Term: Fall, 2007
Instructor: Michael J. Brondino
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Office Hours: TBA
Time and location: TBA

Course Description
Social science research frequently relies on quantitative methods as an aid in interpreting research findings. For this reason, it is important that students develop a thorough understanding of these methods. SW 961 provides an overview of many statistical procedures commonly used in the social sciences and is intended to serve as a foundation for more advanced study. The course is designed to review and introduce parametric and nonparametric approaches to analyzing univariate and bivariate data. Students who have had little exposure to statistics coursework will be helped to move quickly to an intermediate level, in preparation for more advanced coursework. This course, or satisfactory completion of its equivalent or demonstration of equivalency, is required of all students in the social work doctoral program.

This one-semester graduate level course is divided into two parts: a 3 credit lecture section and 1 credit lab. The lecture portion will cover statistical concepts and applications, as well as provide practice in the interpretation and calculation of the various statistics. Lab time will be used to show how the analyses are conducted in the SAS and SPSS statistical software packages and how to interpret the output.

Prerequisites
Graduate standing or the written consent of the instructor.

Course Objectives
On completion of this course, the students will be able to:
1. Choose appropriate statistical procedures to address research questions.
2. Critically assess the application of statistical techniques reported in published research.
3. Perform statistical analyses by hand calculation and using computer software.
4. Properly interpret statistical software output.

Texts / Readings
Lecture texts:


Lecture notes:

• Copies of the lecture notes and other class materials will be available on the D2L system and can be printed out prior to lecture to facilitate note taking.

Course Policies

Campus policy information regarding participation by students with disabilities, accommodations for religious observances, academic conduct/misconduct, incomplete grading policies, complaint procedures, grade appeal procedures, sexual harassment and safety policies, final exam date requirements, and other standing policies/procedures is available on-line at: http:www.uwm.edu/Dept/SecU/SyllabusLinks.pdf.

Academic Misconduct: Academic misconduct is an act in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts.

Prohibited conduct includes cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.

Students' work must be in their own words except where appropriately cited. Excerpts from other authors may be used judiciously, but direct quotes involving even a few words must include the source, date, and page number(s) and must be indented or enclosed in quotations. Failure to comply with these requirements constitutes plagiarism and is grounds for a failing grade.

Late assignments and make-up policy: Students are expected to be present for examinations and to turn in assignments on or before the due date unless they contact the instructor in advance of the exam or due date. If an extension is given for a particular assignment, the grade may be reduced at the discretion of the instructor. Alternatives such as make-up exams or substitute assignments may then be made available at the instructor’s discretion, but these will only be offered as a result of circumstances beyond the student's
control. Failure to comply with the above requirements will result in a grade of zero for the relevant assignment.

**Attendance and class participation:** Because the material will be covered at a rapid pace, attendance is mandatory for all lectures and labs unless prior arrangements have been made with the instructor. Students with unexcused absences will receive a one-third reduction in their final grade for each unexcused absence (e.g., a final grade of A will be reduced to an A-following one absence).

**Participation by Students with Disabilities:** If you need special accommodations in order to meet any of the requirements of this course, please contact me and the Student Accessibility Center as soon as possible to make the necessary arrangements.

**Accommodation for Religious Observances:** Students will be allowed to complete examinations or other requirements in advance of a religious observance.

**Assignments/Grading**

**Weekly assignments:** Students will be assigned weekly homework problems for the lecture portion of the course. Each assignment will be worth 20 points and together will count for 30% of your total grade.

**Exams:** Four (4) exams covering the lecture material will be given over the course of the semester. Exams 1-3 will each count 15% and the *cumulative final exam* 25% toward your final grade; exams count for a total of 70% of your final grade.

**Determination of Student Grade**

Letter grades will not be assigned on individual assignments or exams. Rather, each assignment and exam will be allotted a specific number of points. Points earned will be summed into a final point total and letter grades assigned based on these final point totals by the percents listed below.

