ANT 4591: Quantitative Methods in Biological Anthropology

Dept. of Anthropology, College of Science
3 Credit Hours

Course Information

Course Name: Quantitative Methods in Biological Anthropology (ANT 4591)
Course Modality: Face-to-face (P)
Credit Hours: 3.0
Semester/Year: Fall 2022
Location: PSY 107
Day/Time: Monday 10:30 – 1:20 PM

Professor Information

Professor: Sarah Freidline, Ph.D.
Office Location: Howard Phillips Hall 409I
Office Phone: 407-823-2124
Office Hours: Wednesdays, 3:00 – 4:30 PM, (or by appointment)
E-mail: WebCourses e-mail (best way to contact me) or sarah.freidline@ucf.edu

GTA Information

GTA: Katherine Lane, M.A.
Office Location: Howard Phillips Hall 309 (computer lab)
Office Hours: Thursday, 10:00-11:00 AM (or by appointment)
Email: Katherine.Lane@ucf.edu

University Course Catalog Description

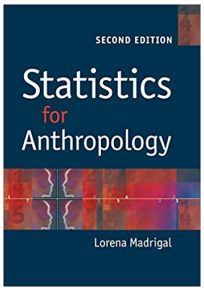
Biological anthropology methodological approaches to analyzing quantitative data, interpreting and writing results. Prerequisite STA 2014C or consent of instructor.

Course Overview and Goals

This course introduces students to basic methodological approaches for analyzing anthropological quantitative data, which often include a biological or physical interpretative framework (e.g., morphometrics, growth and development, sexual dimorphism, evolution, development, forensics, primatology, etc.). This course is designed for anthropology students with little to no quantitative background. Students will develop basic programming skills using the programming language and software R and learn how to carry out basic procedures using anthropological quantitative data. Students will be introduced to anthropological concepts related to graphical techniques, frequency distributions for summarizing and displaying data, research design, sampling, sample size, measurement error, distribution types, probability, and basic univariate hypothesis testing of means and proportions. Students will learn how to organize and summarize quantitative data, and how to interpret and present statistical results, as appropriate for the anthropology discipline. Students will read directly from peer-reviewed literature to be exposed to various types of anthropological methodology and application of statistical methods to datasets. Students will also lead critical analysis discussions based on original anthropological literature.

Required Textbooks

Statistics for Anthropology (2nd edition) by Lorena Madrigal



Additional Required Reading

Numerous links to PDFs of published manuscripts will be provided through WebCourses.

Required Software

You will be required to have access to R Studio (available here: https://www.rstudio.com/products/rstudio/).

Student Learning Outcomes

Upon course completion, you should have:

1. Knowledge and understanding of scientific research methods, including hypothesis building, methods of data collection, and research design.
2. Knowledge and application of univariate statistical methods;
3. Knowledge and application of quantitative methods in biological anthropology;
4. Basic programming skills in R;
5. The ability to critically evaluate research methods;
6. Discussion skills, through in-class discussions;
7. Oral presentation skills, through in-class presentations;
8. Scientific writing skills, through proposal writing;
9. The ability to propose, design and present a research proposal

Course Activities

Financial Aid Requirement:

UCF must comply with a federal financial aid regulation that states that in order to receive federal aid, students must be actively academically engaged (according to a federal definition) in each course in which they are enrolled. Without verification of this engagement, students will not receive their aid. WebCourses@UCF will analyze all student activity to determine which students have met the federal standard, and that information will be sent to the Office of Student Financial Aid for processing. **Students must contribute to the "Beginning of Class" discussion board on WebCourses by 11:59 pm EST on Friday of the first week of class (8/26).** This discussion will be a way for me to gauge your current familiarity with statistics, as well as to let me know what you hope to gain from this class. Your post in this discussion board is your first Homework Assignment.

