

**Department of Environmental and Radiological Health Sciences
Colorado State University**

ERHS 642 Applied Logistic Regression Spring 2016

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This three credit course focuses on effective model building in epidemiologic studies with dichotomous outcomes. All analyses will be performed in SAS (SAS Institute, Cary, NC) and a brief introduction to SAS will be provided.

Course Objectives

Students successfully completing this course will

- Be able to independently perform all steps of a complex logistic regression analysis of unmatched or matched epidemiological data
- Be able to present all steps of the analysis in a format acceptable for a thesis or dissertation
- Be proficient in SAS

Required Course Materials

- Laptop computer with SAS software
- Hosmer and Lemeshow, Applied Logistic Regression 3rd Ed, Wiley, 2013

Additional reading from the literature will be assigned.

Optional Course Materials

- SAS section of UCLA's Institute for Digital Research and Education: <http://www.ats.ucla.edu/stat/>

Course Set-Up

- Lectures
The material will be presented along with many examples; feel free to ask questions during lectures. Power point slides will be posted on Canvas well in advance of the lecture.
- In-class assignments
In-class assignments are group assignments completed and discussed in class; they are not handed in or graded. In-class assignments allow the student to apply the course material to real life settings, explain methods and results to others, work in a team and think on his/her feet.
- Homework assignments
Homework assignments are handed in and graded. They are meant to show the student's understanding of the course material; working in groups is strongly encouraged but each student must hand in his or her own write-up.
- SAS Manual
Each student must create a SAS manual adding SAS code throughout the semester. The SAS manual allows the student to quickly find relevant SAS code for in-class and homework assignments.
- Midterm and final exam
Both exams are take-home exams and are meant to show the student's ability to apply the course material to a specific research question. **Working in groups or discussing exams with others is not permitted.**

**Please always bring your laptop computer, SAS manual, text book and
PowerPoint slides to class.**

Expectations

You are expected to be respectful to others.

- Attendance
You are expected to attend class regularly and to be on time. Unexcused absences/arriving late will result in a loss of points.
- In-class assignments
You are expected to be part of a group. Working on in-class assignments on your own is contradictory to the learning culture in ERHS 642 and is not permitted.
- Homework assignments
Working in groups is strongly encouraged but each student must hand in his or her own write-up. Homework assignments must be handed in on time. Hard copies (preferred) and email submissions are accepted. To encourage clear, concise, well-reasoned and legible answers to the homework questions, you must follow these rules:
 - Answers must be typed and margins must be at least 1 inch wide
 - Tables must be numbered, embedded in the text and referred to by number (Table 1, Table 2, etc.)
 - Long tables that start on one page and continue on the next page must have title and column headings on both pages
 - Tables cross-classifying exposure and disease must be set up such that columns reflect disease status and rows reflect exposure status
 - The SAS code must be attached in an appendixPoints will be deducted for failure to adhere to these rules.
- SAS Manual
The SAS manual is created throughout the semester. The manual can be printed or electronic; you can use a word processor or an organizational tool such as OneNote.
 - Each student must create his or her own manual
 - The manual must include a table of contents and/or index
 - The manual must be clear and easy to use
 - All SAS code covered in class must be included in the manual
 - Relevant additional information from the SAS Online Documentation must also be included, e.g. additional options for SAS procedures (do not directly copy sections from the SAS Online Documentation!)
- Preparation
Lectures and in-class assignments only benefit all students if everyone comes prepared. Reading assignments are not optional and must be completed by the due date. Preparation will be assessed through 5-minute quizzes on Thursdays starting in week 2. There will be no quiz during the midterm exam week or the final exam week. If you have questions or fall behind, I am happy to help you outside of class. Please let me know if you would like to meet. Also, please take advantage of additional learning opportunities offered by the GTA.
- Texting/checking email
If you text or check your email in class you will be asked to leave.
- Academic integrity
Academic dishonesty has negative effects on you and others. Cheating gives you an unfair advantage, is fraud (you do not have the knowledge or skills your grade and degree suggest you have) and undermines not only the value of a CSU degree but also CSU faculty's trust in students. Cheating will likely cause you regret and doubts about your character and ability to be successful.

For these reasons ERHS 642 adheres to the Academic Integrity Policy of the CSU General Catalog & the Student Conduct Code. Specifically, teamwork on exams is cheating and will not be tolerated. Students caught cheating or attempting to cheat will be reported to the CSU Conflict Resolution and Student Conduct Services (CRSCS) office and will receive a grade of 0 on the exam.

