ANTHROP 3BA3 Special Topics: Statistics for Biological Anthropology
Winter 2022

Course Contacts

Instructor: Dr. L. Elizabeth Doyle

Email: doylel6@mcmaster.ca

Office: TBA

Office Hours: Friday Afternoons. In Person or Virtual. Book with Calendly: https://calendly.com/dr-doyle

CLASS TIME: Mo 2:30PM - 5:20PM

CLASSROOM: UH 101

DELIVERY MODE: P (in person; synchronous online delivery via Zoom available as needed).

NOTE ON COURSE DELIVERY: This is a "flipped" course: lectures will be posted on Avenue2Learn for asynchronous access and class time will be devoted to active learning (virtual labs, demos) and discussion. **It is expected that students will review lectures and readings prior to attending class.**

Email Contact: Emails to the instructor **must come from your McMaster email address and include ANTHROP 3BA3** in the subject line.

Contents

Course Description

From pandemics to public policy, harm reduction to human geography, the ability to comprehend and work with data is rapidly becoming a key skill for professional and personal life in the twenty-first century. For social scientists in particular, being able to interpret, use, and critique quantitative information will be a valuable addition to your professional tool kit. 3BA3 Special Topics will be a friendly and practical introduction to statistics for anthropology students with a minimal mathematics background.

This course is designed to prepare students to analyze and interpret quantitative data with *R*, a statistical environment that is growing in popularity in many research fields, including biological anthropology. We will prioritize learning to apply and interpret the most common descriptive and inferential statistics used by anthropologists, with additional emphasis on best practices for collecting and working with data. Skills learned in this course can be applied to analyzing either quantitative or qualitative data.

What the course involves

This is a practical course. Over the term we will cover the conceptual theory and practical application of quantitative methods with a focus on: formulating research questions that can be answered with quantitative data; identifying the appropriate methods to address those questions; and managing our data to facilitate good quality analysis.

Do I have to be good at math?

This course does not require advanced knowledge of mathematics. We will cover the arithmetic basis of commonly used statistics, with a focus on understanding which methods to use for what purpose. We will allow *R* to do the "real" mathematics.

What is *R*

R is a coding language and open-source processing environment designed specifically for statistics. It features a wide range of functions, including mapping and data visualization.

We will perform all work with *RStudio*, a free, user-friendly interface for the *R* statistical analysis environment.

Course Objectives

On completing this course, students will be able to:

- Understand core concepts of probability, error, and hypothesis testing

- Critically assess appropriate research designs and statistical methods to address anthropological questions

- Apply best practices for managing and manipulating raw data

- Explore and apply data with visual and quantitative descriptive methods

- Compute and interpret common inferential statistics used in bioanthropology

- Report results in written formats

Required Materials and Texts

Required equipment: personal or University-issue computer

Required software (free):
R : https://www.r-project.org/
R Studio. Available in desktop and Cloud versions:
https://rstudio.com/products/rstudio/#rstudio-desktop ; https://rstudio.cloud/.

Required text

Madrigal, L. (2012). *Statistics for Anthropology*. Cambridge: Cambridge University Press.
doi:10.1017/CBO9781139022699 ***E-version available from McMaster Library**

Suggested Readings:

Biruk, C. 2018. Chapter 4, Materializing Clean Data in the Field. In: Cooking Data. Duke University Press.

Bland, J.M. and Altman, D.G., 2000. The odds ratio. *British Medical Journal*, 320(7247), p.1468.

Broman, K.W., & Woo, Kara H. 2018. Data Organization in Spreadsheets. The American Statistician 72(1): 2–10. https://doi.org/10.1080/00031305.2017.1375989.

Coe, Robert. 2002. "It's the Effect Size, Stupid: What Effect Size Is and Why It Is Important." Conference paper presented at the Annual Conference of the British Educational Research Association, University of Exeter, England, September 12. Accessed 2020-08-16, http://www.leeds.ac.uk/educol/documents/00002182.htm

Cohen, H.W., 2011. P values: use and misuse in medical literature. *American Journal of Hypertension*, 24(1), pp.18-23.

