UCLA FIELDING SCHOOL OF PUBLIC HEALTH

Course: **BIOSTAT 200C: Methods in Biostatistics C**
Term: Spring 2022
Credits: 4

COURSE SYLLABUS

A. Overview

Course Description	Designed for students pursuing graduate degrees in biostatistics. Generalized linear models, description, and analysis of discrete data with applications to public health. Students are trained to identify different types of discrete data; use statistical software R to manage, summarize, and analyze data; use appropriate statistical techniques for analyzing public health data using generalized linear models; apply generalized estimating equations for analyzing longitudinal data; and write formal statistical report of data analysis for public health researcher.
Prerequisites	BIOSTAT 200A,B
Instructor	Zhe Fei, PhD Assistant Professor In-Residence Department of Biostatistics UCLA Fielding School of Public Health (FSPH) Office: CHS 21-293D Phone: (310)825-9786 Email: feiz@ucla.edu
Class Days, Times, Location	Tuesday: 10am-11:50am, Thursday: 10am-10:50am Discussion: Thursday: 11am-11:50am Location: CHS 51-279
Office Hours	Tuesday: 9am-10am Location: CHS 21-293D
Teaching Assistant	**KELSEY ISHIMOTO** **kmishimoto@g.ucla.edu** Lab: Thu 3:00 – 3:50 pm / 4:00 – 4:50 pm Location: CHS 61-262 Office hour: Mon 12-1 pm/Wed 9-10am Location: CHS A1-279
Course Texts	***Extending the Linear Model with R (2nd edition)*** by Julian Faraway. Chapman and Hall/CRC. (2016). ***An Introduction to Generalized Linear Models (4th Edition)*** by Annette J. Dobson, Adrian G. Barnett. Chapman and Hall/CRC.
Required Readings	Reading for a particular class should be completed before coming to class.

Course Format	Lecture (3 hour) with lab (1 hour).
Classroom Participation & Attendance	Class attendance is an important and necessary element for successful completion of the class. You are expected to attend every lab, discussion and lecture session.
UCLA ADA Policy	Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. When possible, students should contact the CAE within the first two weeks of the term as reasonable notice is needed to coordinate accommodations. For more information visit www.cae.ucla.edu.
ADA Contact	Nickey Woods Center for Accessible Education A255 Murphy Hall Phone: (310) 825-1501 TTY / TTD: (310) 206-6083 Fax: (310) 825-9656
Inclusivity	UCLA's Office for Equity, Diversity, and Inclusion provides resources, events, and information about current initiatives at UCLA to support equality for all members of the UCLA community. I hope that you will communicate with me or your TA if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the Office of Equity, Diversity, and Inclusion on their website (https://equity.ucla.edu/).

B. Learning Objectives

The following concentration competencies in Biostatistics are addressed in this course using the course objectives along with the assessment that will evaluate students' attainment of these objectives.

Course Objectives	Support these Concentration Competencies	Assessment Opportunity

Able to identify different types of discrete data that arise naturally in the health sciences and appreciate their unique features and use in public health research. Able to use the statistical software package to efficiently manage, summarize and analyze data, including all gate-keeping activities in an on-going study.	MS2: Examine foundations of linear and generalized linear statistical models MS3: Employ computational methods of applied regression to analysis of biomedical data sets PHD1: Demonstrate mastery of advanced theory and applications of statistical models	Homework will be assigned about once every two weeks, along with lab work. Each homework will include a theoretical part and a data analysis part. We use R to manage and analyze data in this class. Homework assignment 1: Students are required to demonstrate mastery of logistic regression and use R to analyze a biomedical data set with binary or binomial outcomes. Homework assignment 2: Students are required to demonstrate mastery of Poisson regression and use R to analyze a biomedical data set with count outcomes. Homework assignment 3: Students are required to demonstrate mastery of the theory of generalized linear models. Homework assignment 4: Students are required to demonstrate mastery of the theory of mixed models and use R to analyze a biomedical longitudinal data set. Homework assignment 5: Students are required to demonstrate mastery of the theory of generalized additive models and regression trees and use R to analyze a biomedical data set.

		Both the mid-term and the final exam will be 1 hour 50 mins closed book tests given in class.

C. Course Assignments & Exams

Homework will be assigned about once every two weeks, along with lab work. We use R to manage and analyze data in this class.

Grading:
--40% Homework and class attendance
--30% Mid-term exam
--30% Final exam

Grading Scale:

Grade Point:	4.0	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0
Final Percentage:	100-98	97-93	92-90	89-88	87-83	82-80	79-78	77-73	72-70	69-68	67-63	62-60	<60
Letter Grade:	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Course Exams Schedule

Both the mid-term and the final exam will be 1 hour 50 mins closed book tests given in class.

D. Course Policies & UCLA Policies

Message about Academic Integrity to all UCLA Students from UCLA Dean of Students: UCLA is a community of scholars. In this community, all members including faculty, staff and students alike are responsible for maintaining standards of academic honesty. As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. You are evaluated on your own merits. Cheating, plagiarism, collaborative work, multiple submissions without the

permission of the professor, or other kinds of academic dishonesty are considered unacceptable behavior and will result in formal disciplinary proceedings usually resulting in **suspension** or **dismissal**.

