

# POPULATION AND QUANTITATIVE HEALTH SCIENCES

Room W-G57, School of Medicine  
<http://epbiwww.case.edu/>  
 Phone: 216.368.5957  
 Jonathan Haines, PhD, Chair  
[jonathan.haines@case.edu](mailto:jonathan.haines@case.edu)

The Department of Population and Quantitative Health Sciences (<http://epbiwww.case.edu>) (**formerly the Department of Epidemiology and Biostatistics**) draws on the core disciplines of Epidemiology, Biostatistics, and Public Health to help support students in developing the knowledge, skills, and competencies needed to assume positions of leadership with the ultimate goal of advancing the public's health. Through challenging coursework and both independent and collaborative research opportunities, students will develop a thorough understanding of the multiple determinants of population health outcomes; the individual and structural factors that may lead to disparities in those outcomes; and the way in which specific policies and interventions influence the nature and impacts of population health determinants.

The Department of Population and Quantitative Health Sciences offers the following degrees:

- Doctor of Philosophy (PhD)
- Master of Science (MS)
- Master of Public Health (MPH)

The Department of Population and Quantitative Health Sciences also offers a Minor in Public Health.

## Faculty and Research

Department faculty are nationally recognized and have more than \$9.5 million in grants that support projects including HIV/TB research in Uganda, the search for genes that cause disease, cancer prevention and control, studies of interventions to change human behaviors that promote good health, design of clinical trials, studies to change high-risk behaviors related to AIDS, studies of public policies concerning the health of the elderly, and cost/benefit studies of medical interventions. Many research projects are performed in collaboration with the four affiliated hospitals; the University Hospitals, Metro Health, the Cleveland Clinic and the Veteran Administration. The department has offices in two locations at the university, (Wood Building and Wolstein Research Building) and in the Prevention Research Center for Healthy Neighborhoods (PRHCN). The department maintains two scientific computer centers comprised of 14 lab computers and over a dozen servers. Several very large national health care and demographic databases are stored on the servers and are used for faculty and student research and educational projects.

## Master of Science in Biostatistics

Questions and Information:

Nickalaus Koziura, EdM

Master of Science - Biostatistics  
 Case Western Reserve University

10900 Euclid Avenue, W-G74  
 Cleveland, Ohio 44106-4945  
 216.368.5957 - phone  
[nickalaus.koziura@case.edu](mailto:nickalaus.koziura@case.edu) ([drabousky@case.edu](mailto:drabousky@case.edu))

The Department of Population and Quantitative Health Sciences offers a revolutionary new, Master of Science (MS) Program in Biostatistics (and a BS/MS paired with any BS major), a discipline in high and exploding demand. The program can be done intensively in 11 months, or at a slower pace to finish in 1.5 or 2 years. The program was designed after extensive interviews were conducted with a wide array of potential employers to make sure our graduates will have the edge in a marketplace that has been rapidly changing, while also prepared to continue in a PhD program. More and more, biostatisticians are expected to have familiarity with the area of application. The CWRU MS Biostatistics program reflects these new needs. Students may elect to take the program part-time and complete it at their own pace.

Picture yourself saving and improving lives:

- Analyzing data from health studies to determine the best treatment
- Working with data from millions of patients
- Identifying genes linked to specific diseases
- Using data to develop instruments to measure latent constructs like psychosocial well-being

There are four tracks our students can choose from: Biostatistics, Genomics & Bioinformatics, Health Care Analytics, and Social & Behavioral Science.

Students do internships at leading academic medical centers and research centers, at the National Institutes of Health and in industry. Graduates are going on to jobs at leading health institutions and getting funded PhD slots at top Universities.

### Core Courses for this Program:

PQHS 414	Data Management and Statistical Programming	3
PQHS 431	Statistical Methods I	3
PQHS 432	Statistical Methods II	3
PQHS 453	Categorical Data Analysis	3
PQHS 490	Epidemiology: Introduction to Theory and Methods	3
PQHS 602	Practicum (Internship/Practicum)	3
PQHS 602	Practicum (Introduction to Biostatistical Consulting)	1
Total Units		19

### Biostatistics Track:

#### Required Courses (9 Credits)

PQHS 435	Survival Data Analysis	3
PQHS 480	Introduction to Mathematical Statistics	3
PQHS 459	Longitudinal Data Analysis	3

#### Select 1 of the following Track Electives (3 Credits)

PQHS 471	Machine Learning & Data Mining	3
STAT 426	Multivariate Analysis and Data Mining	3

**Genomics and Bioinformatics Track:****Required Track Courses (12 Credits)**

PQHS 471	Machine Learning & Data Mining	3
PQHS 451	A Data-Driven Introduction to Genomics and Human Health	3
PQHS 452	Statistical Methods for Genetic Epidemiology	3
PQHS 457	Current Issues in Genetic Epidemiology: Design and Analysis of Sequencing Studies	3

**Health Care Analytics:****Required Track Courses (6 Credits)**

PQHS 435	Survival Data Analysis	3
PQHS 515	Secondary Analysis of Large Health Care Data Bases	3

**Select 2 of the following Track Electives (6 Credits)**

PQHS 459	Longitudinal Data Analysis	3
PQHS 500	Design and Analysis of Observational Studies	3
PQHS 450	Clinical Trials and Intervention Studies	3
PQHS 471	Machine Learning & Data Mining	3

**Social and Behavioral Sciences Track:****Required Track Courses (12 Credits)**

PQHS 459	Longitudinal Data Analysis	3
MPHP 482	Qualitative and Mixed Methods in Public Health	3
NURS 632	Advanced Statistics: Structural Equation Modeling	3
PSCL 412	Measurement of Behavior	3

Graduates from accredited universities and colleges will be considered for admission to the department. All applicants must satisfy both CWRU and department requirements for graduate admission. The MS program in Biostatistics consists of a 16-credit core curriculum, plus a 12 credit major and a 3 credit internship or practicum.

**General Requirements**

Students must satisfy the requirements of the School of Graduate Studies as stated here, as well as those outlined by the Biostatistics program. The MS program in Biostatistics offers "Plan B", as defined by the CWRU School of Graduate Studies. For Plan B, the student must successfully submit and pass their written internship/practicum project.

**Minor in Public Health**

Questions and Information:

Nickalaus Koziura, EdM

Undergraduate Minor in Public Health  
Case Western Reserve University  
10900 Euclid Avenue, W-G74  
Cleveland, Ohio 44106-4945  
216.368.5957 - phone

nickalaus.koziura@case.edu (drabousky@case.edu)

The impact of public health and the need for the general public to know more is periodically highlighted during crises such as epidemics and pandemics like Zika, Ebola, and Avian Flu. Education in public health is not only necessary for those entering the public health workforce, but is a critical complementary subject for all those considering a career in a health related field.

The Undergraduate Minor in Public Health is a 15 credit program that exposes students to the field of public health. This minor is designed to equip students with the core concepts of Public Health and is highly collaborative with many departments to provide a robust option for students who are pre-health or pursuing medical anthropology, medical sociology, mental health, global health, or nutrition and health promotion.