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Topics

Week 1: Introduction and overview

Readings: Chapters 1 & 2 Gravetter & Wallnau

1. Overview of basic concepts, populations, samples, etc.
2. Frequency distributions
3. The normal distribution; z-scores; t-scores; the unit normal table; finding percentile ranks, estimating proportions, finding scores from percentiles.

Week 2: Descriptive Statistics cont.

Readings: Chapters 3, 4 & 5 Gravetter & Wallnau

4. Measures of central tendency: unweighted and weighted means, median, mode, harmonic mean, geometric mean, robust measures including Winsorized and trimmed means, quadratic mean.
5. Measures of dispersion or variability: Sum of Squares, variance, standard deviation (sample and population estimate), range, semi-interquartile range, interquartile range.
6. Graphing: bar charts, histograms, line graphs, box plots, stem and leaf plots, scatter plots, etc.

Week 3: Correlation

Readings: Chapter 16 Gravetter & Wallnau

1. Overview of correlation concepts and the general formula for Pearson's r
2. Interpretation of and understanding the meaning of the correlation coefficient - z-score formula, range, direction, magnitude
3. Members of the Pearson family of correlation coefficients, their application, and extensions: biserial, point-biserial, tetrachoric, polychoric, polyserial, Spearman's rho, Phi
4. Coefficient of determination

Week 4: Elementary Inferential Statistics

Readings: Chapters 6, 7 & 8 Gravetter & Wallnau

1. Probability
2. Overview of hypothesis testing:
   Population, sample, and sampling distributions
   Constructing an empirical sampling distribution - resampling methods
   Central limit theorem
   4 step procedure for hypothesis testing
3. Introduction to the concept of power and effect sizes
4. One sample z-test

**Weeks 5-6: Elementary Inferential Statistics**

Readings: Chapters 9, 10 & 11 Gravetter & Wallnau

5. One sample t-test
6. Independent and related samples t-tests
7. Robust significance testing using Winsorized and trimmed means
8. Fisher's z-transformation and testing the difference between two correlation coefficients
9. Methods for calculating power, effect, and sample sizes for the t-test and correlation coefficients; corrected standard error for correlations with small samples
10. Confidence intervals - rationale, methods of construction and interpretation

**Exam I**

**Weeks 7-9: Analysis of Variance**

Readings: Chapters 13, 14, & 15 Gravetter & Wallnau

1. ANOVA Introduction and overview, assumptions of the ANOVA model

2. Completely Randomized Design
   - Design model
   - Expected Mean Squares
     - Fixed vs. random effects
   - F-tests
     - Type I error rate
   - Normalizing transformations
   - Preplanned vs. post hoc tests
   - Multiple comparison tests
   - Trend analysis
     - eta-squared, rho and omega²
   - Power and sample size estimation

3. One-way repeated measures ANOVA
   - Design model
   - Expected Mean Squares
   - F-tests
   - Multiple comparison tests
   - Understanding interactions
     - Simple main effects
     - Contrast x contrast interaction effects
   - Graphing interactions
     - eta-squared, rho and omega²
Power and sample size estimation

4. 2-way Completely Randomized Factorial Design
   Design model
   Expected Mean Squares
   F-tests
   Multiple comparison tests
   Understanding interactions
      Simple main effects
      Contrast x contrast interaction effects
   Graphing interactions
   eta-squared, rho and omega²
   Power and sample size estimation

**Weeks 10-11: Regression Analysis**

Readings: Chapter 17 Gravetter & Wallnau

OLS regression model and OLS estimation
Model assumptions
Conceptual meaning of the intercept and slope
Partitioning the Sum of Squares
Calculating the slope and intercept
   Standardized vs. unstandardized
   X and Y regression lines
Tests of significance
   Standard error of the coefficient
   Standard error of the estimate
   Confidence intervals
R-squared
Diagnostics - plotting data and residuals
Specification errors
Power and sample size

