DEPARTMENT OF PUBLIC HEALTH SCIENCES COURSES OFFERED BY QUARTER

Summer 2016

Clinical Epidemiology
PBHS 30700
Course Instructors: Brian Chiu & Diane Lauderdale
T/Th 9:00-11:00am
PQ: Introductory Statistics recommended, may be taken concurrently.
ID: CCTS 45100
Clinical epidemiology is the "application of epidemiologic principles and methods to problems encountered in clinical medicine." This course introduces the basic principles of epidemiologic study design, analysis and interpretation, with a particular focus on clinical applications. The course includes lectures and discussions based on critical appraisal of significant research articles. The course is primarily intended for, but not restricted to, students with prior clinical training. Public Health Sciences 30700 and 30900 may not both be taken for credit, either will fulfill the basic epidemiology requirement for the MSCP in Public Health Sciences and either will serve as the epidemiology prerequisite for Public Health Sciences 31001.

Introduction to Biostatistics
PBHS 32100
Course Instructor: Sydeaka Watson
T/W/Th 3:00-4:30pm
PQ: 2 quarters of pre-calculus (Required course for MSCP)
ID: CCTS 45000
This course will provide an introduction to the basic concepts of statistics as applied to the bio-medical and public health sciences. Emphasis is on the use and interpretation of statistical tools for data analysis. Topics include (i) descriptive statistics; (ii) probability and sampling; (iii) the methods of statistical inference; and (iv) an introduction to linear and logistics regression.
In addition to the course, there is a statistical computing workshop held on Wednesdays from 10-11:30am in BSLC 018.

DEPARTMENT OF PUBLIC HEALTH SCIENCES COURSES

Autumn 2016

Epidemiology and Population Health
PBHS 30910
Course Instructor: Diane Lauderdale
T/Th 3-4:20pm
PQ: STAT 22000 or other introductory statistics highly desirable. **For BIOS students**-completion of the first three quarters of a Biological Sciences Fundamentals sequence.
ID: STAT 22810, PPHA 36410, ENST 27400
Epidemiology is the basic science of public health. It is the study of how diseases are distributed across populations and how one designs population-based studies to learn about disease causes, with the object of identifying preventive strategies. Epidemiology is a quantitative field and draws on biostatistical methods. Historically, epidemiology's roots were in the investigation of infectious disease outbreaks and epidemics. Since the mid-twentieth century, the scope of epidemiologic investigations has expanded to a fuller range non-infectious diseases and health problems. This course will introduce classic studies, study designs and analytic methods, with a focus on global health problems.

Critical Readings in Epidemiology
PBHS 31510
Course Instructor: Briseis Aschebrook-Kilfoy
W 1:30-3:20pm
PQ: PBHS 30700 (HSTD 30700) or PBHS 30900 (HSTD 30900)
Course consists of reading and critiquing important and innovative recent papers in epidemiology. Each week, there will be a different substantive or disease focus for the papers. Research areas covered will be primarily, but not exclusively, in noninfectious diseases. Different faculty will lead the discussion each week and students will prepare and present summary critiques of the articles.

Applied Regression Analysis
PBHS 32400
Course Instructor: Lin Chen
T/Th 10:30-11:50pm
PQ: PBHS 32100 (HSTD 32100); STAT 22000 or equivalent
ID: STAT 22400 (Primary)
This course is an introduction to the methods and applications of fitting and interpreting multiple regression models. The main emphasis is on the method of least squares. Topics include the examination of residuals, the transformation of data, strategies and criteria for the selection of a regression equation, the use of dummy variables, tests of fit. Stata computer package will be used extensively, but previous familiarity with Stata is not assumed. The techniques discussed will be illustrated by real examples involving biological and social science data.

Applied Longitudinal Data Analysis
PBHS 33300
Course Instructor: Don Hedeker
T/TH 9:00-10:20am
PQ: PBHS 32400 (HSTD 32400)/STAT 22400 or equivalent, and PBHS 32600 (HSTD 32600)/STAT 22600 or PBHS 32700 (HSTD 32700)/STAT 22700 or equivalent; or consent of instructor.
ID: STAT 36900
Longitudinal data consist of multiple measures over time on a sample of individuals. This type of data occurs extensively in both observational and experimental biomedical and public health sciences, as well as in studies in sociology and applied economics. This course will provide an introduction to the principles and methods for the analysis of longitudinal data. Whereas some supporting statistical theory will be given, emphasis will be on data analysis and interpretation of models for longitudinal data. Problems will be motivated by applications in epidemiology, clinical medicine, health services research, and disease natural history studies.

DEPARTMENT OF PUBLIC HEALTH SCIENCES COURSES

Winter 2017

Epidemiologic Methods
PBHS 31001
Course Instructor: Dezheng Huo
T/Th 12:00-1:20pm
PQ: PBHS 30700 or PBHS 30900 or PBHS 30910 **and** PBHS 32400 or applied statistics courses through multivariate regression or consent of instructor
ID: STAT 35700
This course expands on the material presented in "Principles of Epidemiology," further exploring issues in the conduct of epidemiologic studies. The student will learn the application of both stratified and multivariate methods to the analysis of epidemiologic data. The final project will be to write the "specific aims" and "methods" sections of a research proposal on a topic of the student's choice.