**Required Courses (9 Credits):****Required Courses (6 Credits)**

MPHP 101	Introduction to Public Health	3
MPHP 301	Introduction to Epidemiology	3

**One of the following courses in Global Health (3 Credits)**

INTH 301	Fundamentals of Global Health	3
ANTH 359	Introduction to Global Health	3

**Electives (6 credits from one of the following areas):****Global Health**

INTH 301	Fundamentals of Global Health	3
BETH 315B	International Bioethics Policy and Practice: Public Health in the Netherlands	3
ANTH 359	Introduction to Global Health	3
ANTH 354	Health and Healing in East Asia	3
ANTH 323	AIDS: Epidemiology, Biology, and Culture	3
BIOL 352	Ecology and Evolution of Infectious Diseases	3

**Medical Anthropology**

ANTH 354	Health and Healing in East Asia	3
ANTH 326	Power, Illness, and Inequality: The Political Economy of Health	3
ANTH 328	Medical Anthropology and Public Health	3
ANTH 338	Maternal Health: Anthropological Perspectives on Reproductive Practices and Health Policy	3
ANTH 359	Introduction to Global Health	3
ANTH 215	Health, Culture, and Disease: An Introduction to Medical Anthropology	3
ANTH 323	AIDS: Epidemiology, Biology, and Culture	3

**Medical Sociology**

SOCI 264	Body, Culture and Disability	3
SOCI 311	Health, Illness, and Social Behavior	3
SOCI 344	Health Disparities	3
SOCI 345	Sociology of Mental Illness	3

SOCI 365	Health Care Delivery	3
<b>Mental Health</b>		
PSCL 315	Social Psychology	3
PSCL 317	Health Psychology	3
PSCL 321	Abnormal Psychology	3
PSCL 344	Developmental Psychopathology	3
SOCI 345	Sociology of Mental Illness	3
<b>Nutrition and Health Promotion</b>		
NTRN 341	Food as Medicine: How what we eat influences how we feel, think, and our health status	3
NTRN 343	Dietary Patterns	3
NTRN 328	Child Nutrition, Development and Health	3
MPHP 313	Health Education, Communication, and Advocacy	3

## Master of Public Health (MPH)

Questions and Information:

Tara Hannum, MA

Master of Public Health Program  
Case Western Reserve University  
10900 Euclid Avenue, W-G74  
Cleveland, Ohio 44106-4945  
216.368.7567- phone  
216.368.2286 - fax  
tmh123@case.edu (drabousky@case.edu)

A Master of Public Health degree is designed to prepare students to address the broad mission of public health, defined as “enhancing health in human populations, through organized community effort,” utilizing education, research and community service. Public health practitioners are prepared to identify and assess the health needs of different populations, and then to plan, implement and evaluate programs to meet those needs. It is the task of the public health practitioner to protect and promote the wellness of humankind. The master of public health program prepares students to enhance health in human populations through organized community effort. Graduates are qualified to work in local and state health departments, universities and colleges, hospitals, ambulatory medical centers, non-profit organizations, and the insurance and pharmaceutical industries. The program seeks to attract a rich mix of students, including those pursuing degrees in medicine, nursing, dentistry, law, social work, anthropology, bioethics, management and other fields, as well as students holding undergraduate degrees.

The CWRU MPH Program has a two-year curriculum requiring 42 credit hours. Eighteen credits are accumulated in six core required courses, representing the fundamental domains of public health: biostatistics, epidemiology, environmental health sciences, health services administration, public health history and social and behavioral sciences. Students receive nine credits for three courses in the concentration of their choice, six credits for two elective courses, and nine credits for the “Culminating Experience,” a 3 credit public health field practicum and a 6 credit capstone project. Previous experience or education pertaining to public health may increase the student’s flexibility in course selection. Students may also enroll part-time and take courses over a three to five year period.

### Requirements: Course List

#### Core required courses (18 credits)

MPHP 405	Statistical Methods in Public Health <sup>1</sup>	3
MPHP 406	History and Philosophy of Public Health	3
MPHP 411	Introduction to Health Behavior	3
MPHP 429	Introduction to Environmental Health	3
MPHP 439	Public Health Management and Policy	3
MPHP 483	Introduction to Epidemiology for Public Health Practice	3
<b>Culminating Experience</b>		
MPHP 652	Public Health Capstone Experience	6
MPHP 650	Public Health Practicum	3
Complete 9 credits within chosen Concentration <sup>2</sup>		9
Elective		6
Total Units		42

<sup>1</sup> Students in the Population Health Research major should strongly consider taking MPHP 431 Statistical Methods I in place of MPHP 405.

<sup>2</sup> Choices for concentration are Population Health Research, Global Health, Health Policy & Administration, Health Promotion and Disease Prevention, or Health Informatics.

#### MPH Sample Plan of Study (full-time):

	Units	
	Fall	Spring
History and Philosophy of Public Health (MPHP 406)	3	
Introduction to Health Behavior (MPHP 411)	3	
Introduction to Epidemiology for Public Health Practice (MPHP 483)	3	
Statistical Methods in Public Health (MPHP 405)		3
Introduction to Environmental Health (MPHP 429)		3
Public Health Management and Policy (MPHP 439)		3
Public Health Practicum (MPHP 650) ( Public Health Capstone Experience)		3
Year Total:	9	12
<b>Second Year</b>		
	Units	
	Fall	Spring
Concentration course 1	3	
Concentration course 2	3	
Elective course	3	
Public Health Capstone Experience (MPHP 652) (Public Health Capstone Experience)	3	
Public Health Capstone Experience (MPHP 652) (Public Health Capstone Experience)		3
Elective Course		3
Concentration Course 3		3
Year Total:	12	9

Total Units in Sequence: 42

## Concentrations

Currently, five different concentrations (a.k.a. tracks) are offered by the CWRU MPH Program: **Population Health Research, Global Health, Health Policy & Management, Health Promotion & Disease Prevention, and Health Informatics**. Each concentration has a required course or courses (in addition to the core required courses), plus selective offerings to be combined for a total of 9 credit hours in major coursework. Students develop a Capstone project relevant to the concentration area to expand and apply the knowledge of the subject. Individual emphasis will differ from student to student within each concentration.

MPH students can also choose to expand the emphasis and depth of their program of study by electing to do a double concentration plan of study. For the double concentration, the student chooses two areas (two concentrations) of equal emphasis and takes 3 courses in each area (this requires the student to take a minimum of 48 credit hours). The student's Capstone project must embrace and integrate both emphases, and no double-counting of credits can take place. Students choosing to do the double concentration plan of study should also work closely with an advisor to ensure optimal course selection and foster the evolution of a successful Capstone project.

### Population Health Research Concentration

**Coordinator - Mendel Singer, PhD, MPH**

#### Learning Objectives:

- Working knowledge of epidemiologic principles, terminology, and tools
- Working knowledge of the primary analytic methods employed in both prospective and retrospective studies relating to population health
- Understand the most common study designs used in public health and/or clinical research
- Gain familiarity with some of the key advanced concepts in one of the subspecialties of population health (e.g. epidemiology, health services research, outcomes research).

