THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

SCHOOL OF SOCIAL WORK

Course Number: SOWO 911
Course Title: Introduction to Social Statistics and Data Analysis
Semester and Year: Fall 2020
Course Website: http://sakai.unc.edu

Meeting Times: Online (Thursdays, 9:00 am – 11:50 am)
Zoom link: https://zoom.us/j/93982471585
Zoom meeting passcode: *Instructor will email the passcode to students*

Instructor: David Ansong, PhD, MSW, ansong@email.unc.edu
Teaching Assistant: Gerard Chung, MSW, gcsk1982@live.unc.edu

Office/Consultation Hours: By appointment

Course Description and Objectives: This course is designed to explore basic statistical concepts related to the behavioral sciences and to provide instruction on the following topics: basic data analysis; construction and analysis of data tables; graphical analysis of data; knowledge and application of descriptive and inferential statistics; and knowledge and application of statistical software programs to analyze data. Upon completion of this course, students will be able to:

1. Use a computing software package to create and analyze data relevant to social behavioral research;
2. Understand a normal distribution and apply it to inference of a population mean by conducting univariate z-tests and t-tests;
3. Know how to develop and test alternative and null research hypotheses, understand Type I and II errors, and understand factors affecting statistical power;
4. Understand the central limit theorem and other sampling theories and the application of this knowledge to assessing strengths and limitations of probability and nonprobability sampling strategies;
5. Understand the chi-square distribution and apply it to the analysis of contingency tables involving two or more categorical variables;
6. Understand correlation and apply it to the evaluation of associations between continuous variables;
7. Know how to perform independent samples t-test, paired t-test, one-way between-subject analysis of variance (ANOVA), one-way within-subject ANOVA, and two-factor ANOVA;
8. Know how to interpret results of statistical analysis and clearly and effectively communicate findings, and
9. Have general knowledge about non-normal distributions (Bernoulli, binomial, exponential and exponential family, and multinomial) in preparation for advanced statistics courses.

Required Course Books:
- Kiess, H. O., & Green, B. A. (2010). *Statistical concepts for the behavioral sciences* (4th ed.). Boston, MA: Allyn & Bacon.

Optional Course Books:
- Gordon, R. A. (2012). *Applied statistics for the social and health sciences*. New York, NY: Routledge.

- Acock, A. A. (2018). *A gentle introduction to Stata* (6th Ed). College Station, TX: Stata Press.

Supplemental Course Materials:
1. Stata YouTube Channel: https://www.youtube.com/user/statacorp
2. UCLA Institute for Digital Research and Education: https://stats.idre.ucla.edu/stata/
3. Electronic Statistics Textbook: http://www.statsoft.com/textbook/stathome.html

<u>Community Standards in Our Course and Mask Use</u>. This fall semester, while we are in the midst of a global pandemic, all enrolled students are required to wear a mask covering your mouth and nose at all times when we meet in person in our classroom. This requirement is to protect our educational community -- your classmates and me – as we learn together. If you choose not to wear a mask, or wear it improperly when we meet in person, I will ask you to leave immediately, and I will submit a report to the Office of Student Conduct. At that point you will be disenrolled from this course for the protection of our educational community. Students who have an authorized accommodation from Accessibility Resources and Service have an exception. For additional information, see https://carolinatogether.unc.edu/university-guidelines-for-facemasks/.

<u>Teaching Methods</u>: The contributions of all students are central to the success of the class. Our online class sessions will consist of a mix of lectures, discussions, student presentations, and data analysis labs. Students are responsible for reading all assigned materials before the class date for which the readings are assigned.

<u>Policy on Incomplete or Late Assignments</u>: Written assignments are to be submitted to the instructor by 9 am on the day they are due. Students must notify the instructor at least 24 hours before an assignment is due if an assignment is going to be turned in late. Extensions may be given at the instructor's discretion. If permission for late submission is not granted before breaking a deadline, the grade will automatically be reduced by 10%, and another 10% reduction will occur each 24-hour period, including weekends. A course grade of *Incomplete* will be given only in extenuating circumstances and in accordance with the School of Social Work (SSW) and University policy. It is the student's responsibility to initiate a conversation with the instructor to request an *Incomplete*.

Please note that technical difficulties are <u>not</u> an acceptable excuse for turning in an assignment late. All technical inquiries should be directed to the staff of the SSW Computing Information and Technology Unit (CITU). Please contact Phil Kaufman at philk@email.unc.edu or 919-962-6416.

