

# LIFE SCIENCES AND PUBLIC HEALTH DUAL DEGREE

Degree Types: PhD/MPH

The Life Sciences and Public Health Combined PhD/MPH Program (<https://www.feinberg.northwestern.edu/sites/dgp/prospective-students/dual-degree-options.html>) focuses on scientific research and interdisciplinary public health. Graduates of this program will be positioned for leadership roles in academic and government institutions seeking expertise in molecular or cellular approaches to population-based health questions.

Students typically conduct thesis research in the basic mechanisms of infectious diseases or cancer biology. These areas play an increasingly important role in the emerging specialization of molecular epidemiology. Other areas of research, however, are available to dual-degree students.

Applicants wishing to apply to the combined PhD/MPH degree program will do so by selecting L21PH from the application pull-down menu. Applicants should include their intention in their personal statement.

The PhD/MPH program will also accept applications from first-year Driskill Graduate Program in Life Sciences (DGP) students who did not seek admission to the combined degree program before matriculation.

Successful applicants will demonstrate exceptional academic potential, indicative of an ability to master the additional course load required of the combined degree. The DGP and MPH admissions committees make admission decisions jointly.

## **Additional resources:**

- Department website (<https://www.feinberg.northwestern.edu/sites/dgp/>)
- Program handbook(s)

## Degree Offered

• Life Sciences and Public Health Dual Degree PhD/MPH (<https://catalogs.northwestern.edu/tgs/life-sciences-public-health-dual-degree/life-sciences-public-health-dual-degree-phd-mpf/>)

## Life Sciences and Public Health Dual Degree Courses

### **DGP 402-0 Fundamentals of Biomedical Sciences 1 (1 Unit)**

Fundamentals of Biomedical Sciences 1 and 2 provide an overview of the foundations of modern biomedical sciences. Students will learn about key concepts in biochemistry, molecular biology, genetics, and cell biology. Emphasis will be placed on understanding foundational science, experimental techniques and design. Fundamentals of Biomedical Sciences 1 will cover protein biochemistry, nucleic acids and molecular genetics.

Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 403-0 Advanced Immunology (1 Unit)**

Topics in immunology. Discussion of current experimental papers. Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 404-0 Fundamentals of Biomedical Sciences 2 (1 Unit)**

Fundamentals of Biomedical Sciences 1 and 2 provide an overview of the foundations of modern biomedical sciences. Students will learn

about key concepts in biochemistry, molecular biology, genetics, and cell biology. Emphasis will be placed on understanding foundational science, experimental techniques and design. Fundamentals of Biomedical Sciences 2 topics will include cellular homeostasis and metabolism, cytoskeleton, adhesion and extracellular matrix, and cell signaling.

Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 415-0 Radiation Biology (1 Unit)**

Understanding how cells, tissues, and the body as a whole respond to ionizing radiation is important for a comprehension of radiotherapy. This course will discuss the effects of ionizing radiation at the molecular, cellular, tissue, and whole organism level. The effects of repair, reoxygenation, repopulation, and cell cycle redistribution will be discussed. Normal tissue toxicities including acute and late effects will be detailed in the course. Discussion will include radiation carcinogenesis, radiation cataractogenesis, low dose effects, the linear non-threshold model for radiation damage. Course is offered only on demand.

Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 420-0 Introduction to Pharmacology (1 Unit)**

This lecture-based course begins with an introduction to the basic principles of pharmacology, namely pharmacodynamics (what the drug does to the body) and pharmacokinetics (what the body does to the drug). The subsequent topics apply these basic pharmacological principles to a discussion of the normal physiology, the pathophysiological processes that produce disease, and the targeted pharmacological treatment of disease. This integrated physiological, pharmacological and clinical approach will be applied to the following global topics in sequence: Neuropharmacology (Peripheral and Central Nervous Systems), Antimicrobial and Anticancer Chemotherapy, Cardiovascular and Renal Physiology and Pharmacology, Endocrine and Immunopharmacology.

Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 422-0 Introduction to Translational Research (1 Unit)**

This course is intended to introduce basic life sciences and clinical research graduate students to the thought processes involved in human disease research and its translation into therapy by providing an overview of disease processes, how they are treated, how basic biological science is used to develop those treatments, and the role of various stakeholders in the translational research pipeline. At the end of this course the student should understand the medical rationale for studying basic pathomechanisms and how to utilize that rationale to design studies and grant proposals. In addition, the student will obtain background knowledge for further, disease- or organ-specific upper-level courses. Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 425-0 Topics in Drug Discovery (1 Unit)**

Key precedents and contemporary topics in drug discovery research in academia and industry. Principles of drug design and action, pharmacogenetics, macromolecular target identification and characterization, bioassays and animal models of disease, study design and information management.

### **DGP 430-0 Genetics (1 Unit)**

Genetics of prokaryotic and eukaryotic organisms; gene regulation and variation; chromosome structure and behavior; linkage and recombination; quantitative and population genetics; biochemical and developmental genetics; and manipulation of genes in organisms, including humans.

Prerequisite: Open Registration restricted to IGP Students Only.

### **DGP 432-1 Chromatin & Epigenetics (1 Unit)**

Students will understand foundational and transformational studies in chromatin and epigenetics. Enrollment is restricted to DGP Students.