Cowgill, G. L. 2015. Some Things I Hope You Will Find Useful Even if Statistics Isn't Your Thing. *Annu. Rev. Anthropol*. 44, 1–14

Government of Canada Panel on Research Ethics. 2018. Chapter 1. *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.* Available at https://ethics.gc.ca/eng/policy-politique_tcps2-eptc2_2018.html

Nikita, Efthymia. 2020. An introduction to the R language. In: *Statistics and Probability in Forensic Anthropology*, eds. Z. Obertová, A. Stewart, C. Cattaneo. Academic Press. pp.353-372.

Quinn, G., & Keough, M. (2002). Chapter 7: Design and Power Analysis. In: *Experimental Design and Data Analysis for Biologists*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511806384

Spake, Laure, and Hugo F.V. Cardoso 2018. Are We Using the Appropriate Reference Samples to Develop Juvenile Age Estimation Methods Based on Bone Size? An Exploration of Growth Differences between Average Children and Those Who Become Victims of Homicide.

Forensic Science International 282: 1–12.
http://www.sciencedirect.com/science/article/pii/S0379073817304528

Class Format & Instructor Availability

The Winter 2022 iteration of ANTHROP 3BA3 will be fully in person, but remote attendance via Zoom will be offered as needed. This is a **flipped course**, which means that recorded lectures will be provided asynchronously ahead of class, and class time will be devoted to active learning, such as laboratory demonstrations and practical activities.

You are expected to do the assigned readings and other work beforehand and come to class prepared to discuss them. Class time will involve short lectures, laboratory demonstrations, workshops, and presentations with breaks as needed.

Instructor Availability

Dr Doyle is available by appointment. Please use the Calendly link at the top of the syllabus to book a time.

Course Evaluation – Overview
1. Ticket In The Door (5%), cumulatively due by 23:59h April 11

2. Lab Assignment 1 (15%), due Jan 31 by 23:59h

3. Research Method Case Study *Outline* (5%), due by 23:59h Feb 14

4. Lab Assignment 2 (20%), due by 23:59h February 28th

5. Lab Assignment 3 (25%), due by 23:59h April 4

6. Research Method Case Study (30%), due by 23:59h April 11

Course Evaluation – Details

Ticket In The Door (5%). See due dates in Overview, above.

> This is a lab-focussed class, so it is expected that you will attend each class unless prevented from doing so. You will signal your participation by submitting a comment or question at the top of class. Each week's submission will count for 0.5 up to a total of 10 submissions, cumulatively

worth 5% of your grade. Your "ticket in the door" can be submitted asynchronously (i.e. remotely). All 10 are due by the final day of term.

Laboratory Assignments (60% cumulatively). See due dates in Overview, above.

Since the aim of this class is to give students a thorough practical introduction to quantitative analysis, there is a significant applied component. This work is divided into two graded laboratory assignments, encompassing four major modules (Exploring Data, Comparing Central Tendencies, Analyzing Counts, and Estimating Linear Relationships). For each lab, you will be given a dataset and guidance in analyzing it using common methods appropriate for the type data provided. **Lab 1 will use a spreadsheet** program; **Labs 2 and 3 will use R**. You will be expected to write up your results in a concise **IMRAD** (Introduction, Methods, Results, Discussion) report format. All labs will be introduced during class time. Some class time will be made available for guided work, but you should expect to do much of your lab work independently.

Lab Assignment 1 (15%): see due dates in Overview, above. The first lab will focus on setting up your dataset and calculating basic descriptive statistics using a spreadsheet program, as a first step toward attaining comfort with data analysis.

Lab Assignment 2 (20%): see due dates in Overview, above. The second lab focuses on **Exploring Data and Comparing Central Tendencies**.

Lab Assignment 3 (25%): see due dates in Overview, above. The third lab will focus on Analyzing Counts and Estimating Linear Relationships. It is most heavily weighted because it involves more work.

Research Method Case Study: **35% cumulatively**. See due dates in Overview, above.

Students will select a topic of interest and explore the research designs and quantitative methods normally used for that topic in an approximately 20-page paper. The aim of this project is for each student to deeply explore how contemporary scholars approach a given type of data, what kinds of constraints they face, and how they deal with them. At the end of this project, each student should be prepared to design and implement a statistical analysis in the context of an original research project. This term project will be excellent preparation for students who are considering taking an advanced topical course such as 4R03. Citations and bibliography must use Chicago (Author-Date) style.

