Statistical Methods in Public Health II
Biostatistics 140.622

October 29 - December 19, 2019

Department of Biostatistics
Johns Hopkins University
Bloomberg School of Public Health

Faculty Instructors:
Marie Diener-West, PhD
Karen Bandeen-Roche, PhD
COURSE SCHEDULE AND READINGS
STATISTICAL METHODS IN PUBLIC HEALTH II (140.622)
SECOND TERM
October 29 - December 19, 2019

Faculty Lecturers:
Marie Diener-West, PhD (Section 140.621.01)
Office W1015 or E3148, 410-502-6894, mdiener@jhu.edu

Karen Bandeen-Roche, PhD (Section 140.621.02)
Office E3527, 410-955-3067, kbandee1@jhu.edu

Department of Biostatistics
Johns Hopkins University
Bloomberg School of Public Health

Lectures: 10:30 am - 12:00 pm – Tuesday and Thursday

Sommer Hall (E2014) - Section 140.621
Sheldon Lecture Hall (W1214) - Section 140.621.02
Overflow Rooms with transmission from Sommer Hall: W4030 and W3030

Lab 140.921.xx: for review of material through a structured exercise and time for questions:

Lab 01 Monday, 1:30 pm - 3:00 pm - W5030
Lab 02 Tuesday, 1:30 pm - 3:00 pm - W5030
Lab 03 Wednesday, 1:30 pm - 3:00 pm - W5030
Lab 04 Thursday, 1:30 pm - 3:00 pm - W5030
Lab 05 Friday, 1:30 pm - 3:00 pm - W5030
Lab 06 Monday, 3:30 pm - 5:00 pm - W5030
Lab 07 Tuesday, 3:30 pm - 5:00 pm - W5030
Lab 08 Wednesday, 3:30 pm - 5:00 pm - W5030
Lab 09 Thursday, 3:30 pm - 5:00 pm - W5030
Lab 10 R LAB: Friday, 3:30- 5:00 pm – W5030

There is open time for questions with two lab instructors between 3:00 pm -- 3:30 p.m. each day.
Lab Instructors:
Karen Bandeen-Roche, PhD
Marie Diener-West, PhD
Sophie Berube (Lead TA)
Jacob Fiksel (Lead TA)
Jason Ji (Lead TA)
Albert Kuo (Lead TA)

Teaching Assistants:
Eric Bridgeford
Justin Chun
Debangan Dey
Lacey Etzkorn
Brian Gilbert
Haley Grant
Kening Jiang
Heesu Kim
Fangyu Liu
Jingmiao Long
Arkajyoti Saha
Nikki Shen
Bingkai Wang
Siruo Wang
Jingning Zhang
Yifan Zhang

Teaching Assistant Office Hours (optional):
Monday through Friday 12:15 pm - 1:15 pm in W2009

Teaching Assistant Office Hours in Computer Lab (optional):
Monday through Friday 2:30 pm - 3:20 pm in W3025
CoursePlus Site:
Available through CoursePlus: Course schedule, lecture notes, self-evaluation problems, Stata or R lecture notes, problem sets, data sets and solutions, quiz and exam solutions. Purchase of hardcopy material is included in registration. Lecture capture recordings from each lecture are recorded using Panopto.

Suggested Books:
There are no required books for this course. Most introductory statistics textbooks will provide background information. In addition, there are online resources, such as http://onlinestatbook.com/
Some helpful books are:
Lawrence C. Hamilton, Statistics with Stata 12, 2012, Duxbury, Thomson Brooks/Cole, Belmont,

Handheld Calculator:
A handheld calculator is needed for quizzes and examinations. Basic functions should include (+, -, *, /), logarithms and exponents, simple memory and recall, factorial key.

Statistical Computing Package:
Stata 16 Intercooled, Stata Press, College Station, Texas
(Buy through http://www.stata.com/order/new/edu/gradplans/student-pricing/) 
This course supports the use of Stata as a statistical analysis package for laboratory exercises and problem sets.
R software
We also support the use of the R freeware by offering a smaller R Users Group for students who have had prior programming experience and have a rationale for learning R. The lab for the R Users Group is on Fridays from 3:30 -4:50 pm. The R Users Group from first term will continue in second term.

