Methods in Health Services Research I
HSMP 7607, Spring 2019

Updated: 2/21/2018

Instructors:

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Office Hours: Available by appointment

Course Title: **Methods in Health Services Research I**
Credit Hours: Three Credit Hours
Meeting Time: Tuesday and Thursday, 9am-10:30am
Meeting Place: Ed 2 South, L28-1308

HSMP Course Competencies:
1. Accurately select, use, and interpret statistics commonly used in health services research
2. Apply and use appropriate study designs and methods to address research questions/hypotheses
3. Utilize healthcare databases and other information technologies used in research

Course Overview:

The first of a two-course sequence in empirical methods in health services research. This course will introduce students to the statistical theory and the application of regression analysis. This course will also serve as an (advanced) introduction to Stata. Topics covered include:

- Exploratory data analysis
- Causal inference
- Simple linear regression (ordinary least squares, OLS)
- Multiple linear regression
- Maximum likelihood
- Regression diagnostics
- Variable transformation and weighted least squares
- Qualitative variables
- Linear probability models; logistic and probit regression
- Marginal effects
- Variable selection
- Dealing with autocorrelation
- Dealing with collinearity

The course will use the language of econometrics and statistics/biostatistics as health services research is an interdisciplinary field that uses methods originating in different disciplines.

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Learning Objectives

1. Understand how to explore a dataset, including graphical techniques

2. Understand the statistical theory and assumptions underlying regression methods

3. Understand how to interpret regression parameters

4. Understand how to perform hypothesis testing

5. Understand under which circumstances a regression model can have a causal interpretation

6. Understand when and how various methods should be used, including the different uses of regression analysis (causal, descriptive, predictive)

7. Understand how to correctly write a statistical model

8. Learn to "translate" econometrics to statistics terms (and vice versa)

9. Become proficient in the use of Stata

IV.   Evaluation

Grades are based on performance on:

- Homework   30%
- Midterm   30%
- Final exam   40%

Homework: Homework assignments are usually due after a week. **No late homework allowed** unless you have a valid justification, which needs to be communicated *before* the due date.

Midterm: Thursday, March 7, 9:00 a.m.

Final Exam: Thursday, May 16 at 9:00 a.m.

Required textbooks: **Note the editions**. Introductory statistics has not changed much in the last 20 years. **Save money; get a used textbook**.

Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach*. **5th edition**. Australia; Cincinnati, Ohio: South-Western College Pub, 2013.

Chatterjee, Samprit, and Ali S. Hadi. *Regression Analysis by Example*. **4th edition**. Hoboken, N.J: Wiley-Interscience, 2006.

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Suggested textbooks:

Deb P, Norton E, Manning WG, *Health Econometrics*, Stata Press, 2017.

Angrist, Joshua D., and Jörn-Steffen Pischke. *Mostly Harmless Econometrics: An Empiricist's Companion*. 1 edition. Princeton: Princeton University Press, 2009.

Cameron, A. Colin, and Pravin K. Trivedi. *Microeconometrics Using Stata: **Revised Edition**. **2 edition***. College Station, Texas: Stata Press, 2010.

Additional Reading Material: Posted on Canvas. **Starred articles are optional.**

Expectations:
I.   Class attendance & Participation
   A. **Attendance is not required**, but is highly recommended.
II. Policies:
   A. Academic Honesty: Refer to school guidelines.
   B. Students are responsible for being attentive to or observant of campus policies regarding academic honesty as stated in the University's Student Conduct Code.
   C. Plagiarism is the use of another person's words or ideas without crediting that person. Plagiarism and cheating will not be tolerated. Either plagiarism or cheating may lead to failure of an assignment, or the class, and/or dismissal from the University.
   D. You are responsible for being attentive to or observant of campus policies about academic honesty as stated in the University's Student Conduct Code. (http://catalog.ucdenver.edu/content.php?catoid=6&navoid=530)
III. Access, Disability, Communication:
   Students requesting accommodations for a disability must contact one of the following:
   Sherry Holden | Coordinator
   University of Colorado Anschutz Medical Campus Disability Resources & Services
   | Bldg. 500, Room Q20-EG 305A
   Phone: (303) 724-5640, Fax (303) 724-5641
   Part-time: Monday, Tuesday and Thursday
   sherry.holden@ucdenver.edu
   Selim Özi | Assistive Technology Specialist, Accommodation Coordinator
   University of Colorado Anschutz Medical Campus Disability Resources & Services
   | Mail Stop A010, Building 500, Room Q20-EG 306
   Phone: (303) 724 8428, Fax: (303) 724 5641
   selim.ozi@ucdenver.edu
   Be aware that the determination of accommodations can take a long period of time. No accommodations will be made for the course until written documentation is provided by the Disability resources and services office to the course directors. It is the student's responsibility to coordinate approved accommodations with the Disability resources and services office in advance. Further general Information regarding disability resources and services can be found at:
   http://www.ucdenver.edu/student-services/resources/disability-resources-services/accommodations/Pages/accommodations.aspx

