GEORGE MASON UNIVERSITY
COLLEGE OF HEALTH AND HUMAN SERVICES

COURSE TITLE: GCH 601 – 003 Introduction to Biostatistics (76790)

INSTRUCTOR: Pankaj Roy Dwarka
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MEETING TIMES: Friday 7:20 – 10:00 p.m.
CLASS LOCATION: 1108
OFFICE HOURS: By appointment
FALL 2009

COURSE DESCRIPTION: This course applies selected biostatistics techniques to public health and health system management issues. Includes univariate and bivariate statistics and regression analysis.

TEXTBOOKS:

1. Gerstman, B. B. (2008).*Basic biostatistics: Statistics for public health practice.* Boston: Jones and Bartlett.
2. Norusis, M. J. (2008). SPSS 17.0 Guide to Data Analysis. Upper Saddle River, NJ: Prentice-Hall, Inc. (Required)
3. SPSS Inc. (2008). SPSS Student Version 17.0 for Windows. Upper Saddle River, NJ: Prentice-Hall, Inc. (Optional)

SPSS SOFTWARE: SPSS 17.0 is one of the most used software in Biostatistics. If you do not have access to GMU campus computers with SPSS (SPSS is available on all computers labs at the GMU computers) it can be purchased and installed on your computer. The student version is sufficient for the course.

LEARNING OBJECTIVES:

By the end of this course, the students will be able to:

1. Select statistical procedures appropriate to specific research designs and sample characteristics.
2. Interpret the results from statistical procedures used in public health and biomedical practice and research.
3. Describe the sampling distributions and discuss their use in inferential statistics.
4. Differentiate between parametric and nonparametric tests.
5. Perform various parametric statistical tests including one-sample z-test, one-sample t-test, two independent samples, and Pearson correlation coefficient.
6. Interpret the components in a one-way analysis of variance (ANOVA).
7. Compute and interpret a regression equation.
8. Run SPSS for univariate and bivariate statistical tests and interpret the results.
9. Indicate the kinds of data and circumstances that call for a chi-square test.

EVALUATION:

1. Quizzes (40 points)

2. Written homework assignments (70 points)
3. Research Project (15 points)
4. Final exam (25 points)

GRADING SCALE:

Scores	Percentage	Grade
141 – 150	94 –100	A
135 - 140	90 -- 93	A-
130 - 134	87 – 89	B+
125 - 129	83 – 86	B
120 - 124	80 – 82	B-
111 - 119	74 – 79	C

COURSE OUTLINE AND READING ASSINGMENTS:

Date	**Topic (Reading)**
September 04	Introduction: Goals of the course. Definition of biostatistics, Scales of Measurement, Organization of data; An overview of SPSS 16.0 (Basic Biostatistics Ch. 1; SPSS Guide to Data Analysis Ch. 2) Administer a diagnostic statistics test (**Pre-test)**
September 11	Types of Studies: Surveys and Comparative Studies; Sample and Population; Types if Variables. (Basic Biostatistics Ch. 2; SPSS Guide to Data Analysis Ch. 3)
September 18	Frequency Distributions: Stemplots, Shape, Location, Spread, Frequency Tables, Frequency Charts (Basic Biostatistics Ch. 3; SPSS Guide to Data Analysis Ch.4)
September 25	Measures of Central Tendency. (Basic Biostatistics Ch. 4; SPSS Guide to Data Analysis Ch. 5, pp. 80-88)
	Quiz # 1: Descriptive Statistics
October 02	Measures of Variability. (Basic Biostatistics Ch. 4; SPSS Guide to Data Analysis Ch. 5, pp. 89-96)
October 09	Fundamentals of Probability; Normal Probability Distributions; Properties of the Normal Distribution; Areas under the Normal Curve. (Basic Biostatistics Chs . 5 & 7; Data Analysis & Statistics Ch. 11)
October 16	Introduction to Statistical Inference and Basics of Hypothesis Testing. (Basic Biostatistics Ch. 8, pp. 155-167 & Ch. 9); SPSS Guide to Data Analysis Ch. 12)
	Quiz # 2: Measures of Variability/Probability

Date	**Topic (Reading)**
October 23	Interval Estimation and Inferences about a Mean.

(Basic Biostatistics Ch. 10 & 11; SPSS Guide to Data Analysis Ch. 12)

October 30 — Comparing the Means of Two Populations.
(Basic Biostatistics Ch. 12; SPSS Guide to Data Analysis Ch. 13 & 14)

November 06 — Comparing the Means of Three or More Independent Samples.
(Basic Biostatistics Ch. 13; Data Analysis & Statistics Ch. 7; SPSS Guide to Data Analysis Ch.15)

November 13 — Bivariate Descriptive Statistics; Inferences about the Pearson Product Moment Correlation Coefficient.
(Basic Biostatistics Ch. 14, pp. 295-311; Data Analysis & Statistics Ch. 20 pp. 488-490)

Quiz # 3: ANOVA

November 20 — Linear Regression and Correlation. (1): Regression Equations, Correlation, Prediction, Regression and Sums of Squares.
(Basic Biostatistics Ch. 14, pp. 311- 332; Data Analysis & Statistics Ch. 20 pp. 443-461, 469-476)

December 04 — Linear Regression and Correlation (2): Predication Equation using Life Expectancy and Birthrate, The Computer and Linear Regression.
(SPSS Guide to Data Analysis Ch. 20, pp. 477-487) (**Post test)**

Quiz # 4: Regression/Correlation

December 11 — Chi-Square and Other Nonparametric Tests. Course/Faculty Evaluation.
(Basic Biostatistics Ch. 18, pp. 421 – 431; SPSS Guide to Data Analysis Ch. 17, pp. 365-377)

December 18 — Final Exam

CLASS ATTENDANCE AND PARTICIPATION:

Classroom sessions consist of a combination of lectures, exercises, and discussion. Students are expected to participate in the discussion and to complete the reading assignments and answer the learning objectives prior to the class session. The instructor should be informed in advance of any planned absence.

