POPULATION & QUANTITATIVE HEALTH SCIENCES (PQHS)

PQHS 401. Research Seminar. 0 Unit.
This seminar series includes faculty and guest-lecturer presentations designed to introduce students to on-going research at the University and elsewhere. Seminars will emphasize the application of methods learned in class, as well as the introduction of new methods and tools useful in research.

PQHS 411. Introduction to Health Behavior. 3 Units.
This course will provide a broad overview of health behavior theories and health behaviors in the context of health promotion, examining a variety of models and frameworks to better understand correlates of health risk and protective behaviors, behavior change, and contextual factors that affect health in both individuals and populations. Emphasis is placed on applying "theory" to a variety of health concerns that have strong behavioral components. The relationship between health behavior and individual, interpersonal, and community/environmental context will be presented. Offered as MPHP 411 and PQHS 411. Prereq: Enrollment limited to Master of Public Health or Epidemiology & Biostatistics students.

PQHS 413. Introduction to Data Structures and Algorithms in Python. 3 Units.
This course is an introduction to data types and algorithm design in computational analysis, specifically using Python. It has two main parts: The first part focuses on data structures and includes topics such as files, expressions, strings, lists, arrays, control flow, functions, object-oriented programming, and computation complexity and efficiency. This part aims to provide students with a solid understanding of general data structures in computer science and introduce key concepts for computational purposes. The second part covers algorithm design in Python and includes topics like searching trees, sorting, graph algorithms, random walks, Monte Carlo simulation, sampling, confidence intervals, and machine learning. This part emphasizes algorithm design, particularly in statistical programming. While the class prioritizes computation implementation over statistical theories and research projects, students will gain computational skills and practical experience in simulations and statistical modeling using Python programming.

PQHS 414. Data Management and Statistical Programming. 3 Units.
This is an online course that offers no in-person meetings. This course serves as a general introduction to the use of computer systems in epidemiologic investigations and biostatistical applications. Students will develop a conceptual understanding of data types, basic data structures, relational database systems and data normalization, data warehousing, control statements, and programming logic. Further, students will develop basic scripting skills and will learn to read in, manipulate, and perform basic descriptive analyses on research data using the SAS programming language. Primary emphasis in this course is on developing the knowledge and familiarity required to work with data in a statistical programming context. Basic familiarity with statistics is beneficial, as this course does not teach inferential statistical analysis in detail, but it is not vital to learning the course material.

PQHS 416. AI in Medicine: Knowledge Representation and Deep Learning. 3 Units.
This course introduces students to computational techniques and concepts that underpin biomedical and health informatics data management and analysis. In particular, the course will focus on the three topics of: (1) Biomedical terminologies and formal logic used in building knowledge models such as ontologies; (2) Natural language processing (NLP), and (3) Big Data technologies, including components of Hadoop stack and Apache Spark. This is a lecture-based course that relies on both materials covered in class and out-of-class readings of published literature. Students will be assigned reading assignments, homework exercise assignments and they are expected to complete homework assignment for each class. The students will be involved in a team project and they will be expected to prepare a project report at the end of the semester.

PQHS 417. Biomedical Data Science and Visualization. 3 Units.
The learning objective of this class is to understand the core components of data science workflow and infrastructures for the ingestion, processing, storage and serving data generated by healthcare systems at an unprecedented speed and scale. The course is organized into the following modules: (1) Data architectures for large-scale data management, (2) Exploratory data analysis for knowledge discovery and (3) High dimensional data analysis. This is a lecture-based course that relies on both materials covered in class and out-of-class readings, including published literature. Students will be assigned weekly homework assignments that will include programming labs in Python. A final assessment will be conducted at the end of the course based on lectures, reading references and programming labs. Prereq: PQHS 413.

