



University of Massachusetts Boston

From the Selected Works of Michael P. Johnson

Fall 2021

Course Syllabus, UPCD 620 Quantitative Analytic Methods for Urban Planning & Community Development

Michael P Johnson, Jr.



Available at: https://works.bepress.com/michael_johnson/68/

Institution:
UMass Boston

Degree Program:
MS in Urban Planning & Community Development

Course number: UPCD 620

Number of Credits: 3

Course Name: Analytical Methods for Planners I

Meeting time: M 5:30 – 8:15 PM

Classroom: Healey Library Purple Lab (H-UL-0042)

Instructor: Michael P. Johnson, PhD

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Preferred Gender Pronouns: he, him, his

Office Hours: Monday and Wednesday, 4 – 5 PM; Thursday, 8 – 9 PM and by appointment

Teaching assistant: Ben Gagnon

Email: Ben.Gagnon001@umb.edu

Office Hours: Monday and Wednesday, 4 – 5 PM and by appointment

Grader: Shengli (Salina) Chu

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Course Description (on-line course introduction available at <https://bcove.video/2MtHLE6>)

This course provides students with an introduction to quantitative analytic methods appropriate to propose, support and evaluate localized and regional initiatives in planning and community development. Technical skills associated with these methods will be taught with a focus on the needs of community-based organizations which typically have limited time, human, financial and technical resources to perform detailed analyses in support of their programs and initiatives. This is a core, required course in the Urban Planning and Community Development master's program. No previous university-level exposure to probability and statistics are necessary.

Students will learn basic skills in analysis and interpretation of quantitative data through an introduction to probability and statistics. The course will emphasize hands-on work with data using Microsoft Excel 2016. Students will gain an understanding of data management, presentation, exploration and problem-solving that will enable them to serve as, consult with and supervise data analysts for nonprofit and government organizations.

For most class meetings, course material will be presented in two formats: in lecture format, for the first 60 to 80 minutes of the class, and in a hands-on session, featuring tutorials in Microsoft Excel, for the remainder of the class. However, students will have the ability to do a variety of computations with Microsoft Excel during the lecture portion of the class session as well. Students will thus have an opportunity to use class time

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throughout each class meeting to learn Excel-specific skills in data management and analysis, to implement principles learned in lecture, and to solve homework assignments.

Quantitative analytic methods are foundational to urban planning and community development. Therefore, the emphasis in this course will be on skill-building, through class examples, homework assignments and a final exam. There will also be opportunities to apply principles learned in class and lab through case studies and mini-projects.

Textbook/Required Readings (purchase/rent highly recommended):

Frye, Curtis D. 2019. *Microsoft Excel 2019 Step by Step*. Redmond, WA: Microsoft Press. ISBN 978-1-5093-0767-8, \$39.99. Available as e-book, ISBN 978-1-5093-0618-3, \$31.99.

Meier, Kenneth J., Brudney, Jeffrey L. and John Bohte. 2015. *Applied Statistics for Public and Nonprofit Administration, 9th Edition*. Stamford, CT: Cengage Learning. ISBN 978-1-285-73723-2, \$199.95. Available as e-book, \$34.49.

These texts are available in the UMass Boston bookstore at slightly different prices. The e-book version of the Meier, Brudney and Bohte text is available through Blackboard. Please bring the Frye text to class sessions.

Prerequisites: Graduate standing

Objectives/Learning Outcomes/ Course Expectations:

Students who complete this course will (a) become educated consumers of applied research and practice using a variety of quantitative analytic methods, (b) supervise and collaborate with technical experts on projects requiring advanced methods and (c) initiate proof-of-concept analytic tasks using commonly-available tools and methods.

