

PHTH 2210 Foundations of Biostatistics

Bouve College of Health Sciences

Department of Health Sciences

Fall 2015

Course Description: This course for undergraduate students is intended to introduce the fundamental concepts of biostatistics. Students will learn to apply statistical thinking to practical problems across several health disciplines. Topics include descriptive statistics; sampling; estimation and hypothesis testing; sample size and power; correlation and regression methods. In order to understand the concepts behind hypothesis testing, we must discuss basic probability and certain distributions. Examples and readings will be drawn from public health practice. Use of Stata as statistical software package will be introduced.

Class Location: 410 Ell Hall

Class Time: Monday, Wednesday, Thursday 1:35pm – 2:40pm

Instructor: Justin Manjourides PhD

Office location: 316 Robinson Hall

Office hours: Tuesdays 3-5pm (try to email if you're going to show up)

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Teaching Assistant: Meredith Milstein

Email: Milstein.m@husky.neu.edu

Office hours: TBA

Course Goal: Students participating in this course should acquire the ability to formulate and test statistical hypotheses by clearly organizing, summarizing, and presenting data.

Course Outcomes: By the end of this course you will be able to:

- Interpret health data using both numeric and graphic techniques
- Quantify the uncertainty surrounding assumptions about data by creating, testing, and interpreting statistical hypotheses.
- Appropriately design studies by calculating necessary sample sizes
- Infer associations between variables through linear regression modeling
- Evaluate statistical measures reported in medical literature through research and use of course vocabulary
- Use Stata to summarize, analyze, and display data

Course Topics:

1.0 Appropriate summarizations health data:

1.1 Types of data

1.2 Data visualization

1.3 Measures of center and spread

2.0 Basic concepts of probability:

- 2.1 General mathematical properties of probabilities and random variables
- 2.2 Bayes' rule and diagnostic testing
- 2.3 Distributions of random variables
- 2.4 The sampling distribution of the mean
- 2.5 The Central Limit Theorem

3.0 Formulations, testing, and interpretation of hypothesis tests:

- 3.1 Confidence intervals
- 3.2 Z-tests, t-tests, tests of proportions
- 3.3 P-values, Type-1 errors, Type-2 errors
- 3.4 Power and sample size
- 3.5 Nonparametric tests

4.0 Linear regression modeling

- 4.1 Assumptions
- 4.2 Correlation
- 4.3 Hypothesis testing
- 4.4 Interpretations of model parameters

5.0 Use of the Stata statistical software package

Credit hours: 4 semester hours

Class time: Monday, Wednesday, Thursday: 1:35pm – 2:40pm.

Prerequisites: None.

Recommended Textbooks:

Principles of Biostatistics
Pagano and Gauvreau
2000

ISBN-13: 978-0534229023.

You can order textbooks from Northeastern University Bookstore by phone at (617) 373-3182 or (617) 373-2286, [online](#), or purchase in person at the main campus bookstore. This book is also available at amazon.com, and there is a copy on reserve at Snell Library. Any version of the "Second Edition" of this book will suffice (the cover will be purple, not red).

Policy regarding the use of electronic devices:

Computers can be used during class for the purpose of taking notes. Tape recorders can be used but students are asked to inform the instructor. Cell phones should be turned off during class.

Academic Honesty:

“Northeastern University is committed to the principles of intellectual honesty and integrity. All members of the Northeastern community are expected to maintain complete honesty in all academic work, presenting only that which is their own work on tests and assignments. If you have questions regarding the definitions of cheating or plagiarism, consult the Northeastern University Student Handbook and/or contact the professor prior to submitting work for evaluation.”

Any student who has witnessed an act of academic dishonesty should report it to the course faculty member.

Special Accommodations: If you have specific physical, psychiatric or learning disabilities that may require accommodations for this course, please contact Northeastern's Disabilities Resource Center (DRC) at (617) 373-2675. The DRC can provide you with information and assistance to help manage any challenges that could affect your performance in the course. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

Classroom Behavior: Classroom participation is anticipated. Phones and laptops should be silenced. Everyone is expected to be respectful of fellow classmates.

Assignments and Assessment:

Ten Homework Assignments: The assignments are to be completed and turned in at the beginning of the class in which they are due. Late homework assignments will not be accepted. Aside from any Stata output, homework assignments are to be completed by hand.

