



PubH 4410-Section 1

Summer Institute in Biostatistics

Summer 2015

Credits:	4 Credits
Meeting Days:	M- F (5 days) for six weeks: June 15, 2015 – July 24, 2015
Meeting Time:	8:30am-10:00am, 10:30am-11:30 am, 1:00pm-3:30pm (most days)
Meeting Place:	Bruininks Hall, Room 530A I (formerly STSS building)
Instructors:	SIBS Core Faculty: Jim Neaton, Susan Telke, John Connett, Greg Grandits, Ann Brearley, Russell Luepker, and Cavan Reilly
Teaching Assistants:	Carrie Groth, Matthew Partridge and Kristine Kubisiak
Office Address:	A460 Mayo Building, Division of Biostatistics
Office Phone:	Megan Schlick SIBS Coordinator: 612-625-5451
Fax:	612-626-0660 (Attn: Megan)
E-mail:	adam0489@umn.edu
Office Hours:	To Be Determined

I. Course Description

Each day will begin with a 1.5-hour lesson guided by a member of the core faculty with focus on one of the four primary content areas: 1) Basic Biostatistics and Epidemiology (Weeks 1, 2, and 3, Telke and Luepker); 2) Clinical Trials (Weeks 4 and 5, Connett and Neaton); and 3) Genetics (Week 6, Reilly). The morning lessons will usually be followed, after a brief break, by a seminar, a debate, or a field trip. In the afternoon students will be engaged in problem solving in our computer laboratory (Grandits and Brearley). Tstudents will learn the basics of SAS through data analysis projects that use public-use data from the Multiple Risk Factor Intervention Trial (MRFIT), and will work on projects in small groups (5 students per group). Students will be asked to prepare brief summary reports for presentation, interpreting assigned data analysis projects and journal articles.

Students will participate in two group projects aimed at developing an understanding of the key pieces of a study protocol, and of the practical and logistical issues involved with implementing a study and collecting and analyzing data. For the former, the students will work together to develop a protocol for a clinical trial of the “polypill” to prevent cardiovascular disease. For the latter, “The Island”, a simulated population, will be used.

The polypill project will be carried out through the entire 6 week training program. Each week a group of students, designated as the team lead, Protocol Groups 1 to 5, will present a different part of the protocol. At the end of 6 weeks the students will have collectively developed a full study protocol. We chose to use the “polypill” (a single pill that contains blood pressure and lipid lowering treatment and aspirin) as the protocol group project because it builds on several aspects of the course (e.g., absolute risk, thresholds of risk, the additive nature of major CVD risk factors on morbidity and mortality, and clinical trial design principles such as randomization and blinding). It is also a study that is very topical and not without some controversy.

The Island is a population of virtual human beings living in communities with ancestors, living relatives, and family units (3). Each Islander (currently 9,273 alive and 6,401 who have died) has a chance of developing one or more diseases based on genetic, environmental and various infectious processes. In addition to certain characteristics of each individual on the island (such as gender, age, and smoking history), there are over 200 tasks that the user can use to generate values of biological measures (such as blood pressure, heart rate, and cholesterol) or apply an intervention (such as taking a pharmacologic agent or exercise) to the individual. The Island is intentionally a large, open-ended environment, providing little or no directions on how to conduct research. For example, there is not an easy way to randomize and then collect data on subjects all at once. Mimicking real world experience, students must contact each participant, determine eligibility, request consent (which can be denied), track contact information, apply treatment, and then return to each participant separately to collect outcome data (participants may move to a new city or experience competing events). The onus is on the students to design the study, collect and record the data, and analyze and interpret the study results.

We plan to use The Island for an experimental project (e.g., a study of the effects of caffeine on heart rate, blood pressure and running time). Each student group will conduct a separate experiment on The Island beginning in week 3 and report their results during Week 6.

II. Course Prerequisites

Registration with permission of instructor only

III. Course Goals and Objectives (Note: Field trips are subject to date modifications)

Learning Objectives for Week 1:

- Recognize different research study designs and potential implications for interpretation of results.
- Define outcomes (dependent variables) and predictors (independent variables).
- Calculate and interpret odds ratios, relative risks, sensitivity, specificity and positive predictive values for 2X2 tables.
- Distinguish between linear and logistic regression; and interpret regression coefficients.
- Learn about the MRFIT study. Read MRFIT data files into SAS, learn the basics of the SAS data step, compute new variables, and learn SAS procedures for basic data summaries, hypothesis testing, linear and logistic regression.
- Understand the basic anatomy and physiology of the cardiovascular system, common diseases affecting the heart, and the burden of CVD in the U.S. and around the world.
- Understand the key sections of a study protocol and read about the polypill.
- Begin to have appreciation of career opportunities for biostatisticians.
- Get to know biostatistics faculty, fellow SIBS students, and current Minnesota biostatistics MS and PhD students through planned social functions.

Learning Objectives for Week 2:

- Compute crude and adjusted odds ratio estimates using logistic regression.
- Understand absolute risk, relative risk and attributable risk estimates.
- Understand simple models for causation and confounding.
- Use SAS procedures to carry out cross-sectional analyses in MRFIT using logistic regression analysis; use SAS procedures to study predictors of time-to-event outcomes such as coronary heart disease mortality in MRFIT.
- Learn how collaborative teams worked together to carry out important studies in lung health.
- Understand the key elements of a protocol: background and rationale, treatment, and endpoints.
- See how biostatisticians in a contract research organization (NAMSA) support the design, conduct and analysis of trials.
- Understand the breadth of biostatistical applications in public health by visiting with the Dean of the School of Public Health and faculty over lunch.