Outline & Sources List (**5**%). Provide an outline and a list of 3 sources that you will use to start your research.

Final Paper (**30**%). Approximately 20 pages in length. The term paper should consider: sampling methods and factors affecting sample quality; measurement method, validity, and reliability (e.g. intra- and inter-observer error; sensitivity and specificity); descriptive statistics & presentation; common inferential statistics; statistical power & factors affecting it; potential sources of error & bias; how other researchers have analyzed similar datasets.

No final exam.

Email and Tech Support Contact

Dr Doyle's Email Commitment
I will do my best to provide a timely response to email communications. During the week, I will generally get back to you within 48h. Emails sent during weekends or after 5pm will generally not receive a response until at least the next business day.

What To Do if You Encounter Technical Problems

Do not panic! Follow the below steps to troubleshoot:

1. **Document the problem**: ESPECIALLY if you are attempting to submit an assignment on deadline. Describe it in detail and **take screenshots that include your desktop clock as a time-stamp**.

2. Check the **Avenue To Learn Support Wiki**:
   https://wiki.mcmaster.ca/avenue/

3. Check the manufacturer's help documents!
   https://documentation.brightspace.com/EN/learners/learners.htm A2L is McMaster's local version of Brightspace Desire2Learn (D2L), therefore many of its functions and quirks will be the same.

4. Contact the Avenue2Learn help desk directly (during business hours):
   https://avenue.mcmaster.ca/support.html

5. If all else has failed … proceed to contact your professor!

Weekly Course Schedule and Required Readings

Sessional Dates:
https://academiccalendars.romcmaster.ca/content.php?catoid=44&navoid=9034

PLEASE NOTE: This is a "flipped" course: lectures will be posted on Avenue2Learn for asynchronous access and class time will be devoted to active learning (virtual labs, demos) and discussion. It is expected that students will review lectures and readings prior to attending class. "

WEEK: 1

DATES (Mon/Fri):   2022-01-10 to 14

TOPIC: Orientation, course expectations, and installing R.

READINGS: n/a

NOTES /DEADLINES: *NO PRE-RECORDED LECTURE THIS WEEK.

WEEK: 2

DATES (Mon/Fri):   2022-01-17 to 2022-01-21

TOPIC: Exploring Data - Samples and Populations

PRACTICAL: Using spreadsheets to calculate descriptive statistics"

READINGS: Madrigal 2012. Chapter 2. Computing Descriptive Statistics

NOTES /DEADLINES: Add/Drop Deadline: Jan 18 ; Start Lab 1 (Setting Up and Generating Descriptive Stats in R)

WEEK: 3

DATES (Mon/Fri):   2022-01-24 to 2022-01-28

TOPIC: Probability as the basis for inferential statistics AND Hypothesis-Testing

PRACTICAL: Work on lab 1

READINGS: Madrigal 2012. Chapter 3: Probability and Statistics ; Chapter 4. Hypothesis testing and estimation

NOTES /DEADLINES: na

WEEK: 4

DATES (Mon/Fri):   2022-01-31 to 2022-02-04

TOPIC: Comparing central tendencies ; Expectations for Term Project

PRACTICAL: T-tests and nonparametric alternatives. (This is the start of Lab 2 - Comparing Central Tendencies)

READINGS: Madrigal 2012. Chapter 5. The difference between two means

NOTES /DEADLINES: Lab 1 DUE (15%) Jan 31 BY 23:59h

WEEK: 5

DATES (Mon/Fri):   2022-02-07 to 2022-02-11

TOPIC: Analyses of Variance (ANOVA)

PRACTICAL: ANOVA in R

READINGS: READINGS: Madrigal 2012. Chapter 6. ANOVA

NOTES /DEADLINES: Peer review of proposal topics IN CLASS. (Your paper outline is due next week!)

WEEK: 6

DATES (Mon/Fri):   2022-02-14 to 2022-02-18

TOPIC: PRACTICAL ONLY class: t-tests, ANOVAs, and nonparametric alternatives in R!

READINGS: n/a

NOTES /DEADLINES: Attendance at this class is *strongly recommended*. PAPER OUTLINE DUE by 23:59h Feb 14.

