

# **BIOS 600, Section 2, Fall 2009**

## **Principles of Statistical Inference**

### **Course Information**

**Robert M. Hamer, Ph.D., Professor of Biostatistics and Psychiatry**

Class Location and Time: 8:00 AM-9:15 AM, Tuesdays, Thursdays, Rosenau Auditorium (Section 2)

Recitation Section Location and Time: 3:30 – 4:50 Tuesday, McGavran-Greenberg 2304

(The recitation section is simply one of the sets of office hours; all are interchangeable)

#### *Professor*

Robert M. Hamer, Ph.D.

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Office Hours: By appointment

*Teaching Assistants and Graders:* To be arranged

#### [UNC's Honor Code](#)

“It shall be the responsibility of every student at the University of North Carolina at Chapel Hill to obey and to support the enforcement of the Honor Code, which prohibits lying, cheating or stealing...”

#### [Text of Honor Code](#)

#### *Grading:*

Homework: 0%,

Weekly Quizzes 10% (drop the 3 lowest scores including zeros if some are not taken *no makeup quizzes*),

Midterm 40% (takes two class periods),

Final: 50%

(Quizzes, Midterm and Final are closed book, but you will be allowed one 8.5 by 11 sheet (both sides) of formulae or other text per quiz and all of your quiz formula sheets can be used cumulatively for the midterm and final examinations.)

***NOTE THAT THIS MEANS THAT DURING QUIZZES, MIDTERMS, AND FINAL EXAMINATIONS YOUR COURSE NOTES SHOULD BE CLOSED AND YOUR BOOK SHOULD BE CLOSED. TABLES ARE ON-LINE, AND YOU SHOULD PRINT THEM AND BRING THEM TO CLASS; THUS THERE IS NO NEED FOR THE BOOK DURING EXAMS.***

The final average (10% quizzes, 40% midterm, 50%final) will be used to assign a letter grade for the course as follows:

Graduate Grade	Final Average		Undergraduate Grade	Final Average
H	90 to 100		A	95 to 100
P	70 to <90		A-	90 to < 95
L	65 to < 70		B+	85 to < 90
F	Below 65		B	80 to < 85
			B-	75 to < 80
			C+	72 to < 75
			C	68 to < 72
			C-	65 to < 68
			D+	63 to < 65
			D	60 to < 63
			F	Below 60

**Grades will not be curved.** I have gotten pretty good over the years at writing test items which are of the same difficulty, so if there are differences between classes in the grade distribution from year to year, it is most likely due to actual differences in the class, rather than the tests. If you are prepared, and if you study and do the exercises, it ought to be very difficult to fail this course. You will be able to drop the course after the midterm, and I would urge students who have not done well on the midterm to consider dropping and retaking the course. I do not enjoy giving out F, L, or D grades. Other than that, the grades fall where they fall.

**Quizzes:** Quizzes occur approximately weekly when we have covered an entire chapter or major unit, usually after 2 lectures, and on the day when we start the next chapter or major unit. Dates are listed in the syllabus. They comprise the first 10 minutes of classes on the days they occur. This is to ensure that (a) you are not late for class, and (b) you come to most classes and thus have a better chance of learning the material. We drop the 3 lowest quizzes to allow for religious holidays, illness, or a just plain off day. That means that if you miss some of the quizzes, you will get zero for those quizzes, and those zeros are the lowest grades. That means you can miss up to three quizzes and have those resulting zero scores dropped. *There are no make-up quizzes.* Quizzes are graded on a 10-point scale. If you have been keeping up with the material, you should have no trouble doing well on the quizzes. Due to Fall Break, while quizzes will occur at the beginning of the semester on Tuesdays, they will switch to Thursdays after the break.

**Homework:** There are weekly homework assignments, which we will not collect. Although homework does not count toward your grade, if you can't do the homework, it is unlikely that you'll be able to do the quizzes, and unlikely that you will be able to do the midterm and final, and will fail the course. Most of the homework assignments are exercises from the book, but a few of them involve material which will be posted on the web.

**Midterm and Final:** The midterm and final examination are multiple choice. The midterm will take two class periods and will consist of 50 questions total, and the final exam will consist of 50 questions total. These questions are all multiple choice questions, and usually have 5 choices. With the size classes we have, there is no way I'm going to write and grade problem sets for the midterm and final. I understand that some of you would rather have problem sets, but I just really can't do it.

