JSGS 807 Statistics for Public Sector Managers

May 2022	University of Regina	
Instructor:	Justin Longo, Associate Professor and Director, Digital Governance Lab	
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Office Hours:	Class days @ 10-11 am or direct message me on Slack, email, or text to request a time	
Office Location:	JSGS College Avenue Campus, CB 332.6	
Classroom:	JSGS College Avenue Campus, CB 330	
Dates:	May 2, 4, 6, 10, 12, 16, 18, 20, 24, 26, 1-5pm (attendance required)	
Communications:	Canvas (gradebook only)	Google Drive folder	Slack
Teaching Assistant:	tbc	

Calendar Description

Administrative decision making and policy development often require the analysis of quantitative data. This course will introduce students to descriptive and inferential statistics often used in policy environments so that they will be effective data users and interpreters. Students will be taught how to use and present descriptive statistics.

Course Content and Approach

This is a course for future public sector leaders with limited background in (and even an aversion to) mathematics, statistics, or economics, providing an overview of statistical concepts, principles, and techniques that are relevant and useful in public administration and policy making. The central aim of this course is to make you an intelligent consumer of statistical analysis, and a strategic user of statistics in policy and administrative processes, through critical assessment and working first-hand with datasets and spreadsheets. The core argument that this course advances is that policy analysts and public sector managers responsible for policy development and delivery have a special responsibility to manage and use data and statistics accurately and ethically. To exercise this responsibility requires a conceptual understanding of data and analysis beyond the techniques of statistical analysis. In response, this course offers an introduction to the language, techniques, and tools involved in the collection, analysis, interpretation, and presentation of data and statistical analysis in support of policy making and administration, an exploration of critical questions in the use of statistical analysis in the public sector, and an assessment of the best ways to support informed policy and administrative decisions using data and statistical analysis.

> *Nothing that you will learn in the course of your studies will be of the slightest possible use to you in after life – save only this – that if you work hard and diligently you should be able to detect* when [someone] is talking rot*, and that, in my view, is the main, if not the sole, purpose of education.*
> - John Alexander Smith, 1914 (ref)

LEARNING OBJECTIVES

Following successful completion of this course, students should be able to:

- Analyze (with a focus on spreadsheet skills), interpret, and present policy-relevant data and statistics.
- Ask critical questions and be an informed consumer of statistical analysis as support for policy making and the administration of public programs and citizen services.
- Map the appropriate application of statistical analysis to specific policy and administration problems.
- Critically evaluate the public benefit of investments in data collection and analysis, and the value of publicly releasing public sector information (i.e., open data), and
- Articulate public service responsibilities surrounding the collection, interpretation, communication, and presentation of public sector data and statistics.

REQUIRED ATTENDANCE AND PARTICIPATION

JSGS 807 in May 2022 will be conducted as a face-to-face class with required attendance. Online attendance is possible where necessary, though online participants will need to be on camera for the entire session and participate fully in each class.

The course is organized in ten daily sessions, with a one-day break between each class (see the Course-at-a-Glance schedule, on the next page). Following each class, you will have until the start of the next class to review the course content consisting of online course notes, online readings, video uploads, and links to other online resources like articles and videos. Lab assignments are exercises that relate to the issues discussed in the videos, readings, and class notes. Each class participant will meet by video (or telephone) with the course instructor once during the two-week period (each meeting will be scheduled for 15 minutes) to discuss one of the labs. This meeting will form the basis of your evaluation on that lab assignment (this will be indicated in the assignment).

COURSE-AT-A-GLANCE

Module	Date	Topics
0	April 18, 7pm	Syllabus Review (1 hour optional recorded session)
1	May 2, 1-5 pm	Course Overview: Frameworks and Concepts
2	May 4, 1-5 pm	Foundations: Descriptive Statistics
3	May 6, 1-5 pm	Foundations: Inferential Statistics
4	May 10, 1-5 pm	Data Collection by Listening to People: Polling, Surveys, and Social Listening
5	May 12, 1-5 pm	Data Collection by Other Means: Sensors, Devices, Open Data, and Big Data
6	May 16, 1-5 pm	Models, Simulations, and Scenario Tools
7	May 18, 1-5 pm	Indices and Indicators + Dashboards
8	May 20, 1-5 pm	Probabilities and Predictive Analytics
9	May 24, 1-5 pm	In Graphic Detail: Information Visualization and Infographics
10	May 26, 1-5 pm	Can Government Play Moneyball, and Ethical Statistics