COURSE SCHEDULE AND READINGS
Course Policies:

- Please email your faculty lecturer (Dr. Diener-West or Dr. Bandeen-Roche) regarding extenuating circumstances or conflicts regarding course deadlines.
- Attendance is required for quizzes and exams and expected for lectures and labs.
- Laptops and iPads may be used during lecture for class-related purposes. Common courtesy should be followed.
- Availability for course questions: after lecture, during labs, TA office hours, and Stata office hours.

Exam Policy:

Course exam dates will be provided to students on the first day of class, as well as posted in the syllabus on CoursePlus. Students are expected to take examinations at the assigned times and on the assigned dates.

Previous Conflicts
Students who have a legitimate conflict (e.g., clinical responsibilities, research presentations including travel, jury duty and other court appearances, weddings and personal travel, that were scheduled before the start of the class) with the scheduled exam dates must inform their faculty lecturer in writing via email at least two weeks prior to the scheduled exam date. If conflicts arise within two weeks of the scheduled exam date, the lecturer should be informed in writing immediately and students must provide documentation (e.g. letter from medical provider, school representative, or conference organizer) of the conflict.

Sudden Illness
Students who are not well on or near the exam date must provide medical documentation in the form of a statement on the medical provider’s letterhead and based on a clinic visit within two days of the missed exam.

Tardiness
Students who are late for the exam will be given the remaining period of time to complete the exam (that is, they will not be granted additional time). If there is an unforeseen event outside the student’s control (such as a traffic accident) that causes tardiness and the student calls the course coordinator to report the impending tardiness, accommodations may be made at the discretion of the faculty.

Unexpected Emergency
Students who experience an unexpected severe personal or family emergency during the course should contact their faculty lecturer as soon as possible. Each case will be handled separately and reasonable effort will be made to allow for completing in a timely fashion missed work and/or exams with the approval of the course faculty lecturers.
Exam Policy (continued):

Scheduled of Make-up Exams
Exams will typically be re-scheduled after the posted exam date. Students typically will have no more than one week after the scheduled exam date to take a make-up exam. However, exceptions may be made at the discretion of the faculty for an exam to be rescheduled one or two days prior to the scheduled exam date. Or, for intractable legitimate conflicts, an alternative such as a take-home exam may be offered.

If the lecturer is not notified of conflicts prior to the exam, medical documentation is not provided for an illness or the make-up exam is not scheduled according to the procedures described above, students will receive no points for the exam towards their course grade.

Course Grade:

- 20% completion of 4 problem sets (1 point is deducted for each day if turned in late)
- 5% quiz 1 (through CoursePlus)
- 5% quiz 2 (through CoursePlus)
- 35% midterm examination (in class)
- 35% final examination (in class)

Quizzes and examinations are individual work for which a student must work by himself or herself.

Problem sets may be worked on together and discussed. However, each student must write up the problem set individually using his or her own words. Copying work is not allowed.

Academic Ethics Code:

- The code, discussed in the Policy and Procedure Memorandum for Students, March 31, 2002, will be adhered to in this class
  https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/Policy\ProcedureMemoranda/Students\_01\_Academic\_Ethics.pdf
- Students enrolled in the Bloomberg School of Public Health of The Johns Hopkins University assume an obligation to conduct themselves in a manner appropriate to the University's mission as an institution of higher education. A student is obligated to refrain from acts which he or she knows, or under the circumstances has reason to know, impair the academic integrity of the University.
Disability Support Services:

If you are a student with a documented disability who requires an academic accommodation, please contact Ms. Betty Addison in the Office of Career Services and Disability Support: dss@jhsph.edu, 410-955-3034, or Room W1600.

Health and Well-Being

Johns Hopkins University is committed to helping you thrive personally and professionally and providing an environment that supports your health and well-being. Please contact your professors (Dr. Diener-West and Dr. Bandeen-Roche) who are always available to meet with you to discuss any situation that you encounter.

We also encourage you to seek support from the following JHU resources, particularly if you are experiencing anxiety, stress, depression, or other concerns related to your health and well-being.

The Office of Student Life at JHSPH is available to assist students by providing support in navigating resources pertaining to personal and academic challenges. If you would like to schedule a one-on-one appointment with a staff member in the Office of Student life, you can contact the Office of Student Life at jhsph-studentlife@jhu.edu or 410-502-2487.

Students can also contact the Johns Hopkins Student Assistance Program (JHSAP) which provides resources to assist students across the Johns Hopkins community with any pressures and difficulties they may face during their academic careers. Getting help is free, convenient, and confidential. Counselors are available to speak with you 24 hours a day, 7 days a week at 443-287-7000. Services include: Short-term counseling, crisis response, healthy relationship support, school-life coaching and adjustment and educational workshops.

