EPIDEMIOLOGY (EPID)

EPID 510 Introductory Epidemiology
This course provides an introduction to the fundamentals of research in clinical epidemiolgy. 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 the preceding lecture. Prerequisite: Permission of instructor
Taught by: Bewtra
Course usually offered summer term only
Activity: Lecture
1.0 Course Unit

EPID 516 Mathematical Models for the Control of Infectious Diseases
As infectious diseases are transmitted from one host to another, the dynamics of transmission in the population of hosts follow certain basic rules. If one knows and understands these rules, one can plan rational strategies to prevent or control infections. One of the principal tools of those interested in public health interventions to control or ameliorate infectious diseases is the mathematical model. A model is just a means of representing and manipulating something that would not otherwise be accessible. This course provides students with the opportunity to construct models of the transmission of infectious diseases and to use these models to plan or compare disease control strategies. The course is predicated upon the notion that the act of building a mathematical model of disease transmission is often the very best way of understanding what is going on. This understanding will be further refined by the examination of more complicated and sophisticated model structures as they appear in the recent published literature. Prerequisite: Permission of instructor 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
Course usually offered in fall term
Also Offered As: PUBH 610
Activity: Lecture
1.0 Course Unit

EPID 518 Geography & Public Health
This course will provide an introduction to GIS in public health research and practice. Through a series of lectures and labs students will explore theories linking health and the environment, spatial analysis and spatial epidemiology, and applications of GIS-related data collection and analysis.
Course usually offered in fall term
Also Offered As: PUBH 517
Activity: Lecture
1.0 Course Unit

EPID 526 Biostatistics for Epidemiologic Methods I
The first half of this 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. Prerequisite: Permission of instructor. This course runs from mid summer to mid fall term. There is a corresponding lab.
Taught by: Cucchiara, Yang
Activity: Lecture
1.0 Course Unit

EPID 527 Biostatistics for Epidemiologic Methods II
The first half of this 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. Prerequisite: This course runs from mid fall to mid spring term. There is a corresponding lab.
Taught by: Landis, Shaw
Prerequisite: EPID 526
Activity: Lecture
1.0 Course Unit

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. Prerequisite: Restricted to MSCE degree students. Permission of Instuctor.
Taught by: Harhay
Course usually offered in spring term
Activity: Lecture
0.5 Course Units

EPID 534 Qualitative Methods in the Study of Health, Disease and Medical Systems
This course combines informal lecture and discussion with practical exercises to build specific skills for conducting qualitative research on healthcare, broadly defined.Readings include books and papers about research methodology and articles that provide exemplars and pitfalls of qualitative research. Specific topics covered include: the role of theory in qualitative research, method-research question fit, collecting different types of qualitative data (observation, interview, focus group, text, video), ethical issues in qualitative research, establishing rigor in qualitative research, introduction to qualitative data analysis using software, mixing methods,approaches for obtaining grant funding for qualitative research and writing up qualitative research studies for publication.The objectives of this course are: To introduce the student to the epistemological underpinning of qualitative methodology; To review how to select the best qualitative approach for different research questions; To introduce the student to different qualitative data collection techniques; To review standards of methodological rigor in qualitative research; To introduce the basic principles of qualitative data analysis using NVivo software; To provide practical advice about planning, getting funding for and and implementing a qualitative study. Prerequisite: Previous course work in researh methods or permission of course director.
Taught by: Szymczak
Course usually offered in fall term
Activity: Lecture
1.0 Course Unit

EPID 542 Measurement of Health in Epidemiology
This course addresses the measurement of epidemiological variables, which broadly encompasses the tasks involved in obtaining data, without which analyses cannot proceed.Course topics to be discussed include: defining the the concepts of exposure, disease, and health; approaches to measuring exposures, which may be personal (i.e., psychological, behavioral, biological, or genetic) or environmental (i.e., physical, chemical, social, or organizational); approches to measuring disease and health status; assessing the validity and reliability of measurement instruments; problems of misclassification of exposure status; missing data; instrument (e.g., questionnaire) development; and qualitative methods. Prerequisite: If course requirement not met, permission of course director.
Taught by: Farrar
Course usually offered in fall term
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
0.5 Course Units