DUE DATE SCHEDULE

Item	Value	Due
Web Safari 1	2%	11 am May 2
Web Safari 2	2%	11 am May 4
Web Safari 3	2%	11 am May 6
Web Safari 4	2%	11 am May 10
Web Safari 5	2%	11 am May 12
Web Safari 6	2%	11 am May 16
Web Safari 7	2%	11 am May 18
Web Safari 8	2%	11 am May 20
Web Safari 9	2%	11 am May 24
Web Safari 10	2%	11 am May 26
Module 1 Lab	4%	1pm May 4
Module 2 Lab	4%	1pm May 6
Module 3 Lab	4%	1pm May 10
Module 4 Lab (individual meetings)	4%	See lab instructions
Module 5 Lab	4%	1pm May 16
Module 6 Lab**	4%	1pm May 18
Module 7 Lab	4%	1pm May 20
Module 8 Lab	4%	1pm May 24
Module 9 Lab (Flourish) & (Tableau)	4%	1pm May 26
Module 10 Lab	4%	1 pm May 30
Statistical Analysis Assignment Part 1	15%	1pm May 15
Statistical Analysis Assignment Part 2	15%	1 pm May 30
Self-Assessment (part 1)	0%	1 pm May 4
Self-Assessment (part 2)	5%	1 pm May 30

COURSE MODULES

Module 1 - Course Overview: Frameworks and Concepts

In this first full session, we will review the framework for the course stressing the need for policy analysts and public sector managers to use data and statistics accurately and ethically. And since much of the work done in this course (and a lot of statistical analysis done in the public sector) uses spreadsheets, we'll get started with some basic spreadsheet software exercises and techniques.

Module 2 - Foundations: Descriptive Statistics

Descriptive statistics involves the analysis of data that *describe* or summarize a sample or population. Descriptive statistics can be presented using tables, graphs and charts, and a narrative discussion of the results. Descriptive statistics will be the most frequent type of statistical analysis that you will produce or consume as a public servant.

Module 3 - Foundations: Inferential Statistics

Descriptive statistics are calculated on a population where you have data on every entity in a group. Often, however, you do not have access to the whole population you're interested in, but only a limited "sample" which is then used to make *inferences* about the whole population.

Module 4 - Data Collection by Listening to People: Polling, Surveys, and Social Listening

In these two related modules (modules 4 and 5), we'll consider how to source the data necessary for undertaking statistical analysis. In this first session, we'll focus on data that can be collected by asking people what they think, accessing information that they've recorded somewhere, or by 'listening' to what they're saying in public social media spaces.

Module 5 - Data Collection by Other Means: Sensors, Devices, Open Data, and Big Data

Governments collect, generate, and continually compile vast amounts of data from collecting vital statistics, to administering the tax system, recording government operations activity, managing public infrastructure and natural resources, surveying and recording public and private lands, processing regulatory requirements, managing social service delivery, and the census and survey work conducted by public statistics agencies. These administrative data records are the core of statistical analysis in the public sector. Where governments make these data records available on the internet for anyone to use, "open data" refers to initiatives by governments to make publicly available the vast stores of data they hold in filing cabinets and isolated computer hard drives, for use by individuals, organizations, and other governments. Now, with the emergence of new technological mechanisms for collecting "big data", a whole new range of data sources are beginning to influence government policy making and public administration. In this second part of our look at "data collection", we'll look at the vast range of data, and consider the risks of the problem of too much data.

Module 6 - Models, Simulations, and Scenario Tools

Models are used in the decision-making process to provide insight into the consequences of different courses of action. Spreadsheets are a simple tool for the development of business decision models,

allowing us to ask "what-if?" questions in the face of different inputs and probabilities. Simulations model how markets, societies, organizations, and natural systems dynamically interact and react to changing assumptions, allowing users to consider different possible courses of action. And scenario tools represent a computerized version of scenario planning, using intuitive, game-like user interfaces that allow non-experts to explore the possible consequences of different policy choices. In this session, we will explore how to build and work with spreadsheet models, simulations, and scenario tools.

Module 7 - Indices and Indicators + Dashboards

Index numbers (or indices) are among the most commonly used techniques in the area of economic statistics, used to combine large amounts of data about a given variable into a single number. Changes in this index number can then be compared over time. Some common statistics measured using index numbers include inflation, stock market prices, and volumes of production. An indicator is a summary statistic or combination of statistics that explains system conditions from a high-level view. A good indicator highlights a problem early and identifies what needs to be done to solve it. We will also look at constructing dashboards as a way of providing real time information to decision makers.