**DGP 433-0 Advanced Microbial Pathogenesis (1 Unit)**

AMP is an advanced paper discussion and grant writing course centered around topics such as immune responses to and pathogenesis of bacterial and viral infections, as well as basic mechanisms of pathogen replication and disease causation. The class begins with an overview of the NIH grant system followed by student-led paper discussions and writing of 1-page Aims pages, which serve to build critical thinking skills. The course culminates in the writing of a 6-page R21-style grant that is reviewed in a student-led mock NIH-style study section.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 435-0 Signal transduction and human diseases (1 Unit)**

Integrated discussion of different superfamilies of signaling receptors and their effectors. Pathways discussed include G-protein linked, growth factors and cytokines, nuclear receptors and transcription factors.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 436-1 Drugs and the Brain (1 Unit)**

Graduate neuropharmacology course with a mix of didactic instruction (33%) and in-depth classroom discussion of primary research papers (66%). The course is not a survey course, but rather will cover selected topics in neuropharmacology with the goals of 1) informing the student of the latest neuropharmacology knowledge, 2) inculcating a rigorous approach to examination of the scientific literature, and 3) encouraging best practices in experimental design.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 440-0 Immunology (1 Unit)**

An integrated view of contemporary immunology: antigens, antibodies, humoral and cell-mediated immune responses, cellular interactions, and regulation of immune responses.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 442-0 Fundamentals of Microbiology (1 Unit)**

This course emphasizes the basic principles of virology and bacteriology, focusing on selected molecular aspects of viral and bacterial lifecycles, as well as on the interactions between these microbes and the host immune system. The course will consist of a blend of instructor lectures, journal club discussions, and take-home assignments. In addition to acquiring fundamental knowledge in microbiology, students will refine their critical analysis and scientific communication skills through the evaluation and presentation of journal articles.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 450-0 Tumor Cell Biology (1 Unit)**

Basic aspects of the neoplastic phenotype, including morphologic, biochemical, genetic, cytogenetic, and other features; regulation of cell proliferation and differentiation; basic concepts in molecular mechanisms of chemical, viral, and radiation carcinogenesis; solid tumor growth, progression, and metastasis; tumor immunology.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 456-0 Topics in Developmental Biology (1 Unit)**

Survey of current models in mammalian and nonmammalian development. Emphasis on stem cell biology. Discussion of experimental papers.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 460-0 Pharmacovigilance in Early Drug Development (1 Unit)**

Pharmacovigilance is the science dealing with the collection, assessment, monitoring, and prevention of adverse effects of drugs and pharmaceutical products and is a fast-growing area in industry, health sciences, and in regulatory agencies. The course will address the fundamentals of pharmacovigilance especially in the context of early

drug development. Topics covered will include causality assessment and management of drug safety during drug discovery, benefit-risk analysis, signal management, and product safety monitoring in clinical trials. Students will learn about how to monitor, recognize, and manage adverse drug reactions, medication errors, issues related to misuse and abuse of drugs, as well as drug safety during pregnancy and pediatric populations. The lectures will be given by experts in the field affiliated with Northwestern University and Abbvie, Inc. A key aspect of the course will include Case studies, which will discuss real published data on assessment of a specific drug or pharmaceutical products. Upon completion of this course, graduate students will demonstrate an understanding of pharmacovigilance and patient safety in the context of early drug development.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 466-0 Structural Basis of Signal Transduction (1 Unit)**

The structural and thermodynamic basis by which protein-protein or protein-nucleic acid interactions mediate signal transduction. Signaling pathways used to explore how the structural biological mechanisms underlying these pathways can be experimentally determined and understood.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 475-0 Virology (1 Unit)**

Mechanisms of genome replication, control of gene expression, and protein functions are analyzed in RNA and DNA viruses.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 480-0 Molecular Mechanisms of Carcinogenesis (1 Unit)**

Current literature relating experimental approaches and recent discoveries in the fields of cell biology, virology, and molecular genetics to mechanisms of carcinogenesis. Advanced level.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 484-0 Quantitative Biology, Statistics and Data Analysis for Life Scientists (1 Unit)**

Parametric statistics (such as the familiar t test); nonparametric and simulation approaches (such as permutation tests) better suited to "real" data; and a conceptual survey of more sophisticated data-mining/machine-learning techniques.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 485-0 Data Science For Biomedical Researchers (1 Unit)**

Introduction to the data and analysis tools from several areas of study within the Biomedical Informatics research spectrum. Didactic instruction as an introduction to the topics followed by hands-on demonstrations and exercises to reveal practical use of relevant software tools.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 486-0 Advance Bioinformatics and Genome Informatics (1 Unit)**

The course will be oriented towards graduate students in HSIP, DGP and related programs. It will consist of lectures/seminars, each two hours in duration. The course will introduce various high-throughput technologies, such as microarray and Next Generation Sequence data, for measuring and analyzing gene expression, chromosomal deletions and amplifications, methylation patterns and genome architecture. Further, various algorithms and bioinformatics tools for analyzing the produced high-dimensional data will be discussed. The course begins with couple of introductory lectures in the biology part (Experimental/Technology part - 2 hours duration - no laboratory) followed by presentations on algorithms and data analysis (Bioinformatics part - 2 hours duration). Finally some recently published articles using these technologies will be discussed. At the end of the course, the students will be expected to gain an overview of the current highthroughput technologies and use of associated bioinformatics algorithms and analytical methods.

