Analytic Methods in Observational Epidemiology

Epid 718

Course Syllabus, Fall 2017

Meeting location and times:
McGavran-Greenberg 2308       Tues/Thurs 9:30-10:45

Instructors:
Brian W. Pence, PhD            Stephen W. Marshall, PhD
Dept of Epidemiology           Dept of Epidemiology
bpence@unc.edu                 smarshall@unc.edu
2103C McGavran-Greenberg       2101E McGavran-Greenberg

Teaching Assistants:           Office hours (in Epid TA room, off Student Room):
Lauren Graybill, lag11@email.unc.edu T 1:30-2:30
Libby McClure, emclure@email.unc.edu W 2:00-3:00
Adrien Wilkie, awilkie@email.unc.edu M 1:30-2:30

If emailing a TA about a course-related matter, please copy all 3 TAs. This increases the efficiency of
the TA team and will also increase the quality of the answer you receive and the consistency of the team’s
answers to all students’ questions. Emails addressed to all TAs will receive a response before emails
addressed to a single TA. If you do email just one TA, she will generally copy the others on the reply.

Plan ahead and respect your TAs’ time. Do not expect a response to an email outside of business hours
(Monday-Friday 8am-5pm). In particular, if you send a question about an assignment the night before it is
due, it will almost certainly not get answered in time to be helpful to you.

Course Description:

This course provides an in-depth treatment of the analysis of data from observational epidemiologic
studies, including both tabular and regression modeling approaches, and with an emphasis on the importance
of study design in developing and executing an analysis plan. We will examine generalized linear models,
including regression models for continuous and binary outcomes (e.g., linear, logistic, binomial risk, and log-
risk regression). Topics will include functional form, relationships between tabular and regression analyses,
understanding and evaluating model assumptions, model building strategies, assessment of modification and
confounding, model diagnostics, consideration of bias, and interpretation of results in both cohort and case-
control designs.

A major focus of the course is the semester-long, independent data analysis project in which you will
apply and integrate the concepts covered in class to a dataset and research question of your choosing. **If
you do not already have this dataset in hand, you should probably consider dropping the class.**
Course Objectives:

The objectives of this course are to equip you to:
- Clearly and compellingly articulate an etiologic research question and the public health importance of that research question
- Distinguish confounders, mediators, and modifiers, and address each appropriately in your analyses
- Understand the relationship between your research question, the study design, your selection of the effect measure to estimate, and the generalized linear regression model that will provide that estimate
- Understand, evaluate, and relax as needed the central assumptions of ordinary least squares and generalized linear regression models
- Address modification and confounding in the context of regression models, including using interaction terms and weighting
- Interpret data analysis results in the context of uncertainty and bias, in particular measurement error, selection bias, and confounding
- Design, implement, execute, and interpret a complete analysis plan to address an etiologic research question in a quantitative dataset
- Function effectively as part of a group
- Evaluate both your own and your group members’ contributions and areas for growth

Textbooks and Readings:

This course does not follow a single textbook. Readings come from several texts as well as a number of journal articles. Required and suggested readings for the semester, subject to change, are summarized in the “List of required and suggested readings” documents on Sakai > Resources > Class Sessions.

In addition to Modern Epi 3, your 715 text, we will refer to the following textbook, which is available as a free download from the UNC library using the link below:

- Regression Methods in Biostatistics (RMB): Linear, Logistic, Survival, and Repeated Measures Models
  Eric Vittinghoff, Stephen C. Shiboski, David V. Glidden, Charles E. McCulloch
  Book website: [http://www.biostat.ucsf.edu/vgsm/1st_ed/index.html](http://www.biostat.ucsf.edu/vgsm/1st_ed/index.html)

The following textbook is an optional additional reference:

  David G. Kleinbaum, Mitchel Klein

Software:

The focus of the class is not on code but on analytic methods. You will not submit code or output for grading, but will be graded on the motivation, results, presentation, and interpretation of your analyses. You may use SAS, STATA, or R (or something else). You need to be largely self-sufficient in your chosen program.

**The TAs cannot trouble-shoot your code with you.** When course code is provided, it will generally be provided in SAS, STATA, and R.