WEEK: 7

DATES (Mon/Fri):   2022-02-21 to 2022-02-25

TOPIC: READING WEEK

READINGS: na

NOTES /DEADLINES: na

WEEK: 8

DATES (Mon/Fri):   2022-02-28 to 2022-03-04

TOPIC: Analysis of Counts Data: Goodness-of-fit and Chi-Square tests

PRACTICAL: Begin Lab 3 - Analyzing Counts & Linear Relationships"

READINGS: READING: Madrigal 2012. Chapter 8. Analysis of Frequencies

Suggested reading: Bland & Altman 2000. The Odds Ratio

NOTES /DEADLINES: Lab Assignment 2 (20%) due by 23:59h February 28th;

WEEK: 9

DATES (Mon/Fri):   2022-03-07 to 2022-03-11

TOPIC: PRACTICAL CLASS: Work on Lab 3 (Chi-Square and Goodness of Fit Tests)

READINGS: na

NOTES /DEADLINES: na

WEEK: 10

DATES (Mon/Fri):   2022-03-14 to 2022-03-18

TOPIC: Linear 1: Correlation

PRACTICAL: Parametric and nonparametric correlation statistics

READINGS: READINGS: Madrigal 2012. Chapter 9. Correlation

NOTES /DEADLINES: na

WEEK: 11

DATES (Mon/Fri):   2022-03-21 to 2022-03-25

TOPIC: Linear 2: Regression

PRACTICAL: Ordinary Least Squares Linear Regression

READINGS: READINGS: Madrigal 2012. Chapter 10. Regression

NOTES /DEADLINES: Last day to drop without failure: Friday, March 18

WEEK: 12

DATES (Mon/Fri):   2022-03-28 to 2022-04-01

TOPIC: Linear Relationships: Regression (2), quantifying predictive error

PRACTICAL: Work on Lab 3

READINGS: READINGS: Madrigal 2012. Chapter 10. Regression

NOTES /DEADLINES: na

WEEK: 13

DATES (Mon/Fri):   2022-04-04 to 2022-04-08

TOPIC: PRACTICAL CLASS: Work on Lab 3

READINGS: n/a

NOTES /DEADLINES: Final term paper is due next week! ; Lab 3 due by 23:59h April 4

WEEK: 14

DATES (Mon/Fri):   2022-04-11 to 2022-04-12

TOPIC: Considering Sources of Interpretive Error: Effect Size and Validity

READINGS: *SUGGESTED* readings: Coe 2002 ; Spake & Cardoso 2018 (on A2L)

NOTES /DEADLINES: CLASSES END ; Term Paper DUE by 23:59h April 11

EXAM PERIOD   No exam

Course Policies

Assignment Submissions
It is expected that all assignments will be submitted as PDF files to that assignment's dropbox on Avenue to Learn (A2L) **Assignments submitted by e-mail will not be accepted.**

If you run into technical problems when submitting an assignment or exam, <u>take a screenshot that shows your submission screen and desktop clock as a timestamp!</u> Then visit the Avenue to Learn Support page for help.

Late Submissions
You have a 48h grace period before late penalties are applied for <u>written assignments only</u> (does not apply to tests or exams). This means that you can submit your assignment up to 48h after a deadline, without losing points.

A late penalty of 2 points (2% of the total course grade) will be deducted from an assignment's total per 24-hour period (or part thereof late) for assignments.

Absences, Missed Work, Illness

It is your responsibility to complete all work by the deadline at which it is to be handed in. Extensions will not be available without one of: a McMaster Student Absence Forms (MSAF) if applicable; OR written certification approved by your Faculty office.

Please note that policies concerning the use of MSAFs (McMaster Student Absence Forms) have changed (see https://www.mcmaster.ca/msaf/).

<u>Note that MSAF's cannot be used for:</u>

- **<u>Any coursework worth 25% or more.</u>**
- Absences lasting longer than 3 days

If you require relief for an assessment worth 25%+ or for longer than 3 days, you must contact your faculty office, with documentation, if you wish to apply for a faculty-issued MSAF.

Please note – **<u>all deferred and makeup exams will be in essay format</u>**.

Assignment Reappraisal

Your assignments are marked by TAs using a grading rubric provided by the instructor, which is based on the criteria outlined in each assignment guide.

