

BIOS 6110 Applied Categorical Data Analysis

Fall, 2017

11:00A - 12:20P MW C301 CPHB

Instructor Dr. Yuan Huang, N318 CPHB, 384-1589, yuan-huang@uiowa.edu

Instructor Office Hours 1:00 - 3:00 T or by appointment

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Introduction This course provides an introduction to methods most commonly used in practice for analyzing categorical data. Course topics include estimation of proportions, multi-way contingency tables; generalized linear models for discrete data; logistic regression for binary responses; multi-category logit model for nominal and ordinal responses; inference for matched-pairs; log-linear models, etc. In this course, the students are expected to

- learn the methodology through theoretic development and examples
- understand applicability and limitations of the statistical methods
- perform analyses using SAS/R statistical software packages
- interpret and communicate analysis results

Prerequisite BIOS 5120 Regression & ANOVA in Health Sciences

Textbook The required textbook has been ordered through the University Book Store.

- Required-An Introduction to Categorical Data Analysis (2nd edition), Alan Agresti, John Wiley, 2007.
- Suggested-Categorical Data Analysis Using the SAS System (2nd edition), Stokes ME, Davis CS and Koch GG, Wiley-SAS Publishing, 2000.

Computing Software SAS/R

Course Websites The course website http://yuanhuang.org/bios6110_2017fall/ and ICON website <http://icon.uiowa.edu> will both be used for this course. Lecture notes, sample codes, data sets, and other relevant study materials will be released in the course website. The rest, such as homework assignments, will be posted in ICON.

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| Evaluation | Homework | 40% | ~ 10 assignments. Drop the lowest one. |
| | Midterm in-class exam 1 | 20% | Tentative date: sep 27 |
| | Midterm in-class exam 2 | 20% | Tentative date: nov 1 |
| | Final | 20% | |

Students are expected to do the assignments individually except if groups are explicitly assigned. You may discuss problems with fellow students, but you must write up your own solutions and your own computer code. You should appropriately format the code, and include only relevant output and graphics. Results without interpretation/conclusion will not be given credits. Late homework will not be accepted unless two business days prior approval are obtained from the instructor or unless an unforeseen emergency arise.

The in-class exams will be closed book and open notes (A4, one page, one-sided). No sample exams will be provided, but students can expect that the exams resemble homework problems. Cell phones are prohibited in the exams. No make-up exams unless two business days prior approval are obtained from the instructor or unless an unforeseen emergency arise.

Letter grades will be used according to the following rules. The highest of ≥ 93 (A), ≥ 90 (A-), ≥ 87 (B+), ≥ 83 (B), ≥ 80 (B-), ≥ 77 (C+), ≥ 70 (C), ≥ 60 (D), else (F).

Tentative Topics

Introduction

Statistical methods for one proportion

Contingency tables

- Comparing proportions in 2×2 tables
- Relative risk and odds ratio
- Chi-square tests of independence
- Testing independence for ordinal data
- Exact inference for small samples
- Three-way tables

Logistic regression

- Odds Ratio and Confidence Interval Estimation
- Statistical Inference
- Model-Building Strategies
- Model Diagnostics
- Analysis of Matched Data

Generalized linear model and Poisson regression

Multinomial logit model

Cumulative logit model

Loglinear model

Methods for correlated data

Generalized linear mixed models

Class policy Students are expected to attend every class session. Although there is no direct penalty for missing class, attendance at lectures is absolutely essential. Lectures are meant to enrich the students reading and understanding of the textbook. Cell phones, tablets, or laptops may not be used during class except for viewing class notes or webpages being shown by the lecturer. I will not hesitate to ask someone to stop using these devices during lectures. Also please mute your phone when class begins.

Electronic Communication University policy specifies that students are responsible for all official correspondences sent to their standard University of Iowa e-mail address (@uiowa.edu). Students should check this account frequently.

Administrative Home This course is given by the College of Public Health. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Public Health. Students wishing to add or drop this course after the official deadline must receive the approval of the Associate Dean for Academic Affairs in the College of Public Health. Details of the University policy of cross enrollments may be found at: <https://www.provost.uiowa.edu/sites/provost.uiowa.edu/files/crossenroll.pdf>.

MPH Competencies

- Demonstrate a broad knowledge and understanding of statistical techniques used in public health studies and investigations.
- Serve as an advocate for good statistical design in public health investigations.

- Apply appropriate statistical methods for inference about public health related questions, and describe the results to public health professionals and educated lay audiences.
- Interpret the results of statistical analyses in public health related publications for public health professionals and educated lay audiences.
- Promote the use of sound statistical methods to answer open questions in public health practice.
- Assume responsibility for the design and implementation of analyses in investigations of public health questions.
- Demonstrate effective written and oral communication skills when communicating quantitative information and statistical inferences to different audiences of public health professionals.

Accommodations for Disabilities The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic accommodations for a disability (which includes but is not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services (SDS) and then meet with the course instructor privately in their office to make particular arrangements. Reasonable accommodations are established through an interactive process between the student, instructor, and SDS. See <http://sds.studentlife.uiowa.edu/> for more information.

Academic Misconduct Academic misconduct is defined by the University of Iowa in its Code of Student Conduct here: <https://dos.uiowa.edu/policies/>. Please take the time to read this short description. Academic misconduct refers primarily to plagiarism or cheating. It is the student's responsibility to seek clarification from the course instructor of any situation in which he/she is uncertain whether academic misconduct is/has been involved. Academic misconduct includes but is not limited to the following:

- presentation of ideas of others without credit to the source;
- use of direct quotations without quotation marks and without credit to the source;
- paraphrasing without credit to the source;
- participation in a group project which presents plagiarized materials;
- failure to provide adequate citation for material obtained through electronic research;
- downloading and submitting work from electronic databases without citation;
- submitting material created/written by someone else as one's own, including purchased term/research papers;
- copying from someone else's exam, homework, or laboratory work
- allowing someone to copy or submit one's work as his/her own;
- accepting credit for a group project without doing one's share;
- submitting the same paper in more than one course without the knowledge and approval of the instructors involved;
- using notes or other materials during a test or exam without authorization;
- not following the guidelines specified by the instructor for a "take-home" test or exam.

Concerns about Faculty Actions Students who have a concern about a faculty action should first address the issue with the instructor, then the course supervisor (if there is one), and then the departmental DEO. Students may also contact the Associate Dean for Academic Affairs

in the College of Public Health. Another resource for students is the Office of the University Ombudsperson. If a complaint cannot be resolved at the departmental and/or collegiate level, students may file a formal complaint utilizing the procedure specified in the Operations Manual (II-29.7).

Sexual Harassment/Misconduct and Class Accommodations Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported to the UI Office of Sexual Misconduct Coordinator (OSMRC), or to the Office of Equal Opportunity and Diversity (EOD). Students impacted by a Title IX issue (sexual misconduct, dating/domestic violence, or stalking) may be eligible to request an academic accommodation. See the OSMRC for assistance, definitions, and the full University policy at Office of the Sexual Misconduct Response Coordinator. Additional information about confidential resources for students subject to sexual harassment/misconduct is available at Confidential Resources for Students.

Reacting Safely to Severe Weather In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit <http://hawkalert.uiowa.edu/>.