

Genetic Epidemiology

Course Information: U10.2420.001

Mondays 6:45PM – 8:25PM

NYU SoM Parasitology Seminar Room, 341 E 25th Street, 1st Floor

Instructor: Karen Day, PhD
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Course Description

This course will examine the impact of genetic diversity on global health. It will provide the training to allow an investigator to explore why we are not equally susceptible to the same diseases and to incorporate pathogen genetics into epidemiologic analysis. Its aim is to provide the necessary background in genomics, bioinformatics and population genetics to practice genetic epidemiology. The course will teach basics in genomics and bioinformatics to utilize both pathogen and human genome diversity data. The principles of population genetics will be taught in the context of epidemiological analyses. Epidemiologic designs and statistical methods required for linkage studies and mapping genetic traits (both simple and complex) will be defined.

Objectives

By the end of the course, students will:

1. Have a working knowledge of the basic language of population genetics necessary to understand genetic diversity in relation to public health
2. Understand evolutionary relationships via phylogenetics and phylogenomics
3. Define human genetic diversity in a framework that is useful to a public health professional
4. Understand the genetic basis of susceptibility to infection and non-communicable disease
5. Understand the use of molecular epidemiology in infectious disease surveillance.
6. Critically read and evaluate genetic epidemiology studies.

Course Structure and Requirements

This course has three main components: lectures; 2 long essays, from a selection of 3 topics; (these will take place outside of class time) and a project. Each student is required to attend lectures and participate in a tutorial to design a genetic epidemiology project.

1. Students are expected to attend all lectures and practicals. On-time attendance is greatly appreciated in order to avoid disrupting the lecture and classroom activities. If you can not attend a practical, please notify the TA beforehand, or in the case of an emergency, immediately upon return.
2. Complete reading assignments prior to class.

NOTE: All assignments **must** be typed (1" margins, Times New Roman 12pt or Arial 11pt font). Calculations may be neatly handwritten. Your name must be on the top of each page that you hand in.

Grading

1. 2 long essays: 40%
2. Project: 60%

Readings

Readings will be assigned for each specific lecture topic or as part of various homework assignments; these will be made available to students via the class blackboard at least one week prior to class.

As background to the course and the introductory lecture:

1. NCBI Science Primer “What is a genome?”
http://www.ncbi.nlm.nih.gov/About/primer/genetics_genome.html
2. Genome-wide association study of 14,000 cases of seven common diseases and 3,000 shared controls. Wellcome Trust Case Control Consortium. *Nature* 2007 447(7): 661-678 plus methods.
3. Personalized Medicines: Hopes and Realities. The Royal Society. 2005.
<http://www.royalsoc.ac.uk/displaypagedoc.asp?id=23244> (this is a large report so we might just ask that they read chapters 1 – 3)
4. Pang, T. The Impact of genomics on global health. *American Journal of Public Health* 2002 92(7): 1077 – 1079.

Lecturers

Stuart Brown, Karen Day, Judith Goldberg, Delores Malaspina, Harry Ostrer

Syllabus

SESSION	DATE	LECTURE TOPIC	ASSIGNMENT	LECTURER
2	9/17/07	Bioinformatics I – Introduction to Molecular Genetic Data and Databases		Stuart Brown
3	9/24/07	Bioinformatics II – Molecular Phylogenetics	Hand out Essay 1	Stuart Brown
4	10/1/07	Bioinformatics III – Genetic Variation in Populations		Stuart Brown
5	10/15/07	Mendelian Inheritance of Deleterious Traits	Essay 1 Due	Harry Ostrer
6	10/22/07	Human Population Structure and Susceptibility to Disease		Harry Ostrer
7	10/29/07	Measuring Genetic Susceptibility to Disease	Hand out Essay 2	Harry Ostrer
8	11/5/07	Biostatistics in Genetic Epidemiology - I		Judith Goldberg
9	11/12/07	Biostatistics in Genetic Epidemiology - II	Essay 1 Due	Judith Goldberg
10	11/19/07	Human Diversity and Infectious Disease		Karen Day
11	11/21/07	Human Diversity and Cardiovascular Disease Epidemiology		TBA
12	11/26/07	Genes, Epigenetics and Mental Health		Delores Malaspina
13	12/3/07	Genetics and Infectious Disease Surveillance	Project Due	Karen Day
14	12/10/07	Presentations		

Details of Coursework:

1. **Essays:** Students will be asked to choose 2 essays from 3 topics that apply genetic epidemiological techniques to questions of global public health importance
2. **Project:** Students will be asked to write a grant proposal on a genetic study design to test a hypothesis of relevance to global health.