#### 1 of the Following Required Concentration Courses (3 Credits)

MPHP 432	Statistical Methods II	3
PQHS 515	Secondary Analysis of Large Health Care Data Bases	3
MPHP 482	Qualitative and Mixed Methods in Public Health	3

#### 2 of the Following Concentration Electives (6 Credits)<sup>1</sup>

MPHP 421	Health Economics and Strategy	3
MPHP 450	Clinical Trials and Intervention Studies	3
PQHS 465	Design and Measurement in Population Health Sciences	3
MPHP 467	Comparative and Cost Effectiveness Research (Section 100)	1
MPHP 467	Comparative and Cost Effectiveness Research (Section 101)	1
MPHP 467	Comparative and Cost Effectiveness Research (Section 102)	1
MPHP 484	Global Health Epidemiology	1 - 3

PQHS 414	Data Management and Statistical Programming	3
PQHS 451	A Data-Driven Introduction to Genomics and Human Health	3
PQHS 452	Statistical Methods for Genetic Epidemiology	3
PQHS 459	Longitudinal Data Analysis	3
NURS 631	Advanced Statistics: Multivariate Analysis	3
NURS 632	Advanced Statistics: Structural Equation Modeling	3

<sup>1</sup> MPHP 432, MPHP 482, and MPHP 515 can also be taken as concentration electives as long as they were not taken as the "Required Concentration Course".

### Global Health Concentration Coordinator - Peter Zimmerman, PhD

#### Learning Objectives:

- Develop a global perspective on health and diseases
- Learn to design, execute, analyze, and evaluate global health research or projects
- Acquire skills to understanding and communicate meaningfully with colleagues from distant fields of global health
- Learn to integrate multiple objectives in global health across academic and applied disciplines
- Understand ethical and regulatory issues for global health research

#### Required Concentration Courses (6 Credits)

INTH 401	Fundamentals of Global Health	3
MPHP 484	Global Health Epidemiology	3
<b>Concentration Electives (3 Credits)</b>		
MPHP 510	Health Disparities	3
ANTH 461	Urban Health	3
ANTH 480	Medical Anthropology and Global Health I	3
ANTH 511	Seminar in Anthropology and Global Health: Topics	3
LAWS 4101	International Law	3
LAWS 5123	International Trade Law and Policy	3
MGMT 460	Managing in a Global Economy	3

### Health Care Policy & Administration Concentration Coordinator - TBA

#### Learning Objectives:

To improve population health through leadership by developing knowledge, ability and skills to lead care improvement, including:

- Knowledge of social science through theories and how they can be used to understand the organization of health care (health economics, sociology, organization theory, social psychology)
- To understand the role of the manager, organizational control and design, relationships with professional workers, adaptation to change and public accountability
- To understand and be able to use management techniques including quality improvement, small group leadership, budgeting, cost effectiveness, and decision supports

- Able to analyze a public health problem, recommend solutions, make a public presentation, and carry out improvements

#### Required Concentration Course (3 Credits)

MPHP 468	The Continual Improvement of Healthcare: An Interdisciplinary Course	3
----------	--	---

#### Select 2 Concentration Courses from the list below (6 Credits)

MPHP 421	Health Economics and Strategy	3
MPHP 456	Health Policy and Management Decisions	3
MPHP 467	Comparative and Cost Effectiveness Research	1
MPHP 475	Management of Disasters Due to Nature, War, or Terror	3
MPHP 510	Health Disparities	3
MPHP 532	Health Care Information Systems	3
POSC 483	Health Policy and Politics in the United States	3
HSMC 420	Health Finance	3
LAWS 5205	Public Health Law	2
BETH 417	Introduction to Public Health Ethics	3

#### Health Informatics Concentration Coordinator - Siran Koroukian, PhD

##### Learning Objectives:

- Understand how clinical data are collected and coded
- Aggregate, normalize, and integrate clinical and/or claims data originating from disparate forms
- Understand standard health data exchange formats and vocabularies, including Health Level 7 (HL7, designed to transfer clinical and administrative data across different applications), the Logical Observation Identifiers Names and Codes (LOINC, for encoding laboratory test and result information), the Systematized Nomenclature of Medicine (SNOMED, clinical terminology designated as a US standard for electronic health information exchange).
- Understand the ethical, regulatory, and practical aspects of data security
- Know how to retrieve and use data from social media/mobile health

#### Required Concentration Courses (9 Credits)

PQHS 416	Introduction to Computing in Biomedical Health Informatics	3
PQHS 515	Secondary Analysis of Large Health Care Data Bases	3
IIME 473	Fundamentals of Clinical Information Systems	3

#### Health Promotion & Disease Prevention Concentration Coordinator - Erika Trapl, PhD

##### Learning Objectives:

- Describe models and theories of health behavior as they relate to health promotion and disease prevention
- Identify multi-factorial causes of health behavior and disease

- Demonstrate knowledge and skills necessary to support behavior change
- Apply principles and practice of effective health communication
- Describe development, implementation, and evaluation of programs that promote healthy lifestyle and behaviors

#### Required Concentration Courses (6 Credits)

MPHP 433	Community Interventions and Program Evaluation	3
MPHP 413	Health Education, Communication, and Advocacy	3

#### Select 1 Concentration Course from the list below (3 Credits)

MPHP 464	Obesity and Cancer: Views from Molecules to Health Policy	3
MPHP 475	Management of Disasters Due to Nature, War, or Terror	3
MPHP 485	Adolescent Development	3
MPHP 510	Health Disparities	3
ANTH 461	Urban Health	3

#### Intensive Research Pathway

The MPH is not a research degree, yet many use it as a springboard for a career in research. Some continue on for a PhD in a related field, such as Epidemiology. Others look for jobs as research assistants and compete for these jobs with people who have obtained a research master's degree - often at a disadvantage due to their limited number (and level) of advanced research methods courses. The MPH degree offers a broad foundation in public health and experience in community settings and has great value both as a secondary degree (e.g. MD/MPH) and as a primary terminal degree. Yet even within the framework of an MPH degree, more can be done to accommodate those intending to pursue a career in research, either directly or by first pursuing a PhD. In addition to better preparing these students for research careers and PhD programs, students wishing to continue for a PhD (at CWRU or elsewhere) can, with by doing the IRP, get more credit towards their PhD degrees.

The goal is to create a unique hybrid that combined the benefits of a research level Master's degree with the broader professional public health training of the MPH degree. This optional program of study can be completed with any of the MPH concentrations by completing the course list below (33 credits) plus any of the 9 credit concentration sequences.