Students will gain experience in genomic data visualization tools to analyze multi-omics data for gene expression, genome rearrangement, somatic mutations and copy number variation. The course will conclude with analyzing and conducting pathway analysis on the resultant cancer gene lists and integration of clinical data.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 494-0 Colloquium on Integrity in Biomedical Research (0 Unit)**

Required by National Institutes of Health (NIH) but does not count as one of the required IGP courses.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 496-1 Introduction to Life Science Research (0 Unit)**

Provides first-year IGP students with tools to develop the knowledge base and skill set necessary for competent research.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 496-2 Introduction to Life Science Research (0 Unit)**

Provides first-year IGP students with tools to develop the knowledge base and skill set necessary for competent research.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 496-3 Introduction to Life Science Research (1 Unit)**

Provides first-year IGP students with tools to develop the knowledge base and skill set necessary for competent research.

Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 499-0 Independent Study (1-3 Units)**

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Prerequisite: Open Registration restricted to IGP Students Only.

**DGP 590-0 Research (1-3 Units)**

Independent investigation of selected problems pertaining to thesis or dissertation.

Prerequisite: Open Registration restricted to IGP Students Only.

**PUB\_HLTH 301-0 Behavior, Society & Health (1 Unit)**

The course analyzes the interplay of social structure, technology, culture and demography on patterns of health, illness and health behavior. The course focuses on the application of theories of behavioral change for solving health and public health problems, including stages of change, relapse prevention, social advertising and social marketing methods for use in primary care and community settings.

**PUB\_HLTH 302-0 Introduction to Biostatistics (1 Unit)**

The course focuses on descriptive statistics, principles of exploratory data analysis, basic probability, hypothesis testing, correlation, simple linear regression, and the basics of the analysis of variance. All examples are directed towards application of these methods in the medical and health fields.

**PUB\_HLTH 303-0 Environmental Health Sciences (1 Unit)**

The course offers a broad background introduction to the analysis of the health consequences of exposure to air, weather, food, the workplace and other special environments potentially contaminated by biologic, chemical and physical agents.

**PUB\_HLTH 304-0 Introduction to Epidemiology (1 Unit)**

This course introduces the science of epidemiology and its uses, including measures of disease occurrence, common sources and types of data, important study designs and sources of error in epidemiologic studies.

**PUB\_HLTH 305-0 Programming for Statistical Analysis (1 Unit)**

This an introductory course to programming for statistical analysis using SAS. Topics include data management, descriptive statistics, tests of association and reports.

**PUB\_HLTH 306-0 Health Literacy, Communication, & Systems Change (1 Unit)**

This course explores health literacy across personal, organizational, and systemic levels, emphasizing the critical roles of clear communication and systems change in advancing public health. Combining insights from disciplines such as sociology, user-centered design, health communications, healthcare quality, patient safety, and health policy, the course provides a comprehensive approach to understanding and improving health literacy. Key topics include plain language, motivational interviewing, teach-back methods, data visualization, risk communication, and user-centered design principles. This course focuses on tailoring messages to diverse audiences, with a strong emphasis on health equity, cultural competence, and cultural humility. Students will develop practical skills, such as rewriting health materials for clarity, critiquing data visualizations, creating process maps to identify intervention opportunities, and delivering professional presentations. Class time includes interactive lectures, in-class exercises, and small-group discussions. The course culminates in a final project where students create a user journey map, identifying opportunities to enhance health literacy and improve system processes. Designed for students pursuing careers in public health, this course equips participants with practical tools to communicate effectively and drive impactful systems change. By the end of the course, students will be equipped to apply health literacy principles to address real-world public health challenges.

Prerequisites: PUB\_HLTH 301-0 Behavior Society and Health.

**PUB\_HLTH 310-1 Public Health Practice for Physicians I (0 Unit)**

The Public Health Practice for Physicians course series develops foundational public health knowledge and skills that are essential for students to become effective public health physicians. Class sessions are not lecture-based but seminar style and highly interactive as we engage in mutual exploration of the broad and complex topics that underlie public health work. Guest discussants with both MD and MPH credentials center learning around real-world scenarios allowing the students to think critically about how concepts are applied in practice. Assignments focus on practical skill-building and professional development specific to physicians and physicians-in-training.

**PUB\_HLTH 310-2 Public Health Practice for Physicians II (0 Unit)**

The Public Health Practice for Physicians course series develops foundational public health knowledge and skills that are essential for students to become effective public health physicians. Class sessions are not lecture-based but seminar style and highly interactive as we engage in mutual exploration of the broad and complex topics that underlie public health work. Guest discussants with both MD and MPH credentials center learning around real-world scenarios allowing the students to think critically about how concepts are applied in practice. Assignments focus on practical skill-building and professional development specific to physicians and physicians-in-training.

**PUB\_HLTH 310-3 Public Health Practice for Physicians III (0-1 Unit)**

The Public Health Practice for Physicians course series develops foundational public health knowledge and skills that are essential for students to become effective public health physicians. Class sessions are not lecture-based but seminar style and highly interactive as we engage in mutual exploration of the broad and complex topics that underlie public health work. Guest discussants with both MD and MPH credentials center learning around real-world scenarios allowing the students to think critically about how concepts are applied in practice. Assignments focus on practical skill-building and professional development specific to physicians and physicians-in-training.

**PUB\_HLTH 313-0 Topics in Public Health (0.5 Unit)**

This variable topics course addresses important current issues in public health.

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**PUB\_HLTH 316-0 Topics in Public Health (1 Unit)**

This variable topics course addresses important current issues in public health.

**PUB\_HLTH 317-0 Seminar in Community Health Research (0 Unit)**

The Seminar in Community Health Research is a weekly one-hour seminar that is required for all MPH students in the Community Health Research concentration. The student will earn one unit of credit for each year, awarded in the fall quarter. The seminar will provide students with an overview of methods, approaches and research design considerations that are relevant to design, implementation and evaluation of community health research. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program. An emphasis will be placed on providing case examples to help illustrate key points. These case examples will highlight community health research conducted by Northwestern faculty as well as research conducted at other universities.

