

GCH 805-001: Advanced Quantitative Data Analysis for Health Care Research II  
Department of Global and Community Health  
George Mason University

\* *Syllabus adapted from Dr. Heibatollah Baghi*

**Course information**

Credits: 3

**Instructor information**

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## GENERAL COURSE INFORMATION

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### **Overview and Course Description**

Examines data analysis techniques for data management, data cleaning, exploratory data analysis, and statistical modeling, and applies these approaches to public health data using a statistical computing package. Introduces advanced statistical analysis techniques including Poisson regression, longitudinal data analysis, survival analysis, and analysis of survey data. Offered by Global and Community Health. May not be repeated for credit. Equivalent to NURS 805.

### **Prerequisites**

GCH 804 or an equivalent multivariate statistics course.

### **Place in Curriculum**

Can be used to fulfill an MPH Epidemiology concentration requirement.

### **MPH Competencies Addressed**

#### Communication

- Speak in a clear, logical and grammatically correct manner in formal and informal public health settings.
- Write in a clear, logical and grammatically correct manner in formal and informal written communications,
- Communicate complex information in a manner that is easily understandable to the non-expert.
- Appropriately communicate information to scientific and public health professionals

#### Critical Thinking and Analysis

- Make inferences from qualitative and quantitative data and literature to identify and create plans for addressing public health problems

#### Scientific Knowledge

- Apply scientific principles to address public health problems

#### Biostatistics

- Students will be able to select and apply statistical techniques for detection of significant associations and differences in public health data.
- Students will be able to interpret the results from statistical techniques used in public health research.
- Students will fully understand the meaning of important terms related to estimation and hypothesis testing methods, and to correctly interpret the results for confidence interval and hypothesis testing methods
- Students will be able to perform various parametric and nonparametric statistical tests including independent and dependent t-tests, analysis of variance,

correlational techniques, linear regression, contingency tables and chi-square test.

- Students will have mastered the basics of at least one statistical software package. They will know how to (i) enter data from a variety of sources, (ii) create graphs useful for exploratory and diagnostic purposes, (iii) execute common statistical procedures that are part of the package.
- Foster the communication and presentation of statistical analysis in public health research.

### Epidemiology

- Explain the processes used to collect, manage, and analyze data.
- Calculate and interpret measures of association between exposures and health outcomes.
- Identify possible sources of bias and confounding and describe methods for minimizing or adjusting for them.

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### EPIDEMIOLOGY CONCENTRATION:

- Use data from surveillance activities and published literature to identify acute and chronic conditions or other adverse outcomes in the population.
- Organize and analyze data from epidemiologic investigations of (a) surveillance, (b) screening, (c) outbreak investigation, (d) program evaluation, (e) research.
- Communicate the process of conducting research in human populations.
- Evaluate results of an epidemiological analysis, identify sources of bias and communicate appropriate conclusions in context of the methodology and sources of bias.
- Describe the process for applying epidemiological principles to (a) surveillance, (b) screening, (c) outbreak investigation, (d) program evaluation, and (e) research.

### **Course Objectives**

At the completion of this course, each student should be able to:

1. Explain the advantages of multivariate analysis of variance (MANOVA) and multivariate analysis of covariance (MANCOVA) versus a series of univariate analyses.
2. Analyze explained and unexplained sources of variability in MANOVA and MANCOVA.
3. Interpret computer printouts from MANOVA, MANCOVA, multiple regression (ordinary least squares) and logistic regression.
4. Determine when multiple regression (ordinary least squares) and logistic regression should be used.
5. Differentiate between predictive and explanatory functions of multiple regression.

