DEPARTMENT OF **EPIDEMIOLOGY** | Columbia University MAILMAN SCHOOL OF PUBLIC HEALTH

Executive MS Introduction to Biostatistics
Fall Semester 2012

COURSE DESCRIPTION

Biostatistics is essential to ensuring that findings and practices in public health and biomedicine are supported by reliable evidence. This course covers the basic tools for the collection, analysis, and presentation of data in all areas of public health. Central to these skills is assessing the impact of chance and variability on the interpretation of research findings and subsequent recommendations for public health practice and policy. Topics covered include: general principles of study design; hypothesis testing; review of methods for comparison of discrete and continuous data including ANOVA, t-test, correlation, and regression.

This course is part of the core course requirement for the MPH and is a prerequisite for other courses in the Department of Biostatistics and throughout the Mailman School of Public Health.

COURSE LEARNING OBJECTIVES

Students who successfully complete this course will be able to:
- Describe the roles biostatistics serves in public health and biomedical research;
- Explain general principles of study design and its implications for valid inference when, for example, identifying risk factors for disease, isolating targets for prevention, and assessing the effectiveness of one or more interventions;
- Assess data sources and data quality for the purpose of selecting appropriate data for specific research questions;
- Translate research objectives into clear, testable statistical hypotheses;
- Describe basic principles and the practical importance of key concepts from probability and inference, inductive versus deductive reasoning, including random variation, systematic error, sampling error, measurement error, hypothesis testing, type I and type II errors, and confidence bounds;
- Apply numerical, tabular, and graphical descriptive techniques commonly used to characterize and summarize public health data;
- Identify appropriate statistical methods to be applied in a given research setting, apply these methods, and acknowledge the limitations of those methods;
- Evaluate computer output containing statistical procedures and graphics and interpret it in a public health context; and
- Differentiate between quantitative problems that can be addressed with standard, commonly used statistical methods and those requiring input from a professional biostatistician.

COURSE USEFUL WEBSITES
- **https://courseworks.columbia.edu/**
- **http://twitter.com/#!/search/realtime/%23P6103EXEC**
  (To every tweet, attach hash tag #P6103EXEC)
- **http://twitter.com/Prof_P6103**
  (To send me a direct tweet, start with "@Prof_P6103" . This is a combined account for all classes I teach.)

CLASS SESSIONS

Day	Date	Time	Location
Friday	September 7	3:30pm – 5:00pm	11th Floor Conference room
Saturday	September 8	9:00am – 1:00pm	11th Floor Classroom
Sunday	September 9	9:00am – 1:00pm	11th Floor Classroom
Friday	October 5	8:00am – 12:00pm	11th Floor Conference room
Saturday	October 6	9:00am – 1:00pm	11th Floor Classroom
Sunday	October 7	9:00am – 1:00pm	11th Floor Classroom
Friday	November 2	8:00am – 12:00pm	11th Floor Conference room
Saturday	November 3	2:00pm – 6:00pm	11th Floor Classroom
Sunday	November 4	2:00pm – 6:00pm	11th Floor Classroom
Friday	December 7	8:00am – 12:00pm	11th Floor Conference room
Saturday	December 8	2:00pm – 6:00pm	11th Floor Classroom
Sunday	December 9	2:00pm – 6:00pm	11th Floor Classroom

INSTRUCTOR

Martina Pavlicova
Biostatistics Department, 722 W 168th Street, 6th floor, rm 635
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Phone: (212) 305-9405 (I prefer the use of email)
Fax: (212) 305-9408
Office hours by appointment

RECOMMENDED TEXTBOOKS

Principles of Biostatistics, 2nd edition (BIO)
ISBN: 0534229026
Publisher: Brooks/Cole Cengage Learning
Author(s): M. Pagano, K. Gauvreau
Publication Date: 2000

The Cartoon Guide to Statistics (CGS)
ISBN: 0062731025
Publisher: Collins; 1st HarperPerennial Ed
Author(s): Larry Gonick, Woollcott Smith
Publication Date: February 25, 1994

ASSESSMENT OF LEARNING

Exam 1……………………………………………..………….10%
Exam 2…………………………………..……………………10%
Exam 3……………….…………...……………………………10%
Final Exam………..…………….....………………..……...…..20%
Homeworks (best 10 out of 11) …........……………...………...40%

Homeworks will be due Mondays at 6pm EDT electronically. Late homeworks will not be accepted under any circumstances! There will be no make up exams.

Exams: Exams will be given in-class, closed-book with formula sheets. If there is a valid reason for missing an exam (with documented proof), you must notify the instructor <u>one week prior</u> to the exam and an additional weighting will be given to the final exam.

Final Exam: This will be an out-of-class, closed-book online exam using ExamSoft. You will be given two hours to complete the exam and can open the exam anytime between **December 14th and 19th.**   The exam will cover material presented over the entire semester.