Cancer Epidemiology
PBHS 31200
Course Instructor: Brian Chiu
M/W 1:30-2:30pm
PQ: PBHS 30700 or PBHS 30900
The purpose of this course is to review the basic concepts and issues relevant to cancer epidemiology. Specifically, this course will focus on interpreting cancer statistics, and describing the current state of knowledge regarding the etiology and risk factors for the major cancer sites. In addition, issues in research design and interpretation within the context of cancer epidemiology, as well as the molecular and cellular basis of carcinogenesis as it pertains to cancer occurrence in populations will be discussed. The course is appropriate for students who have an introductory knowledge of epidemiology. Previous study of cancer biology is helpful but not required.

Biostatistical Methods
PBHS 32700
Course Instructor: Fan Yang
T/Th 10:30-11:50am
PQ: PBHS 32400/STAT 22400; or STAT 24500; or equivalent; or consent of instructor
ID: STAT 22700
This course is designed to provide students with tools for analyzing categorical, count and time-to-event data frequently encountered in medicine, public health and related biological and social sciences. The course will emphasize application of the methodology rather than statistical theory, including recognition of the appropriate methods, interpretation and presentation of results. Methods covered include: contingency table analysis, Kaplan-Meier survival analysis, Cox proportional-hazards survival analysis, logistic regression, Poisson regression.

Introduction to Health Economics
PBHS 38010
Course Instructor: Tamara Konetzka & Rena Conti
Day & Time: M/W 1:30-2:50pm
PQ: Microeconomics course
ID: PBHS 28010
This course covers the foundations of the economics of health care. Content includes demand for health, medical care, and insurance; supply of medical care and behavior of health care practitioners; and economic perspectives on measurement in health care research. Using a combination of lectures, readings, and problem sets, the goal is for students to acquire a basic understanding of economic knowledge and thinking that can be applied to current challenges in health care policy and practice. The course is open to undergraduate and graduate students with at least one prior course in microeconomics.

Introduction to Causal Inference
PBHS 43201
Course Instructor: Guanglei Hong, Fan Yang, and Kazuo Yamaguchi
T 1:30-4:20pm
PQ: Intermediate statistics or equivalent such as STAT 22400/PBHS 32400, PPHA 31301, BUS 41100 or SOCI 30005.

ID: CHDV 30102 (Primary)
This course is designed for graduate students and advanced undergraduate students from social sciences, education, public policy, health studies, social service administration, and statistics who are involved in quantitative research and are interested in studying causality. The course begins by introducing the notion of counterfactual outcomes and various causal inference techniques that are comparatively new to most social scientists. A major emphasis will be placed on conceptualizing causal questions, comparing alternative research designs, and identifying the assumptions under which a causal effect can be estimated from non-experimental data. In addition to studying experimental, quasi-experimental, and non-experimental designs, students will become familiar with causal inference techniques suitable for evaluating binary treatments, concurrent multi-valued treatments, time-varying treatments, as well as moderated and mediated treatment effects in non-experimental data.

Policy Analysis Methods and Applications
PBHS 45610
Course Instructor: Harold Pollack
Th 9-11:50am
PQ:
ID: SSAD 45600 (Primary); PPHA 40101
This course examines the intellectual bases and analytic tools for the professional practice of policy analysis, with an emphasis on economic policy analysis in the form of cost-benefit analysis, decision analysis, and cost-effectiveness analysis. Many examples will be drawn from medicine and public health, which offer particularly clear application of the basic methods. However we will also draw upon examples and challenges from environmental policy, criminal justice, transportation, and welfare policy.

Topics to be covered will include cost-benefit analysis, decision analysis, quality of life and cost measurement, model development and parameter estimation, and cost-effectiveness methods. Students will have weekly problem sets and instruction in a computer lab that will provide them with hands on experience performing decision analysis and cost-effectiveness analyses. Students taking this course will be prepared to take Advanced Applications of Cost-Effectiveness Analysis, which provides doctoral-level training in this area.

DEPARTMENT OF PUBLIC HEALTH SCIENCES COURSES

Spring 2017

Epidemiology and Population Health
PBHS 30910
Course Instructor: Ben Lahey
T/Th 3-4:20pm
PQ: STAT 22000 or other introductory statistics highly desirable. **For BIOS students**-completion of the first three quarters of a Biological Sciences Fundamentals sequence.
ID: STAT 22810, PPHA 36410, ENST 27400
Epidemiology is the basic science of public health. It is the study of how diseases are distributed across populations and how one designs population-based studies to learn about disease causes, with the object of identifying preventive strategies. Epidemiology is a quantitative field and draws on biostatistical methods. Historically, epidemiology's roots were in the investigation of infectious disease outbreaks and epidemics. Since the mid-twentieth century, the scope of epidemiologic investigations has expanded to a fuller range non-infectious diseases and health problems. This course will introduce classic studies, study designs and analytic methods, with a focus on global health problems.