**PUB\_HLTH 318-0 Seminar in Community Health Research II (0 Unit)**

The Seminar in Community Health Research is a weekly one-hour seminar that is required for all MPH students in the Community Health Research concentration. The student will earn one unit of credit for each year, awarded in the fall quarter. The seminar will provide students with an overview of methods, approaches and research design considerations that are relevant to design, implementation and evaluation of community health research. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program. An emphasis will be placed on providing case examples to help illustrate key points. These case examples will highlight community health research conducted by Northwestern faculty as well as research conducted at other universities.

**PUB\_HLTH 319-0 Seminar in Community Health Research III (1 Unit)**

The Seminar in Community Health Research is a weekly one-hour seminar that is required for all MPH students in the Community Health Research concentration. The student will earn one unit of credit for each year, awarded in the fall quarter. The seminar will provide students with an overview of methods, approaches and research design considerations that are relevant to design, implementation and evaluation of community health research. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program. An emphasis will be placed on providing case examples to help illustrate key points. These case examples will highlight community health research conducted by Northwestern faculty as well as research conducted at other universities.

**PUB\_HLTH 320-0 Community Engaged Research (1 Unit)**

This introductory course in community health considers the basic elements that determine health and asks difficult questions about why the richest and most powerful country in world history is so unhealthy? Discussion will focus on differences in communities, community health assessments, principles for effective collaboration with communities and introduction to community health research.

**PUB\_HLTH 323-0 Health Equity (1 Unit)**

This course provides an overview of social, economic and political inequities in the United States and their impact on the health of the poor, uninsured, elderly, racial and ethnic minorities, migrants, gendered and sexual groups, rural residents, people with mental and physical

disabilities and other vulnerable and socially disadvantaged populations. Past and current policies and trends in health /medical care programs and services at the local and national levels will be discussed. Students will examine social science concepts and theoretical frameworks that will expand their knowledge and skills and empower them to become agents of social change using public health models to impact individuals, families, communities and institutions. Class topics and discussions will center on: social and income inequalities; access (or lack of) to healthcare, including preventive services and other social resources; roles of government and the legislative process; quality care; legal and ethical issues; among others. Throughout the course, discussions will center on the social determinants of health - neighborhood environments and strategies toward short and long term solutions in the elimination of health disparities and achieving health equity. Discussion about the Patient Protection and Affordable Care Act and recent Supreme Court rulings will also be integrated into many of the discussions.

**PUB\_HLTH 330-0 Global Tobacco: Control and Prevention (1 Unit)**

The purpose of the course is to provide students with information on the health problems associated with tobacco use across the lifespan; the consequences of second- and third-hand smoke; new and promising clinical, public health and legal strategies for both prevention and cessation; and international perspectives on tobacco control. Special emphasis will be directed at tobacco use and prevention among vulnerable populations, including youth, minorities and the poor.

**PUB\_HLTH 350-0 Dual Degree Seminar: Topics in Public Health for the Physical Therapist (0.05-0.15 Unit)**

The Topics in Public Health for the Physical Therapist seminar course sequence prepares the physical therapist/public health professional by explicitly linking and integrating physical therapy practice and public health practice. The course emphasis is to foster awareness of opportunities for the physical therapist/public health professional through discussion and analysis of public health practice and physical therapy practice. This course provides students the opportunity to interact with faculty on topics that integrate physical therapy and public health practice and policy. Goals of this course are to discuss the intersection of population health and clinical practice and the application of core skills needed for success in a physical therapist-public health career. Prerequisite: Only students in the DPT-MPH degree program are eligible to take this course.

**PUB\_HLTH 351-0 Introduction to Implementation Science (1 Unit)**

In the United States, it takes an average of 17 years for research to change clinical practice. This delay is known as the "know-do gap" in healthcare. The goal of implementation science is to close the know-do gap and equitably advance public health. This course provides an introduction to implementation science, an interdisciplinary field focused on promoting the integration of evidence-based practices in real-world health settings. Students will gain a foundational understanding of key theories, methods, and tools to address barriers to the uptake of health interventions. Through didactic lectures, group discussions, and case study analysis, students will acquire practical knowledge on how to design and execute an implementation project aimed at closing the know-do gap.

**PUB\_HLTH 360-1 Seminar in Data Science (1 Unit)**

This course serves as a requirement for the MPH concentration in Public Health Data Science. Proficiency in various skills is essential in the field of public health, including extracting, cleaning, analyzing, interpreting, and sharing information from various data sources. Students will utilize R/RStudio to complete assignments that involve statistical programming. Throughout this course, we will delve into relevant topics at the intersection of data science and public health. We will explore

various methodologies and tools used to collect, analyze, interpret, and visualize public health data, placing strong emphasis on their practical application in real-world scenarios and common pitfalls encountered when working with such data. By the course's conclusion, students will expand upon fundamentals in data science in order to evaluate complex public health challenges, critique policies, and formulate solutions to improve population health outcomes.

#### **PUB\_HLTH 370-1 Seminar in Maternal Child Health (0 Unit)**

This course is designed to be a seminar series highlighting key aspects of maternal and child health including obstetric health policy, obstetric health services, reproductive autonomy, complicated pregnancies, postpartum care and policy, and obstetric technologies. Students will have the opportunity to engage in discussions with leaders in maternal child health as they share their insights and expertise through a series of guest lectures.