In particular, students will also be able to demonstrate the following skills:

1. Assemble data and solve problems to evaluate evidence, and assess the level of support for initiatives, projects and programs, where:
 - i. 'Evidence' is understood to be the output of technical analysis that uses data appropriate to the problem at hand;
 - ii. 'Data' are understood to be artifacts of real-world phenomena: systems, events and the like. The data we use in this course are usually quantitative, i.e. objective numeric measures of various entities, and often collected from secondary sources
 - iii. 'Solving a problem' means using the best mix of data and methods as possible in a process that is rigorous, reproducible and necessarily collaborative.

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2. Apply appropriate methods from measurement and research design, descriptive and inferential statistics, analysis of nominal and ordinal data, and regression analysis
3. Evaluate quantitative analyses from a variety of sources, application areas and professional disciplinary traditions

Relationship of course to program context and effectiveness:

UPCD 620 is one of three courses related to research methods in the UPCD curriculum. This course provides hands-on exposure to fundamental methods in 'stand-alone' quantitative analysis of non-spatial administrative and archival data. These skills are essential to understanding the role that qualitative data analysis (GERON 609/UPCD 697 Special Topics: Research Methods for Planners II) and spatial data analysis (UPCD 623L Introduction to Geographic Information Systems) play in planning practice.

Assignments:

There will be four homework assignments. Each assignment will include an empirical component, in which students will perform direct analysis of data, and a judgmental or subjective component, in which students will respond to scenarios and questions, or propose/critique analytic strategies. Each homework assignment will count equally towards the 40% of the grade derived from assignments.

Exams:

Student mastery of course material will be evaluated through a final exam. This will be a take-home exam, combining short-form and long-form responses based on theory and applications of statistics and probability, and computational responses using Excel 2019 and datasets that I will provide. Students will have approximately two days to complete the exam.

Grading:

The grade type for the course is a whole or partial letter grade. (Please see table below.) Note: the lowest passing grade is a "C". Computed grades lower than a "C" will automatically be recorded as an "F" in WISER.

Please see the Undergraduate and Graduate Catalog for more detailed information on the University's grading policy.

UMass Boston Grading Policy		
Letter Grade	Percentage	Quality Points
A	93-100%	4.00
A-	90-92%	3.75
B+	87-89%	3.25
B	83-86%	3.00
B-	80-82%	2.75
C+	77-79%	2.25
C	73-76%	2.00
F	0-72%	0.0
INC	Given under very restricted terms and only when satisfactory work has been accomplished in majority of coursework. Contract of completion terms is required.	N/A
IF	Received for failure to comply with contracted completion terms.	N/A
W	Received if withdrawal occurs before the withdrawal deadline.	N/A
AU	Audit (only permitted on space-available basis)	N/A
NA	Not Attending (student appeared on roster, but never attended class. Student is still responsible for tuition and fee charges unless withdrawal form is submitted before deadline. NA has no effect on cumulative GPA.)	N/A

Note: The instructor will at his discretion record grades for course components (assignments, exams) lower than C as follows:

Informal Grading Policy, Less Than 'C'		
Letter Grade	Percentage	Quality Points
C-	70 – 72%	1.75
D+	67 – 69%	1.25
D	63 – 66%	1.00
D-	60 – 62%	0.75
F	0-59%	0.0

The course final grade is computed using the following rubric:

Evaluation method	Number	Percentage of final grade
Homework assignments	4	40%
Final Exam	1	40%
Participation	on-going	10%
Attendance	required	10%

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Additional texts and papers (required readings among these to be supplied by instructor):

Albright, Chris and Wayne Winston. 2016. *Business Analytics: Data Analysis & Decision Making, 6th Edition*. Mason, OH: South-Western College Publishing. ISBN 978-1-3059-4754-2.

Barnett, Arnold I. 2015a. *Applied Probability: Models and Intuition*. Belmont, MA: Dynamic Ideas, LLC. ISBN 978-0-9899108-7-3.

Barnett, Arnold I. 2015b. *Applied Statistics: Models and Intuition*. Belmont, MA: Dynamic Ideas, LLC. ISBN 978-0-9899108-8-0.

Booz Allen Hamilton. 2013. *The Field Guide to Data Science*. Online.
<https://www.boozallen.com/s/insight/publication/field-guide-to-data-science.html>.