Introduction to Clinical Trials
PBHS 32901
Course Instructor: James Dignam
T/TH 3-4:20pm
PQ: PBHS 32100 (HSTD 32100); STAT 22000; introductory statistics; or consent of instructor
ID: STAT 35201; CCTS 32901
This course will review major components of clinical trial conduct, including the formulation of clinical hypotheses and study endpoints, trial design, development of the research protocol, trial progress monitoring, analysis, and the summary and reporting of results. Other aspects of clinical trials to be discussed include ethical and regulatory issues in human subjects research, data quality control, meta-analytic overviews and consensus in treatment strategy resulting from clinical trials, and the broader impact of clinical trials on public health.

Infectious Disease Epidemiology, Networks and Modeling
PBHS 31300
Course Instructor: Michael David & John Schneider
Day & Time TBD
PQ: PBHS 30700 (HSTD 30700) or 30900 (HSTD 30900) or Introductory Epidemiology or consent of instructor
ID: CCTS 43200; BIOS 25419; MEDC 31300
This intermediate-level epidemiology course directed by two infectious disease epidemiologist-physicians will provide an up to date perspective on forgotten, contemporary and emerging infections. The course lectures and readings will provide a rigorous examination of the interactions among pathogens, hosts and the environment that produce disease in diverse populations. In addition to the demographic characteristics and the behaviors of individuals that are associated with a high risk of infection, we will examine complex aspects of the environment as they pertain to disease transmission. These include poverty, globalization, social networks, public health, and racial and ethnic disparities. Methodologic approaches to infectious disease epidemiology that will be covered include traditional study designs, molecular epidemiology, social network analysis, modeling, and network science. Local and global approaches will be applied to case studies from the United States, Asia and Africa.

Gender Health and Medicine
PBHS 31414
Course Instructor: Anna Mueller
Day & Time: TBD
PQ:
ID: CHDV 44214 (Parent)
From the day we are born til the day we die, we experience a gendered world that shapes our opportunities, our social interactions, and even our physical health and wellbeing. This course will provide an introduction to sociological perspectives on gender and physical and mental health, while also providing a deep interrogation of the social, institutional, and biological links between gender and health. We will discuss inequalities in morbidity, mortality, and health behaviors of women, men, and transgendered individuals from different race, ethnic, and class backgrounds, and we will

use sociological concepts, theories, and methods to understand why these differences appear. By the end of the course, you will be familiar with sociological perspectives on (1) gender and (2) mental and physical health, as well as some of the fundamental debates in current medical sociology and sociology of gender.

Health Services Research Methods
PBHS 35100
Course Instructor: Prachi Sanghavi
M/W 1:30-2:50pm
PQ: At least one course in linear regression and basic familiarity with STATA; or consent of instructor.
ID: PPHA 38010; SSAD 46300
The purpose of this course is to better acquaint students with the methodological issues of research design and data analysis widely used in empirical health services research. To deal with these methods, the course will use a combination of readings, lectures, problem sets (using STATA), and discussion of applications. The course assumes that students have had a prior course in statistics, including the use of linear regression methods.

The U.S. Health Care System
PBHS 35411
Course Instructor: Fabrice Smieliauskas
W 5:30-8:20pm
PQ: GPHAP requirement: **Non-GPHAP students with permission of instructor**
ID: SSAD 47512 (Primary); PPHA 37510
This course is a comprehensive examination of many of the key components of the U.S. health care system and how they work, intended for students from a wide range of backgrounds. Among others, topics may include public and private health insurance, the uninsured, health reform, hospitals, physicians, health care quality and costs, health information technology, pharmaceuticals, medical devices and diagnostics, long-term care, mental health services, and comparisons with health systems in developed and emerging markets.

Applied Bayesian Modeling and Inference
PBHS 43010
Course Instructor: Yuan Ji
Day & Time TBD
PQ: STAT 24400 and STAT 24500 or master level training in statistics.
ID: STAT 35920
Course begins with basic probability and distribution theory, and covers a wide range of topics related to Bayesian modeling, computation, and inference. Significant amount of effort will be directed to teaching students on how to build and apply hierarchical models and perform posterior inference. The first half of the course will be focused on basic theory, modeling, and computation using Markov chain Monte Carlo methods, and the second half of the course will be about advanced models and applications. Computation and application will be emphasized so that students will be able to solve real-world problems with Bayesian techniques.