Grades are not awarded based on demonstrated effort, but on demonstrated achievement. It is normal for a student's average grade in university classes to be somewhat lower than their average grade in high school.

If you disagree with a grade that you have received, please follow the below steps:

1. **Wait 24h after viewing your mark.** Re-read your assignment with a cooler head and consider the rubric, your TA's feedback, and grading criteria outlined in the assignment guide.

2. **Seek more feedback**: Have an appointment with Dr Doyle to discuss your grade and seek clarification if needed.

3. **Formally request a re-appraisal:** Write a 300-word (max) statement, explaining why you believe the initial assessment was mistaken, and submit it to Dr Doyle along with the original assignment.

Please note that requesting a re-appraisal does not guarantee that your mark will go up. Most re-appraisals do not produce a different mark than the original assessment, and some produce a lower mark.

If, after reappraisal by the instructor, you still disagree with an assessment, you may apply for a **re-read** via the McMaster Secretariat website: https://registrar.mcmaster.ca/re-read/

Grades

Marking rubrics and final grades will be based on the McMaster University grading scale:

MARK	GRADE	Qualitative Scale (Unofficial)
90-100	A+	In general, quantitative & categorical grade ranges reflect the following qualitative scale:
85-90	A	
80-84	A-	80% to 100% (A- to A+): Exceptional performance: strong evidence of original thinking; good organization; capacity to
77-79	B+	analyze and synthesize; superior grasp of subject matter

73-76	B	with sound critical evaluations; evidence of extensive knowledge base.
70-72	B-	
67-69	C+	68% to 79% (B- to B+): Competent performance: evidence of grasp of subject matter; some evidence of critical capacity and analytic ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.
63-66	C	
60-62	C-	50% to 67% (D to C+): Adequate performance: understanding of the subject matter; ability to develop solutions to simple problems in the material; acceptable but uninspired work, not seriously faulty but lacking style and vigour.
57-59	D+	
53-56	D	
50-52	D-	
0-49	F	00% to 49% (F): Inadequate performance: little or no evidence of understanding of the subject matter; weakness in critical and analytic skills; limited or irrelevant use of the literature.

Avenue to Learn & Lecture Recording

In this course we will be using Avenue to Learn. Some real-time lecture sessions may be recorded. Attendees will be warned prior to recording.

Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

University Policies

Academic Integrity Statement

You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behavior can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which credit has been obtained.

2. Improper collaboration in group work.

3. Copying or using unauthorized aids in tests and examinations.

Academic Accommodation of Students with Disabilities
Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities.

Religious, Indigenous and Spiritual Observances (RISO)

The University recognizes that, on occasion, the timing of a student's religious, Indigenous, or spiritual observances and that of their academic obligations may conflict. In such cases, the University will provide reasonable academic accommodation for students that is consistent with the Ontario Human Rights Code.

Please review the RISO information for students in the Faculty of Social Sciences about how to request accommodation.

Faculty of Social Sciences E-mail Communication Policy
Effective September 1, 2010, it is the policy of the Faculty of Social Sciences that all e-mail communication sent from students to instructors (including TAs), and from students to staff, must originate from the student's own McMaster University e-mail account. This policy protects confidentiality and confirms the identity of the student. It is the student's responsibility to ensure that communication is sent to the university from a McMaster account. If an instructor becomes aware that a communication has come from an alternate address, the instructor may not reply at his or her discretion.

Privacy Protection

In accordance with regulations set out by the Freedom of Information and Privacy Protection Act, the University will not allow return of graded materials by placing them in boxes in departmental offices or classrooms so that students may retrieve their papers themselves; tests and assignments must be returned directly to the student. Similarly, grades for assignments for courses may only be posted using the last 5 digits of the student number as the identifying data. The following possibilities exist for return of graded materials:

1.   Direct return of materials to students in class;

2.   Return of materials to students during office hours;

3.   Students attach a stamped, self-addressed envelope with assignments for return by mail;

4.   Submit/grade/return papers electronically.

Arrangements for the return of assignments from the options above will be finalized during the first class.

Online Elements

This course includes on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course

material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Course Modification

The instructor and university **reserve the right to modify elements of the course during the term**. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.