Assignment Details

1) Homework Assignments: Homework assignments are due weekly. They are designed to provide evidence of mastery of course concepts. Homework assignments will be found on WebCourses in the module for the week they are due, but they will open one week prior to the due date. You will upload each homework assignment through WebCourses by 10:30 AM EST on Monday each week they are due.

2) Summary and Participation in Student-Led Discussions: Throughout the semester, you will be assigned reading material that relates to biological anthropology history, research, and methods. Each week a student will be assigned a scientific article to lead a class discussion. The goal is for you to learn how to read *and* critique assigned papers based on methodological or statistical issues (where relevant), or to praise those papers that are well-written and well-executed. This skill takes time to develop, and I expect everyone to get better at it as class progresses.

   The discussions require you to submit a **short summary** of the paper and **your participation** on the day of discussion.

   In the **paper summary** you need to include the following points. Please write in full sentences.
   - State the research question and explain why it is interesting.
   - State the hypotheses tested or objectives.
   - Briefly describe the methods (design, participants, materials, procedure, what was manipulated [independent variables], what was measured [dependent variables], how data were analyzed.
   - Describe the results. Were they significant?
   - Explain the key implications of the results.

   For In-class **Discussion**
   - Come prepared to discuss the assigned articles – read the material beforehand, take notes, bring any questions or comments as potential discussion material.
   - Speak up! Be ready and willing to answer open-ended discussion questions. All students must participate in all discussions.
   - Graded based on preparedness and ability to contribute to discussion as well as the paper summary.
   - **DO NOT** use discussions to personally attack classmates – it is ok to disagree with each other but do so in a polite and respectful way.

3) Discussion leaders: Each of you will lead the class discussions on the assigned manuscript once during the semester. As a leader you will give a PowerPoint presentation summarizing the article and evaluating the application and presentation of the methods used in the paper. The Discussion should last about 30 to 45 minutes. What are the methods? Is the methodology sound? Is it the appropriate method for the research question? Are the necessary statistics, figures and tables included? The assignment is to not only summarize the article but to also lead the discussion.

   - Prepare at least **3 questions** to ask your fellow students to stimulate discussion and **post these questions on the Discussion board in WebCourses the Friday 5 PM EST before class**. **Students do not need to respond to the questions on WebCourses, but in class.**
   - For the presentation, begin with a summary of the paper's topics, methods, and results.
   - When there is a lack of participation, you can call on students and make them present their own questions or thoughts.
   - You may bring in supplementary resources if applicable (short video clips, related news pieces, etc.), but these should take up no more than 10 minutes of the class period. Your focus should be on the assigned articles.

- Graded based on quality of questions (thoughtful, open-ended, etc.) and ability to lead and facilitate discussions for an appropriate amount of time.

4) Final Project: This is a group project – consisting of two to three students per group. You will design, undertake, and write-up a research study on an archaeological skeletal collection housed in the Anthropology Department using methods learned in this course.

   *More details will be announced later in the semester.

   In this project you will learn to:
   - Describe the material/sample/collection (age, sex)
   - Learn the basics of data collection (collecting and importing data)
   - Apply a method (caliper measurements, wear patterns, scoring, etc.)
   - Do basic descriptive statistics, and possibly group comparisons (parametric t-test, non-parametric chi-square, correlation, etc.)
   - Present it as a PowerPoint
   - Write it up as a scientific report

   You will work on this project throughout the semester. All groups will propose a topic, provide sufficient background to show the topic to be important and interesting, collect and analyze data, and discuss the results and the significance of the findings. You will need to present your final project in two ways: during class in a PowerPoint presentation format and in a written format as a scientific report due by the date of our final exam.