<u>Policy on Attendance</u>: Attendance at all class sessions is expected; it is important to be on time so as not to disrupt class or miss the in-class quiz. We will cover a large amount of information in each class. If you are not able to attend a class, let the instructor know as soon as possible. It is your responsibility to obtain handouts, information about class content, and information about announcements, etc., from your classmates if you are unable to attend a class. <u>Students with more than two absences, or those who are late to more than four classes, will receive an "L" unless they have made prior arrangements with the instructor.</u>

Policy on Academic Dishonesty: Academic dishonesty is contrary to the ethics of the social work profession, is unfair to other students and will not be tolerated in any form. Please refer to the *APA Style Guide,* The SSW *Manual,* and the SSW Writing Guide for information on attribution of quotes, plagiarism and appropriate use of assistance in preparing assignments. All written assignments should contain a signed pledge from you stating that, "*I have not given or received unauthorized aid in preparing this written work.*" In keeping with the UNC Honor Code, if reason exists to believe that academic dishonesty has occurred, a referral will be made to the Office of the Student Attorney General for investigation and further action as required.

Format for Written Work: APA format should be used for all written assignments. Students should refer to the *Publication Manual of the American Psychological Association* (6th ed.) for information on APA format. The following websites also provide additional information:

http://www.apastyle.org/apa-style-help.aspx

http://ssw.unc.edu/files/web/pdf/APA_Quick_Reference_Guide.pdf

Policy on Accommodations for Students with Disabilities: To obtain disability-related academic accommodations, students with disabilities must contact the instructor and the University's Department of Disability Services as soon as possible. Students may reach the Department of Disability Services at 919-962-8300 (http://disabilityservices.unc.edu/). Pursuant to UNC policy, instructors are not permitted to give accommodations without the permission and direction of the Department of Disability Services. Students must obtain such permission in advance of the due date for the first assignment.

Course Requirements:

1. **Quizzes (20%)**: Ten class sessions will begin with a short quiz on the assigned readings and course materials covered in previous sessions. This is how attendance and participation are graded for this course. Thus they _cannot_ be made up at a later time. The total quiz grade will count for 20% of the course grade.

2. **Homework (25%)**: There will be seven homework assignments during the semester. These assignments are structured to reinforce classroom learning and help students develop further critical thinking and data analysis skills. Homework grades will be averaged, and the final homework grade will count for 25% of the total course grade.

3. **Midterm Exam (20%):** The midterm exam will consist of true/false, multiple choice, short answer, and essay questions.

4. **Research Paper (35%)**: Students will use datasets provided by the instructor or their own datasets to write a research paper (no more than 10 pages, double-spaced) using the univariate and bivariate statistical approaches discussed in the course. The paper should include all the main parts contained in a typical research article: (1) Title, (2) Introduction, (3) Methods, (4) Results, (5) Discussion, and (6) References. The instructor will provide a detailed guide for the assignment.

Evaluations:			Grading Scale:	
Major Tasks	**Due Date(s)**	**% of Total**	**Points**	**Grade**
Quizzes	Weekly	20%	94 – 100	H
Midterm exam	Class 8	20%	80 – 93	P
Homework assignments	Class 3, 4, 6, & 8 - 11	25%	70 – 79	L
Research Paper	Class 13	35%	< 69	F

Course Outline, Readings, and Assignment Due Dates

Class 1

August 13   **Topics:**
- − Introductions
- − Course overview and syllabus
- − Review of basic research concepts
- − Overview of statistical reasoning and paradigms: Bayesian versus frequentist

Required Readings:
- − Kiess & Green: Ch. 2, Statistics in the Context of Scientific Research
- − Pullinger, J. (2013). Statistics making an impact. Journal of the Royal Statistical Society Series A, Royal Statistical Society, 176(4), 819-840.
- − Acock: Ch. 1 - 5 (read these chapters over the next 3 weeks of the course)

Optional Readings:
- − Gordon; Ch. 2, *Planning a Quantitative Research Project With Existing Data*.
- − Stamey, J., Sherr, M., & Williams, N. (2011). Bayesian analysis for evidence-based practice in social work. *Social Work Research, 35*(1), 46-52.

