Quantitative Methods
School of Architecture, Community and Regional Planning
University of Texas at Austin

CRP 381M: Quantitative Methods

**Time:**
- Section 1: 9:30 to 11 am, Monday and Wednesday
- Section 2: 12:30 to 2 pm, Monday and Wednesday

**Room:** WMB 4.118

**Course Overview**
Planners today, more than ever, must operate in a world overflowing with data. Just as planners who primarily gravitate towards statistical models and GIS must nonetheless acquire basic competence with qualitative techniques such as interviews and community participation processes, those who are more qualitatively oriented cannot escape data and data analysis. Our core methods curriculum in the Community and Regional Planning Program is designed to make sure that everyone moving through the program has a solid foundation in both the yin and the yang of quantitative and qualitative methods. CRP 381M is intended to help students “learn to love the data.”

CRP 381M has five basic goals. First, upon completing the course students will have a basic facility with gathering data from a particular source: the United States Census Bureau. There are, of course, many sources of data, but census data is so fundamental to planning that it is emphasized most heavily here. Students will learn how to gather and interpret social-demographic data from the decennial census and the American Community Survey (ACS), and gain at least a passing familiarity with housing data from the American Housing Survey (AHS), and economic data via Longitudinal Employer-Household Dynamics (LEHD) and County Business Patterns (CBP). Certain students will inevitably be more interested in dealing with census data from other nations; however, learning how to gather and interpret information from the US Census will be useful background when applied to other contexts.

Second, we will also briefly “get under the hood” in order to understand how population projections are produced. Since planning is a future-oriented discipline, planners must rely on widely-agreed upon demographic forecasts to make reasonable decisions about allocating resources in the future. Demographic forecasting could be the subject of a whole course unto itself, but in CRP 381M students will get at least an introduction to how official forecasts of this type are made.

Third, students are able to critically unpack the equity implications of sociodemographic data metrics and classification schemes. Sociodemographic data—measuring or classifying people according to contested categories and quantities such as race, ethnicity, citizenship status, gender, employment status, income, poverty, and a host of others—is not inherently neutral or objective. It is instead a human creation, imbued (like all human creations) with all of the inevitable biases and blind spots of its creators, no matter who they are and no matter what
particular choices they make. This by no means invalidates the usefulness or legitimacy of sociodemographic data; but it is vital for students to develop a basic understanding of the choices and tradeoffs that go into creating them, so that they may best understand exactly what they reveal and, importantly, what they conceal.

The fourth goal is for students to learn how to communicate with data in both oral and written form. Knowing (and loving) the data is not enough for planners: informing other people, in particular laypeople, what a given set of data implies is a vital skill for planners. In CRP 381M, we will talk about how to present data, and what to avoid, so as to maximize quantitative methods’ power to educate and minimize their propensity to confuse.

The final goal is for students to become savvy consumers of statistical analyses. CRP 381M is not a classic, in-depth statistics class: we will not, for example, be doing mathematical derivations of statistical formulas (although we will use some of the formulas—just as most of us don’t need to understand what’s under the hood in order to drive a car). But students will emerge from the class with a basic comfort with how to interpret the results of three key statistical techniques: hypothesis tests, surveys, and simple regressions. Students will also, along the way, learn how to do their own analyses using these three basic techniques, but the primary emphasis here is on how to interpret their results. A world awash in data is also a world awash in poorly-justified statistical claims: CRP 381M will help students learn how to sharpen their critical faculties and sort out the sound statistical assertions from the dubious ones.

CRP 381M is designed, as much as possible, to present material in an “inductive” manner, generalizing from specific examples, rather than in a “deductive” fashion (starting from abstract principles and then proceeding to specific examples) as is usually the case in traditional statistics courses. Without question, some students will go on to seek out more advanced statistical courses in CRP or elsewhere at UT. However, CRP 381M is intended to provide a basic foundation that even more qualitatively-oriented students can draw upon throughout their planning careers.

Learning Objectives

- Students have a basic facility with accessing sociodemographic, housing, and other types of data commonly used in planning and published by the US Census Bureau.
- Students have a basic understanding of how the population projections relied routinely relied upon in planning practice are made.
- Students have the ability to critically unpack the equity implications of sociodemographic data metrics and classification schemes, such as those concerning (to name a few) race, ethnicity, citizenship status, gender, employment status, income, and poverty.
- Students are able to effectively communicate data, both orally and in written form, to both lay and professional audiences.
- Students are savvy consumers of statistical analyses, and are able to detect poorly argued or deliberately misleading statistical claims.
Requirements
CRP 381M is a core required course for almost all MSCRPs. Exemption requires the explicit permission of Jake Wegmann.