   - **Approval of Topic** – Your group's proposed topic and a brief description of methods for collecting and analyzing data. This must be submitted to Webcourses by the beginning of class on **October 3rd.**
   - **Written plan for research project** – As a group, you will upload to WebCourses a research plan describing your topic, research question, hypotheses and methods, by the beginning of class on **October 17th.**
   - **Group Dataset Presentation** – At the end of the semester, your group will give a 15 to 30 minute PowerPoint presentation of your final project to the class, and you will be expected to answer questions afterwards. This presentation needs to be uploaded to Webcourses by beginning of class **November 28th.**
   - **Group Research Final Paper** – As a group, you will write up the final project describing the research background, question and hypotheses, methods for collecting and analyzing data, results, discussion and conclusion (including the significance of the project). You will need to include the statistical tests and why they are appropriate for your dataset. The proposal should be approximately **10-pages** (double-spaced; not including bibliography) in length and submitted through WebCourses as either a Microsoft Word or Adobe .pdf document due by **11:59 PM December 5**. Essentially, your final written paper should be the written version of what you presented to the class.

Activity Submission

Homework assignments: You will upload each homework assignment through **WebCourses by 10:30 AM EST Monday** each week they are due.

Scientific article summary: You will upload each summary through **WebCourses by 10:30 AM EST Monday** each week they are due.

Discussion leader: Questions need to be posted on Discussion board on **WebCourses by Friday 5:00 PM EST** at the latest. PowerPoint need to be submitted on **WebCourses by 10:30 AM EST Monday** the day you are presenting.

Final project: Both the "Approval of Topic" and "Written Plan for Research Project" need to be uploaded to Webcourses by 10:30 AM the day they are due (see above and **Course Schedule**). The "Group Data Presentation" and "Group Research Final Paper" will also need to be uploaded to WebCourses (see above and **Course Schedule**).

Attendance/Participation

Attendance is important for understanding course materials and to be successful in this course. Concepts covered in this course build on each other. When possible, you should attend all lectures, complete all reading assignments, and take notes on lectures and reading material. If you miss a class, it could impair your ability to understand future topics. Make sure you obtain notes from a fellow classmate if you miss class.

Class participation is essential. Come prepared to discuss the assigned articles – read the material beforehand, take notes, bring any questions or comments as potential discussion material. Speak up! Be ready and willing to answer open-ended discussion questions. All students must participate in all discussions. Participation is graded based on preparedness and ability to contribute to discussion.

Late Assignments

Late assignments will not be penalized with a valid reason and documentation (e.g., traffic ticket, police report, obituary, or doctor's note). Without a valid reason and documentation, you will be penalized one letter grade per day it's late, and not accepted 5 days late.

If you cannot come to class and participate in the In-Class Discussions, I will allow each student one excused absence. In this case, the student must answer the posted Discussion Questions by 11:59 PM the day of discussion. You will be penalized one letter grade per day it's late, and not accepted 5 days late.

I will not accept a late Final Project.

Grading

Grades will be posted under the WebCourses gradebook. Your final grade will be calculated based on the following activities:

Grade Category	**Weight toward final grade**
Homework assignments	25%
Participation	20%
Discussion leader	15%
Final Project	40%

Total	100%

Grading Scale

The following grading scale will be used in this course:

A	A-	B+	B	B-	C+	C	D+	D	D-	F
92.5-100%	90-92.4%	87.5-89.9%	82.5-87.4%	80-82.4%	77.5-79.9%	70-77.4%	67.5-69.9%	62.5-67.5%	60-62.4%	0-59.9%

Policy Statements

Rules of Conduct Statement

Electronic devices must be turned off during class. This includes phones, radios, headphones, and any other gadgets you may have that may distract me or your classmates. Failure to comply may result in your removal from the class.

The point of working in the computer lab is to allow you to open R, handouts, and PDFs as needed. Please do not surf the internet or do things not related to this course during class time. Failure to comply may result in your removal from the class.

Unauthorized Use of Class Materials or Class Notes Statement

Course materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity are in violation of academic conduct standards and may face penalties. I give you permission to download course handouts and PDFs and save them. I expect that these materials will be useful to you throughout the course and beyond.

Academic Integrity Statement

Students should familiarize themselves with UCF's Rules of Conduct at <http://osc.sdes.ucf.edu/process/roc>. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.

