**EPIDEMIOLOGY (EPID)**

**EPID 510 Introductory Epidemiology**
This course provides an introduction to the fundamentals of research in clinical epidemiology. It covers definitions of epidemiology; measures of disease frequency, measures of effect and association; epidemiologic study designs, including randomized clinical trials, cohort and case-control studies, cross-sectional surveys, meta-analysis and decision analysis; and an overview of the conduct and analysis of epidemiologic studies. The course is composed of a series of lectures and discussion sessions designed to reinforce concepts introduced in the preceding lecture.

Taught by: Lewis, Anderson
Course usually offered summer term only
Prerequisite: Permission of Instructor
Activity: Lecture
1 Course Unit

**EPID 516 Disease Ecology**
The transmission of infectious diseases is a complex and ever-changing process, and the measures we have to protect ourselves against pathogens—vaccines, antibiotics, bed nets—can have equally complex and unpredictable outcomes. The aim of disease ecology is to understand pathogens and their hosts as interacting populations and to use such understanding to design rational strategies to curb or eliminate disease transmission. A disproportionate number of emerging infectious diseases and recent disease outbreaks in the United States and elsewhere have shared a common characteristic: they affect veterinary as well as human populations. Many are also vector-borne, passing between different species of hosts through insects and other invertebrates. In some cases humans are only ‘spillover hosts’ whose infection is incidental to the transmission cycle. Interdisciplinary approaches are especially important to control such diseases. As a particular focus of the course, students will learn the tools needed for successful collaborations to address the growing problem of zoonotic and vector-borne diseases.

Taught by: Levy, Smith
Prerequisite: Permission of Instructor
Activity: Lecture
1 Course Unit

**EPID 518 Geography & Public Health**
Course usually offered in spring term
Also Offered As: PUBH 517
Activity: Lecture
1 Course Unit

**EPID 526 Biostatistics for Epidemiologic Methods I**
The first half of this course will cover graphical methods, probability, discrete and continuous distributions, estimation, confidence intervals, and one sample hypothesis testing. Emphasis is placed on understanding the proper application and interpretation of the methods. The second half of this course will cover two sample hypothesis testing, nonparametric techniques, sample size determination, correlation, regression, analysis of variance, and analysis of covariance. Emphasis is placed on understanding the proper application and underlying assumptions of the methods presented. Laboratory sessions focus on the use of the STATA statistical package and applications to clinical data.

Taught by: Cucchiara, Yang
Prerequisite: Permission of Instructor
Activity: Lecture
1 Course Unit
Notes: This course runs from mid Summer to mid Fall term. There is a corresponding lab.

**EPID 527 Biostatistics for Epidemiologic Methods II**
The first half of this course covers concepts in biostatistics as applied to epidemiology, primarily categorical data analysis, analysis of case-control, cross-sectional, cohort studies, and clinical trials. Topics include simple analysis of epidemiologic measures of effect, stratified analysis; confounding; interaction, the use of matching, and sample size determination. The second half of this course covers concepts in biostatistics as applied to epidemiology, primarily multivariable models in epidemiology for analyzing case-control, cross-sectional, cohort studies, and clinical trials. Topics include logistic, conditional logistics, and Poisson regression methods; simple survival analyses including Cox regression. Emphasis is placed on understanding the proper application and underlying assumptions of the methods presented. Laboratory sessions focus on the use of the STATA statistical package and applications to clinical data.

Taught by: Landis, Hwang
Activity: Lecture
1 Course Unit
Notes: This course runs from mid Fall to mid Spring term. There is a corresponding lab.

**EPID 532 Database Management for Clinical Epidemiology**
This course provides students with an introduction to the techniques of database management as they apply to clinical research. Students learn how to design and implement computerized databases, perform basic query and reporting operations, migrate data between various file formats, prepare databases for statistical analysis, and perform quality assurance procedures. This course focuses on the practical issues of database management and is intended to support each student’s planned research enterprise. Each class session will be preceded by a one-hour online lecture and brief self-assessment quiz to be completed prior to attending class. This lecture is intended to prepare students for the class for the week, which will be dedicated to practical experience in a laboratory setting.

