NYU | ROBERT F. WAGNER GRADUATE SCHOOL OF PUBLIC SERVICE

CORE-GP 1011
Statistical Methods for Public, Non-Profit, and Health Management
Fall 2019

Instructor Information

- Professor Jan Blustein
  - Email: jan.blustein@nyu.edu
  - Office Address: Puck, Room 3042
  - Office Hours: Wednesday || 12:00 pm – 12:45 pm or by appointment, including Zoom hours TBA
- Professor Josh Merfeld
  - Email: merfeld@nyu.edu
  - Office Address: Puck, Room 3040B
  - Office Hours: Monday and Wednesday 5:00pm – 6:00 pm or by appointment
- Professor Judy C. Polyné
  - Email: judy.polyne@nyu.edu
  - Office Address: TBD
  - Office Hours: By appointment only

Lectures:

Section 001:

- Day: Wednesday
- Begin: 9:30 am
- End: 11:25 am
- Location: Meyer Hall, Room 102
- Instructor: Professor Blustein

Section 002:

- Day: Wednesday
- Begin: 6:45 pm
- End: 8:40 pm
- Location: Silver, Room 411
- Instructor: Professor Blustein

Section 003:

- Day: Thursday
- Begin: 6:45 pm
- End: 8:40 pm
- Location: Silver, Room 414
- Instructor: Professor Merfeld

Section 004:

- Day: Friday
- Begin: 9:00 am
- End: 10:55 am
- Location: 60 5th Ave, Room 110
- Instructor: Professor Polyné

Lab:

Section 005:

- Day: Monday
- Begin: 9:00 am
- End: 10:40 am
- Location: Tisch Hall, Room LC9
- Instructor: Professor Polyné

Section 006:

- Day: Monday
- Begin: 4:55 pm
- End: 6:35 pm
- Location: 194 Mercer Street, Room 305
- Instructor: Professor Polyné

Section 007:

- Day: Monday
- Begin: 6:45 pm
- End: 8:25 pm
- Location: 194 Mercer Street, Room 305
- Instructor: Professor Polyné

Section 008:

- Day: Friday
- Begin: 11:00 am
- End: 12:40 pm
- Location: 60 5th Ave, Room 110
- Instructor: Professor Polyné

Section 009:

- Day: Friday
- Begin: 1:30 pm
- End: 3:10 pm
- Location: Silver, Room 401
- Instructor: Professor Polyné

Course Prerequisites

Math preparation:

This course assumes a working knowledge of the algebra skills that are covered in the Wagner/ALEKS online math program. If you have completed ALEKS successfully, you should be well prepared. If you have not yet checked your skills using ALEKS, you should begin as soon as possible. You may also want to work through the "Basic Mathematics Review" that appears as the prologue chapter of your textbook, or take one of the math review courses that is offered by the Wagner School.

Course Description

This course introduces students to basic statistical methods and their application to management, policy, and financial decision-making. The course covers the essential elements of descriptive statistics, univariate and bivariate statistical inference, and an introduction to multivariate analysis. In addition to covering statistical theory, the course emphasizes applied statistics and data analysis, using the software package SPSS.

The course has several “audiences” and goals. For all Wagner students, the course develops basic analytical skills and encourages a critical approach to reviewing statistical findings and using statistical reasoning in decision-making. For those planning to continue studying statistics (often those in policy and finance concentrations), this course additionally provides the foundation for that additional work.