8. Soliciting assistance with academic coursework and/or degree requirements.

For more information about Academic Integrity, students may consult The Center for Academic Integrity <https://academicintegrity.org/>. For more information about plagiarism and misuse of sources, see "Defining and Avoiding Plagiarism: The WPA Statement on Best Practices" <http://wpacouncil.org/node/9>.

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule* <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

Course Accessibility Statement

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. Students with disabilities who need access to course content due to course design limitations should contact the professor as soon as possible. Students should also connect with Student Accessibility Services (SAS) <http://sas.sdes.ucf.edu/> (Ferrell Commons 185, sas@ucf.edu, phone 407-823-2371). For students connected with SAS, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential course access and accommodations that might be necessary and reasonable. Determining reasonable access and accommodations requires consideration of the course design, course learning objectives and the individual academic and course barriers experienced by the student. Further conversation with SAS, faculty and the student may be warranted to ensure an accessible course experience.

Campus Safety Statement

Emergencies on campus are rare, but if one should arise during class, everyone needs to work together. Students should be aware of their surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Students should make a note of the guide's physical location and review the online version at <http://emergency.ucf.edu/emergency_guide.html>.
- Students should know the evacuation routes from each of their classrooms and have a plan for finding safety in case of an emergency.

- If there is a medical emergency during class, students may need to access a first-aid kit or AED (Automated External Defibrillator). To learn where those are located, see <https://ehs.ucf.edu/automated-external-defibrillator-aed-locations>.
- To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to <https://my.ucf.edu> and logging in. Click on "Student Self Service" located on the left side of the screen in the toolbar, scroll down to the blue "Personal Information" heading on the Student Center screen, click on "UCF Alert", fill out the information, including e-mail address, cell phone number, and cell phone provider, click "Apply" to save the changes, and then click "OK."
- Students with special needs related to emergency situations should speak with their instructors outside of class.
- To learn about how to manage an active-shooter situation on campus or elsewhere, consider viewing this video (<https://youtu.be/NIKYajEx4pk>).

Deployed Active Duty Military Students Statement
Students who are deployed active duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make related arrangements.

Make-Up Assignments for Authorized University Events or Co-Curricular Activities
Students who represent the university in an authorized event or activity (for example, student-athletes) and who are unable to meet a course deadline due to a conflict with that event must provide the instructor with documentation in advance to arrange a make-up. No penalty will be applied. For more information, see the UCF policy at: < https://policies.ucf.edu/documents/4-401.2MakeUpAssignmentsorAuthUnivEventsorCocurricularActivities.pdf)>

Religious Observances
Students must notify their instructor in advance if they intend to miss class for a religious observance. For more information, see the UCF policy at:
<https://regulations.ucf.edu/chapter5/documents/5.020ReligiousObservancesFINALJan19.pdf>.

Diversity and Inclusion
The University of Central Florida considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. UCF expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events. Dimensions of diversity can include sex, race, age, national origin, ethnicity, gender identity and expression, intellectual and physical ability, sexual orientation, income, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. The individual intersection of these experiences and characteristics must be valued in our community.
Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources available to support the victim, including confidential resources and information concerning reporting options at https://letsbeclear.ucf.edu and http://cares.sdes.ucf.edu/.
If there are aspects of the design, instruction, and/or experiences within this course that result in barriers to your inclusion or accurate assessment of achievement, please notify the instructor as soon as possible and/or contact Student Accessibility Services.
For more information on diversity and inclusion, Title IX, accessibility, or UCF's complaint processes contact:

- Title IX – OIE – http://oie.ucf.edu/ & askanadvocate@ucf.edu
- Disability Accommodation – Student Accessibility Services – http://sas.sdes.ucf.edu/ & sas@ucf.edu
- Diversity and Inclusion Training and Events – www.diversity.ucf.edu
- Student Bias Grievances – Just Knights response team – http://jkrt.sdes.ucf.edu/
- UCF Compliance and Ethics Office – http://compliance.ucf.edu/ & complianceandethics@ucf.edu
- Ombuds Office – http://www.ombuds.ucf.edu