#### **PUB\_HLTH 370-2 Seminar in Maternal Child Health (0 Unit)**

This course is designed to be a seminar series highlighting key aspects of maternal and child health including obstetric health policy, obstetric health services, reproductive autonomy, complicated pregnancies, postpartum care and policy, and obstetric technologies. Students will have the opportunity to engage in discussions with leaders in maternal child health as they share their insights and expertise through a series of guest lectures.

Prerequisites: PUB\_HLTH 370-1 Seminar in Maternal Child Health (Fall quarter).

#### **PUB\_HLTH 370-3 Seminar in Maternal Child Hlth (1 Unit)**

This course is designed to be a seminar series highlighting key aspects of maternal and child health including obstetric health policy, obstetric health services, reproductive autonomy, complicated pregnancies, postpartum care and policy, and obstetric technologies. Students will have the opportunity to engage in discussions with leaders in maternal child health as they share their insights and expertise through a series of guest lectures.

Prerequisite: PUB\_HLTH 370-1 Seminar in Maternal Child Health (Fall quarter) and PUB\_HLTH 370-2 Seminar in Maternal Child Health (Winter Quarter).

#### **PUB\_HLTH 387-0 Seminar in Global Health I (0 Unit)**

The Seminar in Global Health is a weekly one-hour three-quarter (Fall, Winter, Spring) seminar that is required for all MPH students in the Global Health concentration. The seminar will provide students with an overview of the concentration, the interdisciplinary breadth of coursework, and the field and culminating experiences. The seminar will provide opportunities for critical analysis and dialogue on major global health issues. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program and Global Health Concentration. An emphasis will be placed on providing case examples to help illustrate key points. These case examples will highlight global health research and practice. All three courses (PUB\_HLTH 387-0, PUB\_HLTH 388-0, PUB\_HLTH 389-0) must be successfully completed in order to earn 1 credit at the end of spring quarter.

#### **PUB\_HLTH 388-0 Seminar in Global Health II (0 Unit)**

The Seminar in Global Health is a weekly one-hour three-quarter (Fall, Winter, Spring) seminar that is required for all MPH students in the Global Health concentration. The seminar will provide students with an overview of the concentration, the interdisciplinary breadth of coursework, and the field and culminating experiences. The seminar will provide opportunities for critical analysis and dialogue on major global health issues. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program and Global Health Concentration. An emphasis will be placed on providing case

examples to help illustrate key points. These case examples will highlight global health research and practice. All three courses (PUB\_HLTH 387-0, PUB\_HLTH 388-0, PUB\_HLTH 389-0) must be successfully completed in order to earn 1 credit at the end of Spring quarter.

#### **PUB\_HLTH 389-0 Seminar in Global Health III (1 Unit)**

The Seminar in Global Health is a weekly one-hour three-quarter (Fall, Winter, Spring) seminar that is required for all MPH students in the Global Health concentration. The seminar will provide students with an overview of the concentration, the interdisciplinary breadth of coursework, and the field and culminating experiences. The seminar will provide opportunities for critical analysis and dialogue on major global health issues. Many of the topics covered in this course will be discussed in greater detail in other core and elective courses within the MPH program and Global Health Concentration. An emphasis will be placed on providing case examples to help illustrate key points. These case examples will highlight global health research and practice. All three courses (PUB\_HLTH 387-0, PUB\_HLTH 388-0, PUB\_HLTH 389-0) must be successfully completed in order to earn 1 credit at the end of Spring quarter.

#### **PUB\_HLTH 390-0 Introduction to International Public Health (1 Unit)**

Introduction to International Public Health will orient students to the biological, socio-cultural and economic influences on population-level variation in health and well-being. The continuum between health and illness will be explored, focusing on both the proximate and distal determinants of variation in health and well-being. Students will learn about key players in international health - the multilateral and bilateral donor communities, Ministries of Health, UN agencies, foundations, NGOs - and understand important shifts in donor policies towards healthcare delivery. They will be introduced to the major health problems currently affecting the developing world and alerted to the importance of employing a population-based vs. a purely clinical approach to solving these health problems.

#### **PUB\_HLTH 391-0 Global Health Care Service Delivery (1 Unit)**

The course will engage students in an analysis of case studies that describe interventions to improve healthcare delivery in resource-limited settings. The cases capture various programmatic, organizational and policy-related innovations related to care delivery. Classroom discussions of these case studies will help illuminate principles and frameworks for the design of effective global health interventions. Through a focus on HIV, TB, malaria and other health conditions, these cases will allow students to carefully consider the question of how epidemiology, pathophysiology, culture, economy and politics inform the design and performance of global health programs.

#### **PUB\_HLTH 393-0 Introduction to Health and Human Rights (1 Unit)**

This course, which is open to Public Health, Law and Kellogg students, examines the intersection of health and human rights at the global and national levels, in theory and in practice. Readings and discussion will focus on the following topics: the complex relationship between health and human rights; the right to health; global activism and litigation to promote health and human rights; the movement for access to medicines; sexual and reproductive health rights; and health systems in the United States. Students will work in interdisciplinary teams on a health assessment and intervention known as the Northwestern Access to Health Project. Headed by Professor Brian Citro, with assistance from Health and Human Rights Fellow Elise R. Meyer, the Access to Health Project seeks to leverage academic and community partnerships to maximize access to health in communities in the developing world and the United States.

