

**CHS 627 – Multivariate Methods in Health Statistics
(Spring 2007)**

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Office Hours: By appointment

Goal: To assist the student in understanding and using multivariate statistical methods in health-related research.

Objectives: The student will be able to understand when and how to apply the following multivariate statistical techniques and how to interpret the results:

- Factorial Analysis of Variance
- Repeated Measures Analysis of Variance
- Multiple Regression Analysis
- Analysis of Covariance
- General Linear Model
- Logistic Regression
- Log-linear Analysis
- Exploratory/Confirmatory Factor Analysis
- Path Analysis
- Structural Equation Models

Attendance: Class attendance and participation in discussion are expected and encouraged. There are no specific penalties for failure to attend or participate.

Disabilities: Students with disabilities are encouraged to register with the Office of Disability Services, 348-4285. Thereafter, you are invited to schedule appointments to see me to discuss accommodations and other special needs.

Evaluation: Grades will be based on two written statistical analysis reports (30% each), homework (20%) and a final paper (20%).

Text: Biostatistics: A Foundation for Analysis in the Health Sciences, 8th Edition (Wayne Daniel, author)

COURSE SCHEDULE

<u>Approx. Dates</u>	<u>Topic</u>	<u>Text</u>
1/11	Review / Preview	
1/16 – 1/25	Factorial ANOVA	8.5
1/30 – 2/1	Repeated Measures ANOVA	8.4
2/6 – 2/15	Multiple Regression	10.1 – 10.7/11.3
2/20 – 2/22	Analysis of Covariance (ANCOVA)	-----
2/27 – 3/8	General Linear Model (GLM)	11.2
3/13 – 3/15	Spring Break	
3/20 – 3/29	Logistic Regression	11.4
4/3 – 4/12	Log-linear Analysis	-----
4/17 – 4/19	Factor Analysis	-----
4/24 – 4/26	Path Analysis/Structural Equation Models	-----
5/1 – 5/3	Review	

Statistical Analysis Reports

First Project (due March 27)

NOTE: Use the same continuous outcome variable for all analyses. Also, for this paper, you will need a minimum of two categorical predictors and two continuous predictors.

Introduction - Provide a brief description of where your data came from and the definitions of the variables being used.

Factorial ANOVA - Conduct two factorial ANOVAs, each using at least two categorical predictors. Discuss the assumptions you are making and provide evidence of whether they are valid. Graph main effects and interaction. Interpret the results. Include appropriate multiple comparisons if necessary.

Multiple Regression - 1) Conduct an all-inclusive multiple regression and discuss results including consideration of assumptions and multicollinearity. 2) Conduct a stepwise multiple regression and provide a complete discussion of results at each step. (Use the same continuous outcome for both analyses and the same set of two or more continuous predictors for both.)

Analysis of Covariance - Conduct an ANCOVA using one categorical predictor and one continuous predictor (select from the most promising variables in the prior two analyses). Discuss and graph the results. Contrast your results to an ANOVA that does not use the covariate and a simple linear regression that only uses the covariate.

General Linear Model - Repeat the ANCOVA analysis above as a GLM analysis that includes interaction. Discuss and graph the results. Contrast your results to the previous analyses.

Summary - Discuss what did and what did not influence your outcome variable. Among the analyses conducted, which seem to be the most appropriate and useful.

A major proportion of your grade will depend on the accuracy, thoroughness, and clarity of your discussions.

CHS627 Project One Grading

Introduction

- Data source (1 pt)
- Variable definitions (1 pt)
- Rationale (1 pt)

Factorial ANOVA (2)

- Correct selection of variables (2 pt)
- Discussion of normality assumption (4 pt)
- Discussion of equal variance assumption (4 pt)
- Statements and interpretations of hypotheses tests (6 pt)
- Graphical presentation and discussion of marginal and cell means (6 pt)
- Appropriate use of multiple comparisons (2 pt)
- Discussion of explained variance/practical significance (2 pt)

Multiple Regressions (all inclusive and stepwise)

- Correct selection of variables (2 pt)
- Discussion of correlation matrix (2 pt)
- Discussion of normality assumption (2 pt)
- Discussion of significance of coefficients (2 pt)
- Write out regression equation and interpret what it means (6 pt)
- Interpretation/discussion of practical sig. utilizing explained variance (2 pt)
- Interpretation/discussion of multicollinearity/partial correlation (4 pt)
- Discussion of what happens at each step of stepwise procedure (4 pt)

Analysis of Covariance

- Correct selection of variables (2 pt)
- Discussion of normality assumption (2 pt)
- Discussion of equal variance assumption (2 pt)
- Statements and interpretations of hypotheses tests (4 pt)
- Graphical presentation and discussion of unadjusted/adjusted means (3 pt)
- Appropriate use of multiple comparisons (2 pt)
- Discussion of explained variance/practical significance (2 pt)
- Comparison with one-way ANOVA and simple linear regression (2 pt)

General Linear Model

- Correct selection of variables (2 pt)
- Discussion of normality assumption (2 pt)
- Discussion of equal variance assumption (2 pt)
- Statements and interpretations of hypotheses tests (6 pt)
- Graphical presentation and discussion (4 pt)
- Appropriate use of multiple comparisons (2 pt)
- Discussion of explained variance/practical significance (2 pt)

Summary

- Discussion of results (4 pt)
- Based on rationale stated in Introduction, summary of what was learned from these analyses (4 pt)

Second Project (due April 24)

Note: For this paper you will need a categorical outcome with two categories, a minimum of one continuous predictor, and a minimum of two categorical predictors.

Introduction - Provide a brief description of where your data came from and the definitions of the variables being used.

Logistic Regression - 1) Conduct an all-inclusive logistic regression analysis using a combination of categorical and continuous predictors. Discuss results, including a consideration of multicollinearity. 2) Conduct a stepwise logistic regression analysis using the same variables as in the all-inclusive model and interpret the results at each step. Compare to the all-inclusive model.

Log-linear Analysis - Conduct an analysis using the same outcome as in the logistic regression analysis and two or more categorical predictors. Interpret results, including the use of graphs. Compare the results to the logistic regression results.

Summary - Discuss what did and what did not influence your outcome variables. Among the analyses conducted, which seem to be the most appropriate and useful.

A major proportion of your grade will depend on the accuracy, thoroughness, and clarity of your discussions.

CHS627 Project Two Grading

Introduction

Variable definitions (3 pt)

Rationale (2 pt)

Logistic Regression (2)

Correct selection of variables (10 pt)

Discussion of univariate results (10 pt)

Discussion of relationships among predictors (10 pt)

Discussion of multivariate results (omnibus, r square, Hosmer/Lemeshow, coefficients, significance, odds ratios) (10 pt)

Calculation of probabilities using equation (10 pt)

Comparison of steps in stepwise procedure (5 pt)

Log-linear

Correct selection of variables (5 pt)

Discussion of univariate results using crosstabs (8 pt)

Discussion of multidimensional table, including interaction graphs (9 pt)

Discussion of log-linear significance (8 pt)

Summary

Discussion of results (5 pt)

Based on rationale stated in Introduction, summary of what was learned from these analyses (5 pt)

A major proportion of your grade will depend on the accuracy, thoroughness, and clarity of your discussions.

Final Paper (Due May 7)

Using your work from both projects, draft a scientific paper that includes Introduction, Methods, Results (including appropriate tables and graphs), and Discussion. (Literature not required.)

This will be graded like a peer-reviewed journal article.