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Class preparation and class time:

This course relies heavily on – and grades – your pre-class preparation to maximize your time in class engaging directly with your classmates and instructors about the material. Many class periods will have a handful of 5-15 minute lecture videos and assigned readings to prepare before class, as well as a graded quiz (Individual Readiness Assessment) on the material that must be completed on Sakai before class. Questions on the IRAs may address content from earlier in the semester or from earlier methods courses.

Class time will be a mix of discussions of the material and short or extended group work on applications of class material. Groups have been intentionally designed by the instructional team to maximize heterogeneity on certain characteristics such as department of major, program area, gender, and background experience. Groups will not be altered. In-class group work will sometimes include components that need to be read or prepared in advance and/or be turned in either in class or at the next class.

Both what you gain from this course and the grade you receive will be a function of how you contribute to your group and how effectively your group works. Mutually agreed upon ground rules are one key to successful group work. We’ll talk more in class about ground rules and making groups work well.

Lecture Capture:

All class sessions will be recorded so you can view them if you are away. Recording generally starts a few minutes before 9:30 and continues a few minutes after 10:45, and the ceiling microphones are very sensitive, so be careful what you say! It may be recorded for posterity. Recordings of class sessions can be found via a link in the “Class sessions” folder on Sakai.

Pre-class videos:

Pre-class videos are hosted on Voicethread in the “EPID 718 2017” group, which you can access via a link in the “Resources” main folder on Sakai, or directly from the VoiceThread tab in Sakai. You may need to be on campus or using UNC VPN in order for the link to work. Also, sometimes you need to click the link, sign in with your Onyen, then click the link again in order to get to the right place.

Pre-class quizzes (Individual Readiness Assessments):

There will be one or sometimes two of these per week, available on Sakai. Each IRA is graded on a “make it over the bar” basis – if you complete it on time and get at least 70% of the questions correct, you will receive full marks; if you get less than 70% of the questions correct you will receive the appropriate percentage. Late submissions will receive a grade of 0.

The Project:

You will be responsible for conducting a multifaceted analysis of a research question using methods and concepts taught in the course in the semester-long, independent “Project.” The project is divided into 4 parts, due approximately every 4 weeks. You’ll submit drafts to your groups and provide peer review to your group mates. More detail on the project, grading, and schedule are in “Epid 718 project description” on Sakai under Resources > Project Assignments.

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Working together on projects: More than one student may use the same dataset, but each student must have his/her own research question and will conduct and submit his/her own independent project. However, the class in general will be structured to facilitate peer learning and input into each other’s projects as noted above.

Repeat students: If this is not your first time taking Epid 718, you need to have a substantially different research question for the project than you had before. Please discuss with the course instructor.

Exams:

There will be no mid-term or final exam for this course.

Grading:

Your course grade will be determined as follows:

- **Project (70% overall, each part equally weighted).** Each project part will receive its own grade. Details of the project grading approach and handling of late submissions are in the “Epid 718 project description” document on Sakai under Resources > Project Assignments.
- **Class preparation (15%).** Your average on the pre-class Individual Readiness Assessments (IRAs).
- **Class contributions (15%).** A function of (a) timely submission of things such as your project drafts to your group, your peer reviews, and your assessment of your group members’ contributions; (b) the quality of your peer reviews of group members’ project drafts; (c) your group members’ evaluations of your contributions to group work; and (d) the instructional team’s observation of your attendance, participation, and contributions to your group’s work in class.

Grading Complaints: If you have a complaint about a grade or grading of a question, submit the complaint in writing to Dr. Pence along with the full assignment in question, and he will consider it. Grading of the full assignment may potentially change in either direction as a result of reconsidering your assignment.

Final grades are based on the standard graduate school scale (H,P,L,F). No incompletes will be given except under special circumstances to be agreed upon by the student and instructor.

Individual versus group work:

Please pay careful attention to instructions about individual vs. group work on assignments. Generally, IRAs are to be completed on your own without consulting others and in-class work is designed to be completed in groups. On the project, you are strongly encouraged to discuss issues with and seek guidance from both the teaching team and your classmates, but the assignment you submit should represent your individual intellectual effort and writing. If you have any questions about what is appropriate vs. inappropriate collaboration, please ask.