Advanced Topics in Causal Inference
PBHS 43301
T 1:30-4:20pm
Course Instructor: Guanglei Hong, Kazuo Yamaguchi, Fan Yang
PQ: Intermediate Statistics such as STAT 22400/PBHS 32400, PPHA 31301, BUS 41100, or SOCI 30005 and Introduction to causal inference (CHDV 30102).
ID: CHDV 40102 (Parent); SOCI 40202
This course provides an in-depth discussion of selected topics in causal inference that are beyond what are covered in the introduction to causal inference course. The course is intended for graduate students and advanced undergraduate students who have taken the “introduction to causal inference” course or its equivalent and want to extend their knowledge in causal inference. The course is particularly suitable for students who plan to conduct scientific research that involve investigations of causal relationships as well as for those with strong methodological interests. Topics will include (1) alternative matching methods, randomization inference for testing hypothesis and sensitivity analysis; (2) marginal structural models and structural nested models for time-varying treatment; (3) Rubin Causal Model (RCM) and Heckman’s scientific model of causality; (4) latent class treatment variable; (5) measurement error in the covariates; (6) the M-estimation for the standard error of the treatment effect for the use of IPW; (7) the local average treatment effect (LATE) and its problems, sensitivity analysis to examine the impact of plausible departure from the IV assumptions, and identification issues of multiple IVs for multiple/one treatments; (8) multilevel experimental designs and observational data for treatment evaluation; (9) nonignorable missingness and informative censoring issues.

Clinical Epidemiology
PBHS 30700
Course Instructors: Brian Chiu & Diane Lauderdale
Summer: July 5-August 20;
PQ: Introductory Statistics recommended, may be taken concurrently.
ID: CCTS 45100
Clinical epidemiology is the "application of epidemiologic principles and methods to problems encountered in clinical medicine." This course introduces the basic principles of epidemiologic study design, analysis and interpretation, with a particular focus on clinical applications. The course includes lectures and discussions based on critical appraisal of significant research articles. The course is primarily intended for, but not restricted to, students with prior clinical training. Public Health Sciences 30700 and 30900 may not both be taken for credit, either will fulfill the basic epidemiology requirement for the MSCP in Public Health Sciences and either will serve as the epidemiology prerequisite for Public Health Sciences 31001.

Epidemiology and Population Health
PBHS 30910
Course Instructor: Diane Lauderdale/Ben Lahey
Offered: Autumn & Spring
PQ: STAT 22000 or other introductory statistics highly desirable. **For BIOS students**-completion of the first three quarters of a Biological Sciences Fundamentals sequence.
ID: STAT 22810, PPHA 36410, ENST 27400; BIOS
*Epidemiology is the basic science of public health. It is the study of how diseases are distributed across populations and how one designs population-based studies to learn about disease causes, with the object of identifying preventive strategies. Epidemiology is a quantitative field and draws on biostatistical methods. Historically, epidemiology's roots were in the investigation of infectious disease outbreaks and epidemics. Since the mid-twentieth century, the scope of epidemiologic investigations has expanded to a fuller range non-infectious diseases and health problems. This course will introduce classic studies, study designs and analytic methods, with a focus on global health problems***.**

Epidemiologic Methods
PBHS 31001
Course Instructor: Dezheng Huo
Offered: Winter
PQ: PBHS 30700 (HSTD 30700) or PBHS 30900 (HSTD 30900) and PBHS 32400 (32400)/applied statistics courses through multivariate regression or consent of instructor
ID: STAT 35700
This course expands on the material presented in "Principles of Epidemiology," further exploring issues in the conduct of epidemiologic studies. The student will learn the application of both stratified and multivariate methods to the analysis of epidemiologic data. The final project will be to write the "specific aims" and "methods" sections of a research proposal on a topic of the student's choice.

Cancer Epidemiology
PBHS 31200
Course Instructor: Brian Chiu
Offered: Winter (Course not offered every year)
PQ: PBHS 30700 (HSTD 30700) or PBHS 30900 (HSTD 30900)
The purpose of this course is to review the basic concepts and issues relevant to cancer epidemiology. Specifically, this course will focus on interpreting cancer statistics, and describing the current state of knowledge regarding the etiology and risk factors for the major cancer sites. In addition, issues in research design and interpretation within the context of cancer epidemiology, as well as the molecular and cellular basis of carcinogenesis as it pertains to cancer occurrence in

populations will be discussed. The course is appropriate for students who have an introductory knowledge of epidemiology. Previous study of cancer biology is helpful but not required.

Infectious Disease Epidemiology, Networks and Modeling
PBHS 31300
Course Instructor: Michael David & John Schneider
Offered: Spring (Course not offered every year)
PQ: PBHS 30700 (HSTD 30700) or 30900 (HSTD 30900) or Introductory Epidemiology or consent of instructor
ID: CCTS 43200; BIOS 25419; MEDC 31300
This intermediate-level epidemiology course directed by two infectious disease epidemiologist-physicians will provide an up to date perspective on forgotten, contemporary and emerging infections. The course lectures and readings will provide a rigorous examination of the interactions among pathogens, hosts and the environment that produce disease in diverse populations. In addition to the demographic characteristics and the behaviors of individuals that are associated with a high risk of infection, we will examine complex aspects of the environment as they pertain to disease transmission. These include poverty, globalization, social networks, public health, and racial and ethnic disparities. Methodologic approaches to infectious disease epidemiology that will be covered include traditional study designs, molecular epidemiology, social network analysis, modeling, and network science. Local and global approaches will be applied to case studies from the United States, Asia and Africa.