Gardner, Rachele, Snyder, William and Ayda Zuguy. 2019. Amplifying Youth Voice and Cultivating Leadership through Participatory Action Research. *Education Policy Analysis Archives* **27**(54). Online and open-access. doi: 10.14507/epaa.27.2621.

Hedrick, Terry E., Bickman, Leonard and Debra J. Rog. 1993. *Applied Research Design: A Practical Guide*. Newbury Park, CA: SAGE Publications. ISBN 0-8039-3234-0.

Hindle, Giles A. and Robert Vidgen. 2018. Developing a Business Analytics Methodology: A Case Study in the Foodbank Sector. *European Journal of Operational Research* **268**(3): 836 – 851.

Johnson, Michael P. 2015. Data, Analytics and Community-Based Organizations: Transforming Data to Decisions for Community Development. *I/S: A Journal of Law and Policy for the Information Society: Big Data Future Part Two* **11**(1): 49 – 96.

Levy, John M. 2003. *Contemporary Urban Planning, 9th Edition*. Upper Saddle River, NJ: Prentice-Hall. ISBN 978-0-2057-8159-1.

Singleton, Alex D., Spielman, Seth E. and David C. Folch. 2018. *Urban Analytics*. Los Angeles: SAGE Publications. ISBN 978-1-4739-5863-0.

Stokey, Elizabeth and Robert Zeckhauser 1978. *A Primer for Policy Analysis*. New York: W.W.Norton & Company. ISBN 0-393-09098-1.

Stuart, David. 2020. *Practical Data Science for Information Professionals*. Facet Publishing, London. ISBN 978-1-7833-0344-1.

Treiman, Donald J. 2009. *Quantitative Data Analysis: Doing Social Research to Test Ideas*. San Francisco: Jossey-Bass. ISBN 978-0-4703-8003-1.

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Yin, Robert. 2014. *Case Study Research and Applications: Design and Methods*, 6th Edition. Thousand Oaks, CA: Sage Publications. ISBN 978-1-5063-3616-9.

Lecture and Class Resources:

Class meetings will take place in room H-UL-0042 (Healey Library, Upper Level, Purple Lab) unless otherwise indicated.

All course materials are available on Blackboard Learn (<https://umb.umassonline.net/>). After logging in to Blackboard: for UPCD students, search for UPCD 620 P 1 01 Analytic Methods Fall 2021. On-line lecture materials from a previous offering are available via VoiceThread; videos of in-class lectures from a previous offering are available via Echo 360. Office hours will be available in person and on-line.

Classroom H-UL-0042 has workstations with Microsoft Excel 2019 installed. Therefore students are not required to bring laptop computers to class. If you do bring your own computer to class, it should have Excel 2019 for Windows installed. Licenses for Excel 2019 are available for free from the UMass Boston Information Technology Department (see https://www.umb.edu/it/students/discounts_for_students/microsoft_office_for_students for details).

A general lab is available at in Healey Library, at H-UL-0015 ('Red Lab'). Public labs are available at Healey Café, at 2nd floor Healey Library; 4th floor Healey Library and 8th floor Healey Library. These labs are available during Healey Library's normal operating hours: 7:30 AM – 10 PM Monday – Thursday, 7:30 AM – 6 PM on Friday, 9 AM – 3 PM on Saturday and 11 AM – 5 PM on Sunday. Students doing work on computers other than ones they own are strongly encouraged to save their work to a portable hard drive or to a cloud-based service such as OneDrive (<https://onedrive.live.com/about/en-us/>; UMass Boston students can access OneDrive for free with their student ID), Dropbox (www.dropbox.com), or Box (www.box.com).

