

**Genetic Epidemiology**

**Course Information: U10.2420.001**

Wednesdays 6:45PM – 8:25PM

NYU SoM Parasitology Seminar Room, 341 E 25<sup>th</sup> Street, 1<sup>st</sup> Floor

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**Instructor:** Karen Day, PhD  
**Office Hours:** By Appointment  
**Email:** [karen.day@med.nyu.edu](mailto:karen.day@med.nyu.edu)

**TA:** TBD  
**Office Hours:** By Appointment  
**Email:**

**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 genetics into epidemiologic analyses. 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 four main components: lectures; 1 long essay from a selection of 3 topics (these will take place outside of class time); 2 practical classes; 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. Long essay          | 20% |
| 2. Project             | 40% |
| 3. Lab practicals      | 30% |
| 4. Class participation | 10% |

## 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](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

Oralea Branch, Stuart Brown, Jane Carlton, Karen Day, Peter D'Eustachio, Delores Malaspina, Cheongeun Oh, Silvia Priori

## Syllabus\* (practicals to be added)

SESSION	LECTURE TOPIC	ASSIGNMENTS
1	Genomics and Public Health	
2	Introduction to Genetic Epidemiology	
3	Bioinformatics I - Introduction to Molecular Genetic Data and Databases	Hand out Essay 1
4	Bioinformatics II - Molecular Phylogenetics	
5	Bioinformatics III - Genetic Variation	Essay 1 Due
6	Biostatistics in Genetic Epidemiology - I	
7	Biostatistics in Genetic Epidemiology - II	Hand out Essay 2
8	Human Genetics - I	
9	Human Genetics - II	Essay 2 Due
10	Human Diversity and Infectious Disease	
11	Genetics and Infectious Disease Surveillance	
12	Genes, Epigenetics and Mental Health	
13	Human Diversity and Cardiovascular Disease Epidemiology	Project Due
14	Presentations	

**Details of Coursework:**

1. **Essays:** Students will be asked to choose 1 essay 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.
3. **Lab practicals:** Students will be required to complete lab practicals applying genetic epidemiological principles.