Forms of Academic Dishonesty: As specified in the UCLA Student Conduct Code, violations or attempted violations of academic dishonesty include, but are not limited to, cheating, fabrication, plagiarism, multiple submissions or facilitating academic dishonesty:

Cheating: Unauthorized acquiring of knowledge of an examination or part of an examination

- Allowing another person to take a quiz, exam, or similar evaluation for you
- Using unauthorized material, information, or study aids in any academic exercise or examination – textbook, notes, formula list, calculator, etc.
- Unauthorized collaboration in providing or requesting assistance, such as sharing information
- Unauthorized use of someone else's data in completing a computer exercise
- Altering a graded exam or assignment and requesting that it be regraded

Plagiarism: Presenting another's words or ideas as if they were one's own

- Submitting as your own through purchase or otherwise, part of or an entire work produced verbatim by someone else
- Paraphrasing ideas, data or writing without properly acknowledging the source
- Unauthorized transfer and use of someone else's computer file as your own
- Unauthorized use of someone else's data in completing a computer exercise

Multiple Submissions: Submitting the same work (with exact or similar content) in more than one class without permission from the instructor to do so. This includes courses you are currently taking, as well as courses you might take in another quarter

Facilitating Academic Dishonesty: Participating in any action that compromises the integrity if the academic standards of the University; assisting another to commit an act of academic dishonesty

- Taking a quiz, exam, or similar evaluation in place of another person
- Allowing another student to copy from you
- Providing material or other information to another student with knowledge that such assistance could be used in any of the violations stated above (e.g., giving test information to students in other discussion sections of the same course)

Fabrication: Falsification or invention of any information in an academic exercise

- Altering data to support research
- Presenting results from research that was not performed
- Crediting source material that was not used for research

While you are here at UCLA, if you are unsure whether what you are considering doing is cheating, **don't take chances**, ask your professor. In addition, avoid placing yourself in situations which might lead your professor to **suspect you of cheating**.

Alternatives to Academic Dishonesty

- **Seek out help** – Meet with your professor, ask for assistance as needed.
- **Ask for an extension** – if you explain your situation to your professor, she/he might be able to grant you an extended deadline for an upcoming assignment.
- **See a counselor** at Student Psychological Services, and/or your school, college or department – UCLA has many resources for students who are feeling the stresses of academic and personal pressures.

If you would like more information, please come see us at the Dean of Students' Office in 1206 Murphy Hall, call us at (310) 825-3871 or visit their website at www.deanofstudents.ucla.edu.

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E. Course Outline

This schedule may subject to change as the quarter progresses, according to student enrollment and needs.

Time	Syllabus for Biostat 200C: Course coverage in this class follows roughly the sequence given in the textbook with supplementary materials provided in class or online. **Lecture**	**Lab**
Week 1	**Lectures 1, 2 and 3**: Describe class structure: organization, expectation and coursework. Review mathematical statistical background expected of students. Definition and properties of multivariate normally distributed variables.	**Lab 1**: Introduction to R. Review basic R commands for summarizing, analyzing and graphing data etc.
Week 2	**Lectures 4, 5 and 6:** Distribution of quadratic forms. Review of basic likelihood theory. Introduction to exponential families and generalized linear models.	**Lab 2:** Data management commands in R.
Week 3	**Lectures 7, 8 and 9:** Examples and estimation procedures for generalized linear models. Logistic Models.	**Lab 3:** Familiarize yourself with R commands useful for analyzing the logistic and ordered logit, including graphical diagnostic plots.
Week 4	**Lectures 10, 11 and 12:** Sampling distribution for score statistics, log-likelihood ratio statistics and sampling distribution for the deviance. Poisson regression models.	**Lab 4:** Commands for Poisson and negative binomial models. Write do files to and analyze different types of discrete data in public health studies.

Week 5	**Lectures 13, 14 and 15: Over-dispersed models: Negative Binomial models. Model fit assessment for generalized linear models.**	**Lab 5: Exercises in fitting generalized linear models and.**
Week 6	**Lectures 16, 17 and 18: Multinomial models. Ordered logit models. Zero- inflated models.**	**Lab 6: Use R to analyze multinomial models, ordered logistic model and zero-inflated models.**
Week 7	**Lectures 19, 20 and 21: Mid-term Exam.** **Generalized estimating equations (GEE) for correlated observations in longitudinal studies.**	**Lab 7: Use GEE commands in R to analyze clustered data sets.**
Week 8	**Lectures 22, 23 and 24: GEE analysis.** **Different types of confidence intervals for proportion.**	**Lab 8: R commands for generating different types of confidence intervals for proportion.**
Week 9	**Lectures 25, 26 and 27: Description, inference and applications for two-way contingency tables using various measures of association.**	**Lab 9: Analyze r x c contingency tables. Commands for drawing inference for 3-way contingency tables. Use Stata to fit and draw inference for log linear models and perform statistical tests.**

Week 10	**Lectures 28, 29 and 30: Analysis of r x c tables and 3-way tables. Log-linear models, three-way tables.**	**Lab 10: Answer questions for class project and summarize material learned in this class.**

F. Competencies

MPH competencies

1.Demonstrate mastery of fundamental concepts of statistical analysis for datasets from health studies.
2.Employ computational methods for analysis of public data sets.
3.Recommend research study designs to support public-health-relevant data analyses.
4.Contribute to the analysis of public health studies in collaborative multidisciplinary teams
5.Prepare written and oral presentations providing public health insights based on statistical analyses.

MS competencies

1.Demonstrate mastery of the foundations of probability theory and biostatistical concepts.
2.Examine foundations of linear and generalized linear statistical models. 3.Employ computational methods of applied regression to analysis of biomedical data sets .4.Provide effective biostatistical advice in collaborative research projects 5.Communicate results of biostatistical research both orally and in writing

PhD competencies

1.Demonstrate mastery of advanced theory and applications of statistical models.2.Develop algorithms to implement advanced biostatistical methodologies. 3.Present effective seminars on biostatistical research and research in public health sciences.4.Promote effective use of biostatistics in collaborative team research on public health problems 5.Develop original research in the theory/methodology of biostatistics and demonstrate its application in a substantive field.