Syllabus
Biodemography: Integrating Genetics and Social Science Research
Fall 2016: Sociology 901
Instructor: Jason Fletcher
jmflletcher@wisc.edu
Course Time: 9-11:30 am, Tuesdays
Place: TBD (Scheduled: Educ Sci 1053)

Office Hours: Tuesday 1:45-3:30 SS 4430 or By appointment

Course Overview:

Beginning with the sequencing of the human genome in 2003, the possibilities of a new integration between genetic and social science research have increased substantially. Recently, many social science research datasets have added important biospecimen collection activities, including the measurement of genetic sequence data. Examples include the Add Health, the Health and Retirement Study, Fragile Families as well as many international datasets.

The purpose of the course is twofold. First, we aim to gain an intermediate understanding of biological, evolutionary, and genetic theories and facts that then can be deployed to gain novel insights into traditional social science research questions. Second, ideally students would complete the course with the tools and ideas to begin a project that combines genetic and social science data, methods, and theories into a dissertation chapter or related research activity.

The course will begin with an overview, mostly from genetics and biology, of basic concepts. We will aim to utilize both foundational academic papers and also online video lectures and research presentations throughout the course in order to foster discussions of the material. The course will then transition into reading and discussing state-of-the-art journal articles in the integration of genetics and social science research. We will discuss data resources, methodological differences across disciplines, and ideas to extend the research in this area into new directions.

Requirements: Students will make at least two presentations during the course, outlining an assigned paper and outlining a potential research project and will complete a short paper (literature review or research proposal outline, 5-10 pages) on a topic related to genetics and social science.

Pre-requisites: there are no formal prerequisites, but students who have not had prior courses in data analysis and statistical methods may struggle.
Course Objectives:

Students will be able to understand and formulate research questions that combine some aspects of genetics (or biology) and social science research.

Students will gain a basic/intermediate understanding of concepts from the natural sciences that are relevant for conducting interdisciplinary work merging the natural and social sciences.

Students will understand theoretical and empirical issues in current research on genetics and social science.

Grades

Your grades will include of three parts

1. Class participation (30%)
   This is a seminar; you are required to attend each class prepared to discuss the assigned readings. Each student will closely read and give comments to book chapters under preparation.

2. Student Presentation (40%)
   Each student will make a short presentation on a genetics/social science paper, discussing the research question, the data, the empirical approach, the limitations, and key findings.
   Second, each student will make a presentation of his/her short paper topic.

3. Short Paper (30%)
   Each student will prepare a 5-10 page paper that either (1) surveys a specific part of the literature or (2) outlines a potential research project that integrates the biological and social sciences, discussing data, empirical approach and main hypothesis.

Book


We will read draft chapters

Selections from:

*The Gene*: An Intimate History (Mukerjee 2016)

Data Opportunities

HRS
Add Health info
Fragile Families
dbGap
NHAES
WLS

Biomarker Network
Week by Week Overview

Week 1 (9/6)—Overview, Heritability, Adoption Studies and early Gene-Environment Interaction: Conley/Fletcher (CF) 1, 1 Appendix, and 2

Week 2 (9/13)—Genetic concepts/primer: CF 2 Appendices

Week 3 (9/20)—Genetic Discover, Conceptual History and On-going Statistical Issues: CF Chapter 3

Week 4 (9/27)—Genetics of Spousal and Friendship Tie Formation: CF Chapter 4

Week 5 (10/4)—Race, Ancestry and Genetics: CF Chapter 5 and Appendices

Week 6 (10/11)—Approaches to Gene-Environment Interactions: CF Chapter 7

Week 7 (10/18)—GxE II

Week 8 (10/25)—Topics in Genoeconomics I: Genes as Instrumental Variables

Week 9 (11/1)—Topics in Genoeconomics II: Macrogenoeconomics: CF Chapter 6

Week 10 (11/8)—Politics, Crime and Genetics

Week 11 (11/15)—Biomarkers / Telomeres
   *Class cancelled for Thanksgiving*

Week 12 (11/29)—New Directions I: CRISP: CF Chapter 8

Week 13 (12/6)—New Directions II: Epigenetics, CF Chapter 3 Appendix

Week 14 (12/13)—New Directions III: Microbiome and Student Presentations

Week 1 (9/6)
Course Overview and Examples, Discussion
   Heritability studies
   Adoption Studies
   Caspi/GxE
   Student Interests
   Data

Assignment: Catch up on readings

Readings

Wiki Mendel document.

