Epidemiology III
BMTRY 748

Co-Instructors

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EPIDEMIOLOGY III BMTRY 748
January 15, 2016 – April 22, 2016
Fridays
9 a.m. – 12 p.m.
135 Cannon Street, Room 301

Course Outline

Date	Topic	Readings	Instructor / Guest
MODELING AND RISK PREDICTION MODELS			
1-15-16	Longitudinal Data Analysis I	See attached. Page 4	Gebregziabher
1-22-16	Longitudinal Data Analysis II	See attached. Page 4	Gebregziabher
1-29-16	Missing Data Analysis	See attached. Page 4	Gebregziabher
2-5-16	Causation and Causal Inference	Rothman Chapter 2	Wallace
2-12-16	Survival Analysis	See attached. Page 4	Gebregziabher
2-19-16	Risk prediction models	See attached. Page 6	Gebregziabher
MEASUREMENT			
2-26-16	Techniques for Reducing Bias and Propensity Scores	See attached. Page 6	Simpson
3-4-16	Exposure Measurement Measurement Error	Armstrong & White Ch. 1-3; Rothman Ch. 9	Wallace
3-11-16	Intro to Measurement Assessment Methods Understanding the Latent Variable Classical Test Theory	DeVellis, Chapter 2	Sterba
3-18-16	SPRING BREAK		
3-25-16	Reliability and Validity Overview to Scale Development	DeVellis, Chapters 3 and 4 Articles to be distributed in class	Sterba
SPECIAL TOPICS			
4-1-16	Overview of the use of biomarkers in epidemiologic studies: Lab tours	Rothman Ch. 24 Armstrong Ch. 9	Wallace
4-8-16	Meta-analysis	Rothman Ch. 32	Korte
4-15-16	Methodologic aspects of biomarker data capture I and analysis: Exposure	Articles to be distributed in class	Wallace
4-22-16	Methodologic aspects of biomarker II data capture and analysis: Outcome	Articles to be distributed in class	Wallace
4-29-16	Student Presentations	See attached page 3	Gebregziabher/ Wallace

Course Description and Objectives

This course will provide an in-depth quantitative view of advanced statistical analysis of epidemiological studies. Builds on techniques developed in Epidemiology I and Epidemiology II. 3 hours.

Course Readings

Reading of assigned text and papers is expected of students.

Assigned Text and Other Reference Materials (see below for additional references)

The textbook for the course is:

Rothman, Greenland, Lash Modern Epidemiology. Lippincott Willaims & Wilkins, 2008

The textbook is available for check-out at with June Watson, Student Services Coordinator, 135 Cannon Street. The additional readings for each week are detailed below and will be available electronically.

Organization of Course

The course consists of lectures by the co-instructors and guest lecturers. The course is taught in the spring semester on **Fridays from 9 a.m. – 12 p.m. in Room 301**, Cannon Street building.

Student Evaluations

Students are expected to complete written homework assignments and participate in class discussions.

Assignments

The contribution of the topics towards the final grade will generally be proportional and commensurate with the length of contact hours. Assignments will comprise 90% of your grade.

Project

The final project will contribute 10% to the course grade. The project will involve you reading a paper from recent literature on a topic of advanced epidemiologic methods covered during the course. You will select a paper from the literature on a subject matter of interest to you and consult with instructors for appropriateness. You will be responsible for preparing a 10-15 minute presentation in which you summarize the main findings. Presentations will take place during the last day of class during the scheduled final exam time.

MODULE: CAUSALITY:

Week 4 (previously week 1 but changed due to scheduling conflict)
Introduction to causality and causal inference

Models of causality: sufficient causes, component causes
Philosophy of Scientific Inference
Causal Inference in Epidemiology

Required Readings:
1. Rothman, et al. 2008. Chapter 2, pgs. 5-31

Optional Reading:
Rothman KJ, Greenland S. Causation and causal inference in epidemiology. Am J Public Health. 2005;95 Suppl 1:S144-50.

Assessment: Homework. 5% of course grade

MODULE: MODELING

References:
1. SAS 2014. Longitudinal Data Analysis with Discrete and Continuous Responses.
2. Fitzmaurice, Laird and Ware (2004). Applied longitudinal analysis. Wiley Inc.
3. Little and Rubin 2002. Statistical analysis of missing data (2nd ed). Wiley Inc.