Accommodations:

UMass Boston is committed to creating learning environments that are inclusive and accessible. If you have a personal circumstance that will impact your learning and performance in this class, please let me know as soon as possible, so we can discuss the best ways to meet your needs and the requirements of the course. If you have a documented disability, or would like guidance about navigating support services, contact the Ross Center for Disability Services by email (ross.center@umb.edu), phone (617-287-7430), or in person (Campus Center, UL Room 211). To receive accommodations, students must be registered with the Ross Center and must request accommodations each semester that they are in attendance at UMass Boston. For more information visit: www.rosscenter.umb.edu. Please note that the Ross Center will provide a letter for your

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instructor with information about your accommodation only and not about your specific disability.

Health, Wellbeing, and Success:

We are still coming through the COVID-19 pandemic. Due to the emerging COVID-19 variants, all members of the UMass Boston community — students, faculty, and staff — as well as contractors and visitors are required to wear face coverings in public indoor spaces on the UMass Boston campus. The requirement applies to vaccinated and non-vaccinated individuals. Wearing a face covering is important for the health and safety of our community, and each of us has a responsibility to do our part. While on campus, if you notice someone without a face covering indoors, you should feel free to distance yourself to the extent possible or, if you are comfortable doing so, politely remind them of the university policy requiring face coverings for all individuals indoors. As an instructor, for classes on campus, I will remind all students about the indoor masking policy. I will ask students to leave class if they do not comply and I may also refer students to the Dean of Students. If a student refuses to wear a face covering and does not heed requests to comply with the policy, the UMass Boston Police Department may be called to assist. To safeguard your own health and safety as well as that of all students, staff, and faculty, you are reminded that vaccinations are required for all faculty, staff, and students, with limited exceptions (see www.umb.edu/healthservices/corona_virus_information/coronavirus_vaccination_requirements). Following current public health guidance from the CDC and given the protection flowing from a highly vaccinated population, enhanced HVAC and air filtration systems, and the indoor face covering mandate, we have lifted the social distancing requirement. However, if you have symptoms of COVID-19, you should not come to campus. Flexibility and support will be provided for students in such situations and are addressed in this syllabus.

UMass Boston is a vibrant, multi-cultural, and inclusive institution committed to ensuring that all members of our diverse campus community are able to thrive and succeed. The university provides a wide variety of resources to support students' overall success. As we continue to deal with the evolving impacts of the COVID-19 pandemic, these resources are more important than ever.

- Are you in emotional distress? Call 617.287.5690 to speak with a licensed clinician 24/7 who can offer support, crisis recommendations, and assistance with finding resources.
- Have a campus question or issue? Use Here4U in the UMass Boston app or via www.umb.edu/here4U.
- Want advice in navigating a university or life situation? Contact the Dean of Students Office at www.umb.edu/deanofstudents.
- Want to connect with housing and food insecurity support, student life groups and events, or recreation activities? Visit www.umb.edu/life.
- Want to access resources specifically for immigrant-origin, DACA, TPS, and undocumented students? Visit www.umb.edu/immigrant.

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- Looking for additional identity-based community support? Find more resources at www.umb.edu/identity-support
- Want to make the most of your academic experience? Visit [www.umb.edu/academics/vpass/academic support](http://www.umb.edu/academics/vpass/academic_support).
- Unable to attend class on a specific date or participate in an exam or class requirement due to a religious observance? Fill out the excused absence form (requires 2-weeks' notice) to request religious accommodation at www.umb.edu/religiousabsence.

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, lacks a safe and stable place to live, or may be in need of support in any other way, is urged to contact U-ACCESS about their services. They offer a food pantry, lunch 3 days a week, housing assistance, legal consultations, and many other services. You can reach them at u-access@umb.edu or check out their website at <https://www.umb.edu/uaccess>.

Student Conduct:

Education at UMass Boston is sustained by academic integrity. Academic integrity requires that all members of the campus community are honest, trustworthy, responsible, respectful, and fair in academic work at the university. As part of being educated here, students learn, exercise, increase, and uphold academic integrity. Academic integrity is essential within all classrooms, in the many spaces where academic work is carried out by all members of the UMass Boston community, and in our local and global communities where the value of this education fulfills its role as a public good. Students are expected to adhere to the Student Code of Conduct, including policies about academic integrity, delineated in the University of Massachusetts Boston Graduate Studies Bulletin, Undergraduate Catalog, and relevant program student handbook(s), linked at www.umb.edu/academics/academic_integrity.

