HARVARD UNIVERSITY
THE JOHN F. KENNEDY SCHOOL OF GOVERNMENT
QUANTITATIVE ANALYSIS AND EMPIRICAL METHODS I (API-201)
Course Syllabus for Sections A, B, and C – Fall 2021

Live Classes

Section A	Jonathan Borck	Tue/Thu	9:00 a.m. – 10:15 a.m.	R304
Section B	Teddy Svoronos	Tue/Thu	1:30 p.m. – 2:45 p.m.	R304
Section C	Dan Levy	Tue/Thu	1:30 p.m. – 2:45 p.m.	W330

Review Sessions

Teaching Fellows will hold weekly review sessions at the following times:

Session #1	Fri	12:00 p.m. – 1:15 p.m.	L140
Session #2	Fri	3:00 p.m. – 4:15 p.m.	WEX 436

We strongly recommend you attend one of these review sessions each week. You may attend either session.

Contact Information

Faculty	Email
Jonathan Borck	jonathan_borck@hks.harvard.edu
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Will Whitehurst	will_whitehurst@hks.harvard.edu
Danica Yu	danicayu@hks.harvard.edu

Office Hours

Faculty	Times (All times ET)
Jonathan Borck	Mondays, 8:45 - 10:00 AM (Belfer Lobby 2D or Zoom) Tuesdays, 8:00 - 9:30 PM (Zoom) (https://calendly.com/jonathan_borck)
Dan Levy	Fridays, 2:00 PM - 5:00 PM (calendly.com/danlevyofficehours)
Teddy Svoronos	Wednesdays, 2:00 PM - 4:00 PM (calendly.com/tsvoronos) R-140 or Zoom Thursdays, 3:00 PM - 4:00 PM (open, no signup needed) R-140

Office hours for Teaching Fellows and Course Assistants will be posted on Canvas.

Course Overview

API-201 introduces a range of analytic tools commonly used to inform public policy issues. Key content falls in the areas of descriptive statistics, probability theory, decision analysis, statistical inference, and qualitative approaches, with an emphasis on the ways in which they are applied to practical policy questions. Our goal is that by the end of this course you will be able to:

1. Frame a broad descriptive policy question (such as "what has happened to crime rates in the U.S. in the past 30 years?"), figure out the most appropriate analysis to answer the question, conduct the analysis using real world data, identify the most salient findings/patterns that emerge from the data, and present the findings in an effective manner to policymakers.

2. Become skilled in the use of probability and decision analysis tools to better tackle real world personal and policy decisions involving uncertainty.

3. Critically consume policy studies/papers/reports in which statistical analysis is used.

The course content is divided into two broad units: Uncertainty (consisting of Probability and Decision Analysis), and Evidence (consisting of Assessing Descriptive, Statistical, Quantitative, and Qualitative Evidence). The course also provides you with an opportunity to become proficient in the use of Excel as a tool to analyze quantitative data.

This course is required for first-year students in the MPP program. First-year MPP students with prior coursework in statistics can place out of the course entirely by taking an exemption exam at the start of the semester. The only way to exempt from API-201 is to demonstrate a high level of mastery on the exemption exam. Students not enrolled in the MPP program may be admitted with permission of the relevant instructor.

How does Section Z Differ from Sections A, B, and C?

Section Z covers similar material to the non-Z Sections but assumes a greater comfort level with mathematics (but not with statistics) and a willingness to learn to use statistical software, which can be time consuming. It will proceed faster, allowing more time for applications and slightly more advanced topics. The exams and problem sets will be more difficult than those of the other sections. The Section Z problem sets and final exercise will use R for data analysis, as opposed to Excel. Please note that API-202 (the sequel to this course) will use R. Lastly, Section Z's final exercise is open ended, allowing student groups to write on a topic of their choice.

Please note that in order to enroll in Section Z of API-202 in the Spring, either an A, A-, or B+ will be

required in API-201Z. (Either an A or A- will be required in one of the other API 201 sections.) In the absence of these grades, explicit permission from API 202-Z instructor is required. Students are encouraged to talk with the API-201 course head to determine which section is the best fit.

Students may switch from the Z section to another section (but not from the non-Z sections into the Z section). Students who switch by September 30 at 12pm ET are expected to take the midterm exam in one of the other API 201 sections. Students who switch between September 30 and October 14 will take the midterm in the Z section (on October 7), and this midterm grade will count as the midterm grade in the other API 201 sections. No switches will be allowed after October 14 at 12pm ET. The following table summarizes the three scenarios:

If you request switch from Z to A/B/C/E…	**Then you will take the…**	**Also…**
Before 9/30 at 12 PM EST	A/B/C midterm	
Between 9/30 at 12 PM EST and 10/14 at 12 PM EST	Z midterm	Your score will count as your A/B/C/E midterm grade.
After 10/14 at 12 PM EST	Z midterm	You will not be able to switch sections and will remain in the Z section for the rest of the semester.