(20 pts each assignment= 200 points total)

Midterm Exam: The Midterm Exam will be held in class on October 15. The midterm will cover the topics through The Central Limit Theorem. Students will be allowed to bring a calculator and formula/note sheet to the exam. The note sheet is to be handwritten on 1 side of an 8.5 x 11 inch sheet of paper. You may include anything on the note sheet, as long as it is handwritten (no photocopies, nothing computer generated). You may write as small or as large as you would like. Students will turn this note sheet in with their midterm exam. **(100 pts)**

Final Exam: The Final Exam will be held according to the Northeastern University Final Exam Schedule. The final will cover the topics through from Confidence Intervals through the end of the course. Students will be allowed to bring a calculator and formula/note sheet to the exam. The note sheet is to be handwritten on 1 side of an 8.5 x 11 inch sheet of paper. You may include anything on the note sheet, as long as it is handwritten (nothing photocopied, nothing computer generated). You may write as small or as large as you would like. Students will turn this note sheet in with their final exam. **(100 pts)**

Grading Scale: The grading scale will be based on the 400 points possible in the course. Points will break down as follows:

372-400 = A (93%-100%)
360-372 = A- (90-92%)
348-359 = B+ (87-89%)
332-347 = B (83-86%)
320-331 = B- (80-82%)
308-319 = C+ (77-79%)
292-307 = C (73-76%)
280-291 = C- (70-72%)
268-279 = D+ (67-69%)
252-267 = D (63-66%)
240-251 = D- (60-62%)
239 and below = F

Attendance, participation and make-up work: Students are expected to attend each class on time, turn in their own assignments, and participate in the entire class. *Students are reminded to check the midterm exam date and final exam schedule before making any flight reservations home for the holidays.* Early flight reservations will **not** be a reason to miss either exam.

Date	Topics	Assignments
9-Sep	Intro / Types of Data	P&G: 7-48, 52-54
10-Sep	Center, Spread	
14-Sep	Intro to STATA (LAB)	Homework 1 Assigned
16-Sep	Probability	P&G: 125-55
17-Sep	Diagnostic Testing	Homework 1 Due
21-Sep	Bayes Rule	Homework 2 Assigned
23-Sep	LAB	
24-Sep	Samples vs. Populations	P&G:162-175
28-Sep	Binomial Distribution	Homework 2 Due
30-Sep	Poisson Distribution, Proportions	Homework 3 Assigned
1-Oct	LAB	
5-Oct	Normal Distribution/ Standardization	P&G: 176-191, 196-210: Homework 3 Due
7-Oct	CLT	Homework 4 Assigned
8-Oct	LAB	
12-Oct	NO CLASS	Columbus Day
14-Oct	Review	Homework 4 Due
15-Oct	MIDTERM EXAM	
19-Oct	Confidence Intervals	P&G: 214-227
21-Oct	Confidence Intervals	Homework 5 Assigned
22-Oct	Hypothesis Testing	P&G: 232-254
26-Oct	Hypothesis Testing	Homework 5 Due/ HW 6 Assigned
28-Oct	LAB	
29-Oct	Power and Sample Size	
2-Nov	Comparing two means	P&G: 259-278, 285-298: Homework 6 Due
4-Nov	ANOVA	Homework 7 Assigned
5-Nov	LAB	
9-Nov	Inference on proportions	P&G: 323-335: Homework 7 Due
11-Nov	NO CLASS	Veterans Day
12-Nov	Inference on proportions	Homework 8 Assigned
16-Nov	Nonparametric Methods	P&G: 302-312: Homework 8 Due
18-Nov	Correlation	P&G: 3980407: Homework 9 Assigned
19-Nov	Intro to regression	P&G: 415-428
23-Nov	SLR	Homework 9 Due
25-Nov	NO CLASS	Thanksgiving
26-Nov	NO CLASS	Thanksgiving
30-Nov	NO CLASS	
2-Dec	Multiple Regression	P&G: 449-460: Homework 10 Assigned
3-Dec	Regression Diagnostics	P&G: 432-434
7-Dec	Review	Homework 10 Due
9-Dec	LAB	

