HSR 425: Introduction to Quantitative Methods in Health Services and Outcomes Research

Winter 2014

Course Directors:
Suzanne Cox, PhD, MPH
Charlesnika Evans, PhD, MPH

Center for Healthcare Studies
Feinberg School of Medicine
Northwestern University
420 E. Superior, 10th Floor
Chicago, IL 60611-3152

Suzanne Cox
Phone: (312) 503-1707
Email: suzanne.cox@northwestern.edu

Charlesnika Evans
Phone: (708) 202-4868, (773) 209-6982 (cell)
Email: Charlesnika-Evans@northwestern.edu

Office Hours: by appointment

Course Information:
Time: Monday, 3:30-6:30
Location: Rubloff 10th Floor, Lake Shore Conference Room-- We will have computer lab in the classroom if everyone is able to bring a laptop with STATA. If not, then we will move to Galter for lab from 5:30-6:30pm.
Minimum enrollment: 3
Maximum enrollment: 15
Credits: 1 credit

Please note, we only have nine classes; therefore, we expect students not to miss class or to be late to class. If you anticipate attendance issues, please contact the instructors as far in advance as possible.

This course is required for all students in the Health Sciences Integrated Program PhD (HSOR track) and Masters of Science in Health Services and Outcomes Research. It is open to other graduate students with permission from the course directors.

I. Course Description

This course introduces descriptive and analytic epidemiology, and how to apply these methods to the study of health services and outcomes research. Key epidemiological concepts such as association, bias and confounding will be covered, as well as the main epidemiologic study designs. Topics include
overview of research design; basic measurement of health services data; defining and measuring appropriate health outcomes; constructing research questions; conducting univariate analyses; and interpreting results. Practical computer-lab sessions will provide training in importing data into statistical software; cleaning data; creating new variables; descriptive analyses; and univariate analyses.

II. Course Objectives

By taking this course, students will be able to:

1. Define epidemiology and its role in health research.
2. Understand the design of health research projects.
3. Define and measure health services and health outcomes.
4. Use descriptive epidemiologic methods.
5. Generate hypotheses.
6. Test hypotheses using analytic design.
7. Assess the existence of bias or artifacts.
8. Review possible alternative explanations due to confounding through indirect associations.
9. Look for interactions with other variables of interest.

III. Course workload

- 2 hours of lecture and class discussion (students will present and discuss articles) per week
- 1 hour of computer lab per week (weeks 1-8)
- Student project presentations (weeks 9-10)
- There is approximately 2 to 4 hours of outside class work assigned each week.

IV. Grading policy

- 20 % class participation
  - Article discussions
    - During designated sessions, assigned students will lead a discussion of a specific article from the reading list. The article will be based on the previous week’s lecture and readings and provide an opportunity for students to utilize and apply knowledge gained from the current health services literature.
    - Students will be asked to present the article at the beginning of the class session. The discussion will focus on a discussion of key questions that will be provided for each paper. Our intent is that the discussion leader(s) will provide initial answers to these key questions, and then lead a discussion of these questions among the rest of the class. Each student will present at least one paper during the quarter as the lead discussant.
    - In addition to the lead discussant, a random student from the class will be asked to present a brief 2-3 minute synopsis of the paper before the lead discussant addresses the key questions for the paper. No student will be asked to present the synopsis more than 3 times during the quarter. Therefore, we ask that each student have read the assigned material beforehand and be prepared to provide a brief overview of the paper.
    - Students will sign up for their week, the first day of class. The instructors will select the articles; however the instructors will consider recommended articles from students.
All students are expected to participate in lectures and class discussions.

- 50% weekly assignments
  - STATA assignments are due on time each week.
- 30% final assignment (20% written paper and 10% oral presentation)

**Written paper**
- No more than 5-7 pages
- Due on the last day of class (3/10/2014)
- The individual final assignment will provide an opportunity to demonstrate how the epidemiological concepts and study designs taught during the course can be used to improve health services.
  - The first step is to define a specific health outcome of interest.
  - The project should include (1) describing the health problem and affected population, (2) searching for and critically appraising the evidence for healthcare interventions that can be used to address the major causes of the health outcome, and finally, and (3) describing and critiquing the epidemiologic methods used in 2-3 studies from the literature. ‘STrengthening the Reporting of OBservational studies in Epidemiology’ (STROBE) guidelines should be used to critique papers.

**Oral presentation**
- The project will be presented as a 15 minute PowerPoint presentation in week 9 or 10.

### V. Course materials

Reading materials, homework assignments, and lectures will be available on the Course Management System (“Blackboard”).

All students must acquire the following text and software. Books can be ordered at www.abbotthall.bkstore.com.

- Small STATA student version or higher of STATA software, available from http://stata.com/order/new/edu/gradplans/direct-ship-pricing/
  - Small Stata (for student use) is available for a $32 6-month license or a $49 one-year license. Small STATA supports 99 variables and 1,200 observations.
  - Stata/IC 12 (the next step up, supporting 2,047 variables, 798 right-hand variables, and unlimited observations) is available for $65 for 6 months or $98 for a year.
  - Some students might opt for the $179 perpetual license of Stata/IC 12
### VI. Weekly Schedule

<table>
<thead>
<tr>
<th>Session</th>
<th>Dates</th>
<th>Topic</th>
<th>Computer lab</th>
<th>Instructor</th>
</tr>
</thead>
</table>
| 1       | 1/6/2014  | Introduction to Epidemiology and Health Services and Outcomes Research  
• *Sign up for article discussion* | Intro to STATA                                                                 | Evans      |
| 2       | 1/13/2014 | Common measures and basic statistics                                   
• *Article discussion* | Data in and out of STATA                                               | Evans      |
| 3       | 1/20/2014 | NO CLASS - MLK Jr. Day                                                |                                                                   |            |
| 4       | 1/27/2014 | Overview: Observational vs Experimental studies; Cohort studies        
• *Article discussion* | Manipulating variables: tabulate, recode, missing                      | Evans      |
| 5       | 2/3/2014  | Observational studies: case-control, cross-sectional, ecologic        
• *Article discussion* | Manipulating variables: Generating new variables, creating a scale, dummy variables, labeling variables | Evans      |
| 6       | 2/10/2014 | Experimental Designs: Randomized Trials, Quasi-experiment, Natural Experiment Cohort Studies  
• *Article discussion x 2* | Manipulating data: Sorting, merging, appending, longitudinal data                                               | Evans      |
| 7       | 2/17/2014 | Understanding and critiquing quantitative methods in the literature; Planning Student Projects  
• *Article discussion x2* | Descriptive statistics, summary statistics                                                                 | Cox        |
| 8       | 2/24/2014 | Testing hypotheses and Measures of association                        
• *Article discussion* | Review of tabulate and Chi-square                                      | Cox        |
| 9       | 3/3/2014  | Causation, Bias and Artifacts; Confounding and Adjustment; Interaction and Stratified Analysis  
• *Article discussion* | Calculation of RR and OR, introduction to adjustment for confounding Student presentations | Cox        |
| 10      | 3/10/2014 | Student presentations                                                | Student presentations; no computer lab                                    | Cox        |
1. Introduction to Epidemiology and Health Service and Outcomes Research

Objectives:
- Describe goals, format, and grading of the course.
- Describe how the tools of epidemiology allow for the study of health services and outcomes.
- Define epidemiology and its role in health research.
- Describe common epidemiologic measures.
- Calculate incidence and prevalence.
- Basic introduction to STATA.

Required Reading:
- Ch. 1 Introduction
- Ch. 3 Measuring the Occurrence of Disease: I. Morbidity

The STATA Survival Manual, Ch. 1 Getting Started with STATA

Required Reading:
Gordis
- Ch. 4 Measuring the Occurrence of Disease: II. Mortality
- Ch. 17. Using Epidemiology to Evaluate Health Services (pp. 293-297)

STATA Survival Manual
- Ch. 2 Data in and out of STATA

Recommended:
- Ch. 3 Descriptive Epidemiological Measures

2. Common measures and basic statistics

Objectives:
- Calculate morbidity and mortality measures.
- Describe process and outcome measures.
- Learn to get data into and out of STATA.

Required Reading:
Gordis
- Ch. 4 Measuring the Occurrence of Disease: II. Mortality
- Ch. 17. Using Epidemiology to Evaluate Health Services (pp. 293-297)

Recommended:
- Ch. 3 Descriptive Epidemiological Measures

3. MLK Jr. Day- NO CLASS
4. Overview Study Designs: Observational vs Experimental studies; Observational: Cohort Objectives:
   - Understand concept of observational vs experimental study designs and similarities and differences.
   - Describe types of observational study designs.
   - Describe cohort study designs; retrospective and prospective.
   - Use STATA to manipulate variables and perform basic frequency calculations.

Required Reading:
Gordis
   - Ch. 9 Cohort Studies.

STATA Survival Manual
   - Ch. 3 Manipulating Variables (pages 41-61)

5. Observational studies: case-control, cross-sectional and ecologic studies

Objectives:
   - Describe similarities and differences between observational study designs.
   - Describe advantages and disadvantages of each design.
   - Use STATA to generate new variables, create a scale, create dummy variables, and label variables.

Required Reading:
Gordis
   - Ch. 10 Case-Control Studies and Other Study Designs
   - Chapter 13 Comparing Cohort and Case-Control Studies

STATA Survival Manual
   - Ch. 3 (61-94)

6. Experimental Designs: Randomized Trials, Quasi-experiment, Natural Experiment Cohort Studies

Objectives:
   - Describe similarities and differences between experimental designs
   - Describe advantages and disadvantages of each experimental design
   - Use STATA to sort, merge, and append datasets

Required Reading:
Gordis
   - Ch. 7 Assessing the Efficacy of Preventive and Therapeutic Measures: Randomized Trials
   - Ch. 8 Randomized Trials: Some Further Issues

Shadish, Cook, Campbell. Experimental and Quasi-Experimental Designs for Generalized Causal Inference. Ch 1 Modern Descriptions of Experiments pp 12-17
[http://cid.oxfordjournals.org/content/45/7/901.long](http://cid.oxfordjournals.org/content/45/7/901.long)

**STATA Survival Manual**
- Ch. 4 Manipulating Data

**Recommended:**

### 7. Understanding and critiquing quantitative methods in the literature

**Objectives:**
- Describe the key elements used in STROBE guidelines.
- Discuss the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) guidelines and its components.
- Begin planning student projects.
- Use STATA (tabulate command) with two variables to create a cross tabulation.
- Use STATA to identify missing data.

**Required Reading:**


**STATA Survival Manual**
- Ch. 5 Descriptive Statistics and Graphs

**Recommended:**
All GRADE guidelines can be found here:


### 8. Testing hypotheses and Measures of association

**Objectives:**
- Learn how to calculate and interpret Relative Risk.
- Describe Odds Ratios and when to use them.
• Use STATA to test measures of association (chi2 do-file).

**Required Reading:**

Gordis
- Ch. 11 Estimating Risk, Is there an association? (pp. 215-222)
- Ch. 12 More on Risk, Estimating Potential for Prevention (pages 223-246)

Rothman
- Ch. 4 Measures of Effect and Measures of Association (pp. 51-70)

**STATA Survival Manual**
- Ch. 6 Tables and Correlations

**9. Causation, Bias and Artifacts; Confounding and Adjustment and Student Presentations**

**Objectives:**
- List main issues regarding association versus causation in health services research.
- Describe key sources of bias.
- Define a confounder.
- Define interaction and how to test for it.
- Describe how to interpret stratified results.
- In STATA, calculate RR and OR, introduction to adjustment for confounding.
- Present your final project (15 minutes).
- Discuss topics addressed in course and how they apply to your research area.
- Present your final project (15 minutes, 10 minutes for discussion). 3 people

**Required Reading:**

Gordis
- Ch. 14 From Association to Causation: Deriving Inferences from Epidemiologic Studies
- Ch. 15 More on Causal Inferences: Bias, Confounding, and Interaction

**10. Student Presentations**

**Objectives:**
- Discuss topics addressed in course and how they apply to your research area.
- Present your final project (15 minutes, 10 minutes for discussion). 6 people
- Final papers due, please submit via Blackboard.

**VII. Course Evaluation**

The Graduate School Program administers web-based course evaluations to students for each course near the end of the quarter. Your completion of both the Unit (course) and Faculty evaluations is required; failure to complete the evaluations will result in an incomplete grade until the evaluations are submitted. You will be sent the web-link and instructions via e-mail later in the quarter. You will have several weeks to complete the evaluations before grades are submitted. Your evaluation of the course and faculty is anonymous; your identity can not be linked with your responses.
ACADEMIC INTEGRITY
Academic integrity is fundamental to every facet of the scholarly process and is expected of every student in The Graduate School (TGS) in all academic undertakings. Integrity involves firm adherence to academic honesty and to ethical conduct consistent with values based on standards that respect the intellectual efforts of both oneself and others.

Ensuring integrity in academic work is a joint enterprise involving both faculty and students. Among the most important goals of graduate education are maintaining an environment of academic integrity and instilling in students a lifelong commitment to the academic honesty that is fundamental to good scholarship. These goals are best achieved as a result of effective dialogue between students and faculty mentors regarding academic integrity and by the examples of members of the academic community whose intellectual accomplishments demonstrate sensitivity to the nuances of ethical conduct in scholarly work.

Standards of academic integrity are violated when a student engages in actions including:

* cheating in the classroom or on examinations, including master's final examinations and Ph.D. qualifying examinations;
* the intentional and deliberate misuse of data in order to draw conclusions that may not be warranted by the evidence;
* fabrication of data;
* omission or concealment of conflicting data for the purpose of misleading other scholars;
* use of another's words, ideas, or creative productions without citation in either the text or in footnotes;
* paraphrasing or summarizing another's material in such a way as to misrepresent the author's intentions;
* and use of privileged material or unpublished work without permission.

Academic dishonesty is a serious matter for graduate students committed to intellectual pursuits, and will be adjudicated in accordance with procedures approved by the Graduate Faculty.
http://www.tgs.northwestern.edu/academics/academic-services/integrity/index.html