SPECIFIC COURSE OBJECTIVES: By the end of the course, the students will be able to:

1. Define measurements scales and discuss the properties of each scale; explain the appropriateness of each scale to statistical testing methods.
2. Distinguish between descriptive and inferential statistics.
3. Differentiate among univariate, bivariate, and multivariate statistics.
4. Select appropriate procedures for summarizing distributions and describing univariate sample data and bivariate association.
5. Distinguish between dependent (response variable) and independent (explanatory) variables.
6. Distinguish between discrete and continuous variables.
7. Compute measures of central tendency: mean, median, and mode.

8. Compute measures of variation: range, variance, and standard deviation.
9. Describe the properties of the normal curve and standard scores.
10. Compute the percentage of areas between given points under a normal curve.
11. Compute the percentiles of specified variables by using a table of standard scores.
12. Discuss measures of association appropriate for nominal, ordinal, interval and ratio data.
13. Distinguish between (a) population and sample, (b) parameter and statistics.
14. Define random sample.
15. Explain why it is important to use random sampling.
16. Compute and explain the meaning of Pearson's correlation coefficient.
17. Compute and interpret the coefficient of determination (i.e., r^2).
18. Explain the concept of the sampling distribution of means.
19. Interpret the standard error of the mean.
20. Explain a probability distribution and its major use.
21. State the meaning and basic properties of probability.
22. Explain the importance of the Central Limit Theorem.
23. Outline and explain the procedure for a test of significance.
24. Explain the meaning of a null hypothesis and an alternative hypothesis.
25. Define type I error, type II error, statistical power, and effect size.
26. Illustrate how to conduct a statistical test about a population mean based on a one- sample z test.
27. Calculate an exact p value for a z score.
28. Illustrate how to conduct a test about a population mean based on a one-sample t test.
29. Compute a confidence interval from a set of data for a single population mean.
30. Illustrate how to test hypothesis involving mean differences between independent samples.
31. Illustrate how to test hypothesis involving means of dependent samples.
32. Explain the meaning of a null hypothesis and alternative hypothesis.
33. Determine the sample size needed for a study, given α, β, and effect size.
34. Demonstrate the utility of the Chi-square test of independence.
35. Distinguish between statistical and practical significance.
36. Distinguish between the purposes of correlation and regression.
37. Perform a test of significance of a correlation coefficient.
38. Compute and interpret the elements in regression analysis.
39. List the null and alternative hypotheses in regression analysis.
40. Develop and interpret the source table in ANOVA.
41. List the null and alternative hypothesis generated in ANOVA.
42. Compute appropriate post hoc analyses in ANOVA.
43. Run SPSS for ANOVA and regression and discuss the results.
44. Explain the assumptions of ANOVA and regression.
45. Differentiate between parametric and nonparametric tests.

HOMEWORK ASSIGNMENTS:

Students are expected to do the assigned homework and turn it in the specified dates. The homework assignments are to be worked on independently with no help from other students. Late assignments will not be accepted without prior approval of the instructor. The due dates and the number of points for each assignment listed below.

Assignment 1. 5 Points Descriptive Statistics Due Date: Sept. 11

Assignment 2.	5 Points	Univariate Statistics (1)	Due Date: Sept. 25
Assignment 3.	5 Points	Univariate Statistics (2)	Due Date: Oct. 02
Assignment 4.	5 Points	Normal Distribution	Due Date: Oct. 09
Assignment 5.	10 Points	Hypothesis Testing (1)	Due Date: Oct. 23
Assignment 6.	10 Points	Hypothesis Testing (2)	Due Date: Oct. 30
Assignment 7.	10 Points	Comparing the Means of 2 Groups	Due Date: Nov. 06
Assignment 8.	**15 Points**	**ANOVA (Research Paper)**	Due Date: Dec. 11
Assignment 9	10 Points	Regression and Prediction (1)	Due Date: Nov. 20
Assignment 10	10 Points	Regression and Prediction (2)	Due Date: Dec. 04

Note. The assignments must be typewritten and double-spaced.

GUIDELINES FOR WRITTEN RESEARCH PAPER (ASSIGNMENT # 8):

Using the data set that will be provided by the instructor, perform the analysis of variance **(ANOVA)** statistical procedure and write a report. Your report should include the following sections: a) **Introduction,** including research questions, with hypotheses listed in words and symbols; b) **Method**, including population, sample, research design, and statistical method used for data analysis; c) **Results**, including descriptive statistics, inferential statistical analysis using a summary table; (SPSS outputs should be attached to the assignments); and d) **Discussion,** including summary and interpretation of the findings reported in the previous sections relative to the research questions you posed

The project must be typewritten, double spaced and very limited in length.

EVALUATIVE CRITERIA FOR THE RESEARCH PAPER

1.	Clarity and focus	3	2	1	0
2.	Relatedness to course objectives	3	2	1	0
3.	Level of analysis (i.e. intensive summary)	3	2	1	0
4.	Accuracy of interpretations	3	2	1	0
5.	Validation of assumptions	3	2	1	0

3 = Adequate, 0 = Inadequate