EPID/CPH 647 ANALYSIS OF CATEGORICAL DATA

Spring Semester 2016

Time: Tuesday and Thursday 9:00am – 10:15am

Location: Drachman Hall Room A112

Instructor: Chengcheng Hu, Ph.D.
Office: Drachman A228
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Office Hours: After class or by appointment

Catalog Description: This course deals with the analysis of categorical data. It emphasizes applications in epidemiology, clinical trials, and other public health research, and will cover concepts and methods for binomial, multinomial, and count data, as well as proportions and incidence rates.

Course Prerequisites: One year of college calculus, Epidemiology/CPH 576A and 576B, or permission of instructor. Ability to use the statistical software package Stata is also expected. Please check with me if you have doubts about how well your background prepares you for this course.

Course Learning Objectives: At the end of the course, you should be able to:

1. Apply appropriate statistical methods in the design and analysis of public health studies with binomial, multinomial, or count data as responses.
2. Interpret and critique medical and scientific journal articles which involve categorical data.

MPH and MS in Biostatistics Competencies Covered: See the following link:
http://publichealth.arizona.edu/sites/publichealth.arizona.edu/files/academics/Competencies%20Assessment%20Methods_Biostatistics%20MPH.pdf
http://publichealth.arizona.edu/sites/publichealth.arizona.edu/files/academics/MS_BIOSTATS_Competencies.pdf

Course Notes: Notes are available on the D2L website (see below).

Course Website: A webpage is created for this class using the Desire 2 Learn (D2L) interface. This course website will contain the syllabus, class notes, sample Stata programs and outputs, and datasets (used in lectures and for the homework assignments). Class announcements will also be posted on this site, so it is a good idea to check the site regularly to stay current.

To access the course website, login at: http://d2l.arizona.edu/

- Click the 'UA NetID' Login.
- Enter your NetID and password, as you would to access your UA email account.
- Under 'My Courses', click on the link to CPH EPID 647.

For further information on how to use the D2L interface, go to: http://help.d2l.arizona.edu

Recommended Texts/Readings: The following books are either on reserve in the AHSC Library or available online:

H **Multivariate Methods in Epidemiology**, T.R. Holford, Oxford; New York : Oxford University Press, 2002..

A **Categorical Data Analysis**, Second Edition, Alan Agresti, John Wiley & Sons, Hoboken, NJ, 2002. http://onlinelibrary.wiley.com.ezproxy2.library.arizona.edu/book/10.1002/0471249688

A* **Introduction to Categorical Data Analysis**, Second Edition, Alan Agresti, John Wiley & Sons, Hoboken, NJ, 2002.
http://onlinelibrary.wiley.com.ezproxy2.library.arizona.edu/book/10.1002/0470114754

R **Fundamentals of Biostatistics**, Eighth Edition, Bernard Rosner, Boston, MA : Brooks/Cole Cengage Learning, 2016

H and **R** are on reserve in the AHSC Library. UA NetID login or VPN might be required for off-campus access to the online version of **A** and **A***.

Course Requirements: In addition to reading the texts and attending lectures, the primary course requirements consist of homework assignments, one midterm exam and one final exam. The due date will be indicated on each homework assignment. Homework must be turned in by 5pm on the due date. Electronic submission to the instructor's e-mail address (hucc@email.arizona.edu) is preferred. Hard copy can be turned in during class on the due date, or by 5pm in the instructor's mailbox on the second floor of Drachman Hall Room A228. Both exams will be closed-book. For each exam, you can bring two 8½ x 11 pages of notes and formulas. The final exam will cover the whole course, but emphasize the materials taught in the second half of the semester.

Grading: Exams and homework contribute to your final grade as follows:

Homework	30% (each assignment weighted the same, even if length differs)
Midterm Exam	30%
Final Exam	40%

Final grades are based on the following point system (the instructor reserves the right to revise this scale, if necessary):

A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
E = 59% or less

Stata and Computer Labs: Stata is available for public use at the Drachman Hall Computing Lab: Drachman A319, open weekdays, from 8-5; Stata is also available in the Arizona Health Sciences Library Computer Lab: AHSC 2150. These computers are behind the information/reference desk on the main floor. For hours of operation, see the following link: http://www.ahsl.arizona.edu/about/hours. Students in AHSC can access these computers simply by swiping their CatCards. Non-AHSC students have to be added to the master system. If you are a non-AHSC student who wants to take advantage of this facility, please let me know during the first week of class, so I can get you added to the system.

Class Attendance/Participation: Class attendance is strongly encouraged. If you miss class, you are responsible for meeting all course deadlines, and for working with other students and the instructor (during office hours) to catch up. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Communications: You are responsible for reading emails sent to your UA account from your professor and the announcements that are placed on the course web site. Information about readings, news events, your grades, assignments and other course related topics will be communicated to you with these electronic methods. The official policy can be found at: http://www.registrar.arizona.edu/emailpolicy.htm

Disability Accommodation: If you anticipate issues related to the format or requirements of this course, please meet with me. I would like us to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Resources (621-3268; drc.arizona.edu) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations. The official policy can be found at: http://catalog.arizona.edu/2015-16/policies/disability.htm

Academic Integrity: All UA students are responsible for upholding the University of Arizona Code of Academic Integrity, available through the office of the Dean of Students and online: The official policy found at: http://deanofstudents.arizona.edu/codeofacademicintegrity

Classroom Behavior: (Statement of expected behavior and respectful exchange of ideas) The Dean of Students has set up expected standards for student behaviors and has defined and identified what is disruptive and threatening behavior. This information is available at: http://deanofstudents.arizona.edu/disruptiveandthreateningstudentguidelines

