



## PubH 8342 Advanced Epidemiologic Methods: Applications Spring 2016

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<b>Credits:</b>	<b>3</b>	
<b>Meeting Days:</b>	<b>Tu/Th</b>	
<b>Meeting Time:</b>	<b>8:15-9:30 AM</b>	
<b>Meeting Place:</b>	<b>Mayo 1250</b>	
<b>Instructor:</b>	<b>Darin Erickson, PhD</b>	<b>Richard MacLehose, PhD</b>
	<b>Associate Professor</b>	<b>Associate Professor</b>
<b>Office Address:</b>	<b>375 West Bank Office Building (WBOB)</b>	<b>464 WBOB</b>
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<b>E-mail:</b>	<a href="mailto:erick232@umn.edu">erick232@umn.edu</a>	<a href="mailto:mac10029@umn.edu">mac10029@umn.edu</a>
<b>Office Hours:</b>	<b>by appointment</b>	<b>by appointment</b>

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### I. Course Description

This doctoral-level applied methodology course is designed for students in the Epidemiology PhD program who have already had PubH 6341, 6342 and 6343 or their equivalent. Examples and readings are aimed at both clinical/biological and social/behavioral track students.

### II. Course Prerequisites

PubH 8341, Advanced Epidemiologic Methods: Concepts, or equivalent with permission of the instructors.

### III. Course Goals and Objectives

Upon completion of this course the student should be able to:

- Pose a research hypothesis and choose the appropriate analytic technique(s) to answer it.
- Use terminology across areas within epidemiology to describe the analytic process.
- Know how to implement these analyses using STATA and to interpret the output correctly.

- Read scientific literature and determine if the approach taken is appropriate for the research hypothesis and if the interpretation is consistent with the results.
- Be able to determine the best fitting model to the data available, in terms of the exposure, appropriate confounding factors and effect modifiers, and the difference between predictive and etiologic models.

#### IV. Methods of Instruction and Work Expectations

The class will meet twice a week. Lectures will vary between biologically oriented and behaviorally oriented techniques, and readings will be both from the peer-reviewed literature and textbooks. Guest speakers will present real-world experience with the analytic techniques presented.

Students are expected to attend lectures, to have completed assigned readings before class, and to participate in the discussions. Other suggested readings are included for students interested in learning more about a particular topic, but are not required.

This class will emphasize applied analysis of epidemiologic data (of both the biological and behavioral variety). Class will be taught exclusively in Stata and all students will need to have access to Stata (preferably version 14).

#### V. Course Text and Readings

##### Week 1

Chapter 11. Why model? In: Hernán MA, Robins J. Causal Inference. CRC Press, 2012.

Greenland S. Regression Models in The Handbook of Epidemiology. Eds Anders and Pigeot. 2014

*Other suggested readings:*

Glymour M, Greenland S. "Causal Diagrams" in Modern Epidemiology, 3<sup>rd</sup> ed. Eds: Rothman KJ, Greenland S, Lash TL. 2008. Wolters Kulwer Health.

##### Week 2

VanderWeele T, Knol MJ. A tutorial on interaction. [http://people.hsph.harvard.edu/~tvanderw/InteractionTutorial\\_rev.pdf](http://people.hsph.harvard.edu/~tvanderw/InteractionTutorial_rev.pdf)

Greenland S. pp408-417 "Stratified Analysis" in Modern Epidemiology, 3<sup>rd</sup> ed. Eds: Rothman KJ, Greenland S, Lash TL. 2008. Wolters Kulwer Health.

Greenland S. "Stratified Analysis" in Modern Epidemiology, 3<sup>rd</sup> ed. Eds: Rothman KJ, Greenland S, Lash TL. 2008. Wolters Kulwer Health.

*Other suggested readings:*

Richardson, D. B., & Kaufman, J. S. (2009). Estimation of the relative excess risk due to interaction and associated confidence bounds. *American journal of epidemiology*, 169(6), 756-760.

Assmann, S. F., Hosmer, D. W., Lemeshow, S., & Mundt, K. A. (1996). Confidence intervals for measures of interaction. *Epidemiology*, 7(3), 286-290.

Robins J, Greenland S. The role of model selection in causal inference from nonexperimental data. *Am J Epidemiol* 1986; 123:392-402.

Greenland S. Modeling and variable selection in epidemiologic analysis. *American Journal of Public Health*. 79(3): 340-9.