Course and Learning Objectives

Objective 1:

Understand how to analyze and present data using appropriate quantitative research methods. This includes an understanding of sampling techniques, data analytics, statistics, and visualization. By the end of the course, students will have:

a. An understanding of the different levels of measurement (nominal, ordinal and interval/ratio) and their relevance for different analytic techniques.
b. An understanding of basic descriptive statistics including the mean, median, mode, range and standard deviation; and ability to calculate these statistics and to generate them using SPSS software; an understanding of when each may be appropriate for descriptive purposes.
c. An ability to calculate confidence intervals for means and proportions and to assess the relative merits of point versus interval estimates for means and proportions.
d. An understanding of the basic principles of statistical inference including the importance of sampling distributions and the standard error.
e. An ability to determine appropriate tests of statistical significance for differences in means, differences in percentage distributions and cross-tabulations, and to execute that work manually and using SPSS software.
f. An ability to determine when bivariate regression and correlation are appropriate analytic approaches, and to calculate and interpret regression and correlation coefficients, both manually and using SPSS software.
g. An ability to design a multiple regression analysis, to generate regression results using SPSS software, and to interpret these results for statistical and theoretical significance.

Objective 2:

Conduct an impact analysis using appropriate statistical methods and tools, and present a succinct, well-argued memo written with appropriately incorporated tables and graphs.

a. Students will select, synthesize and summarize this quantitative data for a “lay” audience. A special focus will be on the ability to communicate statistical concepts and findings in everyday English.

Objective 3:

Develop a healthy skepticism about claims made with statistics. This includes:

a. An understanding of the importance of unbiased sampling.

b. An appreciation of Type I and Type II error.
c. An understanding of causality, including distinguishing between correlation and causation, the challenges to estimating causal relationships, and the importance of causality for determining impact.

Learning Assessment Table

Course Learning Objective Covered	Corresponding Assignment Title
Objective 1	Homework, Midterm Exam, Final Exam, Final Paper
Objective 2	Final paper
Objective 3	Homework, Midterm Exam, Final Exam, Final Paper

Textbooks

There are two course texts. The first is J. F. Healey's **The Essentials of Statistics: A Tool for Social Research** (4th Edition), Wadsworth/Cengage Learning 2016, ISBN-3:9781305093836)– hereinafter Essentials. This book, which covers basic statistical theory and manual computation, can be purchased at the NYU Professional Bookstore or online. You may also use the 3rd or 2nd edition of this book; equivalent page numbers are provided later in this syllabus. The other text is J. **Blustein's SPSS: The Wagner Way – hereinafter Wagner Way**. This text covers the use of SPSS software for data analysis. It is available on the Main Stat 1 site in NYU Classes as a free .pdf download. There are accompanying videos posted on the Main Stat 1 Site.

NYU Classes Sites

You will use two sites for this class:

(a) the "Main" Stat 1 site, housing material for all of the lecture sections, and
(b) another site housing material just for your lecture section.

In addition to housing the course syllabus, the Main Site houses electronic materials for download that will help you to master the course material (practice problems, challenge problems, and copies of old exams – solutions are provided for all of these), as well as all homework assignments. You should plan to work (and rework!) the practice problems, the challenge problems, and old exams prior to taking the midterm and final. Your Lecture Section site houses the PowerPoint slides that your lecturer will use each week. Hardcopies or electronic versions of these slides should be brought to each lecture. In addition, your Lecture Section site houses a gradebook where you can check all grades that you receive.

SPSS and the weekly lab sessions

This is a course in applied statistics, with a lot of data analysis, both for homework and for the final analytical memo assignment. Some of these analyses will be done manually, with the help of a hand-held calculator. However, computers do this sort of work quickly and without error, making a software package such as SPSS indispensable. SPSS skills are taught in weekly labs sessions. During these labs, your instructor will demonstrate SPSS procedures, explain SPSS output, and generally reinforce and support use of the computer program. Attendance in lab is mandatory.