Taught by: Holmes
Course usually offered in spring term
Prerequisite: Permission of Instructor
Activity: Lecture
0.5 Course Units
EPID 542 Measurement of Health in Epidemiology
Epidemiologic analyses involve three types of procedures: measuring variables (e.g., risk factors), estimating population parameters (e.g., risk ratios), and testing statistical hypotheses. This course addresses the first of these procedures: measurement, which broadly encompasses the tasks involved in obtaining data, without which analyses cannot proceed. Course topics include: defining concepts of exposure, disease, and health; approaches to measuring exposure, which may be personal or environmental; approaches to measuring disease and health status; assessing the validity and reliability of measurement instruments; problems of misclassification of exposure status and disease status and problems of missing data; instrument (e.g., questionnaire) development; and qualitative methods.

Taught by: Wiebe
Course usually offered in fall term
Prerequisites: Permission of course director. Introductory Epidemiology (EPID 510) and Biostatistics for Epidemiologic Methods I (EPID 526) previously or concurrently.
Activity: Lecture
1 Course Unit

EPID 550 Clinical Economics and Clinical Decision Making
This course focuses on the application of decision analysis and economic analysis to clinical and policy research. The course begins with material about the selection, use, and analysis of diagnostic tests using two by two tables, likelihood ratios, and ROC curves. The course continues with the introduction of more general tools for decision analysis, including decision trees and other mathematical models. Special emphasis is placed on the assessment and use of utilities in these models. A major focus of the course is the application of economic principles to the evaluation of health outcomes. During seminars, students will carry out practical exercises that include problem solving, critically analyzing published articles, and learning to use computer software that facilitates decision and economic analyses.

Taught by: Glick, Williams
Course usually offered in spring term
Also Offered As: HPR 550
Prerequisite: Permission of Instructor
Activity: Lecture
1 Course Unit

EPID 560 Issues in Research Protocol Development
This course focuses on major issues in research protocol development, including methodological issues regarding different research designs, development of research questions, and plans for analysis. Each student will present his or her research proposal for open discussion during one of the sessions.

Course usually offered in spring term
Activity: Seminar
0.25 Course Units
Notes: Restricted to MSCE degree students

EPID 570 Critical Appraisal of the Medical Literature
This course focuses on techniques for critical appraisal of the medical literature. Each student will be responsible for at least one critical appraisal session covering different epidemiologic topics.

Course usually offered in spring term
Activity: Lecture
0.25 Course Units
Notes: Restricted to MSCE degree students

EPID 575 Introduction to Genetic Epidemiology
There is an increasing need for researchers to understand the genetic basis of incorporate the collection and analysis of genetic information into studies of The objectives of this course are to provide students with an understanding of used by molecular and genetic epidemiologists.

This course consists of a series of discussions focused on the critical appraisal of genetic/molecular epidemiology. After completing this course, students will be able to read and interpret the medical literature, and understand data collection and analysis approaches. Molecular and genetic epidemiological studies.

Taught by: Devoto, Saleheen
Course usually offered in spring term
Prerequisites: Permission of course director. Students enrolling in this class are expected to have a working knowledge of epidemiology, biostatistics, and human genetics. Students who do not meet these requirements may be allowed to enroll in the class, but may be required to undertake supplemental readings and/or tutorials to obtain the necessary background.
Activity: Lecture
1 Course Unit

EPID 580 Outcomes Research
This course is divided into two main parts. The first part addresses issues related to the measurement of quality in health care. Included is a review of the classical structure-process-outcome quality paradigm. The paradigm’s strengths and limitations are addressed. This part especially focuses on outcome measure of quality and examines the validity of alternative measures. The second part deals with observational, or quasi-experimental, research studies. It addresses the advantages and limitations of alternative designs, and covers the role of clinical risk adjustment in observational studies of medical interventions. It focuses on the problem of selection bias, and reviews recent methods for dealing with this bias, such as instrumental variables.

Taught by: Silber
Course usually offered in fall term
Also Offered As: HPR 580
Prerequisites: Introductory course in statistics including regression methods: EPID 526/ EPID 527 or equivalent. Permission of instructor.
Activity: Lecture
1 Course Unit

EPID 582 Systematic Review and Meta-Analysis
This course will provide an introduction to the fundamentals of systematic reviews and meta-analysis. It will cover introductory principles of meta-analysis; protocol development; search strategies; data abstraction methods; quality assessment; meta-analytic methods; and applications of meta-analysis.