MPHP 406	History and Philosophy of Public Health	3
MPHP 411	Introduction to Health Behavior	3
MPHP 439	Public Health Management and Policy	3
MPHP 650	Public Health Practicum	3
MPHP 652	Public Health Capstone Experience	6
PQHS 414	Data Management and Statistical Programming	3
PQHS 431	Statistical Methods I	3
PQHS 432	Statistical Methods II	3
PQHS 465	Design and Measurement in Population Health Sciences	3
PQHS 490	Epidemiology: Introduction to Theory and Methods	3

Concentration Course Sequence	9
Total Units	42

## Dual Degree Options

Because of the breadth of the field of public health, the MPH Program is an ideal degree to integrate with other professional schools and graduate programs at Case. University leadership has recognized collaboration as one of the priorities for the future of the university, and has approved 11 MPH dual degree programs. They are:

- JD/MPH (School of Law)
- MA or PhD/MPH (Department of Anthropology, School of Graduate Studies)
- MA/MPH (Department of Bioethics, School of Medicine)
- MBA/MPH (Weatherhead School of Management )
- MD/MPH (School of Medicine)
- MS/MPH (Department of Nutrition)
- MSN/MPH (School of Nursing)
- MSSA/MPH (Social Administration, Mandel School of Applied Social Sciences)
- DMD/MPH (School of Dentistry)
- BA/MPH (Integrated Graduate Studies (IGS) Program)
- MSM-HC (Weatherhead School of Management)

Generally, dual degree students complete both degrees by adding one year of study to the partner degree. For example, an MD student could add one year to the four-year MD Program to complete his/her MD/MPH dual degree in five years. In addition to the requirements for the partner degree program, all dual degree students will complete 27 credits of core MPH requirements (18 core credits plus 9 Culminating Experience credits) and participate in both semesters of the MPH seminar series. Of the remaining 15 credits, it is anticipated that 9 will be selected from courses taught by the Department of Epidemiology and Biostatistics. The remaining 6 credits can be selected from the list of approved courses in the partner program. Students wishing to take courses not previously approved in the dual degree plan may petition to do so in writing to both partner programs. In most cases, it will be assumed that dual degree students will adopt an area of concentration specific to their shared degree area.

Dual degree students should have academic advisors from both the MPH Program and the partner program faculty. Advisors of dual degree students are encouraged to develop dialogues with their partner advisors and collaborate on students' programs of study. This dialogue should be accomplished by a minimum of one annual group meeting of both advisors with the student to be arranged by the student. During the initial meeting, before the end of the student's first semester, a Planned Program of Study (PPOS) is developed. The PPOS can be revised later, also with the approval of both advisors. The PPOS should include (if relevant) a written description of how outside courses will benefit the student's public health education. Academic performance issues, or any other issues, are presented by the advisors to the MPH Executive Committee for final disposition. The MPH Executive Committee will adjudicate any difference in opinion between advisors.

The Director of the MPH Program, assisted by the Program Administrative Director, is the coordinator of the dual degree programs and provides services for student support, including special events and publications dedicated to serving the needs of dual degree students and building their sense of scholarship and community as a group. The Office

of the MPH Program Director provides dual degree students a destination for help and building identity.

## Dual Degree Contacts

### MBA/MPH

Deborah Bibb  
FT MBA Program Director  
Weatherhead School of Management  
216.368.6702  
deborah.bibb@case.edu

### JD/MPH

Ruqaiyah A. Yearby, JD, MPH  
Professor  
School of Law  
216.368.6351  
ray31@case.edu

### MSN/MPH

Carol Savrin, DNP, CPNP, FNP, BC, FAANP  
Associate Professor  
School Of Nursing  
216.368.5304  
cls18@case.edu

### Anthropology/MPH

Janet McGrath, PhD  
Associate Professor  
Department of Anthropology  
Mather Memorial 238  
216.368.2287  
jwm6@case.edu

### MD/MPH

Scott Frank, MD, MS  
Director Master of Public Health Program  
216.368.3897  
scott.frank@case.edu

### Bioethics/MPH

Aaron Goldenberg, PhD, MPH  
Assistant professor  
Bioethics - School of Medicine  
216.368.8729  
aaron.goldenberg@case.edu

### Integrated Graduate Studies (BA/MPH)

Claudia C. Anderson  
Assistant Dean  
Office of Undergraduate Studies  
216.368.2928  
cca2@case.edu

### MSSA/MPH

Sharon Milligan, PhD, MSW, MPH  
Associate Dean for Academic Affairs  
Mandel School of Applied Social Sciences  
216.368.2335  
sharon.milligan@case.edu (sharon.milligan.edu)

### DMD/MPH

Sena Narendran, BDS, MPH  
Associate Professor of Community Dentistry  
School of Dentistry

216.368.1131  
 sena.narendran@case.edu

### MS/MPH

Hope Barkoukis, PhD, RD, LD  
 Chair  
 Department of Nutrition  
 School of Medicine  
 216.368.2441  
 Hope.Barkoukis@case.edu

## PhD Epidemiology and Biostatistics

Questions and Information:

Nickalaus Koziura, EdM

Master of Science - Biostatistics  
 Case Western Reserve University  
 10900 Euclid Avenue, W-G74  
 Cleveland, Ohio 44106-4945  
 216.368.5957 - phone  
 nickalaus.koziura@case.edu (drabousky@case.edu)

The mission of the Doctoral Program in Epidemiology and Biostatistics in the Department of Population and Quantitative Health Sciences is to prepare students for an active, fulfilling, and lifelong research career, with the goal of improving human health.

The program draws on the core disciplines of epidemiology and biostatistics, broadly defined, but may also include a wide range of other academic areas, ranging from human genetics to health policy. As part of their training students will develop the knowledge, skills, and competencies necessary to be leading researchers in areas that provide improved understanding of how to advance public health. Through challenging coursework and research opportunities, both independent and collaborative, students will develop a thorough understanding of the multiple determinants of population health outcomes, the individual and structural factors that may lead to disparities in those outcomes, and the way in which specific policies and interventions can influence the nature and impacts of population health determinants. A key aspect of the program is to train students to define important, unanswered questions and design appropriate strategies to solve our pressing health problems, locally, nationally and globally. In addition, the program in Epidemiology and Biostatistics is committed to developing the skills necessary for lifelong learning as we recognize this as being key to continued success.

The program is designed to train students to address critical research questions to advance human and population health utilizing a wide variety of research tools and trans-disciplinary collaborations. This is distinct from historical training in a single discipline (e.g., statistics or genetics) or expertise in a small number of technical skills. The educational mission of the PhD Program in Epidemiology & Biostatistics is to train students using an integrated approach that draws broadly from the population and quantitative health sciences. These include **global, population, public, and community health, biostatistics, epidemiology, health behavior and prevention, genomic epidemiology, bioinformatics, and computational biology**. This training provides the foundation for trainees to play integral roles in successfully solving our most pressing health problems.

Through our rigorous coursework, exposure to discussion of important health related issues, and their research experiences during graduate training, students will develop into junior colleagues of the faculty who

will develop the capacity to work independently. To develop into the research leaders expected of our graduates, each student will take a common set of first and second year courses that provides extensive exposure to each of the areas noted above. By the end of their first year students will choose a mentor and laboratory in which to do their dissertation work. Research areas span all of the above and often combine these approaches with the expectation that cross-disciplinary studies will result in broader and more complete solutions to complex public health problems.

