

# Population Health Sciences

The Master of Population Health Sciences (MPHS) offered by the School of Medicine is a 10-month degree program for clinicians, clinical doctorates, medical students and health sciences students seeking training in clinical research methods. The curriculum emphasizes the role of epidemiology and biostatistics in approaching clinical effectiveness and outcomes research for all medical specialties. The MPHS does not require a research thesis upon completion of the program. Instead, the program innovatively uses applied course work to focus on the long-term mastery of skills. Using topics relevant to their careers and interests, MPHS students practice the art of developing research study protocols, performing systematic reviews, designing epidemiologic studies and much more. Many students go on to produce award-winning research using their applied course work and skills learned in the program. MPHS students deepen their learning by choosing one of four concentrations: Clinical Epidemiology, Health Services, Quantitative Methods, or Psychiatric and Behavioral Health Sciences.

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## Degrees & Offerings

- Master of Population Health Sciences (<http://bulletin.wustl.edu/medicine/degrees-offerings/mphs/>)

## Research

### Research Projects & Assignments

The MPHS program uses applied course work, which means students use their own research projects and interests for class discussions and assignments. This format helps our students apply and master research concepts quickly, and it maximizes research productivity during students' time in the program.

For example, students will write and design research protocols, systematic reviews and meta-analyses, grant proposals and more. In addition, our instructors select case studies, prioritize reading lists, and shape class discussions from current, in-the-news clinical outcomes research and population health topics.

Students are **not** required to complete a research project for graduation. The focus in the MPHS program is on the practice and mastery of clinical research skill sets for long-term benefit.

Students are encouraged to have a primary mentor connected to their research while in the MPHS program. If needed, our program leadership can help students find a research project or mentor.

## Faculty

**Graham Colditz, MD, DrPH** (<https://surgery.wustl.edu/people/graham-colditz/>)  
Director

**Yikyung Park, ScD** (<https://surgery.wustl.edu/people/yikyung-park/>)  
Co-Deputy Director

**Adetunji Toriola, MD, PhD** (<http://publichealthsciences.wustl.edu/Faculty/ToriolaAdetunji/>)  
Co-Deputy Director

**Allison King, MD, MPH, PhD** (<https://wuphysicians.wustl.edu/for-patients/find-a-physician/allison-a-king/>)  
Associate Director for Medical Students

Visit our website for more information about our faculty (<http://publichealthsciences.wustl.edu/Faculty/>) and their appointments.

## Courses

Visit online course listings to view offerings for M19 PHS (<https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M19>).

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### M19 PHS 500 Current Topics in Public Health

Students will review public health research, interventions and problems making headlines in print and television media. Discussion of how the problem is presented and evaluated will take place, and students will discuss alternate approaches. Course activities: brief presentations, short written assignments, class participation. Course note: required for medical students. Credit 1 unit.

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### M19 PHS 501 Introduction to Epidemiology

This course introduces the basic principles and methods of epidemiology, with an emphasis on critical thinking, analytic skills, and application to clinical practice. Topics include outcome measures, methods of adjustment, surveillance, quantitative study designs, and sources of data. Designed for those with a clinical background, the course will provide tools for critically evaluating the literature and skills to practice evidence-based medicine. Course activities: lectures, midterm and final exams, class participation, problem sets and papers. Course note: M21 503 required prerequisite. Credit 3 units.

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### M19 PHS 502 Intermediate Epidemiology

The second course in the Epidemiology series, this course builds upon the basic principles and methods of epidemiology and introduces additional tools and concepts that are critical to a comprehensive study design. Topics include risk and association, sampling strategies, interaction, confounding, adjustment, lifetables, applied causal inference, validity and reliability, social epidemiology, and approaches to data analysis. Upon exiting this course, students will be prepared to approach the study design portion of a protocol, as required by the final course in the Epidemiology series. Course activities: lectures, midterm and final exams, class participation, problem sets and papers. Course note: M19-501 required prerequisite.

Credit 3 units.