Social Epidemiology
PBHS 31400
Course Instructor: Diane Lauderdale
Offered: Winter (Course not offered every year).
PQ: PBHS 30700 (HSTD 30700) or PBHS 30900 (HSTD 30900)/BIOS 29318 or a course in epidemiology, demography, health economics, medical sociology and familiarity with multivariate statistical methods.
ID: BIOS 29325
This course will examine research that has sought to understand how social factors influence health. The course will begin with reading historical studies. We will survey and evaluate different types of measurements used in social epidemiology (such as measurements of socioeconomic status, race, ethnicity, stress, social support and neighborhood characteristics), types of study designs, and debates and theories in the literature. Familiarity with the statistical methods used in the literature we will be reading, in particular multivariable regression analysis, is necessary to understand the reading.

Gender Health and Medicine
PBHS 31414
Course Instructor: Anna Mueller
PQ:
ID: CHDV 44214 (Parent)
From the day we are born til the day we die, we experience a gendered world that shapes our opportunities, our social interactions, and even our physical health and wellbeing. This course will provide an introduction to sociological perspectives on gender and physical and mental health, while also providing a deep interrogation of the social, institutional, and biological links between gender and health. We will discuss inequalities in morbidity, mortality, and health behaviors of women, men, and transgendered individuals from different race, ethnic, and class backgrounds, and we will use sociological concepts, theories, and methods to understand why these differences appear. By the end of the course, you will be familiar with sociological perspectives on (1) gender and (2) mental and physical health, as well as some of the fundamental debates in current medical sociology and sociology of gender.

Critical Readings in Epidemiology
PBHS 31510
Course Instructor: Brisa Aschebrook-Kilfoy
Offered: Autumn (Course not offered every year)
PQ: PBHS 30700 or PBHS 30900 or PBHS 30910
Course consists of reading and critiquing important and innovative recent papers in epidemiology. Each week, there will be a different substantive or disease focus for the papers. Research areas covered will be primarily, but not exclusively, in noninfectious diseases. Different faculty will lead the discussion each week and students will prepare and present summary critiques of the articles.

Genetic & Molecular Epidemiology

PBHS 31831
Course Instructor**:** Brandon Pierce
Offered: Spring (Course not offered every year)
PQ: An introductory course in genetics and an introductory course in (bio)statistics or epidemiology.
ID:
This course is designed for students with research interests related to identifying and characterizing the role of genetic and molecular factors in human disease risk and prognosis. Students will be introduced to the key concepts and methodological issues encountered in epidemiological studies that utilize genetic and molecular data. This course will train students on the theoretical and practical aspects of study design and data generation, and also provide the relevant hands-on training for quality control, management, and analysis of large-scale genomic/molecular data. Students are expected to have taken prior coursework in genetics as well as introductory statistics and/or epidemiology.

Introduction to Biostatistics
PBHS 32100
Course Instructor: Sydeaka Watson
Summer: July 5 - August 20
PQ: 2 quarters of pre-calculus
ID: CCTS 45000
This course will provide an introduction to the basic concepts of statistics as applied to the bio-medical and public health sciences. Emphasis is on the use and interpretation of statistical tools for data analysis. Topics include (i) descriptive statistics; (ii) probability and sampling; (iii) the methods of statistical inference; and (iv) an introduction to linear and logistics regression.
In addition to the course, there is a statistical computing workshop held on Wednesdays from 10-11:30am in BSLC 018.

Applied Regression Analysis
PBHS 32400
Course Instructor: Lin Chen
Offered: Autumn
PQ: PBHS 32100 or STAT 22000 or equivalent
ID: STAT 22400 (Primary)
This course is an introduction to the methods and applications of fitting and interpreting multiple regression models. The main emphasis is on the method of least squares. Topics include the examination of residuals, the transformation of data, strategies and criteria for the selection of a regression equation, the use of dummy variables, tests of fit. Stata computer package will be used extensively, but previous familiarity with Stata is not assumed. The techniques discussed will be illustrated by real examples involving biological and social science data.

