

**Application Due Date: December 1st**

### **Program Director**

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### **MISSION**

The mission of the Epidemiology PhD program in the Milken Institute School of Public Health at the George Washington University is to prepare students for a career in epidemiologic research in an academic, government, or industry settings.

### **PROGRAM GOALS**

The goals of the PhD program are to ensure graduates:

- Gain knowledge across a wide range of epidemiologic theories and methods;
- Gain specific knowledge of epidemiology in one or more of the following areas: infectious disease, chronic disease, environmental and occupational health, or physical activity;
- Understand general and specialized advanced epidemiologic concepts;
- Understand how to apply statistical methods to biological/biomedical sciences and health services;
- Understand and abide by guidelines for ethical treatment of research participants;
- Conduct and analyze data from a research study;
- Disseminate research findings to scientific and lay audiences.

### **PROGRAM REQUIREMENTS**

Doctoral students are required to pass a written comprehensive examination and complete a dissertation. For the comprehensive examination the student must demonstrate advanced knowledge of epidemiologic and biostatistical methods. For the dissertation, the student must design and execute an original research study that contributes new knowledge to the field and demonstrates proficiency in using advanced analytic methods.

Epidemiology PhD students may choose to follow one of two tracks: Option A is more quantitative and requires an additional semester of calculus for admission, enabling more advanced statistical courses in the Department of Statistics. Option B is also quantitative, requiring a minimum of two semesters of calculus, and statistics courses are primarily taken in the Department of Epidemiology and additional elective credits.

### **COMPETENCIES**

At the completion of the doctoral program in epidemiology students will be able to:

- Demonstrate understanding of general and specialized epidemiologic concepts: Demonstrate knowledge of advanced epidemiologic concepts with specialized knowledge in a specific area of epidemiology (e.g., methods, infectious diseases, chronic diseases, environmental and occupational, or physical activity); apply

knowledge of disease pathogenesis to a study proposal; discuss major public health problems; and exhibit knowledge of ethical issues in research.

- Develop a research proposal: Produce a structured proposal of a research study including the background, study hypotheses, design, methodology, and contribution to the field; synthesize and identify gaps and/or limitations of published research and present appropriate hypotheses to address gaps; develop a research protocol that includes identification of data sources and evaluation of appropriate instruments for data collection, the advantages and disadvantages of different epidemiologic study designs, and sources of potential bias.
- Conduct and analyze data: demonstrate proficiency in data collection, data cleaning, primary or secondary data analysis, summarizing statistical analyses and results, and evaluating potential for bias.
- Disseminate research findings: communicate dissertation results to lay and scientific communities through presentations at conferences and publications in the peer-reviewed literature.

## ADMISSIONS REQUIREMENTS

Applicants must hold an undergraduate degree from an accredited institution of higher learning. Although not required, most admitted students have completed a master’s degree prior to admission. Applicants should have academic backgrounds of excellence, usually with majors, or equivalent, in the fields in which they intend to study for advanced degrees. In general, a minimum of a B average (or equivalent) in undergraduate and/or graduate coursework from an accredited college is required. With evidence of special promise, such as high Graduate Record Examination (GRE) scores, an applicant whose academic record falls short of a B average may be accepted on a conditional basis. **All applicants are required to submit current GRE scores (within 5 years of matriculation date)**. Meeting the minimum requirements does not assure acceptance. The number of spaces available for new students limits the number of applicants accepted. Applicants must provide evidence of the completion of their undergraduate and/or graduate work before registration in Milken Institute SPH is permitted. Applicants should be aware that graduate courses taken prior to admission while in non-degree status may not be transferable into those programs. Students completing a master’s degree prior to admission (within 10 years) to the PhD degree program may transfer up to 24 credits towards the PhD coursework requirements at the discretion of the PhD Program Director. In this instance a minimum of 48 additional credit hours of coursework and dissertation research credits is required.

**All applications are submitted through SOPHAS.org.** Information about Milken Institute SPH Admissions and policies are available online at <http://publichealth.gwu.edu/admissions/graduate-admissions>. **For reporting GRE general test scores use the following institutional code: 5268.**

### **Required Courses Prior to Admission Consideration (or equivalents to these GW courses)**

The courses listed below (or equivalents) are required prior to admission consideration and **MUST** clearly appear on an undergraduate or graduate transcript by name, credit hour, and letter grade.

BISC	1115/ 1125	Introductory Biology: Cells and Molecules	4	Lecture (3 hours), laboratory (1 credit/3 hours). Cellular and developmental biology, genetics, and molecular biology.
BISC	1116/ 1126	Introