HSR 465: Intermediate Quantitative Methods in Health Services and Outcomes Research

Spring 2013

Course Director:
Suzanne Cox, PhD, MPH
Center for Healthcare Studies
Feinberg School of Medicine
Northwestern University
420 E. Superior, 10th Floor
Chicago, IL 60611-3152
Tel: 312-503-1707
Email: suzanne.cox@northwestern.edu
Office Hours: by appointment

Course Information:
Time: Thursday, 3:00-6:00
Location: Wiebolt, room 421—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 5:00-6:00pm.
Minimum enrollment: 3
Maximum enrollment: 20
Credits: 1 credit

Please note, you must notify the instructor as far in advance as possible if you have to miss a session. We will be using AdobeConnect to record sessions, so if you have an unmoving conflict you may make up the session afterwards.

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 director.

I. Course Description
This course provides the student with an opportunity to learn and practice more advanced epidemiologic methods in the context of health services and outcomes research. The following topics will be included:

- Epidemiologic research strategies and how to apply these to various research questions
- Review of univariate and bivariate analyses (e.g., Odds Ratios, Chi-sq tests)
- Issues in effect estimation (precision, selection bias, misclassification bias)
- Methods for dealing with covariates (stratified analysis, effect modification, confounding)
- Introduction to multivariable analysis
- Interpreting research findings to guide decision-making
- Introduction to Geographic Information Systems analysis
- Introduction to Psychometric analysis

Practical computer-lab sessions will provide training hands-on STATA training.
II. Course Objectives

At the end of this course, the student will be able to:

- Describe different epidemiologic study designs and their application in health services and outcomes research.
- Select the most appropriate study design for specific research questions or hypothesis based on the advantages and disadvantage of each design.
- Plan, conduct and interpret a descriptive analysis of a data set.
- Plan, conduct and interpret appropriate univariate, bivariate, and multivariable analyses to answer research questions. This includes defining and using exposure variables, outcome variables, and other variables of interest.
- Develop an analytic plan for a research grant or manuscript based on the class content.
- Evaluate observational studies from health research literature.

III. Course workload

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

IV. Grading policy

- 10% class participation
- 50% weekly computer lab assignments (5 assignments at 10% each)
- 40% final assignment
  - 30% written paper (approx. 5 pages) and
  - 10% in-class presentation (15-20 minutes)

The individual final assignment will provide an opportunity to demonstrate how the epidemiological concepts and study designs taught during the course can apply to the student’s research topic.

- The final paper of no more than 6 pages is due on the last day of class.
  - Using the ‘STrengthening the Reporting of OBservational studies in Epidemiology’ (STROBE) guidelines, the student will write a paper in the style of a peer-reviewed journal article or grant application. Include the following sections:
    - Introduction,
    - Methods (describe secondary data set or data collection methodology complete with variables), and
    - Analytic Plan (you must include advanced epidemiologic methods as described in the coursework).
- The project will be presented in-class as a 20 minute PowerPoint presentation during weeks 9 and 10.
V. Course materials
All students must acquire the following texts and software. Books can be ordered at www.abbotthall.bkstore.com.

- Epidemiology, Beyond the Basics (2nd or 3rd edition) by Moyses Szklo and F. Javier Nieto, available in the Chicago campus bookstore
- A Gentle Introduction to STATA (3rd edition) by Alan Acock, available in the Chicago campus bookstore
- 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

PLEASE NOTE:
Additional articles for discussion will be assigned before class. Students may also be asked to identify articles for class discussion and come prepared to discuss them in class.

VI. Weekly Schedule

<table>
<thead>
<tr>
<th>Session</th>
<th>Dates</th>
<th>Topic</th>
<th>Computer lab</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>4/4/2013</td>
<td>Review of basic concepts, measuring disease occurrence</td>
<td>STATA review, managing and cleaning data, creating variables</td>
</tr>
<tr>
<td>3</td>
<td>4/18/2013</td>
<td>Understanding lack of validity: Bias</td>
<td>Sample size and power calculations; Bivariate correlation and regression</td>
</tr>
<tr>
<td>4</td>
<td>4/25/2013</td>
<td>Identifying Noncausal Associations: Confounding</td>
<td>Multiple regression</td>
</tr>
<tr>
<td>5</td>
<td>5/2/2013</td>
<td>Defining and Assessing Heterogeneity of Effects: Interaction</td>
<td>Logistic regression, adjusting for confounders</td>
</tr>
<tr>
<td>6</td>
<td>5/9/2013</td>
<td>Stratification and Adjustment: Multivariable Analysis in Epidemiology</td>
<td>Logistic regression, assessing for interaction</td>
</tr>
<tr>
<td>7</td>
<td>5/16/2013</td>
<td>Introduction to GIS (guest lecture)</td>
<td>Introduction to ArcGIS (guest analyst)</td>
</tr>
<tr>
<td>8</td>
<td>5/23/2013</td>
<td>Introduction to Psychometric Analysis (guest lecture)</td>
<td>Introduction to Psychometric Analysis (guest analyst)</td>
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<tr>
<td>9</td>
<td>5/30/2013</td>
<td>Quality Assurance and Control</td>
<td>Student presentations; no computer lab</td>
</tr>
<tr>
<td>10</td>
<td>6/6/2013</td>
<td>Communicating results of epidemiologic studies; Epidemiologic Issues in the Interface with Public Health Policy</td>
<td>Student presentations; no computer lab</td>
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1. Review of basic concepts, measuring disease occurrence

Objectives:
- Describe goals, format, and grading of the course.
- Review basic concepts such as study design, incidence, and prevalence.
- Define descriptive versus analytic epidemiology.
- Review STATA do files for managing and cleaning data and creating variables.

Required Reading:
Epidemiology: Beyond the Basics (Second Edition). Moyses Szklo and F. Javier Nieto. (referred to hereafter as Szklo and Nieto)
- Ch. 1 Basic Study Designs in Analytic Epidemiology
- Ch. 2 Measures of Disease Occurrence and Association

- Ch. 4 Working with commands, do-files, and results

2. Measuring associations and strength of associations

Objectives:
- Calculate Relative Risk and Odds Ratios.
- Define Attributable Risk.
- Understand the issues of assessing strength of association across exposures of interest.
- Review STATA do files for descriptive and summary statistics and chi-sq tests.

Required Reading:
Szklo and Nieto
- Ch. 3 Measuring Associations Between Exposures and Outcomes

A Gentle Introduction to STATA
- Ch. 6 Statistics and graphs for two categorical variables

3. Understanding lack of validity: Bias

Objectives:
- Define various kinds of bias and related methodological issues.
- Use STATA to calculate statistical power and required sample size.
- Use STATA to calculate bivariate correlation and regression.

Required Reading:
Szklo and Nieto
- Ch. 4 Understanding Lack of Validity: Bias

A Gentle Introduction to STATA
- Ch. 7 Power Analysis (pp. 170-177)
- Ch. 8 Bivariate correlation and regression (pp. 183-202)
4. **Identifying Noncausal Associations: Confounding**

**Objectives:**
- Define relationship between exposure, outcome and confounder.
- Describe the difference between crude and adjusted analysis.
- Use STATA to conduct multiple regression analysis; understand how to use hierarchical regression to examine predictors.

**Required Reading:**
Szklo and Nieto
- Ch. 5 Identifying Noncausal Associations: Confounding

*A Gentle Introduction to STATA*
- Ch. 10 Multiple regression (pp. 249-293)

5. **Defining and Assessing Heterogeneity of Effects: Interaction**

**Objectives:**
- Describe interaction between exposure variables and how to account for significant interaction in analyses.
- In STATA write do-files for regression analysis that assess potential interaction between exposure variables.

**Required Reading:**
Szklo and Nieto
- Ch. 6 Defining and Assessing Heterogeneity of Effects: Interaction

*A Gentle Introduction to STATA*
- Ch. 10 Fundamentals of interaction (pp. 282-289)

6. **Stratification and Adjustment: Multivariate Analysis in Epidemiology**

**Objectives:**
- Understand adjustment techniques based on stratification.
- Describe the key elements used in STROBE guidelines.
- Begin planning student projects.
- In STATA, write do-files for logistic regression.
- Use interaction terms in logistic regression models to assess for interaction.

**Required Reading:**
Szklo and Nieto
- Ch. 7 Stratification and Adjustment: Multivariate Analysis in Epidemiology

*A Gentle Introduction to STATA*
- Ch. 11 Logistic Regression (pp. 297-324)

7. Introduction to GIS (Mike Stiehl)
Objectives:
- Define Geographic Information Systems.
- List key uses of GIS for Health Services and Outcomes Research.
- Gain exposure to Arc GIS interface.
- In Arc GIS, learn how to import Census data and create basic demographic maps.

Required Reading:
- TBD

8. Introduction to Psychometric Analyses (Ben Schalet, Research Assistant Professor in Medical Social Sciences)
Objectives:
- List key measures used in psychometric analyses such as various types of validity and reliability.
- Describe Item response Theory.
- Understand appropriate use of psychometric analyses given data collection tools and methodology.
- Gain exposure to psychometric results and critical interpretation of relevant findings.

Required Reading:

9. Quality Assurance and Control
Objectives:
- Define quality control.
- Describe how quality assurance and quality control employ key epidemiologic methods.
- Present your final project (15-20 minutes).

Required Reading:
Szklo and Nieto
- Ch. 8 Quality Assurance and Control

Optional at-home computer assignment:
Read: A Gentle Introduction to Stata, Revised Third Edition
- Ch. 12, Measurement, reliability, and validity
- At-home exercise- calculations of reliability and validity

10. Communicating results of epidemiologic studies; Epidemiologic Issues in the Interface with Public Health Policy
Objectives:
- Discuss communication of study results and how it applies to your research area.
- Define meta-analysis and discuss relevant guidelines (Meta-Analysis of Observational Studies in Epidemiology- MOOSE).
- Present your final project (15-20 minutes).
- Final papers due, please submit via Blackboard.
Required Reading:
Szklo and Nieto
  • Ch. 9 Communicating results of epidemiologic studies
  • Ch. 10 Epidemiologic Issues in the Interface with Public Health Policy


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