You are encouraged to visit and review the UMass website on Correct Citation and Avoiding Plagiarism: <https://umb.libguides.com/c.php?g=351180&p=2367042>.

Topical Outline/Weekly Schedule:

Class 1: September 13, 2021

Core Topic(s):	Introduction to analytic methods for planning
Learning Objectives:	<ul style="list-style-type: none">• Examples of analytic methods in support of local planning and community development• Quantitative methods and qualitative methods• Inputs, outputs and outcomes• Methodological approaches: single methods, multiple methods and mixed methods• Community data measurement; community data analytics• Introduction to Microsoft Excel
Readings:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 1 and 2• Frye, Chapter 1• Johnson (2015)• Gardner, Snyder and Zuguy (2019)
Assignment:	<ul style="list-style-type: none">• Assignment #1: Design and data collection for a planning study Due September 27, 2021

Class 2: September 20, 2021

Core Topic(s):	Research design
Learning Objectives:	<ul style="list-style-type: none">• Causal relationships• Theory-building• Conceptual and theoretical frameworks• Alternative designs for applied research• Working with data in Excel
Readings:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapter 3• Hedrick, Bickman and Rog, Chapter 2• Yin, Chapter 1• Verhulst 2019• Frye, Chapter 2

Class 3: September 27, 2021

Core Topic(s):	Descriptive statistics: Distributions and graphical presentations
Learning Objectives:	<ul style="list-style-type: none">• Summarize data in frequency and percentage distributions• Present distributions in charts and graphs• Charts and graphs in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapter 4• Frye, Chapter 9
Assignment:	<ul style="list-style-type: none">• Assignment #1 due• Assignment #2: Empirical computation of descriptive statistics Due October 25, 2021

Class 4: October 4, 2021

Core Topic(s):	Descriptive statistics: Distributions and graphical presentations (continued); Measures of central tendency and dispersion
Learning Objectives:	<ul style="list-style-type: none">• Present distributions in charts and graphs• Mean, median and mode• Data calculations in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 4 (continued) and 5• Frye, Chapter 3
Assignment	<ul style="list-style-type: none">• Graded Assignment #1 returned

October 11, 2021 – No class (Columbus Day/Indigenous People's Day)

Class 5: October 18, 2021

Core Topic(s):	Descriptive statistics: Measures of dispersion; Introduction to probability
Learning Objectives:	<ul style="list-style-type: none">• Standard deviation• Using central tendency and dispersion to characterize the distribution of a variable• Foundations of probability• Applications of probability: games of chance, planning applications• Filtering and processing spreadsheet data• Probability calculations in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapter 6• Barnett (2015b), Chapter 1, sections 1.1 – 1.3• Frye, Chapter 5

Class 6: October 25, 2021

Core Topic(s):	Data analytics (Jason Wright, guest lecture)
Learning Objectives:	Build a preliminary understanding of what data science/data analytics is as well as the process typically followed by data analysts in the field
Reading:	<ul style="list-style-type: none">• Booz Allen Hamilton (2013): <u>Skim</u> the following: pp. 17-18, 25-29, 31-32, 42-43, p. 45, p. 55; pay attention to the following: Figure on p. 18, Figure on p. 25, Figure on p. 31• Stuart (2020), Chapter 3
Assignment:	<ul style="list-style-type: none">• Assignment #2 due• Assignment #3: Analysis of a large dataset; Probability and probability distributions Due November 15, 2021