Module 8 - Probabilities and Predictive Analytics

Probability is a way of expressing how likely it is that a future event will happen. For public sector managers, understanding the probability of future events can help with planning, regulatory compliance, and policy analysis. But it is equally important to understand that a high probability of something happening also means the event might not happen. Predictive analytics, as a "big data" form or forecasting, can serve as an input into framing a policy problem before it appears, indicating where a need is being unmet or where an emerging problem might be countered early.

Module 9 - Data and Information Visualization

Visualization is a category of techniques used for data analysis and the communication of quantitative findings using informative graphics. Good visualization should help the viewer understand the underlying data, appreciate the information contained in the analysis, and grasp the complexity of the system. When combined with visual summaries and explanatory text, visualizations form the core of an infographic approach (or visual briefing note) for presenting information quickly to a decision maker.

Module 10, December 1 - Can Government Play Moneyball, and Ethical Statistics

In 2003, Michael Lewis published the book *Moneyball: The Art of Winning an Unfair Game* (later to become the movie Moneyball), that told the story of how the Oakland A's became a high performing Major League Baseball team despite having about a third of the financial resources as the league's wealthiest teams. The central point of Moneyball was that deep statistical analysis, and not intuition nor superficial statistics, could be used to make better decisions. Here, we take a step back from the techniques of data analysis to ask if we should increase the resources devoted to statistically evaluating the effectiveness of government programs? Or do decision makers care about statistical analysis? Effective data analysis in support of public policy making is about more than just technical competency. It also requires ethical integrity in analysis and presentation. We conclude with a consideration of the requirements of public servants to use data and statistical analysis ethically.

EVALUATION

Web Safari (10 @ 2%) (see the Due Date Schedule, above)	20%
Module Labs (10 @ 4%) (see the Due Date Schedule, above)	40%
Statistical Analysis Assignment Part 1	15%
Statistical Analysis Assignment Part 2	15%
Self-Assessment (part 2 due May 30 at 1pm)	5%
Engagement (instructor evaluation)	5%

Web Safari (20%): We are going to collectively build a repository of news stories, articles, videos, blog posts, and other web-accessible resources related to the course themes and content. You can contribute 10 unique posts related to the 10 module themes (1% each; due at 11 am on that day's class), and you will speak to your post during that day's class (1%). Only one submission per daily theme will count (though you can submit these in advance of each deadline if you wish). See this for more information on the learning objectives behind this exercise.

Module Labs (10 * 4%): Ten labs (each worth 4%) demonstrating competency in the concepts covered in the video introductions, the course notes, readings, and other material for each day. Due at 1 pm on the day of the following session (see the Due Date Schedule, above). An answer key (if applicable) will be posted after the lab is due. The module 4 lab will involve a one-on-one video conversation with the course instructor (this will be indicated in the lab), and your demonstrated understanding of the course material in that conversation will form the basis for your grade on that lab.

Statistical Analysis Assignment Part 1 (15%): Due May 15 2022 at 1 pm.
- See detailed instructions here.

Statistical Analysis Assignment Part 2 (15%): Due May 30 at 1 pm.
- See detailed instructions here.

Self-Assessment (5%): After the final class, using the expectations note you wrote to yourself during the first day, reflect on your performance and development during the course. You will assign yourself a grade out of 5%, articulating why you deserve that grade. Submit your grade and rationale here.

Engagement (5%): Class participants are expected to be present and engaged in the class. This includes being prepared for class by reviewing the materials beforehand, contributing thoughtfully to class face-to-face and online discussions, and engaging with the course material and one's colleagues to build a community of developing professionals.