EPID 546 Clinical Database Research Methodology
This course will discuss appropriate selection of automated databases for research questions of interest; assessment of drug exposures; validation of health outcomes of interest;and addressing biases, confounding, and missing data in databases.We will also review key aspects of protocol development for for database studies and discuss research grant applications related to these studies. Prerequisite: If course requirement not met, prermission of course director required.
Taught by: Lo Re
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
0.5 Course Units

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. Prerequisite: Permission of instructor
Taught by: Glick,Williams
Course usually offered in spring term
Also Offered As: HPR 550
Activity: Lecture
1.0 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. Prerequisite: Restricted to MSCE degree students.
Course usually offered in spring term
Activity: Seminar
0.25 Course Units

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. Prereqisite: Resticted to MSCE degree students.
Course usually offered in spring term
Activity: Lecture
0.25 Course Units

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 seriesdiscussions focused on the critical appraisal of genetic/molecular epidemiologiAfter completing this course, students will be able to read and interpret the mepidemiology literature, and understand data collection and analysis approachesmolecular and genetic epidemiological studies. Prerequisite: Permission of course director. Students enrolling in this class are expected to have a working knowledge of epidemiology, biostatistics, and humangenetics. Students who do not meet these requirements may be allowed to to enroll in the class, but may be required to undertake supplemental readings and/or tutorials to obtain the necessary background.
Taught by: Devoto,Saleheen
Course usually offered in spring term
Activity: Lecture
1.0 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 theclassical 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. Prerequisite: Introductory course in statistics including regression methods. Permission of instructor if prerequistion is not met.
Taught by: Silber
Course usually offered in fall term
Also Offered As: HPR 580
Activity: Lecture
1.0 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: Umscheid, Chen
Course offered fall; odd-numbered years
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
1.0 Course Unit

EPID 584 Health Disparities Research
This course will provide an overview of research in health disparities. It will cover the historical aspects, concepts, policy, economic, genomic and social perspectives of health disparities. It will provide students with methodological tools for health disparities research and introduce students to ongoing health disparities research by current Penn and affiliated faculty members.The course is composed of a series of weekly small group lectures and discussion, including critical appraisal of published papers, guest faculty presentations, and student presentations. Students will be expected to attend weekly meetings and participate in class discussions, prepare and lead discussions of assigned papers, review assigned readings, and draft and present a scientific protocol of their choosing related to health disparities.
Taught by: Guevara,Takeshita
Course usually offered in spring term
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
1.0 Course Unit

EPID 600 Data Science for Biomedical Informatics
In this course, we will use R and other freely available software to learn fundamendal 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 explanatory 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. Prerequisite: Familiarity with basic statistical (e.g., EPID 526, 527 or other first-year graduate level stats course) concepts is expected, as this course will not cover basic concepts in depth.
Taught by: Himes
Course usually offered in fall term
Also Offered As: BMIN 503
Activity: Lecture
1.0 Course Unit

EPID 602 Topics in Biom/Hlth Info
Also Offered As: BMIN 504
Activity: Lecture
1.0 Course Unit

EPID 610 Tutorial in Epidemiologic Research
This is a tutorial given by each student's advisor. Advisor and student meet weekly. Topics include: discussion and review of epidemiologic concepts and principles, guided readings in the epidemiology of a specific health area, and the development of the research protocol.
One-term course offered either term
Activity: Independent Study
1.0 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. Software will include Stata and R. Prerequisite: Completion of EPID 526 and 527 or equivalent preparation in biostatistics, including generalized linear models. Completion of semester curse in principles of epidemiology or equivalent. Good working knowledge of Stata and SAS and familiarity with principles of first-year calculus and matrix alegebra. Permission of course director.
Taught by: Shults
Course usually offered in fall term
Activity: Lecture
1.0 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: Xiao
Course usually offered in fall term
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
0.5 Course Units

