

CLRES 2022 Syllabus

Course Description and objectives: This course is designed for medical researchers who are not biostatistics majors. The course will focus on the basic concepts and the use of logistic regression models. At the end of this course, a student should be able to:

- recognize the multivariable problem addressed by logistic regression in terms of the types of variables considered;
- assess the relationship of risk factors and a categorical outcome using a logistic regression model;
- compute and interpret estimated risk of developing a disease or an odds ratio from a fitted logistic regression model;
- understand the limitation in the estimation when different study design is used;
- develop analytic skills through the analysis of data sets taken from the fields of medicine and public health; and
- develop oral and written communication skills through the description of analytic strategies and the summarization and interpretation of results.

INSTRUCTORS

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MEETING TIMES & LOCATION

September 29 – October 25
200 Meyran Ave., Suite 305 A/B

MW 1:00pm – 3pm

Credits: 1 credit (16 total contact hours; 4 contact hours/week for 4 weeks)

Grading: Letter grade based on

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|-----|---------------------------------|
| 45% | Homework assignments |
| 25% | Take-home final project |
| 25% | Final exam |
| 5% | Attendance (BE SURE TO SIGN IN) |

NOTE: Homework assignments, course information, and communication will be available at <http://courseweb.pitt.edu>.

Letter Grades: (I *may* curve grades up slightly depending on the final distribution)

A+: > 95%, A: 92-95%, A-: 90-91%, B+: 88-89%, B: 82-87%, B-: 80-81%, C: 70-79%, D: 60-69%

Required Text

Vittinghoff E, Glidden DV, Shiboski SC, McCulloh CE. *Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models*. New York: Springer (2005).

This is the same as was required for CLRES 2021.

Additional references

Hosmer DW and Lemeshow S. *Applied Logistic Regression, 2nd Edition*. New York: Wiley (2000).

In addition, although I would not specifically buy them for this course, the two optional textbooks (by Kleinbaum, et al. and Rosner) from CLRES 2021 also cover logistic regression in some detail, and could thus serve as useful references (i.e. if you bought them already, don't sell them or throw them away!).

Computing Package: Stata 11, Stata Press, College Station, Texas (www.stata.com)

Problem Sets: The homework assignments are essential in learning the concepts of logistic regression. You are encouraged to discuss and work together about difficult problems, but you must write your own solutions.

Homework 1: due 10/6

Homework 2: due 10/13

Homework 3: due 10/20

LATE HOMEWORK ASSIGNMENTS: All homework assignments will be assigned with a due date (on Wednesdays). Late homework assignments will be **penalized 10% per day over the due date** (unless prior arrangements have been made with the instructor -- only Dr. Abebe) until the following lecture, at which no late homeworks will be accepted.

Final Exam: There will be a final exam on the last day of class consisting of short answer and multiple choice questions. The focus of this exam will be on understanding 1) what to do when, 2) how to interpret what you did, and 3) more focused questions on the important issues. I will give more specifics as the class progresses (and maybe even give away a few specific questions if you pay close attention!).

Final Project (assigned Monday, October 25, 2010; due Monday, November 8, 2010): There will be final project distributed on the last day of class. This project **must be turned in on time** to receive any credit. Students will be asked to analyze a data set and answer specific questions pertaining to this analysis and its results. Trainees must work on the final project **independently**. Discussion, consulting, or working with other people is **not** permitted.

Academic Integrity: Students in this course will be expected to comply with the [University of Pittsburgh's Policy on Academic Integrity \(http://www.provost.pitt.edu/info/ai1.html\)](http://www.provost.pitt.edu/info/ai1.html). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

Disabilities: If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the [Disability Resources and Services \(http://www.drs.pitt.edu/policies.html\)](http://www.drs.pitt.edu/policies.html) as soon as possible, but no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call 648-7890 (Voice or TTD) to schedule an appointment. The Office is located in 216 William Pitt Union.

Incomplete grades: Anyone who is unable to complete the course for any reason must contact the course instructor as soon as possible to discuss grades and remediation.

SESSIONS (Note: additional readings will be assigned as the course progresses)
All readings are from Vittinghoff (Required) and Hosmer & Lemeshow (Optional)

Lecture 1: Introduction to Logistic Regression (Wednesday, September 29, 2010)

Required Reading: Section 6.1

Optional: Chapter 1 and Sections 2.1-2.3

- Course overview
- Introduction to logistic regression
- Maximum likelihood estimation

Lecture 2: The Multiple Logistic Model (Monday, October 4, 2010)

Required: Section 6.2-6.2.3

Optional: Chapter 3

- Interpreting coefficients
- Covariate adjustment
- Confounding and interactions
- Hypothesis testing

Lecture 3: Model Selection (Wednesday, October 6, 2010)

Required: None – the topic is not well covered in the Vittinghoff textbook

Assignment Due: Homework 1

Supplemental: Chapter 4

- Likelihood ratio tests
- Model selection strategies

Lecture 4: Regression Diagnostics (Monday, October 11, 2010)

Required: Section 6.4

Optional: None

- Model fit
- Multicollinearity
- Functional form of covariates

Lecture 5: Case-Control Studies (Wednesday, October 13, 2010)

Required: Section 6.3

Assignment Due: Homework 2

Optional: Sections 6.1-6.3 and Chapter 7

- Overview of case-control and cohort studies
- Measures of association
- Matched case-control studies
- Conditional logistic regression

Lecture 6: Prediction & Multinomial Logistic Regression (Monday, October 18, 2010)

Required: Sections 6.2.4-6.2.5 and 6.5.4

Optional: Sections 8.1-8.2

- Classification
- ROC analysis
- Multinomial logistic regression

Lecture 7: Correlated Binary Data and Course Review (Wednesday, October 20, 2010)

Required: Sections 8.4-8.5 (with a focus on Sections 8.4.5 and 8.5.3)

Assignment Due: Homework 3

Supplemental reading: Section 8.3

- Correlated binary data
- Generalized estimating equations
- Generalized mixed effects models
- Class overview

Lecture 8: Exam, Literature Examples, Project Notes (Monday, October 25, 2010)

Required reading: Case studies from literature (TBA)

FINAL EXAM!!!

Assignment: Final Project