Analysis of Categorical Data
PBHS 32600
Course Instructor: Yibi Huang
Offered: Winter
PQ: PBHS 32100; STAT 22000; or consent of instructor.
ID: STAT 22600 (Primary)
The course is intended to provide students who already have some experience with linear regression with tools for analyzing data, which are largely categorical (rather than continuous measurements). Such data often arise in epidemiology, medicine, demography, sociology, and other social sciences. The course emphasizes good data analysis practice and use of appropriate statistical methods, rather than focusing on statistical theory. A strong emphasis is placed on both computational aspects of data analysis and on clear interpretation and presentation of results.*
**Students interested in a more theoretical course should consider STAT 34700.*

Biostatistical Methods
PBHS 32700
Course Instructor: Fan Yang
Offered: Winter
PQ: PBHS 32400/STAT 22400; or STAT 24500; or equivalent; or consent of instructor
ID: STAT 22700
This course is designed to provide students with tools for analyzing categorical, count and time-to-event data frequently encountered in medicine, public health and related biological and social sciences. The course will emphasize application of the methodology rather than statistical theory, including recognition of the appropriate methods, interpretation and

presentation of results. Methods covered include: contingency table analysis, Kaplan-Meier survival analysis, Cox proportional-hazards survival analysis, logistic regression, Poisson regression.

Introduction to Clinical Trials
PBHS 32901
Course Instructor: James Dignam
Offered: Spring
PQ: PBHS 32100; STAT 22000; introductory statistics; or consent of instructor
ID: STAT 35201; CCTS 32901
This course will review major components of clinical trial conduct, including the formulation of clinical hypotheses and study endpoints, trial design, development of the research protocol, trial progress monitoring, analysis, and the summary and reporting of results. Other aspects of clinical trials to be discussed include ethical and regulatory issues in human subjects research, data quality control, meta-analytic overviews and consensus in treatment strategy resulting from clinical trials, and the broader impact of clinical trials on public health.

Applied Survival Analysis
PBHS 33100
Course Instructor: TBN
Offered: TBD (Course not offered every year)
PQ: PBHS 32100; STAT 22000; or equivalent, **and** PBHS 32400/STAT 22400 or equivalent; or consent of instructor.
ID: STAT 35600
This course will provide an introduction to the principles and methods for the analysis of time-to-event data. This type of data occurs extensively in both observational and experimental biomedical and public health sciences, as well as in industrial applications. While some theoretical statistical detail is given (at the level appropriate for a Master's student in statistics), the primary focus will be on data analysis. Problems will be motivated from an epidemiologic and clinical perspective, concentrating on the analysis of cohort data and time-to-event data from controlled clinical trials.

Statistical Analysis with Missing Data
PBHS 33200
Course Instructor: Lin Chen
Offered: Winter (Course not offered every year)
PQ: PBHS 32400/STAT 22400; or STAT 24500; or equivalent; and basic programming skill using R or equivalent
This course is intended to introduce basic concepts and provide a guide to conducting missing data analysis using the statistical software R. The course will cover topics including Expectation–Maximization algorithm, weighting methods, imputation and other likelihood-based approaches to the analysis of missing data. Some other relevant topics will also be introduced, such as non-ignorable missing data, machine learning methods and multivariate missing data analysis. Computation and application will be emphasized, rather than statistical theory. In the end of the course, the students are expected to complete a final project related to missing data analysis.

Applied Longitudinal Data Analysis
PBHS 33300
Course Instructor: Don Hedeker
Offered: Autumn
PQ: PBHS 32400/STAT 22400 or equivalent, and PBHS 32600/STAT 22600 or PBHS 32700/STAT 22700 or equivalent; or consent of instructor.
ID: STAT 36900
Longitudinal data consist of multiple measures over time on a sample of individuals. This type of data occurs extensively in both observational and experimental biomedical and public health sciences, as well as in studies in sociology and applied economics. This course will provide an introduction to the principles and methods for the analysis of longitudinal data. Whereas some supporting statistical theory will be given, emphasis will be on data analysis and interpretation of models for longitudinal data. Problems will be motivated by applications in epidemiology, clinical medicine, health services research, and disease natural history studies.

Multilevel Modeling
PBHS 33400
Course Instructor: Don Hedeker
Offered: Spring (Course not offered every year)
PQ: PBHS 32400 and PBHS 32700 or consent of instructor.
This course will focus on the analysis of multilevel data in which subjects are nested within clusters (e.g., health care providers, hospitals). The focus will be on clustered data, and several extensions to the basic two-level multilevel model

will be considered including three-level, cross-classified, multiple membership, and multivariate models. In addition to models for continuous outcomes, methods for non-normal outcomes will be covered, including multilevel models for dichotomous, ordinal, nominal, time-to-event, and count outcomes. Some statistical theory will be given, but the focus will be on application and interpretation of the statistical analyses.

Statistical Applications
PBHS 33500
Course Instructor: Robert Gibbons
Offered: Fall 2017
PQ: PBHS 32700/STAT 22700 or STAT 34700 or consent of instructor.
ID: STAT 35800
This course provides a transition between statistical theory and practice. The course will cover statistical applications in medicine, mental health, environmental science, analytical chemistry, and public policy.
Lectures are oriented around specific examples from a variety of content areas. Opportunities for the class to work on interesting applied problems presented by U of C faculty will be provided. Although an overview
of relevant statistical theory will be presented, emphasis is on the development of statistical solutions to interesting applied problems.