Academic integrity, intellectual property, and plagiarism:

Plagiarism is using or closely imitating someone else’s words or thoughts without citing the original author. Plagiarism is an extremely serious academic offense in class assignments as well as in publications. Be sure you fully understand UNC’s policies around plagiarism. An act of plagiarism may be cause for dismissal from the Graduate School, whether it is intentional or simply occurred due to ignorance of the policy or of
what constitutes plagiarism. If you are in doubt about whether something you are writing is allowable or constitutes plagiarism, please ask.

Here are some helpful links from the Health Sciences Library (http://guides.lib.unc.edu/plagiarism-citing) and the UNC Writing Center (http://writingcenter.unc.edu/tips-and-tools/plagiarism/).

**Missed classes:**

We understand that situations such as personal illness and work-related travel may arise over the course of the semester. However, given the structure of the course, missing class has consequences not only for you but for your group. There is no formal “penalty” for missing a class. When evaluating group members’ contributions, everyone will be encouraged to consider each group member’s attendance as a component of their overall contributions, which may impact your grade. If you will miss a class, it is your responsibility to be in open and proactive communication with your team about your absence and ways that you can compensate so that you are contributing your fair share. Examples may include joining the group work remotely via Skype, preparing some component of the class work ahead of time, or taking on some additional responsibility at another time.

If you will be missing a class, when possible, please notify Dr. Pence in advance.
## Fall 2017 Schedule

*Text in blue indicates assignment due*

<table>
<thead>
<tr>
<th>Wk #</th>
<th>Week of...</th>
<th>Tuesday</th>
<th>Thursday</th>
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<tbody>
<tr>
<td>1</td>
<td>8/22, 8/24</td>
<td>Introduction and orientation</td>
<td>Specific aims IRA 1</td>
</tr>
<tr>
<td>2</td>
<td>8/29, 8/31</td>
<td>Causal thinking IRA 2</td>
<td>Matched case-control studies</td>
</tr>
<tr>
<td>3</td>
<td>9/5, 9/7</td>
<td>Effect measure modification IRA 3</td>
<td>Continued PP1 draft due to group</td>
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<tr>
<td>4</td>
<td>9/12, 9/14</td>
<td>PP1 peer review IRA 4 PP1 peer review due to group Monday</td>
<td>Effect measure modification</td>
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<tr>
<td>5</td>
<td>9/19, 9/21</td>
<td>Designs and measures IRA 5</td>
<td>Continued PP1 final due</td>
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<tr>
<td>6</td>
<td>9/26, 9/28</td>
<td>Linearity and functional form IRA 6</td>
<td>Continued</td>
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<tr>
<td>7</td>
<td>10/3, 10/5</td>
<td>Collinearity and sparse cells: Looking for problems in your data IRA 7</td>
<td>Continued PP2 draft due to group</td>
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<tr>
<td>8</td>
<td>10/10, 10/12</td>
<td>Modeling IRA 8 PP2 peer review due to group</td>
<td>University Day – No class</td>
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<tr>
<td>9</td>
<td>10/17, 10/19</td>
<td>Modeling IRA 9 PP2 final due</td>
<td>Fall break – no class</td>
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<tr>
<td>10</td>
<td>10/24, 10/26</td>
<td>Modeling IRA 10</td>
<td>Continued</td>
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<tr>
<td>11</td>
<td>10/31, 11/2</td>
<td>Introduction to survey sampling and weights IRA 11</td>
<td>Weights and missing data PP3 draft due to group</td>
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<tr>
<td>12</td>
<td>11/7, 11/9</td>
<td>Weights and missing data IRA 12 PP3 peer review due</td>
<td>PP3 Peer review</td>
</tr>
<tr>
<td>13</td>
<td>11/14, 11/16</td>
<td>Weights and generalizability IRA 13</td>
<td>Weights and confounding PP3 final due</td>
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<tr>
<td>14</td>
<td>11/21, 11/23</td>
<td>IPTW and propensity scores IRA 14</td>
<td>Thanksgiving – No class</td>
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<tr>
<td>15</td>
<td>11/28, 11/30</td>
<td>IPTW and propensity scores IRA 15</td>
<td>Continued</td>
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<tr>
<td>16</td>
<td>12/5</td>
<td>Last class – Semester review PP4 final due</td>
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<td>12/12, 8am</td>
<td>Final exam period PP4 peer review due (electronically). No attendance required.</td>
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