Course Website

To access the course website:
- Course website URL: https://courseworks.columbia.edu/
- User ID: Your Columbia University email address (abc123@columbia.edu) equals a "uni" of "abc123"
- Password: The same password you use for Columbia University email.
- At the top of the page you will see tabs for your various courses. Click on the tab for P6103.
- Follow the link under Course Number to P6103
- Only students officially registered in this course will be able to access the website by following the instructions given above.

It is essential to visit the course website before each class. It is the primary source of course information, announcements, resources and class assignments, and will be updated regularly. Lecture slides, readings, and exercises will be in PDF format.[1] Access this material via the calendar feature by linking to the relevant lecture date. *Please use Internet Explorer, Firefox, or Chrome as your internet browser to access the course website.* If you need one, computers with Internet access are available at the Health Sciences Library and other locations on the campus.

COURSE STRUCTURE
Weekend sessions consist of a lectures and recitations, topics are described below.

MAILMAN SCHOOL POLICIES AND EXPECTATIONS
Students and faculty have a shared commitment to the School's mission, values and oath. http://mailman.columbia.edu/about-us/school-mission/

Academic Integrity
Students are required to adhere to the Mailman School Honor Code, available online at http://mailman.columbia.edu/honorcode.

Disability Access
In order to receive disability-related academic accommodations, students must first be registered with the Office of Disability Services (ODS). Students who have, or think they may have a disability are invited to contact ODS for a confidential discussion at 212.854.2388 (V) 212.854.2378 (TTY), or by email at disability@columbia.edu. If you have already registered with ODS, please speak to your instructor to ensure that s/he has been notified of your recommended accommodations by Lillian Morales (lm31@columbia.edu), the School's liaison to the Office of Disability Services.

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[1] To download Adobe Acrobat Reader (free version) please visit http://www.adobe.com/support/downloads/

COURSE SCHEDULE

Friday 9/7 : 3:30pm – 5:00pm	
Lecture 1	**Introduction to Introduction to Biostatistics** Chapter 1 (BIO), Chapter 1, 10 (CGS)
Saturday 9/8 : 9:00am – 1:00pm	
Lecture 2	**Descriptive Statistics and Graphical Displays** Chapter 2, 3 (BIO), Chapter 2 (CGS)
Sunday 9/9 : 9:00am – 1:00pm	
Lecture 3	**Probability + Discrete distributions** Chapter 6, 7 (BIO), Chapter 3, 5 (CGS)

- HW #1: due Monday 9/17 at 6pm
- HW #2: due Monday 9/24 at 6pm
- HW #3: due Monday 10/1 at 6pm

Friday 10/5 : 8:00am – 12:00pm	
Lecture 4	**EXAM 1 (8am – 9:30am)** **Normal Distribution** Chapter 7 (BIO), Chapter 4, 5 (CGS)
Saturday 10/6 : 9:00am – 1:00pm	
Lecture 5	**CLT, Sampling Distributions and Estimators** **One Group: Point Estimates, Confidence Intervals** Chapter 8, 9, 14 (BIO), Chapter 6,7 (CGS)
Sunday 10/7 : 9:00am – 1:00pm	
Lecture 6	**Confidence Intervals + Introduction to Hypothesis Tests** Chapter 10, 14 (BIO), Chapter 5-8 (CGS)

- HW #4: due Monday 10/15 at 6pm
- HW #5: due Monday 10/22 at 6pm
- HW #6: due Monday 10/29 at 6pm

Friday 11/2 : 8:00am – 12:00pm	
Lecture 7	**EXAM 2 (8am – 9:30am)** **One Group: Hypothesis Tests** Chapter 10, 14 (BIO), Chapter 5-8 (CGS)
Saturday 11/3 : 2:00pm – 6:00pm	
Lecture 8	**Power computations** **Two Groups: Hypothesis Tests** Chapter 11, 14 (BIO), Chapter 9 (CGS)
Sunday 11/4 : 2:00pm – 6:00pm	
Lecture 9	**One-way, Two-way ANOVA + Interactions** Chapter 12 (BIO)

- HW #7: due Monday 11/12 at 6pm
- HW #8: due Monday 11/19 at 6pm
- HW #9: due Monday 11/26 at 6pm
- HW #10: due Monday 12/03 at 6pm

Friday 12/7 : 8:00am – 12:00pm	
Lecture 10	**EXAM 3 (8am – 9:30am)** **Correlation** Chapter 17 (BIO), Chapter 11 (CGS)
Saturday 12/8 : 2:00pm – 6:00pm	
Lecture 11	**Regression, Multiple Regression** Chapter 18, 19 (BIO), Chapter 11 (CGS)
Sunday 12/9 : 2:00pm – 6:00pm	
Lecture 12	**Contingency Tables + Review** Chapter 15 (BIO), Chapter 11 (CGS)

- HW #11: due Monday 12/13 at 6pm
- Final Exam: 2 hours at home from Friday 12/14 – 12/19