Class Policies

Arriving for class prepared: lecture mini-quizzes and lab videos:

In order to get the most out of lecture and lab, there are assignments to complete in advance. **For lecture**, you must complete the assigned reading before attending class. That means devoting about an hour to reading the assigned material. After doing the reading for each lecture, you will take a brief online multiple choice mini-quiz, which will count toward your course grade. Mini-quizzes are administered through your lecturer's Classes site, and will close one hour before the scheduled lecture. You should plan to log in and take the quiz well before the site closes; you cannot be excused from taking a quiz due to last minute connectivity problems. In tallying your score on the mini-quizzes, you are permitted to have missed (i.e. received a zero) on one quiz, without penalty. In other words, your lowest scored mini-quiz will be dropped. **For lab**, you must view brief (5-10 minute) online videos that correspond to chapters in the Wagner Way. Your instructor will tell you how to access the videos. There are no mini-quizzes on the video material.

Attending alternate lecture sessions:

You should attend the section to which you are assigned (your "home" section). If you are unable to attend your home section on a given week, please email your instructor to let him/her know. You should also send an email to the instructor whose section you will attend to confirm that there is available space.

Homework:

There is homework nearly every week of class. Homework is graded on a scale of 0 (not submitted)/ 1 (submitted but deficient)/ 2 (submitted and adequate). In tallying homework grades, students are permitted to have missed (i.e. received a zero) for one homework, without penalty. In other words, your lowest scored homework will be dropped.

Homework must be submitted to your home lecturer, either during class or before class in the lecturer's faculty mailbox. If you are unable to attend class, please ask one of your classmates to hand in your homework. E-mailed assignments and assignments handed in after class cannot be accepted, nor can assignments handed into sections other than your "home" section.

Calculator:

A highly recommended calculator for the class is the Casio fx-300ES PLUS, which has a "Natural Display." It is $12.95, and it accommodates long Stat 1 calculations easily; and is available at the NYU Bookstore, as well as many online sites.

Tutoring sessions:

Tutors will be available for weekly in-person meetings and discussion of homework problems (times and locations TBA on the Main Stat 1 site in NYU Classes). Tutors will not answer questions about the final assignment (see below).

Important notes regarding the final assignment:

Doing the final assignment takes planning, time and concentration. Many students report that completing the assignment is the best learning experience in the course. You should allocate significant time to it, starting in Week 11 of the course. Please note the following:

- Your lecture instructor and your lab instructor will orient you to the assignment.
- You may work with your fellow students, but this is not a group project. You must run your own analysis, write your own memo, and create your own tables.
- Final assignments written by prior students in Stat 1 *may not* be used as sources for writing your final assignment memo.
- Problem-solving is a big part of the exercise. Lab & lecture instructors will field *specific* questions that are limited in scope. "How should I do this part of the analysis?" will not be answered. "I'm thinking of using procedure X to answer question Y because I believe that the assignment is asking me to examine relationship Z. Does this make sense?" is an appropriate question.
- Working and re-working the presentation of your findings is also a big part of the exercise. However, lab & lecture instructors cannot review your written drafts.
- Please do not ask your tutors for assistance with this assignment, or with other SPSS issues – these should be directed lab instructors. Tutors' responsibility is to handle questions related to the lecture/homework.

Late submission policy for the final assignment:

Extensions will be granted only in case of emergency, out of respect to those who abide by deadlines despite equally hectic schedules. Late submissions without extensions will be penalized 20% per 24-hour period.

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. All students enrolled in this class are required to read and abide by Wagner's Academic Code. All Wagner students have already read and signed the Wagner Academic Oath. Plagiarism of any form will not be tolerated and students in this class are expected to report violations to me. If any student in this class is

unsure about what is expected of you and how to abide by the academic code, you should consult with me.

Henry and Lucy Moses Center for Students with Disabilities at NYU

Academic accommodations are available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website and click on the Reasonable Accommodations and How to Register tab or call or email CSD at (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

Course Requirements and Grades

Course grades are based on the following:

- in-class midterm exam (25%);
- analytical memo assignment (30%);
- in-class final exam (30%); and
- mini-quizzes (5%) and homework (10%)

For the written exams, students will be expected to use a standard calculator (described above). Students will be permitted to bring an **8 ½-by-11-inch, single-sided, handwritten sheet of notes**. The notes may not be electronically produced or reproduced (i.e., cut and paste). There are no make-ups for missed written exams. Unexcused failure to attend will result in a grade of zero.