Class 22

August 20   **Topics:**
- − Frequency distributions
- − Measures of central tendency and variability
- − Crosstabulation, mean differences, scatter plots
- − Lab session: Descriptive statistics

Required Readings:
- − Kiess & Green: Ch. 3, Looking at Data: Frequency Distributions and Graphs
- − Kiess & Green: Ch. 4, Looking at Data: Measures of Central Tendency
- − Kiess & Green: Ch. 5, Looking at Data: Measures of Variability
- − Altman, D. G., & Royston, P. (2006). The cost of dichotomising continuous variables. *BMJ : British Medical Journal, 332*(7549), 1080.

Optional Readings:
- − Gordon; Ch. 5, *Basic Descriptive Statistics*
- − Kiess & Green: Ch. 1, *Making Sense of Variability: An Introduction to Statistics*
- − Kiess & Green: APPENDIX A: Mathematics Review
- − Chowa, G., Osei-Akoto, I., Ansong, D., Masa, R., Lee, Y., Johnson, L., & Sherraden, M. (2015). The Ghana Experiment: Overview of findings. In

YouthSave 2010-2015 findings from a global financial inclusion partnership (pp. 27-31). Washington, DC: New America Foundation.
https://www.newamerica.org/documents/1440/YouthSave_2010_2015.pdf

Assignment Due:
- − In-class quiz 1

Class 3	

August 27   **Topics:**
- − Principles of estimation
- − Principles of inferential statistics

Required Readings:
- − Kiess & Green: Ch. 6, Normal Distribution, Probability and Standard Scores
- − Kiess & Green: Ch. 7, Understanding Data: Using Statistics for Inference and Estimation

Optional Readings:
- − Gordon; Ch. 6, *Sampling, Population, and Sampling Distributions*.
- − Bandyopadhyay, S., Das, S., & Mondal, S. (2014). Assessment of undernutrition among the under-5 children in a slum of Kolkata: A comparison between z-scores and the conventional system. *Infant, Child, & Adolescent Nutrition*, *6*(1), 52-57.
- − Amrhein, V., Trafimow, D., & Greenland, S. (2019). Inferential statistics as descriptive statistics: There is no replication crisis if we don't expect replication. *The American Statistician*, *73*(sup1), 262-270.

Assignments Due:
- − In-class quiz 2
- − Homework 1

Class 4	

September 3   **Topics:**
- − Testing hypotheses (Mean Differences – I)
- − Lab session: Data management

Required Readings:
- − Kiess & Green: Ch. 8, Introduction to Statistical Hypothesis Testing
- − Kiess & Green: Ch. 9, The Basics of Experimentation and Testing
- − Levine, T. R., Weber, R., Hullett, C., Park, H. S., & Lindsey, L. L. M. (2008). A critical assessment of null hypothesis significance testing in quantitative communication research. *Human Communication Research, 34,* 171–187. doi:10.1111/j.1468-2958.2008.00317.x

Optional Readings:
- − Gordon; Ch. 7.2, *One Categorical and One Interval Variable (pp. 203-213)*
- − Pandey, R. M. (2015). Commonly used t-tests in medical research. Journal of the Practice of Cardiovascular Sciences, 1, 185-8. Available from: http://www.j-pcs.org/text.asp?2015/1/2/185/166321
- − Revisit Acock: Ch. 3 - 5

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Assignments Due:
- − In-class quiz 3
- − Homework 2

Class 5	

September 10 **Topics:**
- − Testing hypotheses (Mean Differences – II)
- − Lab session: T-tests

Required Readings: Review…
- − Kiess & Green: Ch. 7, Understanding Data: Using Statistics for Inference and Estimation
- − Kiess & Green: Ch. 8, Introduction to Statistical Hypothesis Testing
- − Kiess & Green: Ch. 9, The Basics of Experimentation and Testing
- − Acock: Ch. 7, Test for One or Two Means

Optional Readings:
- − de Winter, J.C.F. (2013). Using the Student's t-test with extremely small sample sizes. *Practical Assessment, Research & Evaluation, 18*(10), 1-12
- − Ansong, D., & Chowa, G. (2010). Youth savings preferences and the potential for asset accumulation: The case of Masindi, Uganda. *The Social Work Practitioner-Researcher, 22*(3): 402-419.