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**M19 PHS 505 Ethics in Population and Clinical Health**

This course will expose population and clinical health researchers to the various ethical issues and situations encountered in their research and clinical duties, with a focus on research-related issues and solutions. It will also familiarize them with available ethics and compliance resources. Case studies and scenario presentations will facilitate discussion on topics such as informed consent, rights to health, personal responsibility for health, allegations of misconduct, research with communities, data objectivity and presentation, publications, collaborators' rights and responsibilities, intellectual property, and student-mentor relationships.

Credit 1 unit.

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**M19 PHS 507 Applied Research Independent Study**

The purpose of the Independent Study course is to develop and refine the skills students learn in the fall core courses, Introductory and Intermediate Clinical and Epidemiology and Biostatistics series. Students enrolling in this course must come prepared with a circumscribed and well-defined project that relates to public health and population sciences. A research mentor within Washington University School of Medicine must be identified and approved of by MPHS leadership prior to the course enrollment. Objectives, a synopsis and milestones of the project per each student's individualized syllabus should be identified and submitted to the MPHS leadership and mentor prior to the start of the semester. Students will be expected to submit a report, for example, drafted manuscript, an abstract for a conference, data analysis results, at the end of the spring semester to the MPHS leadership for credit. Course credit will be evaluated by both the research mentor and MPHS leadership. This two-credit course will be offered only as a pass/fail course to current MPHS students. Prerequisites: Approval from MPHS leadership and students must have completed the Introductory and Intermediate Clinical and Epidemiology and Biostatistics series.

Credit 2 units.

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**M19 PHS 510 Introduction to SAS for Clinical Research**

This one-week course is designed to equip medical students, clinicians and health researchers with basic SAS programming skills. Students will learn how to operate SAS, import external data, create SAS data sets, create, format and manipulate variables, and export data and results. Upon completion of this course, students will have obtained a basic understanding of the SAS environment.

Credit 1 unit.

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**M19 PHS 511 Introductory Biostatistics for Clinical Research**

This introductory course in biostatistics is designed for medical students, clinicians and health researchers. The course will introduce students to basic statistical concepts including hypothesis testing, probability distributions and relevant basic statistical methods. Through in-class and homework assignments, students will learn to apply statistical concepts to the medical context. Upon completion of the course, students will be able to summarize quantitative data and carry out and interpret simple data description and analyses using the SAS program. Prerequisite for the course is knowledge in SAS.

Credit 3 units.

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**M19 PHS 512 Intermediate Biostatistics for Clinical Research**

This intermediate course is designed for medical students, clinicians and health researchers and builds on the skills developed in Introduction to Biostatistics for Clinical Research. The course will focus on more advanced statistical concepts as applied to clinical and population-based data sets, including linear and logistic regression analyses, and survival analyses. Through applied course work, students will learn how to analyze and interpret clinical research data. Upon completion of the course, students will be able to perform statistical data analyses for regression models with continuous, categorical, and survival outcomes using the SAS program, and will be able to use these models to address their research questions. Prerequisite for the course is an introductory course in biostatistics and SAS knowledge.

Credit 3 units.

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**M19 PHS 520 Introduction to R for Clinical Research**

This course is designed to introduce medical students, clinicians and health researchers to the R programming language. Students will learn how to operate R via R Studio; import external data; create data sets; create, format and manipulate variables; and export data and results. Each session will consist of a combination of lecture and practical hands on exercises. Upon completion of this course, students will have obtained a basic understanding of the R environment.

Credit 1 unit.

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**M19 PHS 5254 Using Administrative Data for Health Services Research**

The objective of this advanced graduate course is to prepare highly motivated students to perform health services research using administrative data. Lectures will provide tutorials on national administrative databases, review journal articles using these databases, instruction in SAS programming and application of health services research methods using administrative databases. Strengths and limitations of large databases that are commonly used for research will be considered, and special attention will be devoted to large federal databases that are readily available to new investigators. Students will learn how to obtain, link and analyze large databases, understand the key issues related to data security and confidentiality, and become knowledgeable about key methodologic issues in observational studies using administrative data. Students will evaluate published studies based on large administrative databases, develop a health services research proposal and complete a short research project that uses administrative data.