Unauthorized Use of Websites and Internet Resources

There are many websites claiming to offer study aids to students, but in using such websites, students could find themselves in violation of academic conduct guidelines. These websites include (but are not limited to) Quizlet, Course Hero, Chegg Study, and Clutch Prep. UCF does not endorse the use of these products in an unethical manner, which could lead to a violation of our University's Rules of Conduct. They encourage students to upload course materials, such as test questions, individual assignments, and examples of graded material. Such materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity could be found in violation of academic conduct standards and could face course and/or University penalties. Please let me know if you are uncertain about the use of a website so I can determine its legitimacy.

Important Dates

Please consult the Academic Calendar (http://calendar.ucf.edu) to keep yourself informed of holidays, special events, etc.

Course Schedule and Assignments

Date	Topics
Week 1: Aug. 22	• Course Introduction • Scientific Method • Introduction to RStudio, R Markdown • **Homework Assignment 1 due Friday Aug. 26 – Financial Aid Requirement**
Week 2: Aug. 29	• Introduction to RStudio, statistics and simple descriptive statistics • How to design a research project; how to read and write a scientific paper • **Homework Assignment 2 due Aug. 29**
Week 3: Sept. 5	• Labor Day – No Class
Week 4: Sept. 12	• Looking at data: descriptive statistics • Discussion: the biological profile - age at death & sex estimation • **Article summary due Sept. 12** • **Homework Assignment 3 due Sept. 12**
Week 5: Sept. 19	• Looking at data: descriptive statistics • Discussion: the biological profile - ancestry & stature estimation • **Article summary due Sept. 19** • **Homework Assignment 4 due Sept. 19**
Week 6: Sept. 26	• Probability and statistics • Discussion: skeletal growth • **Article summary due Sept. 26** • **Homework Assignment 5 due Sept. 26**
Week 7: Oct. 3	• Probability and statistics • Discussion: probability and statistics • **Article summary due Oct. 3** • **Homework Assignment 6 due Oct. 3** • **Final Project: Approval of Topic due Oct. 3**
Week 8: Oct. 10	• Hypothesis testing & estimation • Discussion: hypothesis testing & estimation • **Article summary due Oct. 10** • **Homework Assignment 7 due Oct. 10**
Week 9: Oct. 17	• Hypothesis testing & estimation • Discussion: hypothesis testing & estimation • **Article summary due Oct. 17** • **Homework Assignment 8 due Oct. 17** • **Final Project: Written plan for research project due Oct. 17**
Week 10: Oct. 24	• The difference between two means • Discussion: dental anthropology • **Article summary due Oct. 24** • **Homework Assignment 9 due Oct. 24**
Week 11: Oct. 31	• Non-parametric tests • Discussion: paleopathology • **Article summary due Oct. 31** • **Homework Assignment 10 due Oct. 31**
Week 12: Nov. 7	• The analysis of frequencies • Discussion: paleopathology

	• **Article summary due Nov. 7** • **Homework Assignment 11 due Nov. 7**
Week 13: Nov. 14	• Correlation analysis • Discussion: virtual anthropology, fossil reconstruction & geometric morphometrics • **Article summary due Nov. 14** • **Homework Assignment 12 due Nov. 14**
Week 14: Nov. 21	• Review • **Homework Assignment 13 due Nov. 21**
Week 15: Nov. 28	• **Final Presentations**
Week 16: Dec. 5	**Final Paper Due**

This syllabus is tentative and may change during the semester. It is your responsibility to come to class and check WebCourses for updates. Any changes to readings or assignments will be given in advance.

Required Readings (Tentative List)

(Check WebCourses for updates. Any additions will be announced during the previous week.)