Taught by: Guevara, Umscheid
Course usually offered in fall term
Prerequisites: EPID 510, EPID 526 (may be taken concurrently)
Activity: Lecture
1 Course Unit
EPID 600 Data Science for Biomedical Informatics
Data science refers broadly to using statistics and informatics techniques to gain insights from large datasets. Biomedical informatics refers to a range of disciplines that use computational approaches to analyze biomedical data to answer pre-specified questions as well as to discover novel hypotheses. In this course, we will use R and other freely available software to learn fundamental data science applied to a range of biomedical informatics topics, including those making use of health and genomic data. After completing this course, students will be able to retrieve and clean data, perform exploratory analyses, build models to answer scientific questions, and present visually appealing results to accompany data analyses; be familiar with various biomedical data types and resources related to them; and know how to create reproducible and easily shareable results with R and github.

Taught by: Himes
Course usually offered in fall term
Also Offered As: BMIN 503
Prerequisites: Familiarity with basic statistical (e.g., EPID 526/7 or other first-year graduate level stats course) concepts is expected, as this course will not cover basic concepts in depth. Background in biology and computing would be helpful, but no formal requirements will be enforced.
Activity: Lecture
1 Course Unit

EPID 621 Longitudinal and Clustered Data in Epidemiologic Research
An introduction to the principles of and methods for longitudinal and clustered data analysis with special emphasis on clinical, epidemiologic, and public health applications. Designed for advanced MS and PhD-level students in epidemiology and related fields. Marginal and conditional methods for continuous and binary outcomes. Mixed effects and hierarchical models. Simulations for power calculations. Each student will be required to participate in 4 labs and complete associated problem sets. They may also use their own data to fulfill these requirements in part. Software will include Stata and R.

Taught by: Shults
Course usually offered in fall term
Prerequisites: Completion of EPID 526&527 or equivalent preparation in biostatistics, including generalized linear models. Completion of semester course in principles of epidemiology or equivalent. Good working knowledge of Stata and SAS and familiarity with principles of first-year calculus and matrix algebra. Permission of course director.
Activity: Lecture
1 Course Unit

EPID 622 Applied Regression Models for Categorical Data
This course will provide in-depth treatment of several topics in categorical data analysis. After a brief review of methods for contingency tables, we will introduce the idea of generalized linear models, and focus on two special cases: multiple logistic regression and loglinear models. Each topic will be presented in detail by stating the model and covering parameter estimation and interpretation, inference, model building, regression diagnostics and assessment of model fit. Finally, we will cover extensions to both models, including models for multinomial data, analysis of matched-pair data, and random effects models. Topics will be illustrated in class with examples, and we will discuss the use of STATA to conduct the analyses.

Taught by: Li
Course usually offered in fall term
Prerequisites: EPID 510, EPID 526, EPID 527
Activity: Lecture
0.5 Course Units
Notes: Offered first half of fall term

EPID 623 Applied Survival Analysis
This course will focus on statistical methods for survival or time-to-event data. Topics covered will include: the concepts of survival data and censoring, estimation of survival functions, comparison of groups, regression analysis, sample size and power considerations, and methods for competing risks. All methods will be illustrated by in class examples and homework sets.

Taught by: Li
Course usually offered in fall term
Prerequisites: EPID 510, EPID 526, EPID 527. Additionally, students should be comfortable with basic calculus concepts (e.g., derivatives, integrals, etc).
Activity: Lecture
0.5 Course Units
Notes: Offered second half of fall term

EPID 624 Methods in PCOR
The goal of this course is to provide a broad overview of methods used in patient centered outcomes research (PCOR). Expert faculty will lecture on topics such as standards for research questions, patient centeredness, systematic reviews, causal inference, heterogeneity of treatment effect handling missing data, data networks, Bayesian designs, data registries, and diagnostic tests. Topics may also include advanced observational study design, statistical methods for observational studies, health status/quality of life as applied to PCOR and case studies of patient engagement.