Exposure to cutting edge research will be facilitated by our department-wide seminar that includes talks by world-leading experts both from off- and on-campus. As part of their training all students will participate in these seminars, including as speakers. This will help develop the necessary communication skills that is expected of successful researchers.

Graduates from accredited universities and colleges will be considered for admission to the department. All applicants must satisfy both CWRU and department requirements for graduate admission. Upon acceptance into the PhD program, each student will be assigned an academic advisor, who will guide the student through department and graduate school regulations, assist him or her in designing the initial planned program of study, and track the student's progress toward degree completion.

Research and training will be guided by a committee of faculty including the student's research advisor. The research advisor will have the major responsibility for facilitating, guiding, and advising the student in his or her research, but this will be done in consultation with the faculty committees. A Mentoring committee, selected after first year of Ph.D. training, will help students select courses and educational goals most useful for their research interests. This committee will be replaced at the end of the second year by a Dissertation committee that will play an important role in guiding the student's research project.

On completion of all Core Curriculum course requirements, students take a qualifying examination that is necessary to remaining and advancing in the program. Exceptions to required courses based on prior course work will be decided on a case by case basis.

### Curriculum

The Doctor of Philosophy degree in Epidemiology and Biostatistics in the Department of Population and Quantitative Health Sciences comprises 42 credits from the following components:

- Core Curriculum (22 credits)
- Electives (20credits)
- Department Research Seminar (6 semesters)
- Passing the Qualifying Exam
- Dissertation Research (18 credits)

### Core Curriculum

The Core Curriculum is designed to provide PhD students with a strong foundation in epidemiology and biostatistics and related areas - the fields that comprise population and quantitative health sciences - and the methodological and analytic training to conduct a rigorous, high quality research in the student's selected specialization or concentration.

Core required courses include:

PQHS 431	Statistical Methods I	3
PQHS 432	Statistical Methods II	3

PQHS 440	Introduction to Population Health	3
PQHS 490	Epidemiology: Introduction to Theory and Methods	3
PQHS 465	Design and Measurement in Population Health Sciences	3
PQHS 472	Integrated Thinking in Population and Quantitative Health Sciences	2
PQHS 444	Communicating in Population Health Science Research (**1 unit, taken twice)	2
PQHS 501	Research Seminar	0

### Electives

Electives are chosen in consultation with the student's mentor and mentoring committee.

### Seminars (0 credits)

Attending research seminars is integral to our graduate program and student's professional development. Students are required to attend weekly research seminars. These seminars provide a forum for students to develop skills in scientific presentation, thought and communication, and balance general and concentration-specific speakers and topics. Meeting locations may vary from week to week depending upon the speaker. Each student is required to attend in person six semesters of seminars. All students are required to present once a year during research seminars after their first year in the program.

### Qualifying Exam

Following the completion of the core required courses at the end of their second year; students will take an oral exam based on required coursework that involves analyses of a novel data set. This will include a description of the results, their interpretation and a short proposal on alternative or future research directions based on these findings. Students will be given two attempts to pass this examination. A second failure will result in dismissal from the program.

### Dissertation (18 credits)

After passing the qualifying examination and completing second year course work, students will select a dissertation committee and develop a thesis proposal, based on anticipated research for their dissertation. This will be presented to the student's Dissertation committee that will evaluate the written document and an oral defense of the document. This will be completed no later than the end of the fall semester of the third year. Successful completion of this exam will move the student to candidacy. Each student will be allowed two attempts to pass the oral defense of the proposal.

Students are required to complete 18 credits of dissertation (PQHS 701) prior to graduation.

## MPHP Courses

### MPHP 101. Introduction to Public Health. 3 Units.

The purpose of this course is to introduce students to the science and art of public health through understanding historical and current issues through public health case histories and controversies. Students will be introduced to social, behavioral, cultural, and environmental influences on population health. Emphasis is placed on social justice as a central component of public health, with an overview of health inequity and commitment to vulnerable populations. Core public health practices relating to health promotion program design, community assessment and improvement planning, health communication, health policy and enforcement, and health behavior change will be featured. The course will promote understanding of health care and public health systems domestically and globally, including preparedness for and response to public health emergencies.

### MPHP 301. Introduction to Epidemiology. 3 Units.

This course begins with the exploration of the history, philosophy and uses of epidemiology. It then moves to the basic descriptive functions of epidemiology such as condition, frequency and severity. Data is used to describe qualitatively and quantitatively diseases and injuries in a population. Applications include identifying patterns of disease and injury over time and geography. The course then moves to analytical epidemiology with focus on estimation, inference, bias, confounding and adjustment in the determination of what factors are associated with, or cause disease or injury. The different kinds of study designs are introduced including ecologic, cross-sectional, case-control, retrospective and prospective cohort, and experimental designs such as clinical trials. Students are introduced to evidence-based public health with analysis of harm, benefit and cost, and intervention effectiveness. The course concludes with applications to policy, covering outbreak investigation/testing/screening, public health policy and special epidemiologic applications including molecular and genetic epidemiology, environmental health and safety, unintentional injury and violence prevention and behavioral sciences. Recommended preparation: A course in statistics taken before or concurrently with MPHP 301.

### MPHP 306. History and Philosophy of Public Health. 3 Units.

The purpose of this course is to introduce students to the science and art of public health through an understanding of the history and philosophies that represent its foundation. Students will learn about the essentials of public health and applications of those precepts throughout history and in the present. The course will examine public health case histories and controversies from the past and present, in order to better understand solutions for the future. Offered as MPHP 306 and MPHP 406. Prereq: Enrollment limited to juniors and seniors only.

### MPHP 313. Health Education, Communication, and Advocacy. 3 Units.

Historical, sociological, and philosophical factors that have influenced definitions and the practice of health education and health promotion are studied. Advanced concepts in health communication theory will also be explored. This course is designed to educate, motivate, and empower undergraduate and graduate students to become advocates for their own health, the health of their peers, and the health of the community. Offered as MPHP 313 and MPHP 413.

**MPHP 405. Statistical Methods in Public Health. 3 Units.**

This one-semester survey course for public health students is intended to provide the fundamental concepts and methods of biostatistics as applied predominantly to public health problems. The emphasis is on interpretation and concepts rather than calculations. Topics include descriptive statistics; vital statistics; sampling; estimation and significance testing; sample size and power; correlation and regression; spatial and temporal trends; small area analysis; statistical issues in policy development. Examples of statistical methods will be drawn from public health practice. Use of computer statistical packages will be introduced. Prereq: Enrollment limited to MPH students (Plan A or Plan B) and EPBI students only. All others require instructor consent.