STUDENT RESOURCES

UNIVERSITY OF REGINA	UNIVERSITY OF SASKATCHEWAN
Student Success Centre: Academic advising, learning skills, writing, math, and stats tutoring!	**Student Learning Services**: Academic advising, learning skills, writing, math, and stats tutoring!
Students with Special Needs Any student with a disability, injury or illness who feels they may need academic accommodation should discuss this with the course instructor after contacting the Centre for Student Accessibility at 306-585-4631	**Students with Special Needs** Students in this course who, because of a disability, may have a need for accommodations are encouraged to discuss this need with the instructor and to contact Access and Equity Services at (306) 966-7273
Students Experiencing Stress Students in this course who are experiencing stress can seek assistance from Counselling Services, or call (306) 585-4491. Additional information is available here.	**Students Experiencing Stress** Students in this course who are experiencing stress can seek assistance from the Student Wellness Centre or call (306) 966-4920.
Other Supports for Students ● Sexual Violence Prevention and Response ● ta-tawâw Student Centre ● UR International ● JSGS (UofR) Student Handbook	**Other Supports for Students** ● Sexual Violence Prevention and Response ● UofS Aboriginal Students' Centre ● UofS International Student Centre ● JSGS (UofS) Student Handbook
Academic Integrity and Conduct Ensuring that you understand and follow the principles of academic integrity and conduct as set out by the University of Regina is vital to your success in graduate school. Ensuring that your work is your own and reflects both your own ideas and those of others incorporated in your work is important: ensuring that you acknowledge the ideas, words, and phrases of others that you use is a vital part of the scholarly endeavour. If you have any questions at all about academic integrity in general or about specific issues, contact your course instructor to discuss your questions.	**Academic Integrity and Conduct** Ensuring that you understand and follow the Regulations on Student Academic Misconduct is vital to your success in graduate school. Ensuring that your work is your own and reflects both your own ideas and those of others incorporated in your work is important: ensuring that you acknowledge the ideas, words, and phrases of others that you use is a vital part of the scholarly endeavour. If you have any questions at all about academic integrity in general or about specific issues, contact any faculty member and we can discuss your questions.

COURSE POLICIES

Grading: JSGS has recently re-confirmed its grading policy, one that this course is required to strictly adhere to. The grade descriptors can be found at p. 10 of the JSGS (UofR) Student Handbook and pages 11-12 of the JSGS (UofS) Student Handbook. Note also that I am required to submit grades which yield a class average no higher than 80% (assuming a normal distribution of grades, you should expect that half of your classmates will have a grade below 80%; and you should further assume that you have a 50% chance of being in that below-80% group). Grading complaints should be filed with the Director of the JSGS Regina Campus, Dr. Jim Farney. **_See also this additional note about my philosophy of grading_**.

Course Materials: All readings are accessible through the UofR / UofS library systems,[1] or free online. Since you already pay tuition, and part of your tuition goes to funding the materials available through the library, it does not seem fair to ask you to pay extra for a textbook. I've also not found a decent textbook for this course. However, if you like stats textbooks ...

Some free online textbooks you may find useful:
Bounegru, L., Chambers, L., Gray, J. (2018). *The Data Journalism Handbook.* 2nd edition. EJC.
Black, Ken. (2013). *Business Statistics: For Contemporary Decision Making*, 8th Edition. John Wiley & Sons
Mahbobi, M., Tiemann, T. (2010). *Introductory Business Statistics with Interactive Spreadsheets*. BCcampus.
Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015). *OpenIntro Statistics.* Open Intro.
Illowsky, B., Dean, S. et al. (2016). *Introductory Statistics*. OpenStax.
Shafer, D., Zhang, Z. (2012). *Introductory Statistics.* Saylor Foundation.

Technology Requirements:
- To view the course materials, a standard Internet-connected device and web browser will work.
- All software used in this course is available for use for free from a standard current computer configuration (e.g., laptop computer) with access to the Internet.
- While Excel is the standard spreadsheet software in most organizations, we use Google Sheets when working with spreadsheets in this class as the operation of Sheets is similar to Excel. This also avoids problems with file transfers and providing comments on submitted work. While you will not be learning the particular features of Excel, learning how spreadsheets can be used in the sourcing, organizing, analysis, and presentation of data is transferable between programs.
- Some governments (particularly the Government of Saskatchewan) have restricted access to Zoom meetings when using corporate equipment. If you are using a computer provided to you by such an organization, you will likely not be able to use that computer to engage in any Zoom sessions.
- Students who are unable to participate due to a technology barrier should contact the instructor as soon as possible to discuss alternative arrangements.

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[1] Links are active for on-campus use at the University of Regina. If you are a UofR student connecting from off-campus, use these instructions. If you are a UofS student connecting from off-campus, use these instructions.

Non-registered Students: This course was developed and deployed for the benefit of graduate students registered in the Johnson Shoyama Graduate School of Public Policy (JSGS). It is made freely available as a learning resource for anyone interested in the course content. However, access to the JSGS student community, the resources of either university, or the course instructor is only available to formally registered students.