Credit 3 units.

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**M19 PHS 526 Patient Safety, Quality Management, and Quality Improvement**

This course introduces principles of patient safety, quality measurement and quality improvement. Classes are designed to provide students with hands-on skills in systems thinking and in preventing, learning from, and dealing with medical error and adverse events. Students will also learn fundamentals in approaches to evaluating quality, including quantitative methods in measure development. We will discuss various approaches and challenges to knowledge translation and effective change management in improving quality. Students will be encouraged to use their real-world experiences in problem

solving around patient safety concerns, to develop and evaluate quality measures in their respective fields and to develop a quality improvement project in their area of interest as part of the course. If student is not in the MPHS program, they must contact the program regarding registration.  
Credit 3 units.

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#### **M19 PHS 527 Development, Validation and Application of Risk Prediction Models**

This course will present detailed discussion of the methods of predictive modeling, with applications to clinical and population health settings. Risk prediction/stratification models are used to identify patients at risk for developing poor outcomes, which can help clinical decision-making. Risk prediction models are also used to assess eligibility to clinical trials and interventions and to guide prevention priorities. Building from traditional risk factor identification through regression analysis to model refinement and validation of prediction, a number of statistical approaches will be reviewed. Each method is motivated by clinical examples. Topics covered will include data source, statistical methods for model development, internal and external validation of models, model updating, other methods such as classification and regression trees, and machine learning, and clinical usefulness. Students will critically read and discuss a range of prediction model manuscripts. Through examples, class discussion, practice lab, and homework, students will become familiar with the methods for development and validation, and use of prediction models.  
Credit 3 units.

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#### **M19 PHS 532 Applied Qualitative Methods for Health Research**

This course will introduce students to the most commonly used qualitative methods for medical-related research. It will provide a foundation in the application of qualitative methods to medical and health research. Topics addressed will include uses of qualitative data, designing studies, sampling strategies, collecting data, and qualitative analysis. A variety of methods will be discussed, with an emphasis on using focus groups and various interviewing techniques. Students will learn the best practices in qualitative research and how to critically evaluate qualitative studies and articles. Upon completion of the course, students will be able to plan, conduct and analyze a qualitative study. If student is not in the MPHS program, they must contact the program regarding registration.  
Credit 3 units.

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#### **M19 PHS 540 Decision Analysis for Clinical Investigation and Economic Evaluation**

In this course, we will introduce students to the methods and applications of decision analysis and cost-effectiveness analysis in health care technology assessment, medical decision making, and health resource allocation. At the conclusion of the class, the student will have an understanding of the theoretical basis for economic evaluation and decision analysis, its application, and hands-on experience in the application of the methods. Among the topics covered are the development of a research question, choice of decision perspective, development of a decision analytic model, estimation of costs and benefits, use of preference based measures, addressing uncertainty and preparation of a manuscript presenting a decision analytic study.  
Credit 3 units.

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#### **M19 PHS 550 Randomized Controlled Trials**

This course provides a comprehensive introduction to randomized controlled clinical trials. Topics include types of clinical trials research (efficacy and effectiveness trials), study design, treatment allocation, randomization and stratification, quality control, analysis, sample size requirements, patient consent, data safety and monitoring plans, reporting standards, and interpretation of results. Course activities: lectures, manuscript critiques, class project, paper. Course note: Students are strongly encouraged to have taken or be concurrently enrolled in M21-560. If student is not in the MPHS program, they must contact the program regarding registration.  
Credit 3 units.

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#### **M19 PHS 551 Systematic Reviews and Meta-Analysis**

Introduction to the use of meta-analysis and related methods used to synthesize and evaluate epidemiological and clinical research in public health and clinical medicine. Concepts introduced and illustrated through case studies of public health and medical issues. Course activities: lectures, class discussion, group project, paper. Stata IC required. Course note: M21-570 required prerequisite. If student is not in the MPHS program, they must contact the program regarding registration.  
Credit 3 units.