Taught by: Gelfand
Course usually offered in spring term
Prerequisite: Permission of instructor
Activity: Lecture
1 Course Unit

EPID 625 Advanced Biostatistical Methods for Multivariable Prediction Models
This course is an introduction to statistical methods that can be used to evaluate biomarker prognostic studies and multivariate prediction models. It is designed for advanced MS and PhD-level students in epidemiology and related fields (nursing, health policy, social work, demography). Topics will include biostatistical evaluation of biomarkers, predictive models based on various regression modeling strategies and classification trees, assessing the predictive ability of a model; internal and external validation of models; and updating prognostic models with new variables or for use in different populations. Students will learn about the statistical methods that are required by current reporting guidelines for biomarker prognostic studies or the reporting guidelines for multivariable prediction models.

Taught by: Gimotty
Course usually offered in spring term
Prerequisites: Completion of EPID 526, EPID 527 and either EPID 622 or 623 or equivalent preparation in either categorical analysis or survival analysis. Working knowledge of either Stata, SAS or R to fit regression/logistic regression and/or Cox regression models. Permission of course director for students outside of School of Medicine graduate programs.
Activity: Lecture
0.5 Course Units
EPID 630 Clinical Trials
This course is to serve as a general introduction to clinical trials, with emphasis on trial design issues. This is not a course on the biostatistics of clinical trials. It is expected that at the conclusion of the course, a student will be able to plan a clinical trial. Each class will consist of a two-hour lecture followed by a one-hour discussion.
Taught by: Farrar
Course usually offered in spring term
Also Offered As: REG 630
Prerequisite: EPID 510 or equivalent; EPID 526 or equivalent; permission of instructor
Activity: Lecture
1 Course Unit

EPID 634 Clinical Trial Outcomes: Measurement, Analysis and Interpretation
This course is intended to teach students the skills necessary to select and/or design appropriate outcomes for a clinical trial. Students will focus on recent changes in our understanding of clinical trial outcome measurements, analyses, and interpretation for both subjective and objective phenomenon, such as adherence, use of multiple outcomes, and clinical importance. While design issues for clinical trials are the main focus, other types of clinical studies will be considered as appropriate. Student will be expected to learn about the problems inherent in the design of outcome measures of health and how to apply different epidemiologic and biostatistical concepts toward a solution. It is expected that at the conclusion of the course, students will be able to plan a clinical trial with a valid, responsive, and interpretable outcome.
Taught by: Farrar
Course usually offered in fall term
Prerequisite: EPID 510 or equivalent; permission of instructor
Activity: Lecture
1 Course Unit

EPID 636 Epidemiological Methods in Acute Care
This is an advanced course addressing epidemiological issues as they apply to important clinical topics in acute care, including emergency, hospital, and critical care medicine. Lectures and discussions will have two primary goals: 1) to explore epidemiologic methods specific to acute care settings (i.e., choice of outcomes, risk adjustment); and 2) to explore the epidemiology of particular diseases (e.g., sepsis, acute lung injury, hospital acquired infections) and research questions of current importance in these areas. This course will acquaint students with the classic literature in the field adult and pediatric urgent care, emergency medicine, and critical care epidemiology, teach advanced epidemiological principles using a problem-based approach, and demonstrate the strengths and weaknesses of epidemiological research methodologies as they have been applied to acute care.
Course not offered every year
Prerequisites: EPID 510, EPID 526; Permission of Instructor
Activity: Lecture
1 Course Unit

EPID 638 Topics in Clinical Trial Design and Analysis
This course is intended to follow, and be complementary to EPID 630: Clinical Trials. It will build on the basic principles of design, conduct, and analysis introduced in that course and will go into more detail on particular approaches. Topics covered will include noninferiority trials, phase 1 designs, multi-stage and other adaptive designs, graphical data presentations and current ethical controversies in clinical trials.
Taught by: Ellenberg
Course usually offered in fall term
Prerequisite: EPID 630 or equivalent
Activity: Lecture
1 Course Unit