Grades
Student grades for CRP 381M will be calculated as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Problem sets (individual, 6 out of 7 @ 9% each)</td>
<td>54%</td>
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<tr>
<td>Group presentations (2 @ 15% each)</td>
<td>30%</td>
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<tr>
<td>Individual presentation</td>
<td>6%</td>
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<tr>
<td>Participation</td>
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<tr>
<td><strong>Total</strong></td>
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*Basic philosophy:* In this course, you will be tested on your knowledge frequently but in small increments. The idea here is to avoid the pressure that comes with a large portion of your grade riding on an exam or a major project. If you struggle with an assignment, there will be ample time for you to work with us to figure out what went wrong and how to get back on track.

*Problem sets:* There will be seven problem sets distributed fairly evenly throughout the semester. None of them will be particularly long. I will ask all of you to submit all problem sets individually, but on some of them you may collaborate with up to two other classmates (whether in your section or in the other one) so long as you disclose who you worked with on your paper. On some problem sets, I will ask that you work completely alone. *I will drop your lowest score among the seven problem sets—only six of them will actually count towards your course grade.*

*Group presentations:* There will be two projects where you will form a team with 2-3 other classmates and present in front of the class.

*Individual presentation:* There will be one individual presentation, in front of the class, that will be quite brief.

*Participation:* This is included in your grade to ensure that everyone contributes to the discussion. You can participate in discussions orally during class meetings, or online via Canvas. For instance, you should feel free to initiate an online discussion about anything pertaining to the class that interests you. In a perfect world, you will do both, to sharpen both your speaking and writing skills, but some students may feel more comfortable with either in-person or online participation, and that is fine.

*Real world relevance:* Two of the early assignments, Presentation #1 and Problem Set #2, will yield results that are of interest to the City of Georgetown (located about 30 miles north of downtown Austin), which is currently in the middle of revamping its Comprehensive Plan. I will explain more about this collaboration during class.
**Software and Hardware Requirements**

We will use two pieces of software for statistical analysis in this course: Microsoft Excel and Stats Plus. Excel is (theoretically, at least) platform-independent between Mac or PC, so you can use either. Personally, I will use Excel 2018 running on a Mac for all classroom demos, but it should be easy to recreate them on a PC if you have one. For PC, Excel 2010, 2013, 2016, or 2018 is fine. For Mac, 2011, 2015, 2016, or 2018 are fine. If you use an older version than those listed, you may occasionally have to figure out on your own how to keep up with what we’re doing in class, but that should not be insurmountable.

Whether you have a Mac or a PC, you will need to download the Stats Plus software.

You can download Stats Plus for PC here:  

And here for Mac:  

For either Mac or PC, the free version is adequate for everything we will do in this course.

**Logistics**

Instructor: Jake Wegmann (Assistant Professor, Community and Regional Planning, School of Architecture)

Teaching Assistant: Jonathan (Jon) Cairns (Candidate for Master of Science in Community and Regional Planning, School of Architecture)

Emails: Jake Wegmann: jagw@utexas.edu  
Jon Cairns: jon.w.cairns@gmail.com

Office: For Jake Wegmann: SUT 3.118.  
For Jon Cairns: TBA

Office hours for Jake Wegmann: Monday 2-4 and Thursday 2-4.  
Sign up for 15-minute slots at: http://www.wejoinin.com/sheets/fxldo

Office hours for Jon Cairns: TBA

**Course Policies**

This is a set of guidelines that I use to manage the class. Think of it as a clearly stated set of expectations: what you can expect from me, and what I can expect from you. If any of these seem unreasonable to you, you are always welcome to discuss them with me. (But preferably in advance of any one of them becoming an issue.)
Late assignment policy
You are all adults, and I know that you have many demands on your time beyond this course. If you turn in any assignment late, I will not hold it against you personally or think less of you. In fairness to your classmates, however, I will deduct points: 10% per day that the assignment is late up until one week after it is due, at which point you will receive a zero on the assignment. I will trust you to make the right decision about the best trade-off for you between getting the maximum possible grade and having the flexibility to submit your assignment late. I will make exceptions to this policy for genuine family or medical emergencies, but not for much else.

Start time
I will normally start class promptly. It is OK to arrive in class late, but please do your best to enter quietly if you do, and please understand that in general, I will not review material for you that you have missed because of being late. I pledge to strive to end class promptly 10 minutes prior to the official end of class, in keeping with UT custom, to allow students to get to their next classes. If I go past the allotted time, feel free to point this out to me.

Electronic devices
I am fully aware that this is the year 2018, and that laptops, smart phones, and the like are everywhere. These devices can be immensely powerful learning aids, but they can also be distracting and can degrade the classroom atmosphere. So here’s what I ask from you: 1) please have all handheld devices on silent and out of sight during class, and please do not look at them; 2) laptops and tablets are fine if you are using them for purposes directly related to the class; 3) please do not check e-mail or surf the Internet during class; and 4) under no circumstances should you take a call during class. This type of behavior damages the classroom environment and is unfair to your fellow students. If, for some reason, you really need to be on the Internet or you are expecting to take an important call during class, please just don’t come to class that day. I won’t hold it against you personally; again, I fully recognize that you are an adult with multiple and competing demands on your time. I’d much rather that you miss a class meeting if you have something pressing that is going to keep you on the Internet or on the phone. There is no point to being in class without being fully present and engaged.

