of the textbook (Appendix B).

GETTING HELP: (also see FAQs! Section C)

Instructor and TA: For questions about the course, email the instructor or TA depending on the type of question:

- *Our TA primarily handles questions about homework and straightforward statistical concepts. The TA should be the <u>first point of contact</u> for many issues. TA contact information will be on the homepage of Sakai and announced often.*
- *The instructor primarily handles questions <u>not</u> related to homework – such as scheduling, grading and more advanced statistical concepts.*

We will make every attempt to respond to email within 36 hours. If the matter is not urgent and/or during the weekend, that return email may simply acknowledge receipt and describe when to expect resolution.

If a student's questions are not answered sufficiently by the TA, then the instructor will be happy to answer any questions or elaborate on explanations. Unless a student specifically requests that the question and answer not be shared, any questions to the instructor/TA may be sent to all students through email/announcements, so that all may benefit from the answer. Students are also welcome to meet with the TA or instructor in person if the student is near campus. (Email the instructor or TA to set up a phone conference or a meeting.) Other methods to communicate with students are available such as webcam online sessions, or emailing pdf files with hand-written explanations. The instructor and TA will work with the student preferences and technologic capabilities to help.

Other important contacts: For questions about ONYENs, general computer problems or Sakai, please contact help.unc.edu. For registration questions, please contact your departmental student services manager. For questions where you do not know where to start, start with the TA and cc the instructor.

Online Problem Sessions: Online live problem sessions/office hours will be available before graded assignments are posted. Dates and times will be announced roughly during the second week of class. The online office hours will be used to facilitate live discussions to answer homework or other questions. These live discussions are not required. They will be recorded so that they may be replayed for students who are unable to participate. More information about these optional problem sessions will be provided after the course begins.

Small Groups: Small groups will be assigned after the first week of class. These small groups will be available to discuss homework, concepts, or biostatistics in the news. Students are encouraged to participate in their small group if they find that interaction helpful.

Some students may choose not to participate in their small group – or only participate to a limited extent as their schedule allows. Participation in the small group is not required and will not impact the student grade. More details when small groups are assigned.

Frequently Asked Questions: The amount of information about the administration of this course far exceeds the space available in a Syllabus.   Therefore an enormous amount of information about the course is available in the detailed FAQ document in Sakai including: software and operating system compatibility, pacing of the lessons, suggestions for success, logistics, instructions for rounding calculations, and expectations for the different graded assignments. Enjoy ☺.

CLOSING:
I am glad you are in the course! In the beginning, there is a lot of administration to get familiar with how the course is set up, but there is plenty of help available.   I am eager for you to have an excellent experience in the course and learn a great deal of biostatistics. Please don't hesitate to contact me, Jane Monaco, at jmonaco@bios.unc.edu if you have questions.

Biostatistics 600 meets the CEPH (Council on Education for Public Health) Competencies:

A. BIOSTATISTICS
Biostatistics is the development and application of statistical reasoning and
methods in addressing, analyzing and solving problems in public health; health care;
and biomedical, clinical and population-based research.

Competencies: Upon graduation a student with an MPH should be able to…

A. 1.   Describe the roles biostatistics serves in the discipline of public health.
A. 2.   Describe basic concepts of probability, random variation and commonly used statistical probability distributions.
A. 3.   Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met.
A. 4.   Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
A. 5.   Apply descriptive techniques commonly used to summarize public health data.
A. 6.   Apply common statistical methods for inference.
A. 7.   Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
A. 8.   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.
A. 9.   Interpret results of statistical analyses found in public health studies.
A. 10. Develop written and oral presentations based on statistical analyses for both public health professionals and educated lay audiences.

Other "terms of use" information for UNC courses (the fine print):
1.   By enrolling as a student in this course, you agree to abide by the University of North Carolina at Chapel Hill policies related to the Acceptable Use of online resources. Please consult the Acceptable Use Policy (https://its.unc.edu/files/2016/02/Acceptable-Use-Policy.pdf) on topics such as copyright, net-etiquette and privacy protection.

2.   As part of this course you may be asked to participate in online discussions or other online activities that may include personal information about you or other students in the course. Please be respectful of the rights and protection of other participants under the UNC Chapel Hill Information Security Policies (http://its.unc.edu/files/2014/08/Information-Security-Policy.pdf) when participating in online classes.

3.   When using online resources offered by organizations not affiliated with UNC Chapel Hill, such as Google or Youtube, please note that the Terms and Conditions of these companies and not the University's Terms and Conditions apply. These third parties may offer different degrees of privacy protection and access rights to online content. You should be well aware of this when posting content to sites not managed by UNC Chapel Hill.

4.   When links to sites outside of the unc.edu domain are inserted in class discussions, please be mindful   that clicking on sites not affiliated with UNC-Chapel Hill may pose a risk for your computer due to the possible presence of malware on such sites.

UPDATED: January 10, 2017