Assignments Due:
- − In-class quiz 4

Class 6	

September 17 Topics:
- − Testing hypotheses about three or more means (One-Way Between-Subjects ANOVA)
- − Lab session: One-Way Between-Subjects ANOVA

Required Readings:
- − Kiess & Green: Ch. 10, One-Factor Between-Subjects and Analysis of Variance
- − Acock: Ch. 9, Analysis of Variance (ANOVA)

Optional Readings:
- − Bindah, E. V. (2012). Age and Gender Differences Associated with Family Communication and Materialism among Young Urban Adult Consumers in Malaysia: A One-Way Analysis of Variance (ANOVA). *International Journal of Academic Research in Business and Social Sciences, 2*(11), 228 – 246.

Assignments Due:
- − In-class quiz 5
- − Homework 3

Class 7	

September 24 **Topics:**
- − Testing hypotheses about three or more means (One-Way Within Subjects ANOVA)
- − Lab session: One-Way Within-Subjects ANOVA

Required Readings:
- Kiess & Green: Ch. 12, One-Factor Within-Subjects Design and Analysis of Variance
- Acock: Ch. 9, Analysis of Variance (ANOVA)

Optional Readings:
- Bathke, A. C., Schabenberger, O., Tobias, R. D., & Madden, L. V. (2009). Greenhouse–Geisser adjustment and the ANOVA-type statistic: cousins or twins?. *The American Statistician*, *63*(3), 239-246.
- Uebel, K. E., Joubert, G., Wouters, E., Mollentze, W. F., van Rensburg, D. H. C. J. (2013). Integrating HIV Care into Primary Care Services: Quantifying Progress of an Intervention in South Africa. *PLoS ONE 8*(1),1-8.

Assignments Due:
- In-class quiz 6

Class 8	
October 1	**Topics:**

Topics:
- Mid-term review (Central tendency & variability, hypothesis testing, data distribution, z-test, t-test, ANOVA)
- Mid-term exam

Assignments Due:
- In-class quiz 7
- Homework 4

Class 9	
October 8	**Topics:**

Topics:
- Comparing observed and expected counts
- Lab session: Chi-square

Required Readings:
- Kiess & Green: Ch. 15, Nonparametric Statistical Tests
- Acock: Ch. 6, Statistics and Graphs for Two Categorical Variables

Optional Readings:
- Gordon; Ch. 7.3, *Two Categorical Variables (pp. 214-221)*
- Frazier, L., Yu, E., Sanner, J. et al., (2012). Gender differences in self-reported symptoms of depression among patients with acute coronary syndrome. *Nursing Research and Practice*, Article ID 109251, 5 pages, doi:10.1155/2012/109251

Assignments Due:
- In-class quiz 8
- Homework 5

Class 10	
October 15	**Topics:**

Topics:
- Measuring association
- Lab session: Correlation

Required Readings:
- Kiess & Green: Ch. 13, Correlation: Understanding Covariation
- Acock: Ch. 8, Bivariate Correlation and Regression, pp. 183-196

Optional Readings:
- Gordon; Ch. 7.4, *Two Interval Variables (pp. 222-273)*
- Kao, H. T., Buka, S. L., Kelsey, K. T., Gruber, D. F., & Porton, B. (2010). The correlation between rates of cancer and autism: An exploratory ecological investigation. *PLoS One, 5*(2), e9372.

Assignments Due:
- In-class quiz 9
- Homework 6

Class 11	
October 22	**Topics:**

- All-day data lab session
- Consultation on research paper

Assignments Due:
- In-class quiz 10
- Homework 7

Class 12	
October 29	**Topic:**

- Power analysis
- Data management

Required Readings:
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155.
- G * Power 3.1 manual (March 2017). Available at http://www.gpower.hhu.de/fileadmin/redaktion/Fakultaeten/Mathematisch-Naturwissenschaftliche_Fakultaet/Psychologie/AAP/gpower/GPowerManual.pdf
- Osborne, J. (2005). Notes on the use of data transformations. *Practical assessment, research and evaluation, 9*(1), 42-50.

Optional Readings:
- Lau, C. C., & Kuk, F. (2011). Enough is enough: A primer on power analysis in study designs. The Hearing Journal, 64(4), 30-32.
- Stata Manual. Ladder — Ladder of powers. Available at http://www.stata.com/manuals13/rladder.pdf

Assignments Due:
- In-class quiz 11

Class 13	
November 5	**Topics:**

- End-of-semester review (One-Way Within-Subjects ANOVA, Correlation, Chi-Square)

Assignment Due:
- Research paper

Class 14	
November 12	

- Presentation of research paper
- Course evaluation