**MPHP 406. History and Philosophy of Public Health. 3 Units.**

The purpose of this course is to introduce students to the science and art of public health through an understanding of the history and philosophies that represent its foundation. Students will learn about the essentials of public health and applications of those precepts throughout history and in the present. The course will examine public health case histories and controversies from the past and present, in order to better understand solutions for the future. Offered as MPHP 306 and MPHP 406. Prereq: Enrollment limited to MPH students (Plan A or Plan B) and EPBI students or instructor consent.

**MPHP 411. Introduction to Health Behavior. 3 Units.**

Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Offered as PQHS 411 and MPHP 411. Prereq: Enrollment limited to MPH students (Plan A or Plan B) and EPBI students or consent.

**MPHP 413. Health Education, Communication, and Advocacy. 3 Units.**

Historical, sociological, and philosophical factors that have influenced definitions and the practice of health education and health promotion are studied. Advanced concepts in health communication theory will also be explored. This course is designed to educate, motivate, and empower undergraduate and graduate students to become advocates for their own health, the health of their peers, and the health of the community. Offered as MPHP 313 and MPHP 413.

**MPHP 421. Health Economics and Strategy. 3 Units.**

The purpose of this course is to develop the analytical skills necessary for understanding how the U.S. health care sector operates, how it has evolved, the forces at work behind perceived deficiencies (in quality and cost control), and the impact of alternative policy proposals. Special attention is given to recent developments in the healthcare marketplace, and the strategic considerations they create for providers and insurers. These issues are addressed through the lens of microeconomic theory. Under this framework, outcomes result from the interaction of decisions made by participants in the healthcare economy (e.g. patients, providers, insurers, government), with those decisions governed by the preferences, incentives and resource constraints facing each decision-maker. Principles of microeconomics will be reviewed as necessary to ensure consistent understanding of basic concepts. The course is designed to appeal to a broad audience, particularly students interested in healthcare management, public health, medical innovation, health law, and public policymaking. Offered as HSMC 421 and MPHP 421.

**MPHP 429. Introduction to Environmental Health. 3 Units.**

This survey course will introduce students to environmental and occupational health topics including individual, community, population, and global issues. Students will develop an understanding of the human health impacts of physical, biological, and chemical agents in the environment and workplace including basic principles of toxicology. Presentation of concepts including risk assessment, communication and management as well as discussion of environmental and occupational practices, policies and regulations that promote public and population health is included.

**MPHP 431. Statistical Methods I. 3 Units.**

Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, CRSP 431, PQHS 431 and MPHP 431.

**MPHP 432. Statistical Methods II. 3 Units.**

Methods of analysis of variance, regression and analysis of quantitative data. Emphasis on computer solution of problems drawn from the biomedical sciences. Design of experiments, power of tests, and adequacy of models. Offered as BIOL 432, PQHS 432, CRSP 432 and MPHP 432. Prereq: PQHS/EPBI 431 or equivalent.

**MPHP 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/EPBI 490, PQHS/EPBI 431, or MPHP 405. Offered as PQHS 433 and MPHP 433. Prereq: MPHP 411

**MPHP 439. Public Health Management and Policy. 3 Units.**

This course is designed to introduce students to the basics of health policy-making and includes a background on the basic structure and components of the US Health Care System (such as organization, delivery and financing). It will also cover introductory concepts in public health management, including the role of the manager, organizational design and control, and accountability. We will address relevant legal, political and ethical issues using case examples. At the end of the course, students will understand how health policy is developed and implemented in various contexts, and the challenges facing system-wide efforts at reform. This is a required course for the MPH degree. Grades will be based on a series of assignments. Prereq: Enrollment limited to MPH students (Plan A or Plan B) and EPBI Students or instructor consent.

**MPHP 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/EPBI 431 or consent of instructor. Offered as PQHS 450 and MPHP 450.

**MPHP 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.

**MPHP 456. Health Policy and Management Decisions. 3 Units.**

This seminar course combines broad health care policy issue analysis with study of the implications for specific management decisions in organizations. This course is intended as an applied, practical course where the policy context is made relevant to the individual manager. Offered as HSMC 456 and MPHP 456.

**MPHP 464. Obesity and Cancer: Views from Molecules to Health Policy. 3 Units.**

This course will provide an overview of the components of energy balance (diet, physical activity, resting metabolic rate, dietary induced thermogenesis) and obesity, a consequence of long term positive energy balance, and various types of cancer. Following an overview of energy balance and epidemiological evidence for the obesity epidemic, the course will proceed with an introduction to the cellular and molecular biology of energy metabolism. Then, emerging research on biologically plausible connections and epidemiological associations between obesity and various types of cancer (e.g., colon, breast) will be presented. Finally, interventions targeted at decreasing obesity and improving quality of life in cancer patients will be discussed. The course will be cooperatively-taught by a transdisciplinary team of scientists engaged in research in energy balance and/or cancer. Didactic lectures will be combined with classroom discussion of readings. The paper assignment will involve application of course principles, lectures and readings. Offered as PQHS 464 and MPHP 464.

**MPHP 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.

**MPHP 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.

**MPHP 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.

**MPHP 475. Management of Disasters Due to Nature, War, or Terror. 3 Units.**

The purpose of this course is to make participants aware of the special needs of children and families in disaster situations and understand public health approaches to address these needs. The learning objectives for this course are: 1) Identify the most important problems and priorities for children in disaster situations, 2) Identify the organizations most frequently involved in providing assistance in disaster situations and define their roles and strengths, 3) Describe the reasons why children are among the most vulnerable in disaster events, 4) Conduct emergency nutritional assessments for children, 5) Develop health profiles on displaced children and plan interventions based on results, 6) Define common psychosocial issues of children and the means to address them, 7) List basic points of international law including the Geneva Convention that relate to all persons involved in disaster situations, 8) List important security issues, 9) Appreciate ethical issues involved in disaster situations and employ skills of cross cultural communication, 10) Recognize and respond to special issues for children involved in biological and chemical terrorist attacks.

**MPHP 477. Internship at Health-Related Government Agencies. 3 Units.**

This independent study course will incorporate a one-semester-long internship at health-related government agencies (Ohio Department of Health, Ohio Department of Job and Family Services, or Cleveland City Health Department). The choice of the agency will depend on the student's academic interests and research goals. The objective is to develop a level of familiarity with the organizational and operational aspects of such agencies, and to gain an understanding of agencies' and bureaus' interactions with the legislative body, as well as the processes of developing, implementing, managing, and monitoring health initiative. The instructor and the liaison persons at the agencies will be responsible for planning structured encounters of interns with key administrators and policy makers, and to select a research project, based on the intern's research interests and the agencies' research priorities. Interns will be required to submit a draft of the report to the instructor at the end of the semester. The approved, final report will be submitted to the agency. The project will be evaluated for its methodological soundness and rigor. Students will be required to be at the agency one day a week. Recommended preparation: PQHS/EPBI 515.