PQHS 419. Topics in Urban Health in the United States. 3 Units.
The focus of this course is on designing sustainable urban policies and programs for advancing health equity in Greater Cleveland. The course builds on recent declarations of racism as a public health crisis in Cuyahoga County and the City of Cleveland and ongoing work in applying system dynamics to addressing structural racism for advancing regional equity. The course introduces the use of system dynamics for understanding urban health inequities and designing sustainable social policies and programs for advancing health equity. The course will cover model structure and its relationships to prior knowledge and assumptions, measurable quantities, and ultimate use in solving problems. Application areas focus on social issues of equity in health, education, and general wellbeing emphasizing transdisciplinary integration of systems (vertically from cells to society and horizontality across systems). Model verification is discussed, along with the basic theory and practice of system dynamics. Quantitative methods are emphasized including the formulation and testing of mathematical models of feedback systems and the use of numeric data and estimation of parameters. Special attention will be given to understanding the dynamics of social and economic justice, value and ethical issues, as well as issues related to race, ethnicity, culture, gender, sexual orientation, religion, physical or mental disability or illness, age, and national origin. Offered as PQHS 419 and MPHP 419.

PQHS 426. An Introduction to GIS for Health and Social Sciences. 3 Units.
This course is designed to give students a first exposure to understanding how GIS is integral to understanding a wide variety of public health problems. It introduces students to current spatial approaches in health research and provides a set of core skills that will allow students to apply these techniques toward their own interests. Subject matter will include chronic diseases, infectious diseases, and vectored diseases examples. Other topics related to social determinants of health and current events (e.g., violence, overdoses, disaster and homelessness) will also be incorporated. Students will be exposed to different types of data and different applications of these data (for example, hospitals, police departments), enabling them to think "outside the box" about how GIS can be utilized to solve real-world problems. Students will learn classic mapping and hotspot techniques. In addition, they will be introduced to novel ways to collect geospatial field data using online sources (Google Street View), primary data collection (spatial video) and mixed method approaches (spatial video geonarratives), all of which represent the cutting edge of spatial epidemiology. Offered as MPHP 426 and PQHS 426.

PQHS 427. Geospatial Analytics for Biomedical Health Applications. 3 Units.
Is there greater risk of exposure to Covid-19 for me? How prevalent is monkey pox in the different neighborhoods of Cleveland? Does socioeconomic status contribute to Asthma? Which is the best location in Cleveland to set a mobile Covid vaccination unit? The answer to all these questions and related ones lies in capturing, managing, analyzing and visualizing geospatial data using geospatial analytics for a wide range of biomedical health applications. The motivation behind this course is to equip students with the core skills required for geospatial analytics and to stimulate spatial thinking in students to solve real-world challenges ranging from healthcare quality to effect of environment on individual health. By taking a research-based yet hands-on approach, this course will allow students to explore the different facets of geospatial data analysis using programming languages. Students will be exposed to different type of geospatial techniques that will enable them to think "outside the box" for solving data challenges. As a part of this course, students will be introduced to novel ways of collecting, managing, analyzing, and visualizing large volume of geospatial data in a variety of application domains including biomedical health application.

PQHS 430. Basics of Probability and Statistical Theory. 0 Unit.
A basic introduction to the principles of probability and statistics. Necessary math and calculus will be reviewed. This course is paired with PQHS 431 and aims to give students a brief background in statistical theory which will give students the knowledge and foundation to intuitively apply statistics in practice. Topics covered include: conditional probability, independence, random variables, means, variance, probability mass functions, probability density functions, cumulative distribution functions, correlation, covariance, simulations, random samples, likelihood, maximum likelihood estimators, hypothesis testing, and the likelihood ratio test. Coreq: PQHS 431.

PQHS 431. Statistical Methods I. 3 Units.
This course is the first half of a two-semester sequence focused on modern data analysis, advanced statistical modeling, and programming in R and R Markdown. The course emphasizes placing biological, medical and health research questions into a statistical context, and thinking effectively about practical questions of design and analysis, while minimizing theory. In the first semester, we use tools from the tidyverse and literate programming to produce replicable research on public data. Course projects focus on using modern tools to ingest, tidy, manage, explore (transform, visualize and model) and communicate about data. Foundations of the first semester include exploratory data analysis, estimation strategies for means and proportions, and linear models for prediction and exploration of quantitative outcomes. The course attracts people with varied backgrounds in statistics/data science or coding/programming or biomedical science, and a common interest in using data effectively in scientific research. Instructor permission is required for enrollment. Offered as CRSP 431, MPHP 431, and PQHS 431.