Students can set up an appointment at:
http://www.ucdenver.edu/student-services/resources/disability-resources-services/about-office/contact-us-CUAnschutz/Pages/form.aspx

IV.   Civility:
   A.   Adherence to the Student Conduct Code is expected. I am committed to creating a climate for learning, characterized by respect for each other and the contributions each person makes to class. I ask that you make a similar commitment.
   B.   **Please turn off beepers and cell phones during class.**

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(Note: starred articles are optional)

Week 1: Overview and Stata

Chatterjee and Hadi, Chapter 1
Wooldridge, Chapter 1
Seltman (2015), Chapter 4, Exploratory Data Analysis

*Cameron and Trivedi (2010), Chapters 1 and 2
*UCLA's Stata tutorials: https://stats.idre.ucla.edu/stata/modules/
* Shmueli, G. "To Explain or Predict?", Statistical Science, 2010, Vol. 25, No 3, 289-310.

Week 2: Review of probability and statistics

Wooldridge, Appendix A-C

Week 3: Causal Inference and simple linear regression

Imbens and Rubin (2015), Chapter 2
Guo and Fraser (2015), Chapter 2 (up to section 2.5)
Chatterjee and Hadi, Chapter 2

* Gelman and Hill (2007), Chapters 9 and 10
* Rubin, Donald B. "For objective causal inference, design trumps analysis." *The Annals of Applied Statistics* (2008): 808-840.
*Senn, Stephen. "Francis Galton and regression to the mean." *Significance* 8.3 (2011): 124-126.

Week 4: Simple linear regression

Chatterjee and Hadi, Chapter 2
Wooldridge, Chapters 2 and 3

* Buse, A. "The Likelihood Ratio, Wald, and Lagrange Multiplier Tests: An Expository Note." *The American Statistician*, Vol. 36, No. 3, Part 1 (Aug. 1982), 153-157.
* Engle RF, "Wald, Likelihood Ratio, and Lagrange Multiplier Tests in Econometrics." *Handbook of Econometrics*, Volume 2, Chapter 13, 1984, Pages 775-826.

Week 5: Multiple linear regression

Chatterjee and Hadi, Chapter 3
Wooldridge, Chapter 3

Week 6: Maximum likelihood estimation and midterm (3/1)

Eliason, Scott R. Maximum likelihood estimation: Logic and practice. Vol. 96. *Sage Publications*, 1993. Pages 1-21.

Week 7: Gauss-Markov properties, BLUE, and regression diagnostics
Chatterjee and Hadi, Chapters 5 and 6

Week 8: Qualitative variables as predictors

Chatterjee and Hadi, Chapter 4
Wooldridge, Chapter 6
Dimick, Justin B., and Andrew M. Ryan. "Methods for Evaluating Changes in Health Care Policy: The Difference-in-Differences Approach." *JAMA* 312, no. 22 (December 10, 2014): 2401–2.

Week 9: Modeling and parameter interpretation

Wooldridge, Chapter 6
Cameron and Trivedi (2010), Chapter 3,

*Manning, W. G., and J. Mullahy. "Estimating Log Models: To Transform or Not to Transform?" *Journal of Health Economics* 20, no. 4 (July 2001): 461–94.
*Manning, Willard G., Anirban Basu, and John Mullahy. "Generalized Modeling Approaches to Risk Adjustment of Skewed Outcomes Data." *Journal of Health Economics* 24, no. 3 (May 2005): 465–88.
*Manning, W. G. "The Logged Dependent Variable, Heteroscedasticity, and the Retransformation Problem." *Journal of Health Economics* 17, no. 3 (June 1998): 283–95.
* Deb P, Norton E, Manning WG, *Health Econometrics*, Stata Press, 2017. Chapters 5,6, and 7.

Week 10: Heteroskedasticity

Wooldridge, Chapter 8
Cameron and Trivedi (2010), Chapter 3, section 3.7
Chatterjee and Hadi, Chapter 7

Week 11: Collinearity and other topics

Chatterjee and Hadi, Chapter 9

Week 12: Linear probability model and logistic regression

Chatterjee and Hadi, Chapter 12
Wooldridge, Chapter 17
Norton, Edward C., Bryan E. Dowd, and Matthew L. Maciejewski. "Odds Ratios-Current Best Practice and Use." JAMA 320, no. 1 (03 2018): 84–85.
Norton, Edward C., and Bryan E. Dowd. "Log Odds and the Interpretation of Logit Models." *Health Services Research* 53, no. 2 (April 2018): 859–78.

*Cameron and Trivedi (2010), Chapter 14, skip sections 14.8 and 14.9

Week 13: Marginal effects and probit model

Williams, R. Using the margins command to estimate and interpret adjusted predictions and marginal effects, *The Stata Journal*, Volume 12 Number 2: pp. 308-331.

Long, J. S., and J. Freese. Regression Models for Categorical Dependent Variables Using Stata, Second Edition. 2nd edition. College Station, Tex: Stata Press, 2005.

Week 14: Prediction in logit/probit, variable selection, bootstrapping

Chatterjee and Hadi, Chapter 11

Week 15: Review

Week 16 (5/16) Final exam