Section switches are managed by the MPP Program Office. To switch sections, please email the MPP team at MPP_Program@hks.harvard.edu by the relevant deadline to request a section change and they will work with the Registrar's Office to process it. When switching from Z to the A/B/C sections, you will be assigned to your original A/B/C section.

Course Materials

Textbooks

We do not require a textbook for this course. We strongly recommend, however, that you obtain a textbook to use to prepare for class, to complete the pre-class exercises, and to supplement the material covered in class. Two good options are:

- Introduction to the Practice of Statistics, any edition. David S. Moore, George P. McCabe, and Bruce A. Craig. W.H. Freeman and Company. Parts of this textbook will be available online through the HKS library. It can also be purchased at the Harvard Coop and other sellers.
  http://id.lib.harvard.edu/alma/990141422180203941/catalog
- Open Intro Statistics, fourth edition. David M Diez, Christopher D Barr, and Mine Çetinkaya-Rundel. The electronic version of the textbook is available for free at http://www.openintro.org/. Printed copies may be purchased online for about $15.

In addition, we recommend the following classic texts to supplement your learning:

- How to Lie With Statistics. Darrell Huff, Irving Geis. W. W. Norton & Company; Reissue edition, 1993. ISBN: 0393310728. This book is a classic that has been in print for over 60 years. It has

great, though sometimes dated, examples of how policy makers, journalists, and business people abuse and misuse statistics. http://id.lib.harvard.edu/alma/990076297310203941/catalog

- The Cartoon Guide to Statistics. Larry Gonick, Woollcott Smith. HarperResource; 1st Harper Perennial ed edition, 1994. ISBN: 0062731025. This book provides excellent and amusing non-technical explanations of many key concepts. http://id.lib.harvard.edu/alma/990055717990203941/catalog
- Smart Choices: A Practical Guide to Making Better Decisions. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Broadway, 2002. ISBN: 0767908864. This book provides an introduction to decision analysis by three prominent leaders in the field. http://id.lib.harvard.edu/alma/990092125710203941/catalog

Excel

- One of the objectives of the course is to help you gain proficiency using spreadsheets, which are often used to conduct policy analysis. Problem sets will contain exercises designed to get you to practice the basics of Microsoft Excel.

- The data sets used in the course will be available on the course website in Excel format.

Handouts

Handouts will be available for almost every class. The main goal of the handouts is to facilitate the process of taking notes so that you can fully engage in class. They are not meant to substitute for class attendance or for studying the assigned reading material. Handouts will contain blank spaces for you to fill in during class, usually in response to questions.

Canvas

We will use HKS's Canvas platform for this course. You will be able to find announcements, online readings, assignments, pre-class exercises, and other course materials on our Canvas site. Please visit the site on a regular basis.

GRADING

Our main goal in this course is to help you learn concepts, develop skills, and ultimately change the way you think about the world. To achieve this, we expect you to exhibit the highest professional and ethical standards for every activity you undertake in the course.

The class grade will be based on the following criteria:

10% - Pre-class Exercises (PCEs)

10% - Class participation and engagement

15% - Problem Sets

20% - Midterm Exam

30% - Final Exam

15% - Final Exercise

Pre-class Exercises (10%)

Before most classes, we will ask that you complete an online exercise. The pre-class exercises (PCEs) are designed to help you prepare for class so you can learn optimally in each live class session. At the end of the exercise, there will be an assessment. The assessment's aggregate results will give us information about the overall performance of the class that we will use to prepare class sessions; your individual performance in it will be registered in the system but will not count towards your grade in any way. Your grade for PCEs will be determined by completion and evidence of a good-faith effort. Whether your answers are correct or not will not influence your PCE grade.

Problem Sets (15%)

Problem sets will be assigned almost every week. They will give you hands-on experience with the analytic techniques introduced in class. You should plan to spend approximately 6-8 hours on each problem set. Problem sets (and, eventually, suggested solutions) will be posted on the course website. They will be graded on check-plus/check/check-minus basis.

Problem sets not received before the deadline will be considered late. There will be no credit for late assignments. The lowest problem set grade will be dropped when calculating the average grade for the problem sets.

We abide by the Harvard Kennedy School Academic code (available here) for all aspects of the course. In terms of problem sets, unless explicitly written otherwise, the norms are the following: You are free (and encouraged) to discuss problem sets with your classmates. However, you must hand in your own unique written work. Any copy/paste of another's work is plagiarism. In other words, you can work with your classmate(s), sitting side-by-side and going through the problem

set question-by-question, but you must each type your own answers. Your answers may be similar but they must not be identical, or even identical-ish. Violations of the Academic Code are a serious violation of academic and professional standards and can lead to a failing grade in the course, failure to graduate, and even expulsion from the University. We take this issue seriously. If you have questions about the degree of collaboration allowed or about any other aspect of the Academic Code, please come to see us.