Evaluation

Attendance/on-time arrival	10 points	(1 point is deducted for each unexcused absence or late arrival, up to 10 points)
Preparation/Quizzes	60 points	(12 weeks × 5 points)
Homework assignments	60 points	
SAS Manual	50 points	
Midterm exam	60 points	
Final exam	60 points	
Total	300 points	

Letter grades: A (270-300), B (240-269), C (225-239), D (210-224), F (<210)

Additional Learning Opportunities

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Phone: (970) 491-3878

By appointment

GTA: Charis Ackerson

diaperdays@icloud.com

Office hours/review days TBD

Email

Please feel free to email questions. Allow up to 24 hours for a reply.

Course Outline

Week	Topic
1	Introduction to SAS, Introduction to the logistic regression model
2	Introduction to SAS, Introduction to the logistic regression model
3	Multiple logistic regression
4	Interpretation of the logistic regression model
5	Confounding and interaction in logistic regression
6	Confounding and interaction in logistic regression
7	Assessing the scale of continuous covariates, Numerical problems
8	Assessing the scale of continuous covariates, Numerical problems
	SPRING BREAK
9	Goals of logistic regression analysis, Purposeful selection
10	Stepwise and best subsets selection
11	Disadvantages of automated model selection, Assessing model fit: Overall GOF
12	Assessing model fit: Outliers
13	Prediction
14	Sample size considerations, Logistic regression for matched case-control studies
15	Logistic regression for matched case-control studies

Detailed Course Outline – Weeks 1-8

Wk	Date	Topic	Materials	Reading due dates	Other due dates
1	1/19	Introduction to SAS part 1	Syllabus, SAS Intro1		SAS Manual
	1/21	Overview, Intro to the logistic regression model	LogRegSummary, Chapter1	HL Chapter 1	
2	1/26	Intro to the logistic regression model Introduction to SAS part 2	Chapter1, IC1, SAS Intro2		
	1/28	Introduction to SAS part 2	SAS Intro2		HW1 (5 – not counted)
3	2/2	Multiple logistic regression	Chapter2	HL Chapter 2	
	2/4	Multiple logistic regression	IC2, IC3		HW2 (5)
4	2/9	Interpretation of the logistic regression model	Review_Chapters_1&2 Chapter3_1	HL Chapter 3 and 10.9 (skip 3.6)	
	2/11	Interpretation of the logistic regression model	Chapter3_1, IC4		HW3 (4)
5	2/16	Confounding and interaction in logistic regression	IC4, Chapter3_2		
	2/18	Confounding and interaction in logistic regression	Chapter3_2		HW4 (6)
6	2/23	Confounding and interaction in logistic regression	IC5		
	2/25	Review	Review Chapter 3		
7	3/1	Assessing the scale of continuous covariates	Chapter4_1	HL Chapter 4	
	3/3	Assessing the scale of continuous covariates, Numerical problems	Chapter4_1, Chapter 4_2		HW5 (6)
8	3/8	Assessing the scale of continuous covariates, Numerical problems	IC6		
	3/10	Review	Review Chapter 4_12		MIDTERM
	3/15 3/17	SPRING BREAK			

DUE 3/24

Detailed Course Outline – Weeks 9-15

Wk	Date	Topic	Materials	Reading due dates	Other due dates
9	3/22	Goals of logistic regression analyses, Purposeful selection	Chapter4_3 Chapter4_4 Chapter4_4Results Chapter4_4.sas		SAS Manual
	3/24	Purposeful selection	Chapter4_4Results Chapter4_4.sas IC7		HW6 (12+1)
10	3/29	Stepwise and best subsets selection	Chapter4_5		
	3/31	Stepwise and best subsets selection, Review	Review Chapter 4_345		
11	4/5	Disadvantages of automated model selection	IC8 – Austin paper	Austin paper	HW7 (5+1)
	4/7	Assessing model fit Overall GOF	Chapter 5_1, IC9	HL Chapter 5	
12	4/12	Outliers	Chapter 5_2		HW8 (4+1)
	4/14	Outliers	IC10		
13	4/19	Prediction	Chapter 5_3, IC11		HW9 (6+1)
	4/21	Review	Review Chapter 5		
14	4/26	Sample size considerations	Chapter 10_5, IC12	HL Chapter 10.5	HW10 (7+1)
	4/28	Logistic regression for matched case-control studies	Discuss fit of HW6/7 models Chapter 7	HL Chapter 7	
15	5/3	Logistic regression for matched case-control studies	Chapter 7		FINAL
	5/5	Logistic regression for matched case-control studies	IC13		

DUE 5/12