Conley and Fletcher: Chapter 1


Lewontin. The Analysis of Variance and the Analysis of Causes. AJHG 1974


Conley et al. Testing the key assumption of heritability estimates. AJHG. 2014

Boardman, Blaylock, and Pampel. Trends in the Genetic Influences on Smoking, JHSB 2010


Shostak, Sara, Peter Conrad, and Allan V. Horwitz. 2008. "Sequencing and Its


**Week 2 (9/13)**
Genetics Primer; Sequence and Variation concepts, Mutations

*Ben Domingue* Visit

Homework: Bring in 3 suggestions of good (and bad) parts of the two websites or videos

Videos
- Coursera videos at Learn UW
  - Required: Broad Timeline, Genomics in Medicine
  - Not Required: Lab Tour, *Genetics 101*

Websites:
- [http://gslc.genetics.utah.edu](http://gslc.genetics.utah.edu)
- [http://www.dnaitb.org/1/](http://www.dnaitb.org/1/)

Readings

Attia, J., et al. (2009) How to use an article about genetic association: A: Background concepts. JAMA, 301, 74-81

Wiki: DNA Fingerprinting and Human Genetic Variation


Not Required


Watson TED Talk: [How We Discovered DNA](https://hceconomics.uchicago.edu/video/genetics-and-behavior-intellectual-journey-candidate-gene-studies-gwas)

**Week 3 (9/20)**

**Genetic Discovery: Candidate Genes and GWAS**
- False positives, Replication, Population Stratification, Power Analysis, Multiple Comparisons, GREML,

Videos
[https://hceconomics.uchicago.edu/video/genetics-and-behavior-gwas-panel](https://hceconomics.uchicago.edu/video/genetics-and-behavior-gwas-panel)

**Student Led Reading:**

Reading

Conley and Fletcher Chapter 3


Chabris, Christopher F., Benjamin M. Hebert, Daniel J. Benjamin, Jonathan Beauchamp, David Cesarini, Matthijs van der Loos, Magnus Johannesson et al. "Most reported genetic associations with general intelligence are probably false positives." Psychological science (2012): 0956797611435528.

Chabris, Christopher F., James J. Lee, Daniel J. Benjamin, Jonathan P. Beauchamp, Edward L. Glaeser, Gregoire Borst, Steven Pinker, and David I. Laibson. "Why it is


Not Required


**Week 4 (9/27)**

Genetics of Tie Formation: Spouses, Friends, and Kinship Patterns

**Student Led Readings:**
Student provided overview: Oxytocin

Readings

Conley and Fletcher Chapter 4


**Week 5 (10/4)**

Race and Genetics

Videos

Coursera videos at Learn UW
Required: Genes and Health, Moving Beyond Race

**Student Led Reading**

TBD

Readings

Conley and Fletcher Chapter 5


Not Required


Turkheimer, Eric. 2011. "Genetics and Human Agency: Comment on Dar-Nirod and


**Week 5 (10/11)**
Approaches to Gene-Environment Interactions

  Orchids and Dandelions, Diathesis-Stress Hypothesis, Gene-environment correlation

**Student Led Reading**

Readings
Conley and Fletcher Chapter 7


Not Required


**Week 7 (10/18)**
Continue GxE and consider IGSS submissions
TBD

**Week 8 (10/25)**
Economics

Mendelian Randomization, Genoeconomics

**Student Led Reading:**

**Readings**


**Not Required**


**Week 9 (11/1)**
Population Processes—Health, Economics, and Genetics

**Videos**
https://www.youtube.com/watch?v=egxe1g09XD0
https://www.youtube.com/watch?v=-EgHasXGOxY

**Student Led Reading:**
Justin Cook (2014) The Natural Selection of Infectious Disease Resistance and Its Effect on Contemporary Health

**Readings**
Conley and Fletcher Chapter 6


Not Required


Week 10 (11/8)
Politics and Crime

Student Led Reading:
TBD

Readings


Disgust

**Week 11 (11/15)**

TBD: Biomarker Discussion?
- Telomeres


TED Talk:

Readings


Recommended

**11/22: Class Cancelled: Thanksgiving Break**

**Week 12 (11/29)**

Gene Editing and CRISPR

Readings
- Conley and Fletcher Chapter 8

Doudna [TED Talk](https://www.ted.com/talks)
**Week 13 (12/6)**

New directions: Epigenetics

Video: Ghost in our Genes (PBS)
  [https://www.youtube.com/watch?v=fMxgkSz0Js](https://www.youtube.com/watch?v=fMxgkSz0Js)

Agouti Mice
  [https://www.youtube.com/watch?v=Xjq5eEslJhw](https://www.youtube.com/watch?v=Xjq5eEslJhw)
  [https://www.youtube.com/watch?v=wFsxVkuChdU](https://www.youtube.com/watch?v=wFsxVkuChdU)

Webinar: [http://webinar.sciencemag.org/webinar/archive/promise-microbiome](http://webinar.sciencemag.org/webinar/archive/promise-microbiome)

[http://ics.webcast.uwex.edu/Mediasite6/Catalog/Full/5e041f7db1654480a990568c000d79e121](http://ics.webcast.uwex.edu/Mediasite6/Catalog/Full/5e041f7db1654480a990568c000d79e121)

Readings

Conley and Fletcher Appendix Chapter


**Week 14 (12/13)**

Microbiome

Student Project Presentations

Microbiology: Microbiome science needs a healthy dose of skepticism. Nature Commentary

Not Required