**EPI507: Principles of Genetic Epidemiology**

Fall 2
Meeting Times: Monday 09:45 AM - 11:15 AM; Wednesday 09:45 AM - 11:15 AM

**Course Description**

Genetic epidemiology has contributed to a deeper understanding of disease biology, leading to new therapeutics. It also has direct clinical and public health applications. This course introduces the goals and methods of genetic epidemiology. After a review of the history of genetic epidemiology and basic molecular genetics, the course introduces study designs, data resources and analytic approaches for related but distinct goals, including: gene discovery; clinical and public health applications of genetics; and understanding the joint contributions of inherited genetics, social factors, and environmental exposures to disease etiology and the distribution of disease in populations. Methods for the design and analysis of genome-wide association studies are a particular focus. The course will also review empirical findings on the contribution of genetics to human diseases and traits.

     The target audience includes doctoral and masters’ students looking for a non-specialist introduction to genetic epidemiology. This course is required for epidemiology Ph.D. students and fulfills a core requirement for Computational Biology and Quantitative Genomics M.Sc. students. Pre-Requisites: [EPI 201 and (EPI 202 or BST 210)] or PHS 2000A or BST 213.

**Learning Objectives**

Upon successful completion of this course, students will be able to:

* Describe how molecular, Mendelian, and population genetics relate to epidemiology
* Use publicly available resources describing genetic variation in human populations and its association with diseases and traits
* Relate concepts from genetic epidemiology to general epidemiologic concepts (e.g. population stratification bias is an example of confounding)
* Choose appropriate study designs and analytic approaches for understanding the relationship between genetic variation and variation in human traits
* Critically evaluate genetic association studies as well as claims regarding the importance (or lack of importance) of genetic variation in different contexts (basic research, clinical epidemiology, public health)
* Distinguish concepts of race/ethnicity from genetic ancestry and understand how to appropriately incorporate race/ethnicity in genetic studies

**Course Readings**

There is no required textbook for this class. Readings will consist of book chapters and journal articles available through Countway, links to publicly available articles, and PDFs supplied via the Canvas site. Required readings for each week are listed on the Canvas site. Readings will form the basis of in-class quizzes and discussions.

**Course Structure**

This course will consist of asynchronous recorded lectures, online exercises (Canvas quizzes), live lectures, live interactive team-learning exercises (including small group discussions), individual homeworks, and an individual final project. The live lectures will be recorded for those who cannot attend synchronously.

The Canvas site is an important learning tool for this course where students will access required articles and recordings, submit course assignments and share other resources with the class. Course announcements will be posted on the site and students will be required to check the course website on a weekly basis.

During the first week of class students will be assigned to a small discussion group. Students are expected to attend live class meetings to participate in discussions and team exercises. *If it is not possible for you to participate in these live interactive sessions, please contact the course instructors as soon as possible so we can make alternate arrangements.*

**Grading, Progress, and Assessment**

The final grade for this course will be based on:

* Canvas Quizzes (10%)
* Team-learning exercises (15%)
* Homework (40%)
* Final project (35%)

**The canvas quizzes and team-learning exercises will be graded on a participation basis**. That is, full credit for completion, regardless of whether answers are “correct.” *Again,* *if it is not possible for you to participate in live interactive sessions, please contact the course instructors as soon as possible so we can make alternate arrangements.*

**There will be a total of six graded homeworks throughout the course**. The homeworks will illustrate concepts presented in lectures and discussions and provide opportunity to learn and use some of the online resources and software tools introduced in lectures and exercises. You are allowed to discuss the homework assignments with other students, but you must submit your own answers.

Homeworks will be assigned on Wednesdays and typically due the following **Wednesday before class (before 9:45 a.m. Boston time)**. Homeworks should be uploaded to Canvas. Please see the schedule below for exact due dates.