**Computer Usage:** There will be no computer usage required in this course. If you wish to use computers for the homework assignments, we encourage you to do so. Just remember that you won't have computers in class

for the midterm and final; all you'll have is notes, paper, and your calculator. Further, if you get a fancy calculator (one that does many statistics automatically) you may carry the arithmetic to more decimal places than I do when I construct the items, and you may get a different answer than I. If you do, that is your responsibility. I am of mixed mind about the use of computers in a class like this. Unpleasant as it may be, actually doing the arithmetic (with a calculator) does make sure you understand the steps to follow. I hate doing the arithmetic with a calculator, both because it is tedious and because if I make an error entering a number, I may never know it. That's why when I do arithmetic with a calculator, I usually do it at least twice, just to make sure I get the same answer each time. If we had software that you could use to take the drudgery out of it, but still have to follow all the steps in the computations, that might be useful, but of course, that would still leave the problem of how you would do the midterm and final.

**Calculators:** Get a calculator. You will need it for the homework assignments, quizzes, midterm and final. It does not have to be a complicated calculator; the minimal requirements are that it have the usual four functions, a square root key, and an  $\exp(X)$  key (sometimes written as " $e^x$ "), and at least one memory. A small number of assignments and exam questions will require that you calculate  $\exp(X)$ , which is the base of the natural log system raised to a power. Some calculators have a natural log key and an inverse key, and  $\exp(X)$  is the inverse of the natural log (and visa versa). I think calculators like this cost \$10 or less these days. If you get a fancy calculator that can do t-tests, standard deviations, regression, etc., and rely on that instead of learning to do the calculations, you will probably simply not know how to do many of the test questions and may get the test questions wrong.

**Text:** Daniel, Wayne W., *Biostatistics: A Foundation for Analysis in the Health Sciences*. Ninth Edition. New York: Wiley, 2009. **Datasets from the book can be downloaded from the publisher's website.**

***Other Interesting and Perhaps Useful Books:***

The Cartoon Guide to Statistics, Gonick and Smith ISBN 0-06-273102-5

*(No kidding, this book contains very clear discussions of statistical concepts.)*

Statistics as Principled Argument, Robert P. Abelson ISBN 0-8058-0528-1 (*Paperback*)

*There is a great deal of supplementary material on the web page, and I may add more during the semester. You may find it educational and we may discuss it. Or you may find it completely uninteresting.*

***Important Remarks:***

(1) Taking a first biostatistics course has aspects of learning a new language. Although I allow you to make a sheet of paper corresponding to each quiz, and to use them cumulatively on the midterm and final examination, there is a great deal of memorization which is still required. If you don't know which formula you need for a particular problem, or don't know the symbols for a term, or don't know precisely what a term means, then all the formulas listed on a piece of paper won't help. You won't know what formula to look for; you won't understand the differences between similar formulas and symbols, or when to use which. You have to understand the material, not just use your formula sheets, and not just memorize terms. Memorization, understanding, and precision are all essential to learning and using biostatistics correctly.

(2) It is traditional to say that there is no such thing as a stupid question. Of course there is. However, it is far more likely that any question you wish to ask will be reasonable, and not stupid. I am very open to questions during class, because I need to understand if I am getting the material across, and if you need to ask a question, then possibly someone else needs to ask the same question. Please feel free to ask questions. The worst I'll do is tell you we should cover that after class, or to ask one of the TAs, etc.

(3) One of my goals, is to help you digest and use quantitative and statistical information you encounter in the popular press as well as your scientific literatures critically and skeptically. It is astonishing how much of the quantitative information we read in newspapers, magazines, and our scientific journals nonsense is. I hope to make you very critical consumers of such information.

***Final Remark:***

Many of you are taking this course only because you are required to. I urge you to remember that throughout your careers, you will be reading articles that contain statistical information. It will do you a great deal of good to be able to understand it and digest it critically, rather than simply allow your eyes to skim over it and skip to the discussion section. In terms of enjoying the material, although for some of you it might be difficult, it will (really, I mean it) become easier if you open your minds to the aesthetic beauty inherent in the material, which is about using mathematics (reasonably simple mathematics) to make system out of chaos and make educated guesses about important things we care about when we can't measure them. As a final remark, I will tell you that I am not much of a mathematician. When I got past calculus and linear algebra, to courses where one really dealt with abstract objects, and manipulating them in abstract ways, I found it difficult and didn't do very well. I found it interesting and beautiful, but I didn't do very well. I would like you to convince yourselves that this material we are about to cover is interesting and beautiful; if you can do that, it will be easier for you.

I hope you have an enjoyable voyage in this course.