Instructions for submitting problem sets:

- Turn them in electronically via the Canvas course page.
- Submit them by **8:30 am** on the day they are due.
- Indicate on the cover page the names of the classmates with whom you worked.

Class participation and engagement (10%)

We believe that student participation can substantially enrich the learning experience for both the students and the instructor. In this spirit, we strongly encourage class participation. Effective class participation requires that you complete the pre-class exercise and do any assigned readings *before* coming to class. We encourage you to ask questions and to share with the class any relevant insights you may have from your work experience or from previous exposure to these topics. We only ask that the questions and comments be brief and related to the topic at hand. We will sometimes need to defer questions for a future class or office hours.

The class participation and engagement grade will depend on two things: (1) your participation and engagement in class and (2) your engagement with the course outside class. For all of these, both quantity and quality will count. Attending class regularly and punctually, engaging actively in both class-wide and small group activities, and in general contributing to a positive learning atmosphere in the classroom all contribute to a strong participation and engagement grade.

We will be using a polling technology called Poll Everywhere in class, which requires use of an internet enabled device. When we are not actively using Poll Everywhere, technology use is not permitted. If you feel that your learning experience could be greatly enhanced by your use of technology in class, make an appointment with your section's professor to present your case. You may be able to come to an agreement that will likely involve installing distraction reducing software on your device.

Final Exercise (15%)

The final exercise will require applying some of the statistical tools learned in class using a real data set. It will be a group exercise. More details will be provided later in the course.

Exams (50%)

There will be one midterm and a final exam. The exams will be closed book and closed notes. Calculators may be used, but statistical functions on them may not. Calculators that allow text storage are not permitted.

Note: The midterm exam will be on **Friday, Oct. 1 from 8:00 AM to 10:00 AM**. There will be no review sessions that day. The final exam will be on **Thursday, Dec 9 from 9:00 AM to 12:00 PM**. Please plan your schedule accordingly.

All students are expected to take the exams on the assigned days. We will adhere to the Registrar's policy regarding rescheduling of exams (i.e. only to be done in case of documented health-related or personal emergencies).

The midterm and final exams will be two-stage exams. During Stage 1, you will be asked to complete the exam individually. After Stage 1, the exams will be collected and you will be given a second exam that will contain a subset of the questions from the original exam. During Stage 2, you will be asked to work with a group, reach consensus answers, and submit one copy of the exam for the whole group. If your group grade is higher than your individual grade for that subset of questions, your grade for those questions will be 90% of your Stage 1 score plus 10% of your Stage 2 score. If your Stage 2 grade is lower than your Stage 1 grade, we will not incorporate Stage 2 into your score and your exam grade will simply be your Stage 1 grade.

The main reason we conduct a second stage of the exam is to allow you to learn more during the exam. Traditional exams tend to be summative rather than formative, and two-stage exams represent an opportunity to redress this imbalance. The process of discussing your answers with your teammates is a significant learning opportunity and supports the kind of collaborative learning that we encourage.

Regrade Policy

Requests for reconsideration of grades on exams are not encouraged and will be accepted only in writing, with a clear statement of what has been incorrectly graded, within one week of receiving your graded exam. Please submit your full exam so grading on all questions can be reconsidered.

All course activities, including class meetings, homework assignments, and exams, are subject to the HKS Academic Code (available here) and the HKS Code of Conduct (available here).

Final Letter Grades

Grades for each exam and for each component of the course (problem sets, final exercise, and class participation and engagement) will be standardized (i.e. curved) and an overall score for the course will be calculated for each student. This overall score will be translated into a final course letter grade using the Dean's Recommended Grade Distribution (available here).

Other Items

Recording Classes

Classes will be video recorded, and recordings will be available for two purposes. First, to provide you with the option of reviewing the class so you can clarify or deepen your understanding of a particular concept. Second, to help us improve our teaching. The recordings will be kept in a protected page that is accessible to you only via the course site. As a member of our learning community and to stimulate risk-taking and vigorous debate in class, you are expected to never make any recordings available outside of our learning community. If you are uncomfortable with classes being recorded, please come and speak with us.

Use of Data

Data will be collected in various forms in this course. Some forms of data collection will be obvious to you (such as when responding to a question on a survey) but others might not be (such

as someone from our teaching team recording class participation or the Canvas course website system recording activity while you are logged in). Whatever the form of data collection, we pledge to use the data to help improve our teaching and ultimately your learning. This includes using your responses to online quizzes to tailor a class better to the backgrounds and learning needs of students in the class, conducting research about the effectiveness of a particular teaching approach, etc. We also pledge to keep your data confidential so that it can only be used for the purposes of improving teaching and learning or to help you and other students connect with future professional opportunities. The university-wide policy on use of Canvas data can be found here.