**Exam II**

**Week 12-14: Nonparametric Statistics**

1. Overview of nonparametric statistics

Readings: Chapter 1 Pett

2. "Goodness-of-fit" tests
   Binomial test
   Chi-Square Goodness-of-Fit test
   Kolmogorov-Smirnov One- and Two-sample tests
Readings: Chapter 4 Pett

3. Tests for related samples:
   - McNemar
   - Sign test
   - Wilcoxon Signed Ranks Test
   - Cochran’s Q
   - Friedman’s test

Readings: Chapters 5 and 6 Pett

4. Tests for independent samples
   - Fisher Exact Test
   - Chi-square test for equiprobability and for independence
   - Mantel-Haenszel Chi-square test for trends
   - Median Test
   - Kruskal-Wallis

Readings: Chapters 7 & 8 Pett

5. Stratification tests
   - Cochran, Mantel, Haenszel
     - Odds and odds ratios

Readings: Class handout

6. Additional tests of association
   - Cramer’s V
   - Kappa
     - Weighted and unweighted
     - Problems with Kappa
     - Intraclass correlation coefficient as an alternative
   - Kendall’s Tau

Readings: Chapter 9 Pett

7. Permutation tests (especially randomization tests used in the context of Single System Designs)

Readings: Class handout

**Exam III**
Week 15: Missing Data and Preparing Data for Analysis

Readings: Handouts on D2L

1. Overview of missing data mechanisms and techniques for handling missing data
   MCAR, MAR, and OAR
   Hot-deck imputation
   Cold-deck imputation
   Mean imputation
   Regression-based methods
   Multiple imputation
   The EM algorithm

2. Preparing data for analysis
   Data checking and cleaning
   Data entry methods to reduce data problems
   Checking to see if data meet assumptions for stat tests
     Normality, skew, kurtosis
     Significance tests vs. graphical methods

Cumulative Final examination

Some Web-based resources:

- SAS: www.sas.com
- SPSS: www.spss.com
- An excellent site with information on SPSS: www.spsstools.net
- UCLA Statistical computing site: http://www.ats.ucla.edu/stat/
- Karl Wuensch's Web page with information on SAS and SPSS: http://core.ecu.edu/psyc/wuensch/SAS.htm
- John C. Pezzullo's Interactive Statistics Pages > 600 links http://statpages.org/
- College of St. Benedict - Online computation and notes about the procedures. http://www.physics.csbsju.edu/stats/
- VassarStats - Online computation http://faculty.vassar.edu/lowry/VassarStats.html
- Practical Stats -- http://www.psych.ku.edu/preacher/

Discussion groups:

- news:sci.stat.consult - General issues in Statistics.
- Teaching-Statistics - An e-mail discussion forum for teaching and learning statistics.
- news:sci.stat.edu - Statistics related list focusing on teaching statistics
- news:sci.stat.math - Statistics related list focusing on the mathematical basis of statistics
- http://www.stattransfer.com/lists.html contains a comprehensive web page of such lists
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Course Overview
This 1 credit laboratory section is designed to introduce students to statistical computing using SAS and SPSS. The class will concentrate on the statistical techniques covered in the lecture portion of the course.

Prerequisites
Graduate standing and enrollment in SW 961.

Course Objectives
On completion of this course, the students will be able to:
- Perform statistical analyses using SAS and SPSS.
- Correctly interpret output from SAS and SPSS.

Texts / Readings
Lab text: A lab manual will be available on the D2L system for use in this class. It is extensive (several hundred pages), covering the basics of SAS and SPSS. You can view it online or print sections as needed.

There are a number of excellent introductory level texts available that you also may find helpful. Examples of these are:


These texts and others can be purchased online or through any book store and copies will be placed on reserve in the library.
Other materials are accessible through D2L at www.uwm.edu/UWM/Student/elearning.html.

**Computing Labs**

All students enrolled in social work courses have access to the Schools of Enderis computer lab located on the 10th floor Enderis Hall and computer labs located throughout campus. For specific locations/hours www3.uwm.edu/IMT/services/campus/ccls/.