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

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. Prerequisite: Permission of instructor
Taught by: Gelfand
Course usually offered in spring term
Activity: Lecture
1.0 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. Prerequisite: 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.
Taught by: Gimotty
Course usually offered in spring term
Prerequisite: EPID 526 AND EPID 527 AND (EPID 622 OR EPID 623)
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. Prerequisite: Permission of instructor.
Taught by: Farrar
Course usually offered in spring term
Also Offered As: REG 630
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
1.0 Course Unit

EPID 632 Introduction to Biomedical and Health Informatics
This course is designed to provide a survey of the major topic areas in medical informatics, especially as they apply to clinical research. Through a series of lectures and demonstrations, students will learn about topics such as databases, natural language, clinical information systems, networks, artificial intelligence and machine learning applications, decision support, imaging and graphics, and the use of computers in education.
Taught by: Holmes
Course usually offered in fall term
Activity: Lecture
1.0 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.
Prerequisite: Permission of instructor
Taught by: Farrar
Course usually offered in fall term
Prerequisite: EPID 510
Activity: Lecture
1.0 Course Unit

EPID 636 Epidemiological Methods in Acute Care
This is an advanced seminar that will cover nuanced methodological considerations and logistical challenges of research in acute care settings (e.g. prehospital,emergency department, hospital, and intensive care units). Topics to be covered with regards to primary data collection include: recruitment and consent, outcomes measurement, survey and qualitative research, clinical trials, quality improvement, decision making and cognitive biases, end-of-life issues, and acute care research networks. Topics to be covered with regards to secondary data analysis include: data sources, risk adjustment, missing data, causal inference, predictive modeling, decision rules, variability in care, organizational factors, and economic analysis. The course will finish with a discussion of the landscape for obtaining funding for acute care research. Weekly sessions will include expert guest lectures, review of landmark papers, and round-table discussion of the students'going research projects as they pertain to issues covered in the course. Prerequisite: Permission of instructor.
Taught by: Delgado,Holena
Course not offered every year
Prerequisite: EPID 510 AND EPID 526
Activity: Lecture
1.0 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
Activity: Lecture
1.0 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. Prerequisite: Permission of instructor.
Taught by: Naj
Course usually offered in spring term
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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 weakness 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 epidemiological principles using a problem-based approach, and to stimulate students to develop independent research questions.
Prerequisite: Permission of instructor.
Taught by: Kimmel
Course usually offered summer term only
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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. Prerequisite: Permission of instructor.
Taught by: Aplenc, Getz
Course usually offered summer term only
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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 epidemiolological research designs as they have been applied to obstetrics and gynecology and related clinical disciplines, to expose students to the range oftopics 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
1.0 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 advance(d) 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. Prerequisite: Permission of instructor.
Taught by: Feldman
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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.
Prerequisite: Permission from instructor is needed.
Taught by: Gross,Han
Course usually offered summer term only
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 Course Unit

EPID 658 Gastroenterology Epidemiology
This course provides an in-depth presentation of advanced methodological issues in conducting clinical epidemiological research in the field of gastroenterology. Prerequisite: Permission of instructor.
Taught by: Yang
Course offered spring; odd-numbered years
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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. Prerequisite: Permission of instructor
Taught by: Farrar, Waldman
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
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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. Prerequisite: Permission of the instructor(s).
Taught by: Ogdie-Beatty, Stephens-Sheilds
Course usually offered summer term only
Prerequisite: EPID 526 AND EPID 527
Activity: Lecture
1.0 Course Unit

