PubH 7402-001
Biostatistics Modeling and Methods
Spring 2018

Credits:	**4**
Meeting Days:	**Tues, Thur**
Meeting Time:	**12:20-2:15am**
Meeting Place:	**Weaver-Densford Hall W2120**
Instructors:	**Dr. Sandra Safo**
Office Address:	**Mayo A466**
Office Phone:	**612-625-9142**
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E-mail:	**ssafo@umn.edu**
Office Hours:	**Tues 2:30pm- 4:30pm**
TA:	**Andrew DiLernia**
TA Office Hours	**Mondays (2:00 – 3:00 pm) and Friday (1:00 – 2:00 pm)**
TA Email	**diler001@umn.edu**

I.   Course Description

This course is the second part of a two-course sequence intended for PhD students in the School of Public Health who need a rigorous approach to probability and statistics and statistical inference with applications to research in public health. This course is about modeling data and using the estimates of those models along with estimates of uncertainty of those models to answer scientific research questions. Statistical computing will be performed using either SAS or Stata - Students are allowed to choose whichever software they prefer.

 Acknowledgments
The contents of PubH 7402 have been developed with the contributions of numerous instructors. The notes follow that of Dr. Weihua Guan, with some modifications. Former faculty/instructor, Dr. Melanie Wall, had roles in both the conceptual development and actual content of the current course, and is acknowledged for her contributions.

II.   Course Prerequisites

PubH 7401 is required; or permission by instructors.

III. Course Goals and Objectives

Upon completion of this course, the student should understand the fundamentals of generalized linear models for continuous, ordinal and categorical data. The students should also understand how to model data coming from correlated sampling structures and how to deal with time-to-event data. This means comprehending the concepts of model construction, applying these concepts to actual datasets, and implementing the appropriate model in standard statistical software.

IV. Methods of Instruction and Work Expectations

Instruction will be in-class lecture. Examples and applications will come from the health science related fields. Students are expected to attend class, participate in class discussions, and complete the assigned homework, exam, and project. Working together on homework assignments is permitted, but **each student is expected to independently write-up homework assignments, using their own computing and in their own words.**

The course will present all methods using SAS. STATA will be used occasionally. Both software are comprehensive statistical tools capable of performing most all of the traditional and recently advanced existing statistical methodology. Students are welcome to choose any other software (e.g., R) to perform analyses for homework in this course and can change at any time, but support for these packages cannot be guaranteed from the instructor or teaching assistant.

You can find SAS and Stata on computers at the following public computing labs: Coffman Union B060, Walter Library 103. You can also obtain license for SAS or Stata through the University of Minnesota http://www.oit.umn.edu/utools/.

Useful tutorials at UCLA website:

SAS: https://stats.idre.ucla.edu/sas/
STATA: https://stats.idre.ucla.edu/stata/
R: https://stats.idre.ucla.edu/r/

V. Course Text and Readings
Regression Methods in Biostatistics: Linear Logistic, Survival, and Repeated Measures Models. Vittinghoff, E., Glidden, D.V., Shiboski, S.C., and McCulloch, Second Edition. Springer. 2012.

(EBook: http://link.springer.com.ezp1.lib.umn.edu/book/10.1007%2F978-1-4614-1353-0)

VI. Course Outline/Weekly Schedule

Course weekly outline:

0. Course overview (1 lecture)

1. General linear model (3 weeks)
   * Simple linear regression - OLS
   * Multiple regression including dummy variables
   * Diagnostics, model selection
2. Generalized linear model (3 weeks)
   * Binomial and logistic regression
   * Multinomial response models - proportional odds models, generalized logistic regression (i.e. discrete choice models), diagnostics
   * Poisson regression, overdispersion, diagnostics
3. Model selection (1 lecture)
4. Methods for correlated data (4 weeks)
   * Continuous outcomes (linear mixed effects model)
   * Discrete outcomes (GEE)
5. Methods for survival data (2.5 weeks)
   * Kaplan Meier, log rank
   * Cox proportional hazards

Tentative schedule of activities:

Activity/Assignment	Due Date
Assignment B1	Jan 18
Assignment 1	Feb 2
Assignment B2	Feb 8
Project: Propose topics and dataset	Feb 16
Assignment 2	Feb 23
Assignment 3	Mar 20
Assignment B3	Mar 22
Review for midterm	Mar 27
Midterm	**Mar 29**
Project: Statistical analysis plan	Apr 6
Assignment 4	Apr 13
Assignment B4	Apr 19
Assignment 5	Apr 27
Project: Results	May 4
Project: Poster Presentations	May 11
Project: Final Report and Codes	May 12

Assignments B1-B4 will introduce you to the main concept to be discussed. For these assignments, be prepared to discuss reading materials in class.

Homework and Midterm

Homework will be assigned roughly every 2 weeks, with a total of 5 assignments. One midterm will be given in class.

Final Project

The final will consist a project where you analyze data of your choice. It involves preparing a short (5-10 page) paper and giving a poster presentation of your work. This will be a **group** project; students **must** form into groups of **2 or 3**. Group members may assign speaking responsibilities in any way they please, but writing responsibilities should be shared. All members of a group will receive the same final project grade. Once your group has formed and identified data of interest, you will need to meet briefly with me to discuss your data. More final project information will be provided as the course unfolds. The project grade will be based on clarity of project proposal and quality of statistical analysis plan (30%), poster presentation (30%), final study report (30%), and reproducibility of results in final report using submitted codes (10%).

The final grade will be determined using the follow equation:

$$0.4x \sum_{i=1}^{5} Homework_{\{i\}} + 0.3xMidterm + 0.3xProject$$

At the instructor's discretion, students may earn 5% bonus point for active participation in reading assignments and class discussions.

VII. Evaluation and Grading

Course grade is based on homework (40%), midterm exam (30%), and final project (30%). A letter grade will be determined from the percentage of points each student receives. The curve for final grades will be: A =

95-100; A- = 90-94; B+ = 85-89; B = 80-84; B- = 75-79; C+ = 70-74; C = 65-69; C- = 60-64; F = below 60. For those registered S/N, S = 60-100.

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. 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. 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.

University of Minnesota Uniform Grading and Transcript Policy - A link to the policy can be found at 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.

Course Withdrawal

Students should refer to the Refund and Drop/Add Deadlines for the particular term at 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 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.

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) 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.

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 do not 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. 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.*

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.

OR:

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".