Health Services Research Methods
PBHS 35100
Course Instructor: Prachi Sanghavi
Offered: Spring
PQ: At least one course in linear regression and basic familiarity with STATA; or consent of instructor.
ID: PPHA 38010; SSAD 46300
The purpose of this course is to better acquaint students with the methodological issues of research design and data analysis widely used in empirical health services research. To deal with these methods, the course will use a combination of readings, lectures, problem sets (using STATA), and discussion of applications. The course assumes that students have had a prior course in statistics, including the use of linear regression methods.

The U.S. Health Care System
PBHS 35411
Course Instructor: Fabrice Smieliauskas
Offered: Spring
PQ: Winter quarter is open to Non-GPHAP students; Spring quarter - GPHAP students only. Non-GPHAP students with permission of instructor
ID: SSAD 47512 (Primary); PPHA 37510
This course is a comprehensive examination of many of the key components of the U.S. health care system and how they work, intended for students from a wide range of backgrounds. Among others, topics may include public and private health insurance, the uninsured, health reform, hospitals, physicians, health care quality and costs, health information technology, pharmaceuticals, medical devices and diagnostics, long-term care, mental health services, and comparisons with health systems in developed and emerging markets.

Introduction to Health Economics
PBHS 38010
Course Instructor: Tamara Konetzka & Rena Conti
Offered: Winter
PQ: Microeconomics course
ID: PBHS 28010

This course covers the foundations of the economics of health care. Content includes demand for health, medical care, and insurance; supply of medical care and behavior of health care practitioners; and economic perspectives on measurement in health care research. Using a combination of lectures, readings, and problem sets, the goal is for students to acquire a basic understanding of economic knowledge and thinking that can be applied to current challenges in health care policy and practice. The course is open to undergraduate and graduate students with at least one prior course in microeconomics.

Health Economics and Public Policy
PBHS 38300
Course Instructor: TBN
Offered: TBD

PQ: Microeconomics at the level of the Econ 200-201 series or PPHA 323 & 324 or an equivalent of an intermediate microeconomics course and a working knowledge of calculus
ID: PPHA 38300 **(Primary)**; ECON 27700
This course analyzes the economics of health and medical care in the United States with particular attention to the role of government. The first part of the course examines the demand for health and medical and the structure and the consequences of public and private insurance. The second part of the course examines the supply of medical care, including professional training, specialization and compensation, hospital competition, and finance and the determinants and consequences of technological change in medicine. The course concludes with an examination of recent proposals and initiatives for health care reform.

Advanced Topics in Health Economics
PBHS 38400
Course Instructor: Tamara Konetzka & Rena Conti
Offered: Autumn (Course not offered every year)
PQ: Graduate courses in microeconomics and econometrics or statistics, including the use of linear and nonlinear regression methods.
The purpose of this course is to provide substantial exposure to the state of the evidence and the major theoretical and empirical approaches used to study salient issues in health economics. Selected topics may vary from year to year; examples include health capital, health insurance, health behaviors, health care market structure and competition, not-for-profit ownership, payment incentives, and the effects of information on provider behavior (e.g. public reporting and value-based purchasing) and consumer behavior (e.g., advertising and medical decision making). The course is aimed at students who wish to pursue a career in, or related to, health economics. Students will be expected to read each paper in depth, participate in discussions about them, and present and discuss several papers during the quarter. The instructors will assume that students have had prior graduate courses in microeconomics and econometrics or statistics, including the use of linear and nonlinear regression methods.

Master's Readings in Public Health Sciences
PBHS 39000
Course Instructor: *Varies*
Arrange course content and meeting times with instructor.

Master's Research in Public Health Sciences
PBHS 39100
Course Instructor: *Varies*
Arrange course content and meeting times with instructor.

Public Health Sciences PhD Research & Training
PBHS 40000
PQ: Public Health Sciences PhD students only.

Advanced Topics in Ethics for Public Health Sciences
PBHS 40100
PQ: Public Health Sciences PhD students only.

Advanced Epidemiologic Methods
PBHS 40500
Course Instructor: Dezheng Huo
Offered: Spring
PQ: PBHS 31001
This course examines some features of study design, but is primarily focused on analytic issues encountered in epidemiologic research. The objective of this course is to enable students to conduct thoughtful analysis of epidemiologic and other population research data. Concepts and methods that will be covered include: matching, sampling, conditional logistic regression, survival analysis, ordinal and polytomous logistic regressions, multiple imputation, and screening and diagnostic test evaluation. The course follows in sequence the material presented in "Epidemiologic Methods."

Applied Bayesian Modeling and Inference
PBHS 43010
Course Instructor: Yuan Ji
Offered: Spring 2017 (Course not offered every year)
PQ: STAT 24400 and STAT 24500 or master level training in statistics.

ID: STAT 35920
Course begins with basic probability and distribution theory, and covers a wide range of topics related to Bayesian modeling, computation, and inference. Significant amount of effort will be directed to teaching students on how to build and apply hierarchical models and perform posterior inference. The first half of the course will be focused on basic theory, modeling, and computation using Markov chain Monte Carlo methods, and the second half of the course will be about advanced models and applications. Computation and application will be emphasized so that students will be able to solve real-world problems with Bayesian techniques.