Teachly

We strive to teach in a classroom in which everyone feels welcome to participate in class. To help us get to know you better, keep track of classroom participation patterns and create an inclusive classroom environment, we will be using a tool developed by faculty and students at the Harvard Kennedy School called Teachly. Here is a link to a list of Frequently Asked Questions about Teachly.

READINGS

Baicker et al. "The Oregon Experiment — Effects of Medicaid on Clinical Outcomes" The New England Journal of Medicine. May 2, 2013.

Hammond, John; Ralph Keeney and Howard Raiffa. 1999. "Smart Choices: A Practical Guide to Making Better Decisions" Chapter 8 (Risk Tolerance)

Levitin, Daniel. "Bayesian Thinking in Science and in Court" (pages 216-221 in "A Field Guide to Lies and Statistics"), 2016.

HKS Case 2011.0: "Providing Pensions for the Poor: Targeting Cash Transfers for the Elderly in Mexico"

Schwabish, Jonathan. "An Economist's Guide to Visualizing Data" Journal of Economic Perspectives—Volume 28, Number 1—Winter 2014—Pages 209–234

Stokey and Zeckhauser, A Primer for Policy Analysis, Chapter 12.

The Economist, "Vaccine Economics: A Bigger Dose", August 8, 2020.

Course Schedule

Course schedule below is subject to (modest) change. Please see the Canvas course website for updates.

Date	Class	General Topic	Assignment Due	Readings
Part I – UNCERTAINTY				
Unit IA: Probability				
2-Sep	1	Thinking Probabilistically About the World	PS #0	
7-Sep	2	Probability and Conditional Probability	PCE*	MMC: 4.5, 2.6 OIS: 3.1, 3.2
9-Sep	3	Bayes' Rule	PCE*	New York Times (2016), Oster (2014); MMC: 4.5 (pp. 292-293); OIS: 3.2.8
14-Sep	4	Application: Public Pensions in Mexico	PS #1	Mexico pensions case
16-Sep	5	Probability Distributions	PCE*	MMC: 4.3-4.4 OIS: 3.4
Unit IB: Decision Analysis				
21-Sep	6	Decision Analysis Overview	PS #2	Stokey and Zeckhauser
23-Sep	7	Risk Aversion and Behavioral Biases	PCE*	Hammond, Keeney and Raiffa

28-Sep	8	Application	PS #3	
30-Sep	9	Midterm Review & Being Bayesian	PCE*	
1-Oct	**MIDTERM EXAM (8:00 AM - 10:00 AM; Location TBA)**			
Part II – EVIDENCE				
Unit IIA: Assessing Descriptive Evidence				
5-Oct	10	Evidence Introduction & Describing Data #1	PCE*	An Economist's Guide to Visualizing Data
7-Oct	11	Describing Data #2	PCE*	MMC: 1.1, 1.2, 2.1, 2.2 OIS: 1.1, 1.2, 2.1, 2.2
Unit IIB: Assessing Quantitative Evidence				
12-Oct	12	Introduction to Statistical Inference	PS #4	MMC: 3.4
14-Oct	13	Sampling Distributions for Proportions	PCE*	MMC: 5.2 OIS: 5.1
19-Oct	14	Confidence Intervals for Proportions	PS #5	MMC: 5.2, 6.2 OIS: 5.2
21-Oct	15	Statistical Inference for Differences in Means	PCE*	MMC: 6.1, 8.1, 7.2, 8.2 OIS: 7.1, 5.2, 6.1.2

26-Oct	16	Method Equivalence and Review	PS #6	OIS: 5.3.1, 5.3.4, 4.3.5, 6.1.1, 6.1.3, 6.1.5
28-Oct	17	Significance, Power, and Other Key Concepts	PCE*	MMC 6.4 OIS: 5.3.2
2-Nov	18	Sampling and Survey Design	PS #7	MMC: 3.3
4-Nov	19	Critical Assessment of Evidence	PCE*	
9-Nov	20	Application: Oregon Health Study	PS #8	Oregon Health Study
11-Nov		NO CLASS-VETERANS DAY		
Unit IIC: Assessing Qualitative Evidence				
16-Nov	21	Introduction to Qualitative Methods #1	PCE*	
18-Nov	22	Introduction to Qualitative Methods #2	PCE*	
23-Nov	23	Application: Synthesizing Evidence	PS #9	
Wrap Up				
30-Nov	24	Looking Back and Looking Ahead	PCE*	

2-Dec	25	Final Exercise Presentations	Final Exercise	
9-Dec	**FINAL EXAM (9:00 AM - 12:00 PM; Location TBA) – Details above**			

PCE* = Pre-Class Exercise