Week 1 Course Introduction

Week 2 Introduction to statistics and simple descriptive statistics; Research design

Required Readings

- Madrigal Chapter 1
- DiGangi, E. A., & Moore, M. K. (2013). Chapter 2 - Application of the Scientific Method to Skeletal Biology. In E. A. DiGangi & M. K. Moore (Eds.), *Research Methods in Human Skeletal Biology* (pp. 29-59). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-385189-5.00002-9
- Gastel, B. & Day, R.A. (2013) Chapter 1 – What is scientific writing? In B. Gastel & R.A. Day (Eds.), *How to Write and Publish a Scientific Paper* 8th Edition (pp. 3-5). Greenwood Press.
- Gastel, B. & Day, R.A. (2013) Chapter 4 – What is a scientific paper? In B. Gastel & R.A. Day (Eds.), *How to Write and Publish a Scientific Paper* 8th Edition (pp. 18-23). Greenwood Press.

Week 3 Labor Day – No Class

Week 4 Looking at data: descriptive statistics; The biological profile - age at death & sex estimation

Required Readings

- Madrigal Chapter 2
- Patterson, M., & Tallman, S. (2019). Cranial and Postcranial Metric Sex Estimation in Modern Thai and Ancient Native American Individuals. *Forensic Anthropology*, *2*(4). https://doi.org/10.5744/fa.2019.1009

Further Reading – The Biological Profile

- Krishan, K., Chatterjee, P. M., Kanchan, T., Kaur, S., Baryah, N., & Singh, R. K. (2016). A review of sex estimation techniques during examination of skeletal remains in forensic anthropology casework. *Forensic Sci Int*, *261*, 165 e161-168. https://doi.org/10.1016/j.forsciint.2016.02.007
- Ubelaker, D. H., & Khosrowshahi, H. (2019). Estimation of age in forensic anthropology: historical perspective and recent methodological advances. *Forensic Sci Res*, *4*(1), 1-9. https://doi.org/10.1080/20961790.2018.1549711

Week 5 Looking at data: descriptive statistics; The biological profile - ancestry & stature estimation

Required Readings

- Madrigal Chapter 2
- Smith, A. C., & Boaks, A. (2014). How "standardized" is standardized? A validation of postcranial landmark locations. *J Forensic Sci*, *59*(6), 1457-1465. https://doi.org/10.1111/1556-4029.12576

Further Reading – The Biological Profile

- Cunha, E., & Ubelaker, D. H. (2020). Evaluation of ancestry from human skeletal remains: a concise review. *Forensic Sci Res*, *5*(2), 89-97. https://doi.org/10.1080/20961790.2019.1697060
- Spradley, M. K. (2016). Metric Methods for the Biological Profile in Forensic Anthropology: Sex, Ancestry, and Stature. *Acad Forensic Pathol*, *6*(3), 391-399. https://doi.org/10.23907/2016.040

Week 6 Probability and statistics

Required Readings

- Madrigal Chapter 3
- Wolfe, C. A., & Herrmann, N. P. (2021). Interpreting error in the estimation of skeletal growth profiles from past populations: An example demonstrating skeletal growth in historic African American communities. *American Journal of Biological Anthropology*, *177*(1), 83-99. https://doi.org/10.1002/ajpa.24415

Week 7 Probability and statistics

Required Readings

- Madrigal Chapter 3
- Schillaci, M. A., & Schillaci, M. E. (2009). Estimating the probability that the sample mean is within a desired fraction of the standard deviation of the true mean. *J Hum Evol*, *56*(2), 134-138. https://doi.org/10.1016/j.jhevol.2008.08.019

Week 8 Hypothesis testing & estimation

Required Readings

- Madrigal Chapter 4
- Byers, S. N. (2000). Testing type II error rates in biological anthropology. *American Journal of Physical Anthropology*, *111*(2), 283-289. https://doi.org/https://doi.org/10.1002/(SICI)1096-8644(200002)111:2<283::AID-AJPA11>3.0.CO;2-1