EPID 640 Advanced Topics in Epidemiology
This course is designed to introduce students to advanced epidemiologic methods through a series of readings and discussions. The course aims to deepen the students' understanding of important concepts and controversies in contemporary epidemiology and to enhance their ability to think critically about empirical epidemiologic research. The course is intended for students who are already familiar with the fundamentals of epidemiology and biostatistics, and who wish to gain an understanding of the complex issues underlying epidemiologic study design and interpretation.
Taught by: Bisson, Naj
Course usually offered in spring term
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, EPID 527 or equivalent; permission of instructor
Activity: Lecture
1 Course Unit

EPID 644 Cardiopulmonary Epidemiology
This is an advanced course that addresses epidemiological research issues as they apply to important clinical topics in cardiovascular and pulmonary medicine. Lectures and workshops are designed to acquaint students with the classic literature in the fields of cardiovascular and pulmonary epidemiology, to use a body of literature to demonstrate the strengths and weaknesses of epidemiological research designs as they have been applied to cardiovascular and pulmonary medicine to expose students to the range of topics studied to teach advanced epidemiologic principles using a problem-based approach, and to stimulate students to develop independent research questions.
Taught by: Kimmel
Course usually offered summer term only
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, EPID 527 or equivalent; permission of instructor
Activity: Lecture
1 Course Unit

EPID 645 Research Methods in Cancer Epidemiology
Research in cancer etiology, prevention, treatment, and control includes a wide range of subject matter science, from the initial molecular changes which precede the development of cancer to issues of primary guidelines for cancer survivors. The course reviews the possible study designs applied to cancer etiology, prevention, treatment, and control. These include randomized controlled trials and multiple types of observational studies (cohort, case-control, cross-sectional). Other topics will include causal inference, bias, and effect modification.
Taught by: Schmitz
Course usually offered summer term only
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, EPID 527 or equivalent; permission of instructor
Activity: Lecture
1 Course Unit
EPID 646 Reproductive Epidemiology
This is an advanced course that addresses epidemiological research issues as they apply to important clinical topics in obstetrics and gynecology and related clinical disciplines. Lectures and workshops are designed to acquaint students with seminal issues in the field of reproductive epidemiology, to use a body of literature to demonstrate the strengths and weaknesses of epidemiological research designs as they have been applied to obstetrics and gynecology and related clinical disciplines, to expose students to the range of topics studied, to teach advanced epidemiologic principles using a problem-based approach, and to stimulate students interested in reproductive epidemiology to develop independent research questions.
Taught by: Barnhart
Course offered spring; even-numbered years
Activity: Lecture
1 Course Unit

EPID 652 Renal and Urologic Epidemiology
The objective of this course is to prepare students to function as effective, independent researchers in the fields of renal and urologic epidemiology by providing the students an understanding of how epidemiologic research can and has advanced the knowledge of diseases in treatments of renal and urologic medicine. The structure of the course consists of a lecture series, workshops, and student presentations.
Taught by: Feldman, Anderson, Yang
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, EPID 527 or equivalent, and permission of instructor
Activity: Lecture
1 Course Unit

EPID 656 Research Methods in Infectious Diseases Epidemiology
This is an advanced course addressing epidemiological issues as they apply to important clinical topics in infectious diseases. Lectures and discussions will serve two primary goals: 1) to explore epidemiologic methods specific to infectious diseases (e.g. adherence to therapy) or which have important applications to infectious diseases (e.g. molecular epidemiology); and 2) to explore the epidemiology of particular infectious diseases or syndromes (e.g. HIV). This course will acquaint students with the classic literature in the field of infectious diseases epidemiology, teach advanced epidemiological principles using a problem-based approach, and demonstrate the strengths and weaknesses of research methodologies as they have been applied to infectious diseases.
Taught by: Gross, Han
Course usually offered summer term only
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, a course that covers logistical regression such as EPID 527 or equivalent, and permission of instructor
Activity: Lecture
1 Course Unit

EPID 664 Methods in Neurologic Clinical Epidemiology
This course will introduce students to methods and study design principles that are specific or unique to clinical research and trials in neurology, child neurology, neuro-ophthalmology, neurosurgery, and related fields.
Taught by: Farrar
Course offered spring; even-numbered years
Activity: Lecture
0.5 Course Units