**MPHP 482. Qualitative and Mixed Methods in Public Health. 3 Units.**

Understanding complex public health issues requires both qualitative and quantitative inquiry. The exploration of the perceptions and experiences of people is as essential as analyzing the relationships among variables. Often, the integration of the two methods is required in order to effectively address the significant health issues faced by today's society. It is the purpose of this course to facilitate a meaningful and substantive learning process around engaging in, and critically analyzing, qualitative and mixed methods research in public health. This includes gaining first-hand experience in research design and collecting, managing, analyzing, and interpreting data for the purposes of making data-driven program and policy recommendations. In addition, students will have the opportunity to engage with local professionals engaged in qualitative and mixed methods research.

**MPHP 483. Introduction to Epidemiology for Public Health Practice. 3 Units.**

This course is designed to introduce the basic principles and methods of epidemiology. Epidemiology has been referred to as the basic science for public health. Application of epidemiologic principles is critical to disease prevention, as well as in the development and evaluation of public policy. The course will emphasize basic methods (study design, measures of disease occurrence, measures of association, and causality) necessary for epidemiologic research. It is intended for students who have a basic understanding of the principals of human disease as well as statistics. Prereq: Must be an MPHP Plan A or MPHP Plan B, or EPBI student in order to enroll in the course.

**MPHP 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.

**MPHP 485. Adolescent Development. 3 Units.**

Adolescent Development can be viewed as the overriding framework for approaching disease prevention and health promotion for this age group. This course will review the developmental tasks of adolescence and identify the impact of adolescent development on youth risk behaviors. It will build a conceptual and theoretical framework through which to address and change adolescent behavior to promote health.

**MPHP 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/EPBI 431 or Requisites Not Met permission.

**MPHP 499. Independent Study. 1 - 18 Units.****MPHP 510. Health Disparities. 3 Units.**

This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, PQHS 510, MPHP 510, NURS 510, and SASS 510.

**MPHP 532. Health Care Information Systems. 3 Units.**

This course covers concepts, techniques and technologies for providing information systems to enhance the effectiveness and efficiency of health care organizations. Offered as HSMC 432 and MPHP 532.

**MPHP 540. Operational Aspects of Global Health and Emergency Response. 3 Units.**

Among professional in the medical field and the field of public health, there is a gap in knowledge, structure and research in best practices surrounding emergency response. This gap results from the limited number of training programs in the United States that focus on this very specialized field and the limited number of academic partnerships with international non-governmental organizations (NGOs). This course helps remedy this gap by introducing public health students and international emergency medicine fellows to the overall structure and operations of international humanitarian coordination systems, types of emergency response, morbidity and mortality associated with various emergencies, and the actors and institutions involved. The course highlights, through reading, workshops, and examples, the real world issues that must be faced and overcome in the field during emergency response operations.

**MPHP 650. Public Health Practicum. 1 - 3 Units.**

The Public Health Practicum is an integral component of the MPH curriculum, allowing students to apply, develop, and refine their conceptual knowledge and skills as part of a planned, supervised, and evaluated community-based experience. The Practicum is designed to move students beyond the walls of academia, to understand the political, economic, social, and organizational contexts within which public health activities are conducted. To complete the Practicum, students must complete three credits of MPHP 650, dedicating at least 120 hours to a substantial public health experience, and attend Community Health Research and Practice (CHRP) group meetings. Prereq: Complete at least 9 credit hours in the MPH program and be in good academic standing.

**MPHP 652. Public Health Capstone Experience. 1 - 9 Units.**

Public health field practicum, involving a placement at a community-based field site, and a Master's essay. The field placement will provide students with the opportunity to apply the knowledge and skills acquired through their Master of Public Health academic program to a problem involving the health of the community. Students will learn to communicate with target groups in an effective manner; to identify ethical, social, and cultural issues relating to public health policies, research, and interventions; to identify the process by which decisions are made within the agency or organization; and to identify and coordinate use of resources at the placement site. The Master's essay represents the culminating experience required for the degree program and may take the form of a research thesis, an evaluation study, or an intervention study. Each student is required to formally present the experience and research findings. In any semester in which a student is registered for MPHP 652 credit, it is required that the student attend the Community Health Research and Practice (CHRP) group at a minimum of two sessions per 3 credits. CHRP is held once a week for approximately an hour and a half for the duration of fall, spring, and summer semesters. MPHP 652 credit is available only to Master of Public Health students.

**MPHP 655. Dual Degree Field Practicum II. 3 Units.**

This course is designed to be taken by MSSA/MPH joint degree students as the second field period of their master's program. It consists of a field practicum and participation in professional development opportunities. The Field Practicum is an integral component of the MSASS and MPH curriculums, allowing students to apply, develop, and refine their conceptual knowledge and skills as part of a planned, supervised, and evaluated community-based experience. The Practicum is designed to move students beyond the walls of academia, to understand the political, economic, social, and organizational contexts within which social work and public health activities are conducted. These collective experiences provide students with a forum to develop skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent developing practitioners. (EPAAS Program Objective M6 and EPAAS Content Area 4.7) The overall goal of this course is to provide graduate level MSSA/ MPH joint degree students with field related opportunities to continue to develop foundation level competencies in the eight MSSAS abilities by helping students apply knowledge of social work and public health theory, skills, values and ethics acquired in the classroom in an agency setting. Offered as MPHP 655 and SASS 655.

**MPHP 656. Dual Degree Field Capstone III. 3 Units.**

The Public Health Capstone Project is an integral component of the MPH curriculum, allowing students to apply, develop, and refine their conceptual knowledge and skills as part of a planned, mentored, and evaluated public health scholarly project. This course is designed to be taken by advanced level students. It consists of a 288 hour field based Capstone experience and participation in 12 hours of professional development opportunities. The overall goal of this course is designed to move students beyond the walls and constraints of the classroom, to understand the political, economic, social, and organizational contexts within which public health and social work activities are conducted. It is also designed to provide graduate level dual degree students with field related opportunities to begin to develop advanced level competencies in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. These collective experiences provide students with a forum to continue to develop and hone social work skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent developing practitioners. (EPAS Program Objective M6 and EPAS Content Area 4.7) Offered as SASS 656 and MPHP 656. Prereq: MPHP 655.

**MPHP 657. Dual Degree Field Capstone IV. 3 Units.**

The Public Health Capstone Project is an integral component of the MPH curriculum, allowing students to apply, develop, and refine their conceptual knowledge and skills as part of a planned, mentored, and evaluated public health scholarly project. This course is designed to be taken by advanced level students. It consists of a 288 hour field based Capstone experience and participation in 12 hours of professional development opportunities. The overall goal of this course is designed to move students beyond the walls and constraints of the classroom, to understand the political, economic, social, and organizational contexts within which public health and social work activities are conducted. It is also designed to provide graduate level dual degree students with field related opportunities to begin to develop advanced level competencies in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. Offered as MPHP 657 and SASS 657.

## PQHS Courses

### PQHS 411. Introduction to Health Behavior. 3 Units.

Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Offered as PQHS 411 and MPHP 411. Prereq: Enrollment limited to MPH students (Plan A or Plan B) and EPBI students or consent.