#### **PUB\_HLTH 411-0 Assessment, Planning & Evaluation in Community Health (1 Unit)**

Assessment, Planning and Evaluation are three core features of community health research. The objective of this course is to provide an overview of the fundamental and basic skills needed for conducting research with community partners related to health assessments, program planning and evaluation of public health programs. We will focus on efforts needed in working with community partners and research methodologies recommended for effectively and efficiently conducting research without interrupting the flow of community organizations. You will have an opportunity to talk with representatives from community organizations and to apply your learning to an actual community setting.

**PUB\_HLTH 412-0 Infection Disease Epidemiology and Prevention (1 Unit)**

This course focuses on the public health tools for the surveillance, identification, control and prevention of selected infectious diseases of public health importance. Special emphasis will be focused on outbreak investigations because they provide a unique opportunity to apply many principles of public health practice, including use and interpretation of surveillance data, risk factor analysis and implementation and assessment of control measures.

**PUB\_HLTH 414-0 Injury and Violence Prevention (1 Unit)**

This course examines injury as a public health problem and explores research methods, study design, risk factors and prevention strategies applied to problem of injuries. This general framework will be applied to the study of specific injury mechanisms.

**PUB\_HLTH 415-1 Contemporary Issues in Disease Prevention (1 Unit)**

This course explores the value of and barriers to disease prevention and health promotion (DP/HP), factors that influence personal health decisions, preventive interventions directed at individuals (clinical settings) and populations (community settings), strategies for using population health principles to integrate DP/HP into routine medical and Public Health practice and the organization of federal agencies that fund DP/HP activities.

**PUB\_HLTH 416-0 Program Evaluation (1 Unit)**

This course will provide students with a comprehensive theoretical, methodological and ethical foundation for conducting public health program evaluation. Students will experience the practice aspects of evaluation including communicating and negotiating with stakeholders, conducting an evaluability assessment, developing logic models and evaluation questions, identifying appropriate data collection methods, gathering reliable and valid evaluation data that are appropriate to the selected design and analysis methods, analyzing data, reporting evaluation results, and ensuring evaluation use. The instructor will facilitate a learning and skill-building environment, drawing on personal experiences and the expertise of others in the field.

**PUB\_HLTH 417-0 Public Health Law: Promoting Healthy Youth Development (1 Unit)**

This course examines the application of law to critical Public Health issues affecting children and youth including the constitutional and statutory foundation of Public Health law, how legislative and regulatory decisions must negotiate the balance between individual rights and public good and the principles of *parens patriae* and state police powers. Case studies will illustrate the basis of Public Health jurisprudence at the national level.

**PUB\_HLTH 418-0 Applied Practice Experience I (0 Unit)**

The Applied Practice Experience (APEX) is a two course sequence, PUB\_HLTH 418-0 and PUB\_HLTH 419-0. Students complete this course while working at a public health service organization or faculty-supervised public health project. Students examine real-world aspects

of public health practice through scholarly literature, community-based experiential learning, peer coaching, and skill-building modules.

**PUB\_HLTH 419-0 Applied Practice Experience II (0-0.5 Unit)**

In the APEX II, students gain real-word public health practice experience by working with public health leaders to develop public health products that serve diverse communities in domestic or international settings. All MPH students are required to complete the practice experience. The Applied Practice Experience (APEX) is a two course sequence, PUB\_HLTH 418-0 and PUB\_HLTH 419-0. Students complete this course while working at a public health service organization or faculty-supervised public health project. Students examine real-world aspects of public health practice through scholarly literature, community-based experiential learning, peer coaching, and skill-building modules.

**PUB\_HLTH 420-0 Introduction to US Health Care System (1 Unit)**

**Course Aims:** Be able to state and explain the structure, key facts and important issues pertaining to the U.S. health system. Be able to research topics for further study by becoming familiar with the relevant literature and be able to analyze problems in this sector by understanding applicable frameworks.

**PUB\_HLTH 421-0 Intermediate Biostatistics (1 Unit)**

Intermediate Biostatistics builds upon the material learned in Introduction to Biostatistics. Specifically, the course will focus on single-outcome, multiple-predictor methods: multiple linear regression for continuous outcomes, logistic regression for binary outcomes, and the Cox proportional hazards model for time-to-event outcomes. Degree-seeking students must take either this course or PUB\_HLTH 422-0.

**PUB\_HLTH 422-0 Intermediate Epidemiology (1 Unit)**

This course covers epidemiologic methods used in observational epidemiologic studies including the design, conduct and interpretation of observational studies in human populations with a focus on analytic cross-sectional, case-control studies and cohort studies. Key issues related to statistical approaches, validity of measures of exposure and disease and sources of potential errors in interpreting epidemiologic studies will be addressed.

**Prerequisites:** PUB\_HLTH 304-0, PUB\_HLTH 302-0. **Recommended:** PUB\_HLTH 421-0.

**PUB\_HLTH 425-0 Introduction to GIS and Spatial Analysis for Public Health (1 Unit)**

This course is an introduction to GIS and the collection, maintenance and analysis of spatial data for health. It combines practical ArcGIS skills with study of the theory and applications of spatial data and spatial analysis in general and specifically as it relates to population health.

**PUB\_HLTH 430-0 Global Health Research Practicum (1 Unit)**

Students will learn to design an evidence-based and culturally appropriate global health research project or program. Specifically, students will gain competence in analyzing needs and resources; developing a technically and programmatically sound causal pathway; articulating program objectives; designing relevant program components and partnerships, implementing a program, planning program monitoring and evaluation, and ensuring program sustainability.