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**Accommodation for Religious Observances:** Students will be allowed to complete examinations or other requirements in advance of a religious observance.

### Assignments/Grading

**Weekly assignments:** Students will be assigned weekly computer-based assignments. These 15 assignments will count for 60% of your total score with each counting for up to 40 points (on a 1000 point scale).

**Exams:** Two (2) exams will be given in the laboratory portion of the class. These exams will count for 40% of your total score (up to 200 points each).

### Determination of Student Grade

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### Topics

**Week 1: Introduction and overview: SAS and SPSS**

Readings: TBA

Configuring the software
General program structure
Handling of data sets when processing data
Limitations
Data formats
Variable labels, value labels, and comments - documenting programs

Week 2: Reading and writing data

Readings: TBA

Batch processing
Fixed and Free input formats
Handling missing data
Assigning data formats at input
Advanced SAS input

External data sources
SPSS Get and Write statements
SAS Filename, Libname, Data, and Set statements - two-level names. etc.

Week 3-4: Functions, assignment, and conditional statements

Readings: TBA

Functions
Arithmetic
Statistical
Date and Time
String
Random number

Assignment and conditional statements

Assignment statements
Creating and transforming values
Arithmetic operators, order of precedence, using parentheses
Issues surrounding missing values

Conditional statements
If, then, else keywords
Logical operators
Simple and complex statements
Do if, end if constructions

Week 5: Subsetting cases
Readings:  TBA

Subsetting "if" statements
   SPSS select if, temporary statement, delete vs. filter
   SAS if (argument), if (argument) then delete;

Recoding data
   SPSS Recode statement
   SAS reflexing and conditional processing

**Week 6. Merging data**

Readings:  TBA

Horizontal concatenation (Merge files SPSS and SAS)
   One to one merge
   Match merge

Vertical concatenation (Add files SPSS, Set statement SAS)

**Week 7. Descriptive procedures**

Readings:  TBA

SPSS - descriptives, frequencies, list
SAS - univariate, means, and freq

**Week 8-9. Graphing data**

Readings:  TBA

Bar charts, histograms, stem and leaf, box plots, scatterplots, etc.

**Week 10. Univariate statistics**

Readings:  TBA

Independent and related samples t-test
Bivariate correlations
   Pearson r, phi, rho, point-biserial, tetrachoric
Dealing with tied ranks and small sample sizes
Obtaining confidence intervals

**Exam I**

**Weeks 11-12: ANOVA**
1. One-way ANOVA
   - GLM approach to ANOVA
   - Type I, II, and III sums of squares
   - Testing model assumptions
   - Normalizing transformations
   - User defined contrasts
   - Post hoc tests
   - Line graphs
   - Effect size - eta, intraclass corr, Power

2. Completely randomized design
3. Simple repeated measures ANOVA
   - Test for additivity

**Week 13: Simple Regression**

Readings: TBA

- Testing model assumptions
- Power
- Plotting predicted values

**Weeks 14-15: Nonparametric analyses**

Readings: TBA

- Goodness of fit tests
  - Binomial test
  - Chi-Square Goodness-of-Fit test
  - Kolmogorov-Smirnov One- and Two-sample tests

- Tests for related samples:
  - McNemar
  - Sign test
  - Wilcoxon Signed Ranks Test
  - Cochran's Q
  - Friedman's test

- Tests for independent samples
  - Fisher Exact Test
  - Chi-square test for equiprobability and for independence
  - Mantel-Haenszel Chi-square test for trends
  - Median Test
Kruskal-Wallis

Stratification tests
   Cochran, Mantel, Haenszel - Odds and odds ratios

Additional tests of association
   Cramer's V
   Kappa
      Weighted and unweighted
      Problems with Kappa
      Intraclass correlation coefficient as an alternative
   Kendall's Tau
   Post hoc tests

Exam II