Course Title: Applied Regression Analysis for Public Health Studies

Course Number: BIST 0551J

Course Location: Lectures in RM 334, School of Public Health, Piscataway, NJ; LifeSize to SSB RM 741, Newark, NJ [vice versa on selected days; see the schedule]

Course Date & Time: Tuesday, 6:00 – 8:00 PM

Course Instructor: Sinae Kim, PhD., Assistant Professor Biostatistics, Rutgers School of Public Health sinae.kim@rutgers.edu & (732) 235-8816

Office Hours: Tuesday, 4:30 - 5:30PM, RM 130 (1st floor of SPH, Piscataway, NJ); Office hours in Newark (TBD)

Course Assistant: Wenxuan Xiong, wx70@sph.rutgers.edu (her office hours will be posted in the Canvas)


Additional/Supplemental Readings/Resources:


Course Description: This course introduces students in graduate programs in public health to regression analyses methods. The primary topics are simple, multiple linear regression models, including analysis of covariance (ANCOVA), model diagnostics and model building. Logistic regression for binary outcome will also be introduced. The emphasis will be interpretation and applications. Students will learn how to use SAS for implementing regression analyses.

Selected Concentration Competencies Addressed: Each Concentration identifies competencies for each degree offered. The competencies addressed in this course for the MPH in Biostatistics include:

- Integrate relevant scientific background to design experimental and observational studies in biomedical, clinical and public health research;
- Use statistical computer packages to organize, analyze and report collected data;
- Review and critique statistical methods and interpretations presented in published research studies, presentations or reports; and
- Communicate the results of statistical studies both in writing and orally to investigators and lay community members.
Course Objectives: By the completion of this course, students will be able to:

- Understand the fundamental concepts and assumptions of regression;
- Develop the ability to apply these concepts correctly using statistical software; and
- Develop the ability to interpret the results of an analysis properly.

Course Requirements and Grading:

- Course evaluation
  1. Midterm Examination (in class, closed book) 25%
  2. Final Examination (in class, closed book) 25%
  3. Homework (5 - 6 assignments) 20%
  4. Canvas/Poll-based exercise (participation) 10%
     - Class participation can be of various formats;
     - Poll exercise: Participating in polls (using devices), answering questions right before class
     - Canvas: weekly short quiz will be posted
     - Completeness of the activity is the key; not the correctness.
  5. Data analysis project 20%
     - Data analysis plan 5% (Due 09/25/2018)
     - Exploratory analyses 15% (Due 10/09/2018)
     - Analyses using simple linear regression 20% (Due 11/06/2018)
     - Analyses using multiple linear regression including diagnostics and model building 30%
       (Due 11/27/2018)
     - Final report 25% (Due 12/11/2018)
     - Peer evaluation within group 5% (Due 12/13/2018)

Total: 100%

- Data analysis report: A group of students (2 - 3 per group) will complete a full analysis (linear regression) of a set of data that contains a continuous measured response and multiple covariates (at least 7 covariates, any type) and write a group report (details will be followed in March). Each group provides a set of data, which should NOT be used for any group member’s fieldwork. The emphasis should be on the statistical methodology and how it is applied and the results are interpreted. A plan will be due on September 25. The plan should include a full description of the data set and variables to be used, and a set of clearly defined hypotheses. The final report is due on December 11.

- Grading policy
  1. Homework will be collected at the beginning of lecture on due date. Unless notifying the instructor beforehand, later submission of homework will NOT be graded.
2. On all homework assignments/problem sets, students are encouraged to discuss with one another, but **work should be carried out and written up independently**. If any two identical write-ups are found, both homework assignments are considered failed.

3. It is the students' responsibility to make their papers legible. Unreadable work will NOT be graded.

4. The students are asked to answer each question as accurately and concisely as possible. **If it is necessary to attach the computer output with the homework assignment, ONLY the “essential” segments are required.** DO NOT SUBMIT the complete output section or the log file. Otherwise, 50% of the points will be taken away.

**Course Schedule:** This table provides a general plan for the course; some deviations may be necessary. Please visit the course web in the Canvas on a regular basis to check any update regarding ‘Online activity’; [P] = LifeSize from Piscataway to Newark; [N] = LifeSize from Newark to Piscataway

| Date  | Week | Course overview;

**Online activity:** review on intro biostatistics [watch YouTube videos listed below to review]

[https://www.youtube.com/watch?v=z0Ry_3_qhDw](https://www.youtube.com/watch?v=z0Ry_3_qhDw) [Introduction to Sampling distribution]

[https://www.youtube.com/watch?v=KS6KEWaoOQE](https://www.youtube.com/watch?v=KS6KEWaoOQE) [Hypothesis testing]

[https://www.youtube.com/watch?v=5ABpqVSx33I](https://www.youtube.com/watch?v=5ABpqVSx33I) [Z-test vs. t-test]