Class 7: November 1, 2021

Core Topic(s):	Introduction to probability (continued); Discrete probability distributions; Continuous probability distributions
Learning Objectives:	<ul style="list-style-type: none">• Foundations of probability• Binomial distribution• Uniform distribution• Normal distribution• Applications of probability distributions to planning• Reordering and summarizing data in Excel• Probability calculations in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 8 and 7 (read in this order)• Barnett (2015b), Chapter 1, sections 1.3 – 1.5, 1.11• Frye, Chapter 6
Assignment:	<ul style="list-style-type: none">• Graded Assignment #2 returned

Class 8: November 8, 2021

Core Topic(s):	Continuous probability distributions, continued; Introduction to inference
Learning Objectives:	<ul style="list-style-type: none">• Normal distribution, continued• Poisson distribution• Samples versus populations• Estimates of population characteristics using samples• t distribution• Computing confidence intervals• Inference calculations in Excel• Analyzing data from single and multiple sources
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 7, 9, 10• Barnett (2015b), Chapter 1, section 1.12• Frye, Chapter 7

Class 9 November 15, 2021

Core Topic(s):	Introduction to inference, continued; Hypothesis testing
Learning Objectives:	<ul style="list-style-type: none">• Computing confidence intervals• Formulation of hypotheses• Data collection for hypothesis testing• Evaluate hypothesis• Accept or reject null hypothesis on the basis of statistical significance• Errors in hypothesis testing• Choosing an appropriate sample size• Hypothesis testing in Excel• Data analysis and problem solving in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapter 10 (continued), and 11• Frye, Chapter 8, p. 189 – 196, 208 – 211 and 214
Assignment:	<ul style="list-style-type: none">• Assignment #3 due• Assignment #4: Inference from planning data; nominal and ordinal data analysis <p>Due December 8, 2021</p>

Class 10 November 22, 2021

Core Topic(s):	Hypothesis testing (continued); Estimating population proportions; Nonprofit business analytics
Learning Objectives:	<ul style="list-style-type: none">• Estimating sample size for confidence interval creation and hypothesis testing• Population proportions, sample size and decision-making• Inferential statistics in Excel• Data analysis and problem solving in Excel, continued
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 11 (continued) and 12• Hindle and Vidgen (2018)• Frye, Chapter 8, p. 197 – 207 and 212 - 213
Assignment:	<ul style="list-style-type: none">• Graded Assignment #3 returned

Class 11 November 29, 2021

Core Topic(s):	Testing differences between two groups; Nominal and ordinal data analysis
Learning Objectives:	<ul style="list-style-type: none">• Calculating the difference in means between two samples• Presentation and analysis of contingency tables• Inferential statistics in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 13 and 14• Albright, Winston and Zappe, Chapter 8 (sections 8.3, 8.5, 8.7 and 8.8 only)• Frye, Chapter 10, p. 255 - 280

Class 12 December 6, 2021

Core Topic(s):	Nominal and ordinal data analysis, continued
Learning Objectives:	<ul style="list-style-type: none">• Interpretation of contingency tables• Measures of association for contingency tables• Statistical control table analysis• Pivot tables and contingency table analysis in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 15 and 16• Frye, Chapter 10, p. 280 - 287
Assignment:	<ul style="list-style-type: none">• Assignment #4 due Wednesday, December 8

Class 13 December 13, 2021

Core Topic(s):	Estimating relationships between two variables; Final exam review
Learning Objectives:	<ul style="list-style-type: none">• Visualizing relationships between variables• Statistical correlation• Simple regression• Scatterplots, correlations and regression in Excel
Reading:	<ul style="list-style-type: none">• Meier, Brudney and Bohte, Chapters 17 and 18• Albright, Winston and Zappe, Chapter 10 (part)• Frye, Chapter 11
Assignment	<ul style="list-style-type: none">• Graded Assignment #4 returned

December 17, 2021 – Final exam

Core Topic(s):	This will be a take-home, open-books final exam. It will cover all course topics, including those presented after the last homework assignment has been collected. The exam will be posted and available in hard-copy Friday, December 17 at 8 AM, and due Monday, December 20 at midnight. The exam will include some questions that are required to be answered using Excel functions and features previously discussed in lecture.
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