Course Outline

Week 1-3 Longitudinal Data Analysis

Linear Mixed Models
Generalized Linear Mixed Models (GLMM)
-Practical Application and Interpretation
-SAS procedure (Proc MIXED, PROC GEE, GENMOD. Proc GLMMIX)

Missing Data
-Missing data mechanisms (MCAR, MAR, MNAR)
-Analysis of missing data methods
- Likelihood methods, Multiple Imputation
-SAS procedures (Proc MI and MIANALYZE)

Week 5 Survival Analysis
-Analysis of survival data (time to dropout, time to death, time to event)
- Parametric Survival Models
- Semi-Parametric Survival Models
-SAS procedures (Proc PHREG, PROC LIFREG, PROC LIFTEST)

Week 6 Risk Prediction Models
- Fitting prediction models
- Assessing performance of prediction models (eg. accuracy, discrimination and validation)
- SAS procedure: Proc Logistic (eg. ROC, R-square)

Assessment: Homework, 35% of course grade

MODULE: MEASUREMENT

Week 7 Techniques for Reducing Bias and Propensity Scores I

Required Readings (to be distributed in class):

1. Performing a 1:N Case-Control Match on Propensity Score
   Lori S. Parsons
1. Local and Global Optimal Propensity Score Matching
   Marcelo Coca-Perraillon
2. Matching with Propensity Scores to Reduce Bias in Observational Studies
   Marcelo Coca-Perraillon
3. Matching Methods for Causal Inference: A Review and a Look Forward
   Elizabeth A. Stuart.

Other resources:

Website of Software Code:
http://www.biostat.jhsph.edu/~estuart/propensityscoresoftware.html

Assessment: Homework, 5% of course grade

Week 8: Exposure Measurement Measurement Error

Exposure measurement defined
Methods of exposure measurement
Measurement error (differential and non-differential)

Required Readings:
Emily White, Bruce K. Armstrong, and Rodolfo Saracci (2008) Principles of Exposure Measurement in Epidemiology. Collecting, Evaluating and Improving Measures of Disease Risk Factors. Chapters 1, 2, and 3.

Rothman, et al. 2008. pgs., 137-145, 352-355

Week 9: Measurement I

Assessment Methods
Understanding the Latent Variable
Classical Test Theory

Week 10: Measurement II

Reliability and Validity
Overview to Scale Development

Required Readings
1. Devellis, RF. (2003). Scale development: Theory and applications. Second Edition. Volume 26. Thousand Oaks, CA: Sage Publications.
2. DeVellis RF. (1996). A consumer's guide to finding, evaluating, and reporting on measurement instruments. *Arthritis Care and Research, 9*(3): 239-245.

3. Additional case study articles to be distributed.

Other Resources

1. DeVellis RF. (2006). Classical Test Theory. *Medical Care, 44*(11, Supp 3):S50-S59.
2. Kline P. (1994). *An easy guide to factor analysis.* New York: Routledge.
3. Netemeyer RG, Bearden WO, Sharma S. *Scaling procedures: Issues and applications.* Thousand Oaks, CA: Sage Publications, 2003.

Assessment: Homework, 20% of course grade

***MODULE:* SPECIAL TOPICS**

Week 11 Meta-analysis
Data sources -- TBD

Assessment: Homework, 5% of course grade

Week 12 Overview of the use of biomarkers in epidemiologic studies: Laboratory Tours

Examples to include exposure and endpoint measures: body mass measures, physical activity, serum draws, tissue preparation, diagnosis, IHC analysis, digital analysis, protein expression, immune assay, genomic & epigenomic tests.

Week 13 Methodologic aspects of biomarker data capture I and analysis: Exposure

Emily White, Bruce K. Armstrong, and Rodolfo Saracci (2008) Principles of Exposure Measurement in Epidemiology. Collecting, Evaluating and Improving Measures of Disease Risk Factors. Chapters 4, 5, and 9.
Inter-method and intra-method reliability studies
Data analysis examples: partial correlation coefficient, coefficient of varaition

Week 14 Methodologic aspects of biomarker II data capture and analysis: Outcome
Classification of Disease: problems and pitfalls
Data analysis: Inter and intra-rater reliability (Kappa statistics)

Assessment: Homework, 20% of course grade

Week 15 Student Presentations

Assessment: 10% of course grade