**In-class lecture:** measuring association; correlation coefficient (chap 4, 6)

| Date  | Week | **Online activity:** review on correlation coefficient and simple linear regression

**In-class lecture:** Introduction to simple linear regression with model assumptions and interpretation; regression parameter estimation and inference including confidence interval & hypothesis testing; applications (chap 5, 7);

HW1 assignment will be posted
<table>
<thead>
<tr>
<th>Date</th>
<th>#</th>
<th><strong>Activity</strong></th>
</tr>
</thead>
</table>
| 09/18 | 3 | **Online activity:** review on SLR testing procedure  
**In-class lecture:** Continued in estimation of regression parameters; prediction and predictive interval; assessing model fit (chap 5, 7)  
HW1 DUE  
HW2 assignment will be posted |
| 09/25 | 4 | **Online activity:** review on SLR prediction and model fit  
**In-class lecture:** Residual analysis to check model assumptions; (chap 14.1 – 14.4); discussion on HW1;  
HW2 DUE; Data analysis plan DUE  
HW3 assignment will be posted |
| 10/02 | 5 | **Online activity:** review on SLR residual analysis  
**In-class lecture:** Continued in model diagnostics (outlier; leverage point; influential point) (chap 14.1-14.4); Discussion on HW2 |
| 10/09 | 6 | **Online activity:** review on model diagnostics (outliers)  
**In-class lecture:** Introduction of multiple linear regression (MLR); interpretation and point estimation (chap 8); Discussion on HW3;  
HW4 assignment will be posted  
Data analysis project: exploratory analyses DUE |
| 10/16 | 7 | **Online activity:** review on MLR estimation  
**In-class lecture:** Inference procedure in MLR including confidence interval and hypothesis testing for a single variable; categorical covariates in MLR (chap 9, 10, 12);  
HW4 DUE |
<p>| 10/23 | 8 | <strong>Online activity:</strong> review on MLR hypothesis testing and categorical covariates in MLR |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Activity</th>
<th>Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/30</td>
<td>N</td>
<td>Mid-term</td>
<td>(based on lecture notes 1-7)</td>
</tr>
<tr>
<td>11/06</td>
<td>N</td>
<td>Online activity</td>
<td>review on Binomial distribution [preparing for logistic regression]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-class lecture</td>
<td>Testing for multiple effects using F test (chap 9, 10); discussion on midterm exam;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data analysis project</td>
<td>analyses using simple linear regression DUE</td>
</tr>
<tr>
<td>11/13</td>
<td>P</td>
<td>Online activity</td>
<td>review on partial F-tests</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-class lecture</td>
<td>Model building and checking (chap 14, 16); HW5 assignment will be posted</td>
</tr>
<tr>
<td>11/27</td>
<td>P</td>
<td>Online activity</td>
<td>review on model building and checking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-class lecture</td>
<td>introduction to logistic regression models; maximum likelihood estimation (chap 21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HW5 DUE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data analysis project</td>
<td>multiple linear regression analyses DUE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HW6 assignment will be posted</td>
<td></td>
</tr>
<tr>
<td>12/04</td>
<td>N</td>
<td>Online activity</td>
<td>review on interpretation for the parameters of logistic regression models</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-class lecture</td>
<td>Parameter estimation and inference; goodness-of-fit test; model checking; examples; introduction of ungrouped data (chap 22); discussion on HW5</td>
</tr>
<tr>
<td>12/11</td>
<td>P</td>
<td>Online activity</td>
<td>review on the inference procedure of logistic regression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-class lecture</td>
<td>Logistic regression models II: ungrouped data goodness-of-fit; review for final exam; discussion on HW6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HW6 DUE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data analysis report DUE</td>
<td></td>
</tr>
</tbody>
</table>
Learning Management System: Moodle will be used extensively throughout the semester for course syllabus, assignments, announcements, communication and/or other course-related activities. It is the student's responsibility to familiarize themselves with Moodle and check it regularly. If you have difficulties accessing Moodle, please inform the instructor and Moodle Support (moodlehelp@ca.rutgers.edu). Moodle is accessible at moodle.rutgers.edu.

School of Public Health Honor Code: The School of Public Health Honor Code is found in the student bulletin (sph.rutgers.edu/academics/catalog/index.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the school community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Students with Disabilities: Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student must Apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at ods.rutgers.edu. The student will also be required to participate in an ODS intake interview and provide documentation. If reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

Graduate Student Computer Policy: Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at: sph.rutgers.edu/student_life/computer_requirements.html

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems: When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.

Withdrawal/Refund Schedule: Students who stop attending their course(s) without processing an Add/Drop Course form will receive a failing grade. Furthermore, students dropping to zero credits for the semester are considered withdrawn and must submit a completed Leave of Absence form from the School of Public Health's Office of Student Affairs. The School of Public Health refunds tuition only. Administrative and technology fees are non-refundable. You may find the Withdrawal/Refund Schedule on the School of Public Health website at: sph.rutgers.edu/academics/registration/school_calendars.html