**The final project will consist of a short (less than three pages) analysis proposal using publicly available data from the UK Biobank (UKB) or another publicly available data set.** The proposal will consist of the following sections: Background & Significance; Design; Analytic Approach; Strengths and Limitations. This project will allow students to identify specific hypotheses that they can investigate using genetic epidemiology and choose designs and analyses appropriate for those hypotheses. The project is restricted to publicly available data sets to conform to real-world limitations on technology and budgets and to give students familiarity with available resources. **Due to time, budget and computing restraints, students are not required to actually perform their proposed analyses.**

Draft Background & Significance and Design sections are due November 22 so feedback can be returned by December 1. The final projects will be due by 9:45 a.m. December 14.

**Harvard Chan Policies and Expectations**

**Inclusivity Statement**

Diversity and inclusiveness are fundamental to public health education and practice. Students are encouraged to have an open mind and respect differences of all kinds. The EPI507 teaching team shares responsibility with you for creating a learning climate that is hospitable to all perspectives and cultures; please contact us if you have any concerns or suggestions.

**Bias Related Incident Reporting**

The Harvard Chan School believes all members of our community should be able to study and work in an environment where they feel safe and respected. As a mechanism to promote an inclusive community, we have created an anonymous bias-related incident reporting system. If you have experienced bias, please submit a report [hereLinks to an external site.](https://reportinghotline.harvard.edu/%22%20%5Ct%20%22_blank) so that the administration can track and address concerns as they arise and to better support members of the Harvard Chan community.

**Title IX**

The following policy applies to all Harvard University students, faculty, staff, appointees, or third parties: [Harvard University Sexual and Gender-Based Harassment Policy.Links to an external site.](http://hwpi.harvard.edu/files/title-ix/files/harvard_sexual_harassment_policy.pdf) Procedures [For Complaints Against a Faculty MemberLinks to an external site.](http://hwpi.harvard.edu/title-ix/complaints-against-faculty-member-hsph)

Procedures[Links to an external site.](http://diversity.harvard.edu/policies/hsph-complaints-against-non-faculty-academic-appointees)[For Complaints Against Non-Faculty Academic AppointeesLinks to an external site.](http://hwpi.harvard.edu/title-ix/complaints-against-non-faculty-academic-appointees-hsph)

**Academic Integrity**

Each student in this course is expected to abide by the Harvard University and the Harvard T.H. Chan School of Public Health School’s standards of Academic Integrity.  All work submitted to meet course requirements is expected to be a student’s own work.  In the preparation of work submitted to meet course requirements, students should always take great care to distinguish their own ideas and knowledge from information derived from sources.

Students must assume that collaboration in the completion of assignments is prohibited unless explicitly specified.  Students must acknowledge any collaboration and its extent in all submitted work. This requirement applies to collaboration on editing as well as collaboration on substance.

Should academic misconduct occur, the student(s) may be subject to disciplinary action as outlined in the Student Handbook.  See the [Student HandbookLinks to an external site.](https://www.hsph.harvard.edu/student-handbook/academic-support/academic-integrity/) for additional policies related to academic integrity and disciplinary actions.

**Accommodations for Students with Disabilities**

Harvard University provides academic accommodations to students with disabilities. Any requests for academic accommodations should ideally be made before the first week of the semester, except for unusual circumstances, so arrangements can be made. Students must register with the Local Disability Coordinator in the Office for Student Affairs to verify their eligibility for appropriate accommodations. Contact Colleen Cronin ccronin@hsph.harvard.eduin all cases, including temporary disabilities.

**Religious Holidays, Absence Due to**

According to Chapter 151c, Section 2B, of the General Laws of Massachusetts, any student in an educational or vocational training institution, other than a religious or denominational training institution, who is unable, because of his or her religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such examination or requirement which he or she may have missed because of such absence on any particular day, provided that such makeup examination or work shall not create an unreasonable burden upon the School. See the [student handbookLinks to an external site.](https://www.hsph.harvard.edu/student-handbook/student-life-policies/religious-holidays/) for more information.

**Course Evaluations**

Constructive feedback from students is a valuable resource for improving teaching. The feedback should be specific, focused and respectful. It should also address aspects of the course and teaching that are positive as well as those which need improvement.

Completion of the evaluation is a requirement for each course. Your grade will not be available until you submit the evaluation. In addition, registration for future terms will be blocked until you have completed evaluations for courses in prior terms.