Course topics

Class 1 – Introduction

Topics:

1. Statistics: what's it about?
    - populations and samples
    - descriptive vs. inferential statistics
2. Basic descriptive statistics
    - levels of measurement
    - percentages and proportions
    - ratios and rates
    - frequency distributions: one-way and two-way tables
    - graphs and figures

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 1 - 2
    - 3rd Ed: Chapter 1 - 2
    - 2nd Ed: Chapter 1 - 3
2. Lab
    - Video & text: **Wagner Way** Chapter 1

Class 2 – Central Tendency and Dispersion

Topics:

1. Measures of central tendency
    - mode, median, percentiles, means
2. Measures of dispersion
    - range, interquartile range
    - average deviation
    - standard deviation
    - coefficient of variation

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 3 - 4
    - 3rd Ed: Chapter 3 - 4
    - 2nd Ed: Chapter 4 - 5
    - and see “Box Plots” pp. 97-100 4th edition
2. Lab
    - Video & text: Wagner Way Chapter 2

Class 3 – The Normal Curve

Topics:

1. The normal distribution
    - the normal curve
    - standard (z) scores
    - using the normal curve to estimate probabilities

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 5
    - 3rd Ed: Chapter 5
    - 2nd Ed: Chapter 6
2. Lab

- Video & text: Wagner Way Chapter 3

Class 4 – Sampling and the Sampling Distribution

Topics:

1. How to sample
    - representative samples
    - simple random sampling and other sampling techniques
2. The sampling distribution
3. Using sample statistics to make inferences about population parameters
    - sampling error - standard error of a sample statistic
    - the Central Limit Theorem

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 6 pp 139 - 151
    - 3rd Ed: Chapter 6 pp 128 - 138
    - 2nd Ed: Chapter 7 pp. 146 -154
    - Nothing new in Wagner Way

Class 5 - Estimation

Topics:

1. Good estimators
    - point estimates and confidence intervals
    - bias and efficiency
2. Constructing confidence intervals
    - confidence levels and alpha
    - interval estimates for means and proportions

Reading/Viewing:

1. Lecture
    - 4^{th} Ed: Chapter 6 pp 150 -170
    - 3^{rd} Ed: Chapter 6 pp 138 - 156
    - 2^{nd} Ed: Chapter 7 pp. 154 -172
2. Lab
    - Video & text**:** Wagner Way Chapter 4

Class 6 – Hypothesis Testing - 1

Topics:

1. The logic of hypothesis testing
2. The five-step approach
    - null and research hypotheses
    - establishing the critical region; decision rules
    - one-tailed (< or >) and two-tailed (not =) tests
    - type I and type II error
    - means and proportions
3. Small samples and the t distribution

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 7
    - 3rd Ed: Chapter 7
    - 2nd Ed: Chapter 8
    - Nothing new in Wagner Way

Class 7 – Hypothesis testing - 2

Topics:

1. Two sample hypothesis testing
    - difference of means – large and small samples
    - difference of proportions - large samples

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 8
    - 3rd Ed: Chapter 8
    - 2nd Ed: Chapter 9
2. Lab
    - Nothing new in Wagner Way
    - Midterm Review held in labs

Class 8 – Midterm Exam

The midterm is an in-class exam that covers material through Class 6.

Class 9 – Analysis of Variance

Topics:

1. Hypothesis testing with three or more samples (sample means)
    - the logic of ANOVA: variation between and within groups
    - variation between and within groups - the F ratio
    - the five-step approach to ANOVA
    - limitations of ANOVA and post hoc tests

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 9
    - 3rd Ed: Chapter 9
    - 2nd Ed: Chapter 10
2. Lab
    - Video & text: Wagner Way Chapter 5
    - Note that there are two videos this week.