##### Week 3

Greenland, Sander. "Dose-response and trend analysis in epidemiology: alternatives to categorical analysis." *Epidemiology* (1995):

356-365.

Dohoo, Martin, Stryhn. Ch 18. "Modelling Count and Rate Data" in *Methods in Epidemiologic Research*. VER inc. 2012.

#### Week 4

Lumley T, Kronmal RA, Ma S. Relative risk regression in medical research: models, contrasts, estimators, and algorithms. *University of Washington Biostatistics Working Paper Series* 2006.

Chapter 12. Polytomous logistic regression, and Chapter 13. Ordinal logistic regression. In: Kleinbaum DG, Klein M. *Logistic regression: A Self-Learning Text*. 3<sup>rd</sup> edition. Springer, 2010.

*Other suggested readings:*

Spiegelman D, Hertzmark E. Easy SAS calculations for risk or prevalence ratios and differences. *American journal of epidemiology* 2005; **162**: 199-200.

#### Week 5

Fitzmaurice, Laird & Ware (2004) Applied Longitudinal Analysis Chapters 1 & 2

#### Week 6

Fitzmaurice, Laird & Ware (2004) Applied Longitudinal Analysis Chapters 7 & 8

*Other suggested readings:*

Hedeker & Gibbons (2006) Longitudinal Data Analysis Chapter 4 & 6

Singer & Willett (200x) Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence. Chapters 3 & 4

#### Week 7

Fitzmaurice, Laird & Ware (2004) Applied Longitudinal Analysis Chapters 11

*Other suggested readings:*

Hedeker & Gibbons (2006) Longitudinal Data Analysis Chapters 8 & 9

#### Week 8

Fitzmaurice, Laird & Ware (2004) Applied Longitudinal Analysis Chapters 12

#### Week 9

No Reading Assignments - Spring break

#### Week 10/11

Hosmer DW, Lemeshow S. Ch6-7 in *Applied Survival Analysis*. Wiley.

Kleinbaum. Ch 1- 3 in *Survival Analysis: a self learning text*.

#### Week 12

Suhr D.D. SUGI 30. Principal component analysis vs exploratory factor analysis. Paper 203-30.  
Collins, L.M. & Lanza, S.T. (2010). Latent Class and Latent Transition Analysis Chapters 1 & 2

#### Week 13

Genetic Epi Analysis—Assigned by guest speaker

Kline (2011) Principles and Practice of Structural Equation Modeling (3rd Ed) Chapters 1 & 9

VanderWeele, T. J. (2012). Invited commentary: Structural equation models and epidemiologic analysis. American Journal of Epidemiology, 176, 608-612.

### Week 14

Localio AR, Margolis DJ, Berlin JA. Relative risks and confidence intervals were easily computed indirectly from multivariable logistic regression. Journal of clinical epidemiology 2007; **60**: 874-82.

Greenland S. Model-based estimation of relative risks and other epidemiologic measures in studies of common outcomes and in case-control studies. American journal of epidemiology 2004; **160**: 301-5.

### Week 15

Schafer, J.L., & Graham, J.W. (2002). Missing data: Our view of the state of the art. Psychological Methods, 7, 147-177.

Hosmer DW, Lemeshow S. Ch1-3 in Applied Survival Analysis. Wiley. 2989

*Other suggested readings:*

Enders, C.K. (2010). Applied Missing Data Analysis Chapters 3 & 4 (ML) and 7 & 8 (MI)

## **VI. Course Outline/Weekly Schedule**

WEEK	DATE	TOPIC	INSTRUCTOR
1	19 Jan	INTRODUCTION; Regression modeling	Erickson/MacLehose
	21 Jan	Linear and Logistic Regression Review & Introduction to Stata	MacLehose
2	26 Jan	Variable Selection in Regression Models	MacLehose
	28 Jan	Biological vs Statistical Interactions	MacLehose
3	2 Feb	Trends and Splines	MacLehose
	4 Feb	Poisson Regression - HW1 Due	MacLehose
4	9 Feb	Multinomial and Ordinal Regression	MacLehose
	11 Feb	General Linear Models & Common Dichotomous Outcomes	MacLehose
5	16 Feb	Intro to Correlated Data	Erickson
	18 Feb	Covariance Pattern Modeling	Erickson
6	23 Feb	Random Intercept Regression - HW2 Due	Erickson
	25 Feb	Random Slopes Regression	Erickson