EPID 674 Measuring the Microbiome: Methods and Tools
This is an advanced course addressing the methods and tools used to analyze microbiome data as well as their implications for clinical study design. The course will include: (1) lectures focused on how the microbiome is measured, approaches to the analysis of highly multivariate microbiome data, and the bioinformatic tools used to execute these analyses; (2) hands-on R and command-line codingto build familiarity with commonly used tools and analytic methods; and (3) short, practical assignments to reinforce the lectures and classwork. The course will acquaint students with classic literature in the field of microbiome research and prepare students to integrate microbiome data collection and analysis with epidemiologic research methodologies.
Prerequisite: Permission of instructor if course prerequisites not met
Taught by: Brendan J. Kelly, MD, MSCE Assistant Professor of Medicine (Infectious Diseases) and Epidemiology 731 Blockley Hall brendank@pennmedicine.upenn.edu
Course not offered every year
Prerequisite: EPID 510 AND EPID 526 AND EPID 527
Activity: Lecture
1.0 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 willprovide 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. Prerequisition: 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.
Taught by: Saleheen
Course not offered every year
Activity: Lecture
1.0 Course Unit

EPID 699 Lab Rotation
Activity: Laboratory
0.33 Course Units

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. Prerequisite: Quantitative proficiency. Knowledge and/or experience in working in biomedical research. Permission of instructor.
Activity: Lecture
1.0 Course Unit

EPID 702 Advanced topics in Epidemiologic Research
The overarching goal of this course is to expose doctoral students in epidemiology to advanced epidemiologic and statistical research methods and theories that are limitedly or not otherwise covered in courses available in the curriculum. Topics that will be covered include reporting guidelines and best practices for reporting statistical methods and results, handling missing data, purposeful selection and application of propensity scores, selected topics in longitudinal and clustered data analysis, contemporary topics in statistical inference and use of p-values and other Frequentist statistical methods, Bayesian theory and inference, and topics selected in collaboration with students and the Graduate Group in Epidemiology and Biostatistics (GGEB) each term. This course is intended for doctoral students in the PhD program in Epidemiology. However, students from other graduate groups are welcome, as long as they meet the pre-requisites; such students are welcome during any year of study. Three learning objectives have been developed for this course; (i) provide students with an understanding of modern and cutting-edge quantitative methods, advanced topics, and best practices in epidemiologic, statistical, and biomedical research; (ii) develop students competence and confidence in statistical programing to support accurate and reproducible epidemiologic and biostatistical analyses; (iii) improve the ability of students to make informed decisions regarding the selection of analytic methods in their individual and collaborative research projects. This course emphasizes the following core competencies: knowledge within program area (epidemiologic and biostatistical methods); research skills (study planning, critically appraising published research); quantitative and computational methodologies (data manipulation, data analysis, statistical coding and debugging, Bayesian inference, data visualization, purposeful statistical inference, and model selection). Through technical lectures, reading of carefully selected peer-reviewed tutorials, critical appraisal of published research studies, and in-class statistical coding laboratory sessions, this course will provide instruction on rigorous and informed statistical model selection, estimation, and interpretation.
Taught by: Michael Harhay, PhD, Assistant Professor of Epidemiology and Medicine
Course usually offered in spring term
Prerequisite: EPID 526 AND EPID 527 AND EPID 701
Activity: Lecture
1.0 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. Prerequisite: If course requirement not met, permission of instructor required.
Taught by: Farrar,Gerber
Course usually offered summer term only
Also Offered As: HPR 714
Prerequisite: EPID 510 AND EPID 526 AND EPID 560 AND EPID 570
Activity: Seminar
0.5 Course Units

EPID 899 Pre-dissertation Research
Activity: Laboratory
0.5 Course Units

EPID 900 Master's Thesis
These are a series of tutorial sessions conducted by the student's advisor, which are to support the student's efforts in developing a research protocol, designing a designing a research project, and completing the study.
One-term course offered either term
Activity: Independent Study
1.0 Course Unit

EPID 995 Dissertation
Activity: Dissertation
0.5 Course Units