Intermediate Statistics for Health Service Researchers

HAD 5772
Winter 2024

Instructor: Alex Hoagland, Ph.D.
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Class time and location: Wednesdays, 9:30am to 11:30am. HSB 106

Office hours: Book appointments at https://calendly.com/hoagland-office-hours.

- Tuesdays and Thursdays: 1:00pm to 3:00pm.
- All appointments are by Zoom unless arranged otherwise in advance.
- Please note that I typically respond to emails and other class communication during normal "business hours," and not on evenings, weekends, or holidays.

Course Description: This course is designed to provide introductory background in statistical thinking, and to prepare students in the following areas: correlation; regression; analysis of variance (including factorial, repeated-measures, mixed-design, multivariate); analysis of covariance; logistic regression and factor analysis.

Course Objectives:
At the end of this course, students should be able to:

- Demonstrate an understanding (both conceptual and practical) of analytical approaches
- Identify appropriate analytical approaches to address specific research questions;
- Identify appropriate analytical approaches to use with collected data
- Use the computer program R for data management, statistical exploration, and analysis
- Understand, explain, and present analytical results.

Method of Instruction: There are lectures but the course is designed to foster a seminar atmosphere. Consequently, in-depth discussion of the theoretical economics literature as it pertains to health economics is expected. Course readings are assigned, and participants are expected to have read these prior to class.

Evaluation Criteria

- Assignments: 5 group assignments, collectively worth 30% of the final grade.
- Midterm Assessment: done in class, worth 30% of the final grade.
- Individual Final Assessment: done in class, worth 40% of the final grade.

Assignment: There are 5 assignments, which can be completed in groups. The purpose of each assignment is for you to demonstrate that you can perform the analyses covered in this course and interpret the results. Late assignments will be **discounted by 10 percentage points per day late.**

Assessments: A midterm and a final assessment will be administered during class. Exams will be timed to be completed in approximately one hour (e.g., not long exams) and will be based on the assignments. Exams will combine responses to theoretical questions and applied work (in R).

Grading scale: Courses taken for graduate credit are assigned a letter grade according to the School of Graduate Studies usage as follows:

Letter Grade	Grade Meaning	Numerical Marks (%)
A+	Excellent	90%-100%
A		85%-89.9%
A-		80%-84.9%
B+	Good	77%-79.9%
B		73%-76.9%
B-		70%-72.9%
FZ	Inadequate	0-69%

Note that while course grades may be collectively "curved," no individual grades will be rounded.

Course website and textbook: This course has a GitHub repository that contains all relevant materials; you can access the repo at https://github.com/alex-hoagland/HAD-5772--Winter-2024.

Our required textbook is *Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking* (Harvey Motulsky 2010).

Alternative Textbook options:

- Statistical Inference, 2002 (Casella and Berger)
- Regression and Other Stories: https://avehtari.github.io/ROS-Examples/, https://users.aalto.fi/~ave/ROS.pdf
- Statistical Inference via Data Science: https://moderndive.com/ -- this looks like the best option for the first half of the course, nothing on mixed methods though. Ask Silver?

Course Schedule

Session #	Date	Lecture / Readings	Exercise Due Dates
1	Jan. 10	Introduction • Motulsky, Chapters 1-3	
2	Jan. 17	Visualizing data (+ R IntRoduction) • Motulsky, Chapters 7-9; 32 • If you are interested in R help, check out Appendix C in Motulsky	
3	Jan. 24	Measuring uncertainty I: standard errors + confidence intervals • Motulsky, Chapters 4-6 (emphasis on 4)	Assignment 1 due
4	Jan. 31	Measuring uncertainty II: Theory of confidence intervals • Motulsky, Chapters 12-14 • Additional reading: Chapters 10-11	
5	Feb. 7	Hypothesis Testing I: Statistical Significance • Motulsky, Chapter 16-17	Assignment 2 due
6	Feb. 14	Hypothesis Testing II: *p*-values • Motulsky, Chapters 15, 18-19	
N/A	Feb. 20-21	No class – Winter Reading Week; deadline to drop without academic penalty	
7	Feb. 28	Hypothesis Testing III: Practical Applications • Motulsky, Chapters 20-21, 43 • Time for midterm review if allowed	
8	Mar. 6	**Midterm Exam, In Class**	Assignment 3 due
9	Mar. 13	Multiple Comparisons + Survival Analysis • Motulsky, Chapters 22-23, 29 • Examples from Chapters 27, 30, and 31 • Revisit Ch. 5 if desired	
10	Mar. 20	Linear Regression I: Bivariate Regression Models • Motulsky, Chapters 33-35 • If time, brief description of nonlinear regression (36)	Assignment 4 due
11	Mar. 27	Linear Regression II: Bells and Whistles • Motulsky, Chapters 37-38 • Include notes on DAGs, Moderation/Mediation, and Bad Controls	
12	Apr. 3	Conclusions + Applications • Motulsky, Chapters 44-46 • Time for catchup, if needed • If time allows, discussion on path/factor analysis.	Assignment 5 due
13	Apr. 10	**Final Exam, In Class**	