Full-time, Baltimore-based students also have access to University Health Services (UHS) through the student health fee, which offers primary care and mental health clinical services and wellness initiatives. UHS-Mental Health provides psychiatric assessment and follow-up, medication management and individual psychotherapy. To make an appointment, call 410-955-1892.

Students in need of support regarding sexual assault and/or sexual violence can find resources and information on the University's Sexual Assault Response and Prevention webpage.

If you or someone you know is in crisis, call JHSAP at 443-287-7000 for help immediately. In an emergency, call 911 or go to the nearest emergency room.
Course Objectives:

Students who successfully master this course will be able to:

1. Use statistical reasoning to formulate public health questions in quantitative terms.
2. Distinguish between the appropriate generalized linear models for expressing the relationship between a response and one or more independent variables.
3. Recognize the assumptions required in using regression models and performing statistical tests to assess relationships between an outcome and a risk factor.
4. Use statistical methods for inference, including confidence intervals and tests, to draw valid public health inferences from study data.
5. Formulate and correctly interpret relationships in a linear regression model.
6. Interpret the correlation coefficient as a measure of the strength of a linear association between a continuous response variable and a continuous predictor variable.
7. Interpret the coefficients, including interaction coefficients, obtained from a multiple linear regression analysis.
8. Estimate and interpret the linear regression coefficients and their associated confidence intervals.
9. Assess whether the relationship between a response variable and an independent variable varies by the level of a second independent variable using analysis of covariance.
10. Distinguish the summary measures of association applicable to retrospective and prospective study designs.
11. Estimate two proportions and their difference, and confidence intervals for each. Interpret the interval estimates within a scientific context. Recognize the importance of other sources of uncertainty beyond those captured by the confidence interval.
12. Estimate an odds ratio or relative and its associated confidence interval. Explain the difference between the two and when each is appropriate.
13. Interpret the coefficients, including interaction coefficients, obtained from a multiple logistic regression analysis.
14. Recognize the influence of sample size on statistical inferences.
15. Use the Stata statistical analysis or R packages to perform regression analyses.

The course is designed to enable students to develop their data analysis skills. Important datasets will be analyzed by the students throughout the 621-623 course sequence.
<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Topic</th>
<th>Suggested Reading*</th>
<th>(+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oct 29</td>
<td>Simple linear regression: correlation, prediction</td>
<td>427-465 (11.1-11.4; 11.7-11.8)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Oct 31</td>
<td>Simple linear regression: inference, residual analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nov 5</td>
<td>Simple linear regression: indicator variables (ANCOVA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Nov 7</td>
<td>Multiple linear regression: inference, ANCOVA, splines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Nov 12</td>
<td>Multiple linear regression: checks, cross-validation,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>model selection 468-483</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PROBLEM SET 1 DUE by 11:59 pm</strong> REVISED DATE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Nov 14</td>
<td>Multiple linear regression: nested model comparisons;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>prediction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Nov 19</td>
<td>Multiple linear regression: detailed example</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nov 21</td>
<td>Multiple linear regression: detailed example</td>
<td>(Class 7 continued)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PROBLEM SET 2 DUE by 11:59 pm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Nov 26</td>
<td>MIDTERM EXAMINATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Nov 28</td>
<td>THANKSGIVING HOLIDAY (NO CLASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Dec 3</td>
<td>Inferences for proportions: one sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ch 7.1-7.4, 7.7 (10.1-10.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inferences for differences in proportions: two samples</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ch 8.4-8.7 (10.6-10.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inferences for paired samples; McNemar’s test</td>
<td>Ch 8.2 (10.4)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Dec 5</td>
<td>Simple logistic regression: correlation, prediction,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>checking assumptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>377-380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dec 10</td>
<td>Multiple logistic regression: interaction model, splines</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PROBLEM SET 3 DUE BY 11:59 pm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dec 12</td>
<td>Multiple logistic regression: prediction, cross-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>validation, model selection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>391-394</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Dec 17</td>
<td>Multiple logistic regression: detailed example</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PROBLEM SET 4 DUE by 11:59 pm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Dec 19</td>
<td>FINAL EXAMINATION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


+Fundamentals of Biostatistics by Rosner (8th Edition) - chapter sections