Introduction to Causal Inference
PBHS 43201
Course Instructor: Guanglei Hong, Kazuo Yamaguchi, Fan Yang
Offered: Winter
PQ: Intermediate statistics or equivalent such as STAT 22400/PBHS 32400, PPHA 31301, BUS 41100 or SOCI 30005.
ID: CHDV 30102 (Primary)
This course is designed for graduate students and advanced undergraduate students from social sciences, education, public policy, public health sciences, social service administration, and statistics who are involved in quantitative research and are interested in studying causality. The course begins by introducing the notion of counterfactual outcomes and various causal inference techniques that are comparatively new to most social scientists. A major emphasis will be placed on conceptualizing causal questions, comparing alternative research designs, and identifying the assumptions under which a causal effect can be estimated from non-experimental data. In addition to studying experimental, quasi-experimental, and non-experimental designs, students will become familiar with causal inference techniques suitable for evaluating binary treatments, concurrent multi-valued treatments, time-varying treatments, as well as moderated and mediated treatment effects in non-experimental data.

Mediation, Moderation, and Spillover
PBHS 43251
Course Instructor: Guanglei Hong
Offered: Spring (alternates with PBHS 43301)
PQ: Intermediate statistics such as STAT 22400, PBPL 31301, BUS 41100, or SOCI 30005 and Introduction to Causal Inference (CHDV 30102) or their equivalent.
ID: CHDV 32411 (Parent); PBPL 29411; PSYC 32411; SOCI 30318; STAT 33211
This course is designed for graduate students and advanced undergraduate students from social sciences, statistics, public health science, public policy, and social services administration who will be or are currently involved in quantitative research. Questions about why a treatment works, for whom, under what conditions, and whether one individual's treatment could affect other individuals' outcomes are often key to the advancement of scientific knowledge. We will clarify the theoretical concepts of mediated effects, moderated effects, and spillover effects under the potential outcomes framework. The course introduces cutting-edge methodological approaches and contrasts them with conventional strategies including multiple regression, path analysis, and structural equation modeling. The course content is organized around application examples.

Advanced Topics in Causal Inference
PBHS 43301
Course Instructor: Guanglei Hong, Kazuo Yamaguchi, Fan Yang
Offered: Spring (alternates with PBHS 43251)
PQ: Intermediate Statistics such as STAT 22400/PBHS 32400, PPHA 31301, BUS 41100, or SOCI 30005 and Introduction to causal inference (CHDV 30102).
ID: CHDV 40102 (Parent); SOCI 40202
This course provides an in-depth discussion of selected topics in causal inference that are beyond what are covered in the introduction to causal inference course. The course is intended for graduate students and advanced undergraduate students who have taken the "introduction to causal inference" course or its equivalent and want to extend their knowledge in causal inference. The course is particularly suitable for students who plan to conduct scientific research that involve investigations of causal relationships as well as for those with strong methodological interests. Topics will include (1) alternative matching methods, randomization inference for testing hypothesis and sensitivity analysis; (2) marginal structural models and structural nested models for time-varying treatment; (3) Rubin Causal Model (RCM) and Heckman's scientific model of causality; (4) latent class treatment variable; (5) measurement error in the covariates; (6) the M-estimation for the standard error of the treatment effect for the use of IPW; (7) the local average treatment effect (LATE) and its problems, sensitivity analysis to examine the impact of plausible departure from the IV assumptions, and identification issues of multiple IVs for multiple/one treatments; (8) multilevel experimental designs and observational data for treatment evaluation; (9) nonignorable missingness and informative censoring issues.

Policy Analysis Methods and Applications
PBHS 45610
Course Instructor: Harold Pollack
Offered: Winter
PQ:
ID: SSAD 45600 (Primary); PPHA 40101
This course examines the intellectual bases and analytic tools for the professional practice of policy analysis, with an emphasis on economic policy analysis in the form of cost-benefit analysis, decision analysis, and cost-effectiveness analysis. Many examples will be drawn from medicine and public health, which offer particularly clear application of the basic methods. However we will also draw upon examples and challenges from environmental policy, criminal justice, transportation, and welfare policy.

Topics to be covered will include cost-benefit analysis, decision analysis, quality of life and cost measurement, model development and parameter estimation, and cost-effectiveness methods. Students will have weekly problem sets and instruction in a computer lab that will provide them with hands on experience performing decision analysis and cost-effectiveness analyses. Students taking this course will be prepared to take Advanced Applications of Cost-Effectiveness Analysis, which provides doctoral-level training in this area.

Ph.D. Readings in Public Health Sciences
PBHS 49000
Course Instructor: *Varies*
Arrange course content and meeting times with instructor.

Ph.D. Research in Public Health Sciences
PBHS 49100
Course Instructor: *Varies*
Arrange course content and meeting times with instructor.