Week 9 Hypothesis testing & estimation

Required Readings

- Madrigal Chapter 4
- Smith, R. J. (2018). The continuing misuse of null hypothesis significance testing in biological anthropology. *Am J Phys Anthropol*, *166*(1), 236-245. https://doi.org/10.1002/ajpa.23399

Week 10 The difference between two means; Dental anthropology

Required Readings

- Madrigal Chapter 5
- Ortiz, A., Bailey, S. E., Schwartz, G. T., Hublin, J. J., & Skinner, M. M. (2018). Evo-devo models of tooth development and the origin of hominoid molar diversity. *Sci Adv*, *4*(4), eaar2334. https://doi.org/10.1126/sciadv.aar2334

Week 11 Non-parametric tests; Paleopathology

Required Readings

- Madrigal Chapter 7
- Spake, L., Hoppa, R. D., Blau, S., & Cardoso, H. F. V. (2021). Lack of biological mortality bias in the timing of dental formation in contemporary children: Implications for the study of past populations. *Am J Phys Anthropol*, *174*(4), 646-660. https://doi.org/10.1002/ajpa.24218

Further Readings

- Wood, J. W., Milner, G. R., Harpending, H. C., Weiss, K. M., Cohen, M. N., Eisenberg, L. E., Hutchinson, D. L., Jankauskas, R., Cesnys, G., Gintautas, x10c, esnys, Katzenberg, M. A., Lukacs, J. R., McGrath, J. W., Roth, E. A., Ubelaker, D. H., & Wilkinson, R. G. (1992). The Osteological Paradox: Problems of Inferring Prehistoric Health from Skeletal Samples [and Comments and Reply]. *Current Anthropology*, *33*(4), 343-370.

Week 12 The analysis of frequencies; Paleopathology

Required Readings

- Madrigal Chapter 8

- Orellana-Gonzalez, E., Sparacello, V. S., Bocaege, E., Varalli, A., Moggi-Cecchi, J., & Dori, I. (2020). Insights on patterns of developmental disturbances from the analysis of linear enamel hypoplasia in a Neolithic sample from Liguria (northwestern Italy). *Int J Paleopathol*, *28*, 123-136. https://doi.org/10.1016/j.ijpp.2019.12.005
- Molto, J. E., Kirkpatrick, C. L., & Keron, J. (2019). The paleoepidemiology of Sacral Spina Bifida Occulta in population samples from the Dakhleh Oasis, Egypt. *Int J Paleopathol*, *26*, 93-103. https://doi.org/10.1016/j.ijpp.2019.06.006

Further Readings - Paleopathology

- Grauer, A. L. (2018). A century of paleopathology. *Am J Phys Anthropol*, *165*(4), 904-914. https://doi.org/10.1002/ajpa.23366

Week 13 Correlation analysis; Virtual anthropology, fossil reconstruction & geometric morphometrics

Required Readings

- Madrigal Chapter 9
- Neubauer, S., Hublin, J. J., & Gunz, P. (2018). The evolution of modern human brain shape. *Sci Adv*, *4*(1), eaao5961. https://doi.org/10.1126/sciadv.aao5961

Further Readings

- Baab, K. L., McNulty, K. P., & Rohlf, F. J. (2012). The shape of human evolution: a geometric morphometrics perspective. *Evol Anthropol*, *21*(4), 151-165. https://doi.org/10.1002/evan.21320
- Gunz, P., Mitteroecker, P., Neubauer, S., Weber, G. W., & Bookstein, F. L. (2009). Principles for the virtual reconstruction of hominin crania. *J Hum Evol*, *57*(1), 48-62. https://doi.org/10.1016/j.jhevol.2009.04.004
- Slice, D. E. (2007). Geometric morphometrics. https://doi.org/10.1146/annurev.anthro.34.081804.120613

Week 14 Review

Week 15 Final Presentations