EPID 666 Pharmacoepidemiology Research Methods
The purpose of this course is to explore and integrate concepts and considerations that are key to the conduct of pharmacoepidemiologic research. The format will be a mixture of seminar, instructor-led discussion, student-led discussion, and student presentations. Papers from the applied and methods literature will be used to illustrate concepts and as springboards for discussion. Topics covered include use of automated databases, pharmacogenomics, and approaches to addressing confounding.
Taught by: Hennessy
Course usually offered in spring term
Prerequisites: EPID 510 or equivalent, EPID 526 or equivalent, a course that covers logistical regression such as EPID 527 or equivalent, and permission of instructor(s)
Activity: Lecture
1 Course Unit

EPID 672 Biostatistical Methods for Addressing Confounding
This course is designed to teach epidemiology students the statistical principles of analysis specific to pharmacoepidemiology study designs including the use of propensity scores, inverse probability weighting, time varying confounding analyses, disease risk scores, and instrumental variables. Each session includes both a lecture component and laboratory component. Students will learn the statistical principles and then apply them to example study datasets. Laboratory sessions will be conducted on the students laptops using STATA software.
Taught by: Ogdie-Beatty, Stephens-Sheilds
Course usually offered summer term only
Prerequisites: EPID 526 and EPID 527; permission of the instructor(s)
Activity: Lecture
1 Course Unit


**EPID 675 Advanced Methods for Analysis of Complex Genetic Traits**  
The advent of high-throughput genotyping has created unprecedented opportunities to characterize in detail information related to genome, epigenome and transcriptome. Such technological advancements have offered exciting opportunities for biological discovery as well as translation of biological data for targeted therapies. However, investigation of genetic polymorphisms, epigenetic signatures, gene transcription, biomarkers and their relationship with environmental factors and disease outcomes requires a thorough understanding of a wide range of experimental methods and statistical approaches. Through critical review of the current literature, this course will provide understanding on various "OMICS" approaches for the study of complex disorders and traits. Students will also understand and present advanced statistical methods and how such concepts can be applied.  
Taught by: Saleheen  
Course not offered every year  
Prerequisites: Introduction to Genetic Epidemiology or equivalent; training in study design and statistical analysis related to statistical genetics and molecular epidemiology, and permission of course directors.  
Activity: Lecture  
1 Course Unit

**EPID 700 Doctoral Seminar in Epidemiology**  
The course is intended to meet the needs of PhD students over the entire program from the coursework phase through the dissertation defense, and is intended to optimize cross-fertilization between the students at all phases of their program.  
Taught by: Levy  
Prerequisite: Permission of Instructor  
Activity: Seminar  
0.5 Course Units  
Notes: Restricted to Epidemiology Doctoral Students

**EPID 701 Introduction to Epidemiologic Research**  
This course is intended to provide in-depth, exposure to the theory and methods of epidemiologic research. Topics to be covered include causal inference, measures of disease frequency and association, study design, bias and confounding, validity, and epidemiologic analysis.  
Prerequisites: Quantitative proficiency. Knowledge and/or experience in working in biomedical research. Permission of instructor.  
Activity: Lecture  
1 Course Unit

**EPID 703 Spatial Epidemiology**  
This course motivates the need for, and describes methods for, the analysis of spatially indexed epidemiological data. Major topics to be covered: clustering and cluster detection, disease mapping, spatial regression, methods for infectious disease data, small area estimation and an introduction to geographical information systems. Both point-references and spatially aggregated data will be considered. The use of R packages for analysis will be described.  
Prerequisites: EPID 527 and 621 or equivalent preparation in biostatistics, R programming experience. Permission of instructor.  
Activity: Lecture  
1 Course Unit

**EPID 714 Grant Writing/Review**  
This course will assist students in the design of an NIH grant (F-32, K, R21 orR01) for submission by enhancing their appreciation of the specifics of the grant writing process and in understanding the grant review process. This course is designed to provide background, training, and practice with the writing and submitting of NIH style grants. As a minimum all students who enroll will be expected to write and submit a reasonable draft of a full NIH style grant proposal by the end of the term. During the process, the portions of each proposal will be reviewed as a group by the other students in the course. In response to each review, students are expected to revise their grant sections.  
Taught by: Farrar,Gerber  
Course usually offered summer term only  
Prerequisites: EPID510, EPID526, EPID560, and EPID570 or Permission of Instructor  
Activity: Seminar  
0.5 Course Units