**PUB\_HLTH 431-0 Basic Decision Analysis and Models of Medical Decision Making (1 Unit)**

This course covers quantitative analytic techniques intended to inform decision makers at the bedside, researchers, and those involved with policy-making. Topics include probability, Bayes' theorem, sensitivity and specificity of diagnostic tests, and decision psychology, with a focus on decision analysis, utility assessment, and cost-effectiveness analysis.

**PUB\_HLTH 435-0 Health Services Research Design & Analysis Strategies: Technology Assessment (1 Unit)**

This course is an independent study research seminar based on individual student meetings with the instructor and other faculty mentors. The course focuses on completion of a health services research or health policy paper and oral presentation, often in conjunction with MPH program Culminating Experience requirements. Papers require health services research methodological and study design skills or the conceptual and analytical skills needed for public health history or health policy analyses. Learning objectives include applying health services research methods to a public health, clinical policy or public policy problem or debate, describing factors underlying geographic or provider variations in medical practice or health outcomes, using quality measurement, quality improvement, patient safety or epidemiologic research techniques, conducting risk adjustment for evaluation of medical or behavioral health interventions, and addressing critical issues in social determinants of health or social epidemiology. Enrollment requires prior consent of the instructor.

#### **PUB\_HLTH 438-0 Survey Design & Methodology (1 Unit)**

This course focuses on methodological issues regarding the design, implementation, analysis and interpretation of surveys and questionnaires in Public Health research. Various types of self-report data will be discussed, including knowledge, attitudes, behaviors and patient-reported outcomes. Issues will include formatting and layout, wording of items and response scales, multilingual translations, sampling, timing of assessments, interviewer training, participant recruitment, data analysis and respondent and staff burden.

#### **PUB\_HLTH 439-0 Qualitative Research Methods (1 Unit)**

This course focuses on qualitative research design, sampling, data management, analysis and report writing. Methods covered include cognitive interviewing for survey construction, individual and group interview methodologies, participant observation, writing and using field notes, cognitive tasks such as decision modeling, domain analysis and the use of mapping techniques in qualitative research. Data analysis instruction includes thematic analyses and code development, consensus and network analyses and an overview of qualitative data management programs.

#### **PUB\_HLTH 441-0 Ethical Issues in Clinical Research (0.5 Unit)**

This case-based course provides student with knowledge of the issues surrounding the ethical conduct of research including making ethical choices in the face of conflicts, and gaining a familiarity with the regulations governing human subjects research.

#### **PUB\_HLTH 445-0 Writing and Peer Reviewing for Scientific Publication (1 Unit)**

Writing and Peer Reviewing is an intensive, hands-on, advanced course in writing for publication in biomedical journals and how to be a successful peer reviewer. The student will be expected to prepare an article, respond to two peer review cycles and at the conclusion of the course, to be ready to submit to a journal.

#### **PUB\_HLTH 446-0 LGBTQ Health (1 Unit)**

This course synthesizes work in sexual and gender minority (SGM) population health research. The course will critically examine how power, social context, and social position simultaneously shape the lives and health of SGM people, explore theories that describe the mechanisms and pathways that shape SGM population health outcomes, and discuss the ethical responsibilities of public health professionals to engage SGM individuals and community stakeholders.

#### **PUB\_HLTH 447-0 Structural Racism in Public Health (1 Unit)**

This seminar examines research in which race and structural racism are considered a social determinant of health. It will explore social constructions of health and examine key theoretical frameworks and empirical data from public health. We will evaluate the ways the health

system puts the wellbeing of vulnerable populations at risk and identify prevention and intervention approaches for change.

#### **PUB\_HLTH 448-0 Introduction to Maternal Child Health (1 Unit)**

This course provides an introduction to the health needs of women and children and the services designed to meet these needs. It introduces the epidemiology of maternal and child health (MCH) and the evidence base for MCH programs. The course provides students with a comprehensive knowledge base with respect to federal funding and other public programs addressing MCH.

#### **PUB\_HLTH 449-0 Public Health Policy (1 Unit)**

This course addresses how public policy development and analysis have an impact on the public's health. The course is designed to provide professionals with the skills for collecting, analyzing and communicating information on public health policy issues using approaches that would be useful in the policymaking arena. Students will learn what policy is; who the policymakers are in public health; who the actors are that are affected by Public Health policy; and the major influences in determining what policy gets implemented, including the science underlying policy proposals.

#### **PUB\_HLTH 451-0 Advanced Topics in Implementation Science (1 Unit)**

This course builds upon the foundations provided in the introduction to implementation science course to explore more in-depth core topics in the field of implementation science. The first half of the course explores methods for selecting, designing and tailoring, and evaluating implementation strategies. The second half of the course examines critical topics in the field of implementation science. Students will engage in independent and group activities to apply conceptual and methodological knowledge to "real world" public health scenarios. This course will prepare students to develop key elements of an implementation science project proposal, including contextual assessment, implementation strategy selection and tailoring, and evaluation of implementation outcomes.

Prerequisites: PUB\_HLTH 351 Introduction to Implementation Science.

#### **PUB\_HLTH 460-1 Data Visualization for Public Health (1 Unit)**

This course will build upon the analytical tools learned during the previous courses to enable students to visually convey their findings to both technical and non-technical audiences. In this course, students will learn how to identify and explain the layers of the grammar of graphics, select effective static data visualizations, write R code to manipulate data visualizations, and construct their own compelling visualizations from scratch using health data. Course goals will be achieved using the ggplot2 package in R. By the end of the course, students should be effective visual communicators of their findings and will be proficient in producing impactful visualizations using ggplot.