PQHS 432. Statistical Methods II. 3 Units.
This course is the second half of a two-semester sequence focused on modern data analysis, advanced statistical modeling, and programming in R and R Markdown. The course emphasizes placing biological, medical and health research questions into a statistical context, and thinking effectively about practical questions of design and analysis, while minimizing theory. Course projects focus on using modern tools to ingest, tidy, manage, explore (transform, visualize and model) and communicate about data. Foundational topics discussed in the second semester build on the work done in the first, and include data spending, estimating and assessing models built with multiple engines in replicable ways using the tidymodels framework, as well as logistic regression and generalized linear models for counts and multi-categorical data, and introductions to modeling weighted, time-to-event and multi-level data. The prerequisite is Statistical Methods I, but well-prepared students may seek a waiver from the instructor. Offered as CRSP 432, MPHP 432, and PQHS 432. Prereq: PQHS 431.

PQHS 433. Community Interventions and Program Evaluation. 3 Units.
This course prepares students to design, conduct, and assess community-based health interventions and program evaluation. Topics include assessment of need, evaluator/stakeholder relationship, process vs. outcome-based objectives, data collection, assessment of program objective achievement based on process and impact, cost-benefit analyses, and preparing the evaluation report to stakeholders. Recommended preparation: PQHS 490, PQHS 431, or MPHP 405. Offered as PQHS 433 and MPHP 433.

PQHS 435. Survival Data Analysis. 3 Units.
Basic concepts of survival analysis including hazard function, survival function, types of censoring; non-parametric models; extended Cox models: time dependent variables, piece-wise Cox model, etc.; sample size requirements for survival studies. Prereq or Coreq: PQHS 432.

PQHS 440. Introduction to Population Health. 3 Units.
Introduces graduate students to the multiple determinants of health including the social, economic and physical environment, health services, individual behavior, genetics and their interactions. It aims to provide students with the broad understanding of the research development and design for studying population health, the prevention and intervention strategies for improving population health and the disparities that exist in morbidity, mortality, functional and quality of life. Format is primarily group discussion around current readings in the field; significant reading is required.

PQHS 444. Communicating in Population Health Science Research. 1 Unit.
Doctoral class on scientific communication. The semester-long course focuses on scientific writing, with an emphasis on manuscript and grant writing, and scientific oral presentations. As a required class for the Department of Population and Quantitative Health Sciences (PQHS) Epidemiology and Biostatistics and Biomedical Health Informatics (BHI) PhD programs, emphasis will be placed on scientific topics and anticipated requirements (e.g., departmental seminar in PQHS 501) related to graduate students in these programs. Recommended preparation: PhD students in PQHS. Other students permitted if space available. Fluency in English writing (e.g., in accord with the Harbrace College Handbook). Prereq: PQHS 431 and PQHS 490. Prereq or Coreq: PQHS 432.

PQHS 445. Research Ethics in Population Health Sciences. 0 Unit.
This zero credit course is a required add-on for PhD students in Epidemiology and Biostatistics. Students will register and fulfill all requirements for IBMS 500 "Being a Professional Scientist". The purpose of PQHS 445 is to address specialized population health topics not covered by IBMS 500, including international research, human genomics, and/or big data/electronic medical records. There will be no meetings/lectures for this course. Students will complete a short written assignment due at the end of the semester.

PQHS 450. Clinical Trials and Intervention Studies. 3 Units.
Issues in the design, organization, and operation of randomized, controlled clinical trials and intervention studies. Emphasis on long-term multicenter trials. Topics include legal and ethical issues in the design; application of concepts of controls, masking, and randomization; steps required for quality data collection; monitoring for evidence of adverse or beneficial treatment effects; elements of organizational structure; sample size calculations and data analysis procedures; and common mistakes. Recommended preparation: PQHS 431. Offered as PQHS 450 and MPHP 450.

PQHS 451. A Data-Driven Introduction to Genomics and Human Health. 3 Units.
This course introduces the foundational concepts of genomics and genetic epidemiology through four key principles: 1) Teaching students how to query relational databases using Structure Query Language (SQL); 2) Exposing students to the most current data used in genomics and bioinformatics research, providing a quantitative understanding of biological concepts; 3) Integrating newly learned concepts with prior ones to discover new relationships among biological concepts; and 4) providing historical context to how and why data were generated and stored in the way they were, and how this gave rise to modern concepts in genomics. Offered as PQHS 451, GENE 451, and MPHP 451. Prereq: PQHS 431 and PQHS 490 or Requisites Not Met permission.