Students are expected to be familiar with the UA Policy on Disruptive and Threatening Student Behavior in an Instructional Setting found at: http://policy.arizona.edu/education-and-student-affairs/disruptive-behavior-instructional-setting and the Policy on Threatening Behavior by Students found at: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Grievance Policy: Should a student feel he or she has been treated unfairly, there are a number of resources available. With few exceptions, students should first attempt to resolve difficulties informally by bringing those concerns directly to the person responsible for the action, or with the student's graduate advisor, Assistant Dean for Student and Alumni Affairs, department head, or the immediate supervisor of the person responsible for the action. If the problem cannot be resolved informally, the student may file a formal grievance using the Graduate College Grievance Policy found at: http://grad.arizona.edu/academics/policies/academic-policies/grievance-policy

Grade Appeal Policy: http://catalog.arizona.edu/2015-16/policies/gradappeal.htm

UA Smoking and Tobacco Policy:
The purpose of this Policy is to establish the University of Arizona's (University) commitment to protect the health of University faculty, staff, students, and visitors on its campuses and in its

vehicles. The latest version of the policy is available at:
http://policy.arizona.edu/ethics-and-conduct/smoking-and-tobacco-policy

Syllabus Changes: Information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate.

Course Schedule: Any changes to the following schedule will be announced in lecture. You are responsible for obtaining information on any changes, even if you miss class.

Date	Topic	Reading	Homework Assignment	Homework Due
Thu, 1/14	Introduction; Binomial data: parameter estimation and inference	A 1.1, 1.2.1, 1.4		
Tue, 1/19	Binomial data: normal approximation, maximum likelihood, hypothesis testing	A 1.3, 1.4	HW #1	1/26
Thu, 1/21	Binomial data: confidence intervals, other parameterizations	A 1.3, 1.4		
Tue, 1/26	Multinomial data: parameter estimation, hypothesis testing	A 1.2.2	HW #2	2/2
Thu, 1/28	Contingency tables: sampling schemes, measures of association	A 2.1, 2.2 H Ch. 3		
Tue, 2/2	Contingency tables: hypothesis testing (large sample)	A 3.2 R 10.2 H Ch. 3	HW #3	2/9
Thu, 2/4	Contingency tables: Fisher's exact test, estimation and inference for measures of association	A 3.5 R 10.3 A 3.1 R 13.1-13.3 H Ch. 3		
Tue, 2/9	Contingency tables: estimation and inference for measures of association (continued)	A 3.1 R 13.1-13.3 H Ch. 3	HW #4	2/16
Thu, 2/11	Contingency tables: power and sample size	H Ch. 11 R 10.5		
Tue, 2/16	2xC, Rx2, and RxC tables, ordered categories, tests for trend	A 2.4, 3.4 R 10.6 H Ch. 3	HW #5	2/23
Thu, 2/18	Confounding and effect modification: definition, examples, stratification	A 2.4, 3.4 R 10.6 H Ch. 3		
Tue, 2/23	Confounding: test of no association, common odds ratio	A 2.3 H Ch. 3	HW #6	3/1
Thu, 2/25	Confounding and effect modification: test for homogeneity, test for trend with stratified data	A 2.3 H Ch. 3		
Tue, 3/1	Logistic regression: model specification	A 4.2, 5.1	HW #7	3/8

Date	Topic	Reading	Homework Assignment	Homework Due
		H Ch. 6		
Thu, 3/3	Logistic regression: parameter estimation, confounding and effect modification, parameter interpretation, interaction	A 5.1, 5.5 H Ch. 6		
Tue, 3/8	Review			
Thu, 3/10	**Midterm Exam** 9am-10:50am			
Tue, 3/15	Spring Recess			
Thu, 3/17				
Tue, 3/22	Logistic regression: comparison with stratified analysis, inference	A 5.2 H Ch. 7	HW #8	3/29
Thu, 3/24	Logistic regression: categorical predictors	A5.3 H Ch. 7		
Tue, 3/29	Logistic regression: construction and evaluation of multivariate models	A 5.4, 6.1, 6.2	HW #9	4/5
Thu, 3/31	Logistic regression: collinearity, influence, predictive power, missing data, case-control studies	A 6.2.4, 6.2.5		
Tue, 4/5	Matched samples, McNemar's test	A 10.1 H Ch. 10	HW #10	4/12
Thu, 4/7	Mantel-Haenszel approach, conditional logistic regression	A 10.1, 10.2 H Ch. 10		
Tue, 4/12	Multinomial response: polychotomous logistic regression for nominal response; proportional odds model for ordinal response	A 7.1, 7.2	HW #11	4/19
Thu, 4/14	Incidence rates, Poisson distribution	A 1.2 H Ch. 4 R 4.10-12, 6.9, 7.10		
Tue, 4/19	Incidence rate ratio, test for trend of incidence rates, stratified incidence rate data	H Ch. 4 R 14.3, 14.7	HW #12	4/26
Thu, 4/21	Poisson Regression for rates: model construction, inference, interpretation	A 4.3, 9.7 H Ch. 8		
Tue, 4/26	Poisson Regression for rates: prediction, goodness of fit, extensions	A 9.7 H Ch. 8	HW #13	5/3
Thu, 4/28	Loglinear models for contingency tables	A 8.1, 8.2, 8.3		
Tue, 5/3	Review			
Thu, 5/5	Reading Day, No Class			
Tue, 5/10	**Final Exam** 8am-10am			