*\* These objectives will be updated in future semesters*

## Textbooks

### Required (all available online):

- Regression Methods for Medical Research (Tai, Machin) available at <http://site.ebrary.com/lib/georgemason/reader.action?docID=10784792&ppg=74>
- Applied Longitudinal Data Analysis for Epidemiology (Twisk) available at: <http://ebookcentral.proquest.com.mutex.gmu.edu/lib/gmu/reader.action?docID=218068&ppg=120>
- Applied Survival Analysis (Hosmer, Lemeshow, May) available at <http://proquest.safaribooksonline.com.mutex.gmu.edu/book/statistics/9781118211588/firstchapter>
- Clinical Trials with Missing Data (O'Kelly, Ratitch): available at: <http://ebookcentral.proquest.com.mutex.gmu.edu/lib/gmu/reader.action?docID=1636082&ppg=33>

### Recommended:

- The Little SAS Book: A Primer, Fifth Edition (Delwiche and Slaughter) (**online access available via GMU library, on course reserves**)

This course will utilize SAS, a very popular statistical computing language. All George Mason University computer labs should have SAS v9.4 installed. Students should also have access to SAS off-campus via the Virtual Computing Lab. See <http://library.gmu.edu/use/off-campus> for more information. A good list of resources can be found at: <http://dataservices.gmu.edu/software/sas>

## ASSIGNMENTS

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### **Homework**

The purpose of homework assignments is to provide practice on course topics and to provide experience using SAS for statistical analysis.

All assignments must be submitted to Blackboard by 11:59 PM on the specified due date. Submitted assignments must include both (1) a commented .sas file and (2) a text document answering the relevant questions (e.g. docx file). Students may collaborate on homework assignments, but must turn in their own work. Written files **should not** be copy and pasted between students.

### **Data analysis project**

The data analysis project will be a semester-long project that answers a scientific question using proper statistical tools and a statistical computing language.

### **Data analysis presentation**

Students will present their data analysis project to the class.

### **Participation**

Class attendance is expected. In addition, students should read the assigned material for each class meeting.

## EVALUATION

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### Evaluation criteria

Assignment (#)	Points each	Total points
Homework (6)	15	90
Data analysis project	70	70
Data analysis presentation	30	30
Participation	10	10
Total		200

### Grading Scale

Percentage	Grade
93.5 - 100	A
90.0 - 93.4	A-
87.5 - 89.9	B+
83.5 - 87.4	B
80.0 - 83.4	B-
70 - 79.9	C
<70.0	F

Late assignments will not be accepted without **prior** approval of the instructor. You must let me know before an assignment is due if you have a conflict or personal issue. Participation will be graded based on attendance and participation in discussion. **Final projects MUST be turned in on time because of university final grade policies.** Incomplete grades cannot be given solely for failing to complete course assignments.

## OTHER INFORMATION

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### **Blackboard**

A Blackboard site is available to students enrolled in the course at: <http://courses.gmu.edu>. You will need to log on using your GMU username and password. The weekly lectures and assignments will be posted on blackboard.

### **Email Communication**

Per university policy, the professor will only communicate with students using their GMU email accounts. Any announcements regarding the course will be sent to your GMU account.

### **Students with Disabilities**

All students with questions or concerns about this class are encouraged to set up a time to meet with the professor, preferably during the first two weeks of the semester. Students with disabilities should work with the Office of Disability Services (<http://ds.gmu.edu/>) to identify appropriate accommodations and communicate those with the professor.

### **Academic Honesty**

George Mason University operates under an honor system, which is published in the University Catalog and deals specifically with cheating, attempted cheating, plagiarism, lying, and stealing. Please familiarize yourself with the honor code (<http://oai.gmu.edu/the-mason-honor-code-2/>), especially the statement on plagiarism. If you have questions about how to correctly cite the contributions of published articles, internet resources, people, and other sources to your work, please talk with the professor or utilize the GMU Writing Center.

### **Writing Center**

The GMU Writing Center (<http://writingcenter.gmu.edu/>) provides free one-on-one sessions in which you can get expert feedback on drafts of writing assignments. While the tutors will not fix your papers for you, they will work with you to identify and correct rough areas in your essays and to build your writing, proofreading, and editing skills. This is a service available to all students.

### **Gender Identity and Pronoun Use**

Please let me know of your gender pronoun(s) and how best to address you in class and via email. I use female pronouns for myself (she, her, hers) and you may address me as “Dr. Krall” in email and verbally.