7	2 Mar	Generalized Linear Mixed Models	Erickson
	4 Mar	Generalized Linear Mixed Models	Erickson
8	9 Mar	Generalized Estimating Equations	Erickson
	11 Mar	Generalized Estimating Equations - HW3 Due	Erickson
9	Spring Break	No classes (14 March – 18 March)	
10	23 Mar	Survival Analysis	MacLehose
	25 Mar	Survival Analysis	MacLehose
11	30 Mar	Survival Analysis - HW4 Due	MacLehose
	1 April	Survival Analysis	MacLehose
12	6 April	Principal Component Analysis	Erickson
	8 April	Latent Class Analysis	Erickson
13	13 April	Confirmatory Factor Analysis - HW5 due (Project Proposal)	Erickson
	15 April	Genetic Epidemiology	Pankow
14	20 April	Marginal Effects	MacLehose
	22 April	Marginal Effects - HW6 Due	MacLehose
15	27 April	Missing Data	Erickson
	29 April	Missing Data	Erickson
16	4 May	Special Topics	
	6 May	Concluding Remarks	Erickson/MacLehose

## VII. Evaluation and Grading

HW: 10 points each = total 60 points

Letter grades and associated points are awarded in this course as follows below. These will appear in the student's official transcript. See <http://www1.umn.edu/usenate/policies/gradingpolicy.html> for details.

*Pass/Fail Grading:* An alternative to traditional A-F scale grades is the S/N grading scale. The "S" grade does not carry points but credit will count toward completion of student's degree if permitted by college or program. An "N" is given for student's exercising the S/N grading option but who fail to meet minimum course requirements. Students may change grading options without written permission as specified by the University and without penalty during the initial registration period or during the first two weeks of the semester. The grading option may not be changed after the second week of the term.

The maximum number of points a student can earn is 100. No exam will be given, but a final project based on an analysis technique learned in class and unique dataset **will be worth 30 points**. This final project will test understanding of the class materials and readings as well as the ability to extrapolate basic lecture material. The final project should be in publication format and be approximately 10 pages double-spaced excluding tables. In addition, **six homeworks, each worth 10 points**, will be assigned. Class participation will account for the remaining **10 points**. Numeric grades will map to letter grades as per the table to the right.

Grade Mapping	
Class Points	Letter Grade
>94	A
90-94	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
70+	S
-	N/F
-	I

A 4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements

A- 3.667

B+ 3.333

B 3.000 - Represents achievement that is significantly above the level necessary to meet course requirements

B- 2.667

C+ 2.333

C 2.000 - Represents achievement that meets the course requirements in every respect

C- 1.667

D+ 1.333

D 1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements

S Represents achievement that is satisfactory, which is equivalent to a C- or better.

**For additional information, please refer to:**

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

### Course Evaluation

The SPH will collect student course evaluations electronically using a software system called CoursEval: [www.sph.umn.edu/courseval](http://www.sph.umn.edu/courseval). The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades). All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our

work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

### **Incomplete Contracts**

A grade of incomplete “I” shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an “I” requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student’s college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades).

**University of Minnesota Uniform Grading and Transcript Policy** - A link to the policy can be found at [onestop.umn.edu](http://onestop.umn.edu).

## **VIII. Other Course Information and Policies**

### **Grade Option Change** (if applicable)

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at [onestop.umn.edu](http://onestop.umn.edu).

### **Course Withdrawal**

Students should refer to the Refund and Drop/Add Deadlines for the particular term at [onestop.umn.edu](http://onestop.umn.edu) for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at [sph-ssc@umn.edu](mailto:sph-ssc@umn.edu) for further information.

### **Student Conduct Code**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see:

[http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

### **Use of Personal Electronic Devices in the Classroom**

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:

<http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

### **Scholastic Dishonesty**

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations;

engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code:

[http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see:

<http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

### **Makeup Work for Legitimate Absences**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see:

<http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

### **Appropriate Student Use of Class Notes and Course Materials**

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

### **Sexual Harassment**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:

<http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

### **Equity, Diversity, Equal Opportunity, and Affirmative Action**

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: [http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf).

### **Disability Accommodations**

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.



For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

### **Mental Health and Stress Management**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

### **The Office of Student Affairs at the University of Minnesota**

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development –Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Student Conduct and Academic Integrity, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <http://www.osa.umn.edu/index.html>.

### **Academic Freedom and Responsibility, for courses that involve students in research**

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom and conduct relevant research. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.\* When conducting research, pertinent institutional approvals must be obtained and the research must be consistent with University policies.

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

\* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".

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