

GEORGE MASON UNIVERSITY
COLLEGE OF HEALTH AND HUMAN SERVICES

COURSE TITLE: GCH 601 Introduction to Biostatistics

INSTRUCTOR: Heibatollah Baghi, Ph.D.	MEETING TIMES: Wednesday 4:30 – 7:10 p.m.
OFFICE: Robinson Hall B 415B	CLASS LOCATION: Robinson Hall B 470
PHONE: 703 -205-2207	OFFICE HOURS: W. & TR 10 – 12 A.M.
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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. *Basic biostatistics: Statistics for public health practice.* Bion 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 the most up-to-date software currently available. 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:

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|-----------------|---|-----------------|
| 8. October 21 | Interval Estimation and Inferences about a Mean.
(Basic Biostatistics Chs. 10 & 11, pp. 209 -218; SPSS Guide to Data Analysis Ch. 12) | Quiz # 5 |
| 9. October 28 | Comparing the Means of Two Independent and Dependent Means; t-Test.
(Basic Biostatistics Ch. 12; SPSS Guide to Data Analysis Chs. 13 & 14)
Innovation Hall # 317 | Quiz # 6 |
| 10. November 4 | Comparing the Means of Three or More Independent Samples: ANOVA
(Basic Biostatistics Ch. 13, pp. 259 - 286; SPSS Guide to Data Analysis Ch.15)
Innovation Hall # 317 | Quiz # 7 |
| 11. November 11 | Bivariate Descriptive Statistics; Inferences about the Pearson Product Moment Correlation Coefficient.
(Basic Biostatistics Ch. 14, pp. 295-311; Data Analysis & Statistics pp. 488-490)

Innovation Hall # 317 | Quiz # 8 |
| 12. November 18 | 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)
Innovation Hall # 317 | Quiz # 9 |
| 13. December 2 | 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) | |
| 14. December 9 | 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) | |
| 15. December 16 | 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. 09
Assignment 2.	5 Points	Univariate Statistics (1)	Due Date: Sept. 23
Assignment 3.	5 Points	Univariate Statistics (2)	Due Date: Oct. 07
Assignment 4.	5 Points	Normal Distribution	Due Date: Oct. 14
Assignment 5.	10 Points	Hypothesis Testing (1)	Due Date: Oct. 21
Assignment 6.	10 Points	Hypothesis Testing (2)	Due Date: Oct. 28
Assignment 7.	10 Points	Comparing the Means of 2 Groups	Due Date: Oct. 29
Assignment 8.	15 Points	ANOVA (Research Paper)	Due Date: Nov. 04
Assignment 9	10 Points	Regression and Prediction (1)	Due Date: Nov. 18
Assignment 10	10 Points	Regression and Prediction (2)	Due Date: Dec. 09

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) **Conclusion and 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