PQHS 452. Statistical Methods for Genetic Epidemiology. 3 Units.
Analytic methods for evaluating the role of genetic factors in human disease, and their interactions with environmental factors. Statistical methods for the estimation of genetic parameters and testing of genetic hypotheses, emphasizing maximum likelihood methods. Models to be considered will include such components as genetic loci of major effect, polygenic inheritance, and environmental, cultural and developmental effects. Topics will include familial aggregation, segregation and linkage analysis, ascertainment, linkage disequilibrium, and disease marker association studies. Recommended preparation: PQHS 431 and PQHS 451.

PQHS 453. Categorical Data Analysis. 3 Units.
Categorical data are often encountered in many disciplines including the fields of clinical and biological sciences. Analysis methods for categorical data are different from the analysis methods for continuous data. There is a rich collection of methods for categorical data analysis. The elegant "odds ratio" interpretation associated with categorical data is a unique one. This online course will cover cross-sectional categorical data analysis theories and methods. From this course, students will learn standard categorical data analysis methods and its applications to biomedical and clinical studies. This course will focus mostly on statistical methods for categorical data analysis arising from various fields of study including clinical studies. The course will include recorded-video lectures, quizzes, homeworks, simulations, and data analysis on real and realistic problems in human health tied directly to the student's own professional interests. The focus will be given to logistic regression methods. Topics may include (but are not limited to) binary response, multicategory response, count response, model selection, and evaluation, and exact inference methods for categorical data. This course stresses how the core statistical principles, computing tools, and visualization strategies are used to address complex scientific aims powerfully and efficiently, and to communicate those findings effectively to researchers who may have little or no experience in these methods. Prereq: PQHS 431.

PQHS 457. Current Issues in Genetic Epidemiology: Design and Analysis of Sequencing Studies. 3 Units.
Statistical methods to deal with the opportunities and challenges in Genetic Epidemiology brought about by modern sequencing technology. Some computational issues that arise in the analysis of large sequence data sets will be discussed. The course includes hands-on experience in the analysis of large sequence data sets, in a collaborative setting. Prereq: PQHS 451 and PQHS 452.

PQHS 459. Longitudinal Data Analysis. 3 Units.
This course will cover statistical methods for the analysis of longitudinal data with an emphasis on application in biological and health research. Topics include exploratory data analysis, response feature analysis, growth curve models, mixed-effects models, generalized estimating equations, and missing data. Prereq: PQHS 432.

PQHS 465. Design and Measurement in Population Health Sciences. 3 Units.
This course focuses on common design and measurement approaches used in population health sciences research. This course covers the preliminary considerations used in selecting qualitative, quantitative and mixed methods research approaches including an understanding of different philosophical worldviews, strategies of inquiry and methods and procedures for each approach. The course also includes an introduction to survey design and related concepts of latent variables, factor analysis and reliability and validity. Students will develop an in-depth knowledge of these design and measurement approaches through readings, lectures, group discussions and written and oral project presentations. Prereq: PQHS 440, PQHS 431, PQHS 490, PQHS 432, PQHS 460, PQHS 444 and PQHS 445.

PQHS 466. Promoting Health Across Boundaries. 3 Units.
This course examines the concepts of health and boundary spanning and how the synergy of the two can produce new, effective approaches to promoting health. Students will explore and analyze examples of individuals and organizations boundary spanning for health to identify practice features affecting health, compare and contrast practices and approaches, and evaluate features and context that promote or inhibit boundary spanning and promoting health. Offered as MPHP 466, PQHS 466, SOCI 466, NURS 466 and BETH 466. Prereq: Graduate student status or instructor consent.