Prerequisite: Biostat 306 or previous R experience with approval from instructor.

#### **PUB\_HLTH 470-0 Perinatal Mental Health: The Public Health Implications on Maternal & Child Hlth (1 Unit)**

The perinatal period is the period inclusive of pregnancy and the first year postpartum. This period is one of the most important periods for child development, yet many families and parents face significant challenges during this period. Perinatal mental health disorders are the most common complication of pregnancy and postpartum period. Perinatal mental health includes depression, anxiety, postpartum psychosis, and other mental illnesses, with depression and anxiety among the most common health challenges for women during the perinatal period. More specifically, perinatal depression and anxiety poses significant mental health risks for mothers, parents, families, and their infants. Currently, the U.S is facing a maternal health crisis due to racial and ethnic disparities and inequities. Disparities and inequities at the parent

level have a generational impact. This course will examine multi-level approaches to understanding and addressing the complex factors that affect the health and well-being of women, children, and families during the perinatal period. Students will be introduced to perinatal mental health, the generational impact, and addressing complex problems through elements of implementation science, equity, and public health leadership. This course uses the systems-thinking, reflective practices, and public health leadership teaching methods, which emphasizes active learning, in-class discussion, and out-of-class preparation, reflection, and analysis. This course is highly interactive, requiring active participation by all students, including in small groups.

**PUB\_HLTH 471-0 Advancing Population Health through Medicaid (1 Unit)**

The Medicaid program, a partnership between the federal government and states, provides coverage to 80 million people in the United States, including children, pregnant people, disabled individuals, working-age adults, and senior citizens. Medicaid finances key population health services, including family planning, mental health, immunizations, preventive care, care coordination, and services that allow people with disabilities to be integrated into their communities. Medicaid is increasingly addressing structural determinants of health through evolving payment models. This course is designed to give students a deep understanding of the Medicaid program to enhance public health practice, clinical care delivery, health services research, and advocacy.

**PUB\_HLTH 490-0 Advanced Global Public Health (1 Unit)**

Advanced Global Public Health will provide an in depth exploration of the current approaches to eradicating long-term social and economic inequalities in health outcomes around the world. We will begin with a review of the current state of global health, highlighting the areas of major gains since 2000, discourse on global health governance, and current trends and emerging health challenges (e.g., chronic metabolic diseases, emerging/re-emerging infectious diseases, humanitarian emergencies). We will then directly examine the diverse strategies that have been used to improve health outcomes in low- and middle-income countries. These strategies range from biomedical interventions (e.g., vaccine campaigns, nutritional supplementation) to broader, macro-level approaches such as targeted cash transfers and agricultural reform. Drawing on detailed case studies, we will explore (a) the nature and structure of global health interventions, (b) the creation of successful partnerships for sustaining health outcomes, and (c) the importance of data collection and analysis for monitoring the effectiveness of program interventions.

Prerequisite: PUB\_HLTH 390-0 or GBL\_HLTH 301-0.

**PUB\_HLTH 499-0 Independent Study (0.5-1 Unit)**

**PUB\_HLTH 520-0 Artificial Epidemics and Changes in Human Culture (0.5 Unit)**

This course provides a close examination of how human behavior affects the development and spread of so-called "artificial epidemics," primarily covering non-communicable diseases affecting adults. Diseases and conditions will be examined in order to discern the epidemiology of the disease and how cultural influences can impact both the rise of diseases as public health issues and their subsequent decline in incidence with a view toward prevention of future outbreaks. The course is designed as a "flipped classroom"; students will review materials in advance of the class session and come prepared to share and discuss the week's topic in class. Thus there is an exceptional long reading list each week and only 1 hour of classroom, rather than 90 minutes, per week in this ½ unit class.

**PUB\_HLTH 521-0 Artificial Epidemics and Changes in Human Culture II (0.5 Unit)**

This course provides a close examination of how human behavior affects the development and spread of so-called "artificial epidemics," primarily covering non-communicable diseases affecting women and children. Diseases and conditions will be examined in order to discern the epidemiology of the disease and how cultural influences can impact both the rise of diseases as public health issues and their subsequent decline in incidence with a view toward prevention of future outbreaks.

The course is designed as a "flipped classroom"; students will review materials in advance of the class session and come prepared to share and discuss the week's topic in class. Thus there is an exceptional long reading list each week and only 1 hour of classroom, rather than 90 minutes, per week in this ½ unit class.

**PUB\_HLTH 524-0 Cardiovascular Disease Epidemiology (1 Unit)**

The course will cover selected topics in cardiovascular disease with critical analysis of the current epidemiologic literature. Students will have the opportunity to study methodological issues, contemporary findings and recommendations for future research.

**PUB\_HLTH 525-0 Cancer Epidemiology (1 Unit)**

This course introduces concepts of cancer biology and molecular mechanisms of carcinogenesis, elaborates concepts in epidemiology to studies of cancer epidemiology, uses project-based learning to build skills needed to assess patterns of tissue-specific cancer epidemiology including risk factors and trends, and covers methods of assessing the validity of current literature and media coverage of cancer epidemiology.

**PUB\_HLTH 560-0 Culminating Experience (0.5-1 Unit)**

Development and presentation of a culminating research or service project based on one month (or at least 200 contact hours) of fieldwork in a community agency or work on a research project of the student's choosing (with guidance from a faculty member) in consultation with an adviser or advisory committee. Student presents a seminar and submits a paper on the project.