Learning Objectives for Week 3:

- Compute Kaplan-Meier estimates of time-to-event data; compare survival curves using log-rank statistics.
- Perform proportional hazards regression; and interpret regression coefficients.
- Learn basic repeated measures analysis techniques.
- Appreciate basic approaches to spatial statistics.
- Understand key elements of a protocol: inclusion and exclusion criteria.
- Understand the importance of applied and basic research.
- Learn about the fundamental role of biostatisticians employed in research positions at the Mayo Clinic.
- Discover how biostatisticians in the BDAC at the University of Minnesota are key members of collaborative research teams involved in the latest medical research investigations.
- Gain an appreciation of life as a graduate student in biostatistics.
- Get to know biostatistics faculty in a casual setting through planned social functions.

Learning Objectives for Week 4:

- Understand the importance of randomization and blinding in clinical trials.
- Know the difference between surrogate and clinical outcomes.
- Learn how participants are recruited for clinical trials.
- Understand how randomization schedules are generated.
- Using MRFIT data, carry out treatment comparisons for the two randomized groups, Special Intervention and Usual Care.
- Learn about ethical issues in clinical research.
- Understand key elements of a protocol: treatment allocation, blinding, and data collection plan.
- Understand how clinical trials can influence guidelines for the prevention and treatment of disease.
- Visit the Beating Heart Laboratory at the University of Minnesota to see how data are gathered in the operational laboratory setting.
- Discover the latest research in the detection of cardiovascular disease at the Rasmussen Center CVD Prevention Clinic

Learning Objectives for Week 5:

- Understand sample size considerations for trials and appreciate sensitivity of sample size to the hypothesized treatment difference and variability of response.

- Describe how interim results of trials are monitored and hear about some major trials that were stopped early for benefit or harm.
- Understand how clinical trials can change our thinking about how interventions work.
- Learn about cutting edge research in heart disease using stem cells.
- Understand key elements of a protocol: sample size justification.
- Understand how to critically read a clinical trial report.
- Understand practical and logistical issues around implementing a clinical trial through work on the Island experiment.
- Visit laboratories and clinics where data are generated to gain an appreciation of how data arise at the Minnesota Department of Health.
- Discover how biostatisticians at Medtronic work within the field of medical device investigation.

Learning Objectives for Week 6:

- Understand the basics of genetic material in a cell and the differences between genes, genetic markers, alleles and genotypes.
- Define allele and genotypic associations.
- Gain an understanding of false positive and false negative rates.
- Recognize the several potential areas of emphasis within the field of biostatistics.
- Develop competence in the communication of scientific study results through writing and oral presentation of the “polypill” study results.
- Understand key elements of a protocol: interim and final analysis plans.
- Inspire students to, and give practical advice on how to, apply for graduate school in the field of biostatistics.
- Conclude with a celebration of successful completion of the program by students that includes the biostatistics faculty and current Minnesota biostatistics MS and PhD students.
- Provide opportunity for student feedback about our program and make certain we have contact information for future connections with the core teaching faculty.

IV. Methods of Instruction and Work Expectations

- Morning lessons / lectures and seminars
- Afternoon active-learning labs
- Readings from textbooks and published journal articles
- Mini-presentations related to lab assignments
- Two group projects with presentations
- Students should be aware that attendance and active participation are requirements to receive credit in this course

V. Course Text and Readings

Four textbooks are provided to the students online through the University of Minnesota library:

- [Regression Methods in Biostatistics](#) by Vittinghoff, Glidden, Shiboski, McCulloch
- [Genomes 2nd Edition](#) by Terence A Brown
- [Fundamentals of Clinical Trials](#) by Friedman, Furberg and DeMets
- [Epidemiology Fourth Edition](#) by Leon Gordis

Additional journal articles will be provided throughout the six weeks.

VI. Course Outline/Weekly Tentative Schedule

SIBS 2015 Google Calendar:

https://www.google.com/calendar/embed?src=umn.edu_7mb32fhkmtj0pleto32c9j7fd8%40group.calendar.google.com&ctz=America/Chicago

The course outline and all course materials are located on the Moodle course site:

<https://ay14.moodle.umn.edu/course/view.php?id=14789>. (Note: You must log into the site using your X.500 username and password.)

VII. Evaluation and Grading

Students who have complete attendance and who have actively participated in all projects and laboratory assignments will be considered to have outstanding achievement. Students who fail to attend lectures and do not participate fully in projects and assignments will receive lower scores as outlined below.

- 20% participation in in-class discussions of the morning lectures and seminars
- 50% completion of laboratory work in SAS (and a little R)
- 15% “polypill” group project and presentation
- 15% “Island” group project and presentation

A = 93-100%	(4.0) Represents achievement that is outstanding relative to the level necessary to meet course requirements.
A- = 90-92%	
B+ = 87-89%	
B = 83-86%	(3.0) Represents achievement that is significantly above the level necessary to meet course requirements.
B- = 80-82%	
C+ = 77-79%	
C = 73-76%	(2.0) Represents achievement that meets the minimum course requirements.
C- = 70-72%	
F =	Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

Course Evaluation

Beginning in fall 2008, the SPH will collect student course evaluations electronically using a software system called CourseEval: www.sph.umn.edu/courseeval. 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>.

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. *[Customize with names and contact information as appropriate for the course/college/campus.]*

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

Template update 9/2013