PQHS 467. Comparative and Cost Effectiveness Research. 1 Unit.
Comparative effectiveness research is a cornerstone of healthcare reform. It holds the promise of improved health outcomes and cost containment. This course is presented in a convenient 5-day intensive format in June. There are reading assignments due prior to the 1st session. Module A, Days 1-2: Overview of comparative effectiveness research (CER) from a wide array of perspectives: individual provider, institution, insurer, patient, government, and society. Legal, ethical and social issues, as well as implications for population and public health, including health disparities will also be a component. Module B, Day 3: Introduction to the various methods, and their strengths, weaknesses and limitations. How to read and understand CER papers. Module C, Days 4-5: Cost-Effectiveness Analysis. This will cover costing, cost analysis, clinical decision analysis, quality of life and cost-effectiveness analysis for comparing alternative health care strategies. Trial version of TreeAge software will be used to create and analyze a simple cost-effectiveness model. The full 3-credit course is for taking all 3 modules. Modules A or C can be taken alone for 1 credit. Modules A and B or Modules B and C can be taken together for a total of 2 credits. Module B cannot be taken alone. If taking for 2 or 3 credits, some combination of term paper, project and/or exam will be due 30 days later. Offered as PQHS 467 and MPHP 467.

PQHS 468. The Continual Improvement of Healthcare: An Interdisciplinary Course. 3 Units.
This course prepares students to be members of interprofessional teams to engage in the continual improvement in health care. The focus is on working together for the benefit of patients and communities to enhance quality and safety. Offered as PQHS 468, MPHP 468, and NURS 468.

PQHS 471. Machine Learning & Data Mining. 3 Units.
Vast amount of data are being collected in medical and social research and in many industries. Such big data generate a demand for efficient and practical tools to analyze the data and to identify unknown patterns. We will cover a variety of statistical machine learning techniques (supervised learning) and data mining techniques (unsupervised learning), with data examples from biomedical and social research. Specifically, we will cover prediction model building and model selection (shrinkage, Lasso), classification (logistic regression, discriminant analysis, k-nearest neighbors), tree-based methods (bagging, random forests, boosting), support vector machines, association rules, clustering and hierarchical clustering. Basic techniques that are applicable to many of the areas, such as cross-validation, the bootstrap, dimensionality reduction, and splines, will be explained and used repeatedly. The field is fast evolving and new topics and techniques may be included when necessary. Prereq: PQHS 431.

PQHS 472. Integrated Thinking in Population and Quantitative Health Sciences. 2 Units.
The determinants of common disease are multifactorial and may involve complex interactions among factors, both known and unknown. These risk factors span domains as diverse as social determinants to biochemical lesions. However, most studies of disease risk usually involve a single class of determinants, defined within a single academic discipline. The goal of this course is to teach students to recognize and define explicit and implicit assumptions about studies of disease and to understand how one may integrate different domains of knowledge to improve our understanding of disease etiology and ultimately prevention and treatment efforts. They will learn to understand assumptions built into conceptual models used to describe and predict disease risk. Prereq: PQHS 431 and PQHS 440 and PQHS 490.

PQHS 473. Integrated Thinking in Population and Quantitative Health Sciences II. 2 Units.
The determinants of common disease are multifactorial and may involve complex interactions among factors, both known and unknown. These risk factors span domains as diverse as social determinants to biochemical lesions. The goal of this course is to teach students to recognize and define explicit and implicit assumptions about studies of disease and to understand how one may integrate different domains of knowledge to improve our understanding of disease etiology and ultimately prevention and treatment efforts. This is the second of a two course sequence required of all PhD in Epidemiology and Biostatistics students. PQHS 472 is the first course in the sequence and is a required prerequisite. This course meets weekly and in-person. Prereq: PQHS 472.

PQHS 480. Introduction to Mathematical Statistics. 3 Units.
An introduction to statistical inference at an intermediate mathematical level. The concepts of random variables and distributions, discrete and continuous, are reviewed. Topics covered include: expectations, variance, moments, the moment generating function; Bernoulli, binomial, hypergeometric, Poisson, negative binomial, normal, gamma and beta distribution; the central limit theorem; Bayes estimation, maximum likelihood estimators, unbiased estimators, sufficient statistics; sampling distributions (chi-square, t) confidence intervals, Fisher information; hypothesis testing, uniformly most powerful tests and multi-decision problems. Prereq: MATH 122, MATH 124 or MATH 126.

PQHS 481. Theoretical Statistics I. 3 Units.
Topics provide the background for statistical inference. Random variables; distribution and density functions; transformations, expectation. Common univariate distributions. Multiple random variables; joint, marginal and conditional distributions; hierarchical models, covariance. Distributions of sample quantities, distributions of sums of random variables, distributions of order statistics. Methods of statistical inference. Offered as STAT 445 and PQHS 481. Prereq: Graduate Student standing or MATH 223.