### 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 415. Statistical Computing and Data Analytics. 3 Units.

Statistical computing is an essential part of modern statistical training. This course emphasizes on statistical and data analytic problem solving skills, covers elements of statistical computing, and special topics in modern data analytics. This includes numerical methods for statistics, stochastic simulation, symbolic and graphical computation, plus special topics in resampling methods, EM algorithms, Gibbs Sampling/MCMC, projection pursuit, Laplace approximation, parallel computing, and selected methods for big and high dimensional data. The course will use R/Splus predominantly. However, interface of R with another high level programming language such as C, C++, Fortran, JAVA or Python will be essential for Big Data and intensive computation. Some Matlab, Mathematica, and graphviz will be used for symbolic and graphical computation. Prerequisite: Knowledge in statistics, equivalent to that in either STAT 325/425, or STAT 345/445, or PQHS/EPBI 481, or PQHS/EPBI 431, or by permission. Experience with at least one programming language is required: R/Splus, Matlab, C/C++, Fortran, JAVA, or Python. Prereq: STAT 312, STAT 325, STAT 425, STAT 345, STAT 445, PQHS/EPBI 431 or PQHS/EPBI 481.

### PQHS 416. Introduction to Computing in Biomedical Health Informatics. 3 Units.

The goals of this course are to provide students with a survey of the computational technique that underpin biomedical and health informatics. The course will cover methods in computational system development, including biomedical terminologies, ontologies, natural language processing (NLP), logic, Electronic Health Record (EHR) system architecture as well as applications, and topics related to health information systems. This course is intended for students interested in learning the computational foundations of biomedical and health informatics. Students should have at least a bachelor of science level educational background and an understanding of the fields of biomedical and clinical/translational.

### PQHS 431. Statistical Methods I. 3 Units.

Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, CRSP 431, PQHS 431 and MPHP 431.

### PQHS 432. Statistical Methods II. 3 Units.

Methods of analysis of variance, regression and analysis of quantitative data. Emphasis on computer solution of problems drawn from the biomedical sciences. Design of experiments, power of tests, and adequacy of models. Offered as BIOL 432, PQHS 432, CRSP 432 and MPHP 432. Prereq: PQHS/EPBI 431 or equivalent.

### 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/EPBI 490, PQHS/EPBI 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: PQHS/EPBI 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 seminar on writing journal articles to report original research, and preparing and making oral and poster presentations. The end products are ready-to-submit manuscripts and related slide and poster presentations for the required first-year research project in the PhD program in the Department of Epidemiology and Biostatistics. While this course provides a nucleus for this endeavor, students work intensively under the supervision of their research mentors, who guide all stages of the work including providing rigorous editorial support. Seminar sessions are devoted to rigorous peer critiques of every stage of the projects and to in-depth discussions of assigned readings. Recommended preparation: PhD students in the Department of Biostatistics and Epidemiology. Non-PhD EPBI students permitted if space available. Fluency in English writing (e.g., in accord with the Harbrace College Handbook). Prereq: PQHS/EPBI 431 and PQHS/EPBI 490. Coreq: PQHS/EPBI 432.

**PQHS 445. Research Ethics in Population Health Sciences. 0 Unit.**

This zero credit course is a required add-on for PhD students in EPBI. 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/EPBI 431 or consent of instructor. 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/EPBI 431 and PQHS/EPBI 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/EPBI 431 and PQHS/EPBI 451.

**PQHS 453. Categorical Data Analysis. 3 Units.**

Categorical data are often encountered in many disciplines including in the fields of clinical and biological sciences. Analysis methods for analyzing 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 the biomedical and clinical studies. This particular course will focus mostly on statistical methods for categorical data analysis arising from various fields of studies including clinical studies; those who take it will come from a wide variety of disciplines. The course will include video lectures, group discussion and brainstorming, homework, simulations, and collaborative projects on real and realistic problems in human health tied directly to the student's own professional interests. Focus will be given to logistic regression methods. Topics include (but not limited to) binary response, multi-category response, count response, model selection and evaluation, exact inference, Bayesian methods for categorical data, and supervised statistical learning methods. 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. Recommended preparation: Advanced undergraduate students, and graduate students in Biostatistics or other quantitative sciences with a background in statistical methods (at least one statistics course, equivalent to the PQHS/EPBI 431 course experience).

**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/EPBI 451 and PQHS/EPBI 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/EPBI 432.

**PQHS 464. Obesity and Cancer: Views from Molecules to Health Policy. 3 Units.**

This course will provide an overview of the components of energy balance (diet, physical activity, resting metabolic rate, dietary induced thermogenesis) and obesity, a consequence of long term positive energy balance, and various types of cancer. Following an overview of energy balance and epidemiological evidence for the obesity epidemic, the course will proceed with an introduction to the cellular and molecular biology of energy metabolism. Then, emerging research on biologically plausible connections and epidemiological associations between obesity and various types of cancer (e.g., colon, breast) will be presented. Finally, interventions targeted at decreasing obesity and improving quality of life in cancer patients will be discussed. The course will be cooperatively-taught by a transdisciplinary team of scientists engaged in research in energy balance and/or cancer. Didactic lectures will be combined with classroom discussion of readings. The paper assignment will involve application of course principles, lectures and readings. Offered as PQHS 464 and MPHP 464.

**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/EPBI 440, PQHS/EPBI 431, PQHS/EPBI 490, PQHS/EPBI 432, PQHS/EPBI 460, PQHS/EPBI 444 and PQHS/EPBI 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/EPBI 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 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 345, STAT 445, and PQHS 481. Prereq: MATH 122 or MATH 223 or Coreq: PQHS/EPBI 431.

**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. Application to regression. Graduate students are responsible for mathematical derivations, and full proofs of principal theorems. Offered as STAT 346, STAT 446 and PQHS 482. Prereq: STAT 345 or STAT 445 or PQHS/EPBI 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 causal 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/EPBI 431 or Requisites Not Met permission.

**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 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 510. Health Disparities. 3 Units.**

This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, PQHS 510, MPHP 510, NURS 510, and SASS 510.

**PQHS 515. Secondary Analysis of Large Health Care Data Bases. 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. Recommended preparation: PQHS/EPBI 414 or equivalent; PQHS/EPBI 431 or PQHS/EPBI 460 and PQHS/EPBI 461 (for HSR students).

**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/EPBI 431, MPHP 405, NURS 532 or Requisites Not Met permission.

**PQHS 601. Master's Project Research. 1 - 18 Units.****PQHS 602. Practicum. 1 - 3 Units.**

This course focuses on the skills needed to become an effective statistical consultant. The course objectives are: to learn the role of the consulting statistician and the accompanying responsibilities and ethical considerations, to develop the ability to interact with clients and elicit the information required to provide consulting expertise, to learn general strategies for approaching consulting problems that can be applied to a wide range of problems in medical areas, and to develop expertise in areas needed by the consulting biostatistician. These include database architecture, data quality control, record keeping for potential audits, statistical techniques, and report generation.

**PQHS 651. Thesis M.S.. 1 - 18 Units.****PQHS 701. Dissertation Ph.D.. 1 - 9 Units.**

Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.