Eating and drinking
I recognize that many students’ schedules are jam-packed, and that finding time to eat can be difficult. At the same time, eating a full meal during class can be noisy, odoriferous and just plain distracting and unpleasant for your neighbors. So here’s the deal: coffee and other beverages are fine; fruit is fine; cookies and similar snacks are fine, as long as you are not being noisy. (Use your common courtesy and common sense!) But eating an actual meal in class—say, a burrito—is not fine. Also, you must clean up whatever mess you generate as a result of eating or drinking during class.

Students with disabilities
If you are a student with special needs, please bring me your Accommodation Letter from the Services for Students with Disabilities (SSD) office as early as possible in the semester, ideally before the first lecture so that I can make sure your needs can be accommodated as early and seamlessly as possible.
**Religious holidays and athletic commitments**

If you have special scheduling needs because of your observance of religious holidays, or because you are a student-athlete, please let me know at the very beginning of the semester—ideally within the first week of class—so that we can work out an arrangement to accommodate you.

**Communications**

Please do your best to visit me or Jon during our respective office hours. If our office hours conflict with your schedule, please e-mail us *in advance* so that we can schedule a meeting. If you contact one of us asking for a meeting with something urgent to discuss, please understand that she or I may not be able to meet your request on short notice.

You are also always welcome to e-mail me or Jon with questions (keep them pretty short—if there is something longer that you want to discuss, sign up for office hours). We will do our best to respond to e-mail received from Monday morning through Friday afternoon within 24 hours, and by midday Monday morning for e-mail received after Friday afternoon. The same goes for questions posed via Canvas.

**Atmosphere of respect and civility**

CRP 381-1 students come from a wide variety of backgrounds and bring enormously varying life experiences, perspectives and opinions with them. I pledge to strive to do my best to be cognizant and respectful of those differences, and I hope that you will join me in doing the same.

You should always feel free to express your opinion, whether you agree or disagree with something that I or another student have said, or if you feel that something that has not been discussed needs to be said. Just remember the difference between *disagreeing* with someone and being *disagreeable*. With an open mind, hard work and a little bit of luck, we will all learn from each other, work together, and maintain the CRP 381M classroom as a place of civility and learning.

**Reading materials**

The only book I expect you to have in your possession throughout the semester is *Naked Statistics* by Charles Wheelan. You can purchase it at the Co-Op or easily obtain it at local bookstores, online, etc. You may even be able to borrow it from a library. It is a popular press book, widely available, and easy to read.

That *Naked Statistics* is readable is a deliberate choice. I don’t want an unreadable, expensive, doorstopper of a stats textbook that you will never use again after this class to be an obstacle to you fully engaging with the material. But the flip side of that is that I’m really going to expect you to do the assigned readings in *Naked Statistics*. I will constantly refer to the material in our class meetings.

I will assign several passages of a book titled *Stat-Spotting: A Field Guide to Identifying Dubious Data* by Joel Best (2013 edition). Because I am not having you read the whole book, you do not need to purchase it, but you might choose to. Like *Naked Statistics*, it is highly readable and succinct.
There will be other materials that I will assign and that I will expect you to read. All of them, unless otherwise noted, and other than Naked Statistics, will be put up as PDFs on Canvas in time for you to read them by the assigned date.

Finally, I am suggesting readings in a free, online publication titled *Online Statistics: An Interactive Multimedia Course of Study*. It was funded by the National Science Foundation and developed as a collaboration between faculty from Rice University, University of Houston-Clear Lake, and Tufts University. While my intention is to give you everything you need to learn in the required readings and in our classroom discussions, you may find *Online Statistics* to be a helpful reference. It includes not just text but also helpful graphics, exercises, visualizations, and so on, some of which we will occasionally use during class. Here is the URL:

http://onlinestatbook.com

In the descriptions of classes and call-outs for required readings below, I use NS as shorthand for *Naked Statistics*, SSAFG for *Stat-Spotting: A Field Guide*, and OSB for *Online Statistics* (i.e., “online stat book”).