PQHS 482. Theoretical Statistics II. 3 Units.
Point estimation: maximum likelihood, moment estimators. Methods of evaluating estimators including mean squared error, consistency, "best" unbiased and sufficiency. Hypothesis testing; likelihood ratio and union-intersection tests. Properties of tests including power function, bias. Interval estimation by inversion of test statistics, use of pivotal quantities. Students are responsible for mathematical derivations, and full proofs of principal theorems. Offered as STAT 446 and PQHS 482. Prereq: STAT 445 or PQHS 481.

PQHS 484. Global Health Epidemiology. 1 - 3 Units.
This course provides a rigorous problem-centered training in the epidemiology, prevention, treatment, and control of infectious diseases and, more generally, global health. This is an advanced epidemiology that embraces an active learning environment. Students are expected to invest time out of the classroom reading and working with classmates. Classes will be conducted with discussions, debates, group projects, and group presentations. By taking this course, students will develop a framework for interpreting, assessing, and performing epidemiologic research on issues of global importance. The course will be divided into three modules:1) Global Health Epidemiology 2) Helminth Epidemiology, and 3) Epidemiology of Disease Elimination. Each module is worth 1 credit hour and may be taken separately. Each module will have a separate project and/or exam. The final exam time will be used for group presentations and panel discussion. Active class participation is required through discussions, case studies, and group projects. Offered as PQHS 484, INTH 484, and MPHP 484.

PQHS 490. Epidemiology: Introduction to Theory and Methods. 3 Units.
This course provides an introduction to the principles of epidemiology covering the basic methods necessary for population and clinic-based research. Students will be introduced to epidemiologic study designs, measures of disease occurrence, measures of risk estimation, and casual inference (bias, confounding, and interaction) with application of these principles to specific fields of epidemiology. Classes will be a combination of lectures, discussion, and in-class exercises. It is intended for students who have a basic understanding of the principals of human disease and statistics. Offered as PQHS 490 and MPHP 490. Prereq or Coreq: PQHS 431 or Requisites Not Met permission.

PQHS 491. Advanced Study Design and Analysis in Population Health Sciences. 3 Units.
How do researchers design and analyze population health studies? This course covers essential and cutting edge epidemiological and biostatistical principles and methods for health research. Goals are for students to build a strong foundation for conducting their own research, develop as effective interdisciplinary research team members, and become critical readers of the health literature. This course will rely on, and expand on, the epidemiology background provided in PQHS 490 and the biostatistics methods from PQHS 431. The focus of this course is on study designs for, and the analysis and interpretation of, observational studies. Causal inference and the potential outcomes/counterfactual framework provides a unifying theme. Specific topics include causal diagrams, cohort and case-control study designs, confounding, effect modification, time-dependent covariates, bias, mediation analysis, Mendelian randomization, and sensitivity analysis. A premise of the course is that students learn best by active engagement, and this will be effected in the course by participation in discussions and in carrying out study designs and data analyses. Prereq: PQHS 490 or MPHP 490.

PQHS 499. Independent Study. 1 - 18 Units.

PQHS 500. Design and Analysis of Observational Studies. 3 Units.
An observational study investigates treatments, policies or exposures and the effects that they cause, but it differs from an experiment because the investigator cannot control assignment. We introduce appropriate design, data collection and analysis methods for such studies, to help students design and interpret their own studies, and those of others in their field. Technical formalities are minimized, and the presentations will focus on the practical application of the ideas. A course project involves the completion of an observational study, and substantial use of the R statistical software. Topics include randomized experiments and how they differ from observational studies, planning and design for observational studies, adjustments for overt bias, sensitivity analysis, methods for detecting hidden bias, and focus on propensity score methods for selection bias adjustment, including multivariate matching, stratification, weighting and regression adjustments. Recommended preparation: a working knowledge of multiple regression, some familiarity with logistic regression, with some exposure to fitting regression models in R. Offered as CRSP 500 and PQHS 500.

PQHS 501. Research Seminar. 0 Unit.
This seminar series includes faculty and guest-lecturer presentations designed to introduce students to on-going research at the University and elsewhere. Seminars will emphasize the application of methods learned in class, as well as the introduction of new methods and tools useful in research.