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#### **M19 PHS 559 Dissemination and Implementation Science**

This course provides an overview of dissemination and implementation (D&I) science (i.e., translational research in health). Topics include the importance and language of D&I science; designs, methods, and measures; differences and similarities across clinical, public health, and policy settings; selected tools for D&I research and practice; and future issues.  
Credit 3 units.

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#### **M19 PHS 560 Principles of Shared Decision Making and Health Literacy in the Clinical Setting**

This course will provide a comprehensive introduction to principles of shared decision making and health literacy and their implications for clinical communication. Topics may include basic and applied research on shared decision making, principles of designing and evaluating patient decision aids, principles of health literacy, research on relationship between health literacy, numeracy, and health outcomes, best practices for communication with low-numerate and low-literate individuals, best practices (and controversies) in communicating probabilities and their associated uncertainty about screening and treatment outcomes, and best practices for designing and evaluating written information for clinical populations (such as intake forms, brochures, and informed consent documents). Course activities: lectures, manuscript critiques, class project, paper. If student is not in the MPHS program, they must contact the program regarding registration.  
Credit 3 units.

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#### **M19 PHS 570 Communicating Research Findings to the Media and Lay Audiences**

A critical step in the dissemination of population-level clinical research is communicating research findings and key messages to the media and lay audiences. With conflicting messages coming from advocacy groups and others, the burden falls on the clinician-researcher to distill complex information, dispel misinformation, and tell a compelling story that resonates with the audience. The course will equip students with the

skills, technique, experience and confidence needed to give successful, engaging media interviews and presentations related to the publication of research and expertise-specific topics. Through critique, tape and review exercises, class discussion, and guest speakers, students will learn about the facets that make an interview or presentation successful, including nonverbal communication and delivery skills (body language and vocal interpretation), content and messaging, and navigating interactions with the media. The instructor will evaluate each student's skill set and create a working skills inventory on which the student will build throughout the course in a series of on-camera experiences.  
Credit 1 unit.

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**M19 PHS 580 Introduction to Health Disparities and the Structural and Social Determinants of Health**

The purpose of this course is to explore how structural and social determinants of health (SSDoH) produce and maintain health disparities. There will be a variety of learning modalities, including expert guest lectures to discuss cutting-edge research, key foundational and recent readings related to SSDoH and health disparities, and in-class discussion. The course will use case studies and a research proposal to help students apply what they've learned to real-life situations. By the end of the course, students will be able to (a) define health disparities; (b) explain how social and structural determinants of health - including interpersonal and structural racism - produce and maintain health disparities across each phase of disease development; and (c) identify strategies for assessing and addressing health disparities in their own research.  
Credit 2 units.

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**M19 PHS 601 Grant Writing: Applying Clinical and Population Health Methods**

This course provides students with the opportunity to apply methods and principles learned in previous MPHS classes to the development of a grant application. Students prepare this application on a research question of their own choosing and in the format expected for National Institutes of Health (NIH) R03, R21, or K grant applications (research plan only). Students also have the opportunity to evaluate research proposals for scientific merit. This course is required for medical graduates but optional for medical students.  
Credit 3 units.

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**M19 PHS 610 Multilevel and Longitudinal Data Analyses for Clinical Research**

The course is designed for medical students, clinicians and health researchers. The course is an extension of Intermediate Biostatistics (M19-512, instructor Yan Yan). The topics include basic statistical concepts and methods for various types of clinical data (continuous, categorical, count, and time-to-event outcome data) in multilevel and longitudinal settings. Through lectures, SAS labs, and homework assignments, students will understand the basic statistical concepts and methods for the four types of clinical outcome data in multilevel and longitudinal settings, will be able to address clinical research questions using these concepts and methods, will be able to perform basic data analyses on these types of data with SAS software, and will be able to interpret the results in the context of clinical research.  
Credit 3 units.

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