Finally, I will put up my powerpoints on Canvas.
**Meeting 1: Wednesday, August 29**  
*Course intro; introductions; Microsoft Excel basics*

Reading:
- NS Intro and Chapter 1  

**NO CLASS ON MONDAY, SEPTEMBER 3 (LABOR DAY HOLIDAY)**

**Meeting 2: Wednesday, September 5**  
*Socio-demographic Census data*

Reading:

Problem Set #1 (Downloading and using Census Data) HANDED OUT

**Meeting 3: Monday, September 10**  
*Socio-demographic Census data continued; Census data tools*

Reading:

**Meeting 4: Wednesday, September 12**  
*Economic Census data; housing Census data*

Reading:
- OSB Chapter 1 (optional)

Problem Set #1 (Downloading and using Census Data) DUE
Meeting 5: Monday, September 17
Population projection

Reading:
- Texas State Data Center, Office of the State Demographer. "Projections of the Population of Texas and Counties in Texas by Age, Sex and Race/Ethnicity for 2010-2050."
- SSAFG, pp 7-13.

Presentation #1 Group Assignment (Georgetown Census Trends) HANDED OUT
Problem Set #2 (Population Projections: The Future of Georgetown) HANDED OUT

Meeting 6: Wednesday, September 19
Population projection continued

Reading:

Meeting 7: Monday, September 24
Descriptive statistics

Reading:
- NS Chapter 2
- OSB Chapter III (optional)

Meeting 8: Wednesday, September 26
Pitfalls of descriptive statistics: presentation technique

Reading:
- NS Chapter 3
- Pauline Graivier brief article on presentation technique in Planning magazine, 1992.

Problem Set #2 (Population Projections: The Future of Georgetown) DUE
Meeting 9: Monday, October 1

Chartjunk!

Reading:
- OSB II (optional)

Meeting 10: Wednesday, October 3

In-class presentations

Presentation #1 Group Assignment (Georgetown Census Trends) IN CLASS

No reading.

Meeting 11: Monday, October 8

Correlation

Reading:
- NS Chapter 4
- OSB Chapter IV (optional)

Problem Set #3 (Correlation and Probability) HANDED OUT

Meeting 12: Wednesday, October 10

Basic probability

Reading:
- NS Chapters 5 and 5-1/2
- OSB Chapter V (optional)

Meeting 13: Monday, October 15

Basic probability, continued

Reading:
- NS Chapter 6

Problem Set #3 (Correlation and Probability) DUE
Presentation #2 Individual Assignment (Dubious Statistical Claims) HANDED OUT
Meeting 14: Wednesday, October 17
Data fallacies

Reading:
- NS Chapter 7

Meeting 15: Monday, October 22
Central Limit theorem and sampling

Reading:
- NS Chapter 8
- OSB Chapter VII (optional)

Problem Set #4 (Sampling) HANDED OUT

Meeting 16: Wednesday, October 24
In-class presentations

No reading assigned

Presentation #2 Individual Assignment (Dubious Statistical Claims) IN CLASS

Meeting 17: Monday, October 29
Central Limit theorem and sampling, continued

Reading:
- OSB Chapter IX (optional)

Meeting 18: Wednesday, October 31
Sampling and the American Community Survey

Reading:

Problem Set #5 (Hypothesis Testing) HANDED OUT
Meeting 19: Monday, November 5  
*Hypothesis testing*  

Reading:  
- NS Chapter 9  

Problem Set #4 (Sampling) DUE  

Meeting 20: Wednesday, November 7  
*Hypothesis testing, continued; chi square and ANOVA*  

Reading:  
- OSB Chapters XI and XII (optional)  

Meeting 21: Monday, November 12  
*Chi square and ANOVA*  

Reading:  
- OSB Chapters XV and XVII (optional)  

Problem Set #5 (Hypothesis Testing) DUE  
Problem Set #6 (Survey Design) HANDED OUT  

Meeting 22: Wednesday, November 14  
*Survey design*  

Reading:  

Presentation #3 Group Assignment (Stats and the City) HANDED OUT  

Meeting 23: Monday, November 19  
*Survey design, continued*  

Reading:  
NO CLASS ON WEDNESDAY, NOVEMBER 21 (UNIVERSITY-DESIGNATED HOLIDAY FOR DAY PRIOR TO THANKSGIVING)

Meeting 24: Monday, November 26
Regression analysis

Reading:
- NS Chapter 11

PS #6 (Survey Design) DUE
PS #7 (Interpreting Regression Results) HANDED OUT

Meeting 25: Wednesday, November 28
Regression analysis, continued

No reading assigned

Meeting 26: Monday, December 3
Regression analysis, continued

Reading:
- NS Chapter 12

Meeting 27: Wednesday, December 5
Program evaluation; peer-reviewed research; closing thoughts on the role of statistics

Reading:
- NS Chapters 13 and 14
- Pelechrinis, Konstantinos, Beibi Li, and Sean Qian. "Bike Sharing and Car Trips in the City: The Case of Healthy Ride Pittsburgh." Working Paper. [SKIM]
- SSAFG, pp 100-113.

PS #7 (Interpreting Regression Results) DUE

Meeting 28: Monday, December 10
In-class presentations

No reading assigned