PQHS 502. Introduction to Statistical Consulting. 1 Unit.
What challenges are faced by a Biostatistician working in a collaborative and consulting environment? In order to successfully interact with a client, in addition to a solid foundation in statistical methods, the consultant needs to be prepared to deal with issues such as ill-posed research questions, unrealistic expectations on the part of a client, difficulty in understanding the subject of the consultation, thorny ethical issues, and many others. Courses on statistical consulting are essential components of graduate programs in Statistics. Other courses teach students statistical methods and how to use them to address various problems, but those problems are presented by course instructors who typically have as the goal teaching the appropriate choice and utilization of available statistical tools. This course prepares students to the challenges involved in 'real life' consulting situations, exposing the students to different encounter types, while honing their communication and statistical skills and raising their awareness of their professional responsibilities.

PQHS 505. Seminar in Global Health Epidemiology. 0 Unit.
This seminar series examines a broad range of topics related to infectious disease research in international settings. Areas of interest are certain to include epidemiology, bioethics, medical anthropology, pathogenesis, drug resistance, vector biology, cell and molecular biology, vaccine development, diagnosis, and socio-cultural factors contributing to or compromising effective health care delivery in endemic countries. Speakers will include a diverse group of regional faculty and post-doctoral trainees, as well as visiting colleagues from around the world. Students will be asked to read a journal article written by the speaker and then discuss this article with the speaker after their seminar.

PQHS 515. Secondary Analysis of Large Health Care Databases. 3 Units.
Development of skills in working with the large-scale secondary data bases generated for research, health care administration/billing, or other purposes. Students will become familiar with the content, strength, and limitations of several data bases; with the logistics of obtaining access to data bases; the strengths and limitations of routinely collected variables; basic techniques for preparing and analyzing secondary data bases and how to apply the techniques to initiate and complete empirical analysis. Prereq or Coreq: PQHS 431 and (PQHS 490 or MPHP 483).

PQHS 550. Meta-Analysis & Evidence Synthesis. 2 - 3 Units.
Systematic reviews use reproducible methods to systematically search the literature and synthesize the results of a specific topic area. Meta-analysis is a specific analytic technique used to pool results of individual studies. Systematic reviews are useful ways to establish one's knowledge in a particular field of study, and can highlight gaps in research which can be pursued in future work. They can also inform the background of a grant. This course is designed to introduce students to the methods of conducting a high quality systematic review and meta-analysis of intervention studies. We will cover the design, methods, and analytic techniques involved in systematic reviews. These concepts will prepare students to conduct their own systematic review or evaluate the systematic reviews of others. Sessions will be lectures, labs, and presentations. Topics include developing a search strategy, abstracting key data, synthesizing the results qualitatively, meta-analytic techniques, grading the quality of studies, grading the strength of the evidence, and manuscript preparation specific to systematic reviews and meta-analysis of intervention studies. Caveat: If you would like to conduct a systematic review of your own that can be published after the course ends, you will need to have several other class members or colleagues willing to work with you on the project. The systematic review should be on a topic where you expect no more than 20-30 included studies in order to be able to complete the review soon after the course ends. Offered as CRSP 550 and PQHS 550. Prereq: CRSP 401, PQHS 431, MPHP 405, NURS 532, or Requisites Not Met permission.

PQHS 601. Master's Project Research. 1 - 18 Units.

PQHS 602. Practicum. 3 Units.
This course focuses on gaining experience as a biostatistician and enhancing the skills needed to become an effective biostatistician, serving as consultant and collaborator. The objectives of this mentored experience course are: to learn the role of the consulting biostatistician and the accompanying responsibilities, experience the life cycle of a project, develop and apply the interpersonal and communications skills required for a biostatistician, strengthen skills learned in the program, and often to enhance the skill set of the student, as well as to gain insight into the life and career of a biostatistician. This experience helps prepare the student for future job interviews and jobs, and may lead directly to a job. The deliverable is a professionally written report in the format of a report to a client or a research paper.

PQHS 651. Thesis M.S.. 1 - 18 Units.
(Credit as arranged.)

PQHS 701. Dissertation Ph.D.. 1 - 9 Units.
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.