Class 10 – Bivariate Tables, Chi-Square

Topics:

1. Chi-square test of the association between categorical variables
    - bivariate tables
    - the logic of chi-square: observed vs. expected frequencies
    - the five-step approach; chi-square distribution
    - limitations of the chi-square test: sample size considerations
2. Beyond **Essentials**: Joint and conditional probability

Reading/Viewing:

1. Lecture
    a. 4th Ed: Chapter 10, Chapter 11 pp 292 - 301
    b. 3rd Ed: Chapter 10, Chapter 11 pp 277 - 287
    c. 2nd Ed: Chapter 11, Chapter 12 pp. 282 – 290
2. Lab
    a. Video & text: Wagner Way Chapter 6

Class 11 & 12 – Bivariate Regression & Correlation

Topics:

1. Bivariate regression
    - dependent and independent variables
    - the concept of association, including pattern or direction

- scattergrams; linear relationships
- the least squares approach
- the regression line and the regression coefficient (b)

2. Bivariate correlation
    - coefficient of correlation (r)
    - coefficient of determination (r2)
    - explained and unexplained variation

Reading/Viewing:

1. Lecture
    - 4th Ed: Chapter 12
    - 3rd Ed: Chapter 13 pp 332 - 354
    - 2nd Ed: Chapter 14 pp. 330 – 351
2. Lab
    - Video & text: Wagner Way Chapter 7

Class 13 – Controlling for Other Variables

Topics:

1. Ways that third variables can explain/influence the relationship between X and Y
    - Direct relationships, spurious relationships, intervening variables
2. Introduction to multiple regression
    - the meaning of “controlling for”
    - the multiple regression equation
    - coefficient of multiple determination (R2)

Reading/Viewing:

1. Lecture
    - No reading in Healey.
    - Read Chapters 8 in Wagner Way to prepare for lecture.

Class 14 – Dummy Variables, Controlling for Other Variables Cont’d

Topics:

1. Categorical data in the regression framework
    - dummy coding of independent variables
2. Discussion of final assignment

Reading/Viewing:

1. Lecture
    - No reading in Healey.
    - Read Chapters 8 and 9 in Wagner Way to prepare for lecture.

2. Lab
    - Video & text: Wagner Way Chapters 8 & 9

Class 15 – Wrap up and review – Final Class

1. Lab
    - OPEN LABS

Important Dates and Locations

Midterm Exam:

Midterm exam review sessions will be given in the lab classrooms, for each lab section, on these dates:

- Friday, October 18
- Monday, October 21

Midterm exams will be given in the lecture classrooms, for each lecture section, on these dates:

- Wednesday, October 23
- Thursday, October 24
- Friday, October 25

Final Exam:

Final exam review sessions will be given in the lecture classrooms, for each lecture section, on these dates

- Wednesday, December 11
- Thursday, December 12
- Friday, December 13

Final exams will be given in to-be-announced classrooms. Each student will have the opportunity to select one of these final exam times

- Wednesday, December 18; 9:30 am – 11:30 am
- Wednesday, December 18; 6:30 pm – 8:30 pm
- Thursday, December 19; 9:30 am – 11:30 am
- Thursday, December 19; 6:30 pm – 8:30 pm

Final Assignment:

The final assignment is due on Monday, December 16 at 6pm for all sections. Assignments will only be accepted as hard copy. Each lecturer will provide instructions regarding the logistics of submission.

Homework Assignments:

Homework assignments are posted on the Main Stat 1 Classes site under "Resources." You will not hand in homework in Class 1. You will hand in homework beginning with Class 2; you will submit your homework to your lecture instructor.

Mini-Quizzes:

Mini-quizzes are posted on your lecture section Classes site under "Tests and Quizzes." There will be no mini-quiz for the Class 1 material. The first mini-quiz, covering the Class 2 material, will be due just before your Class 2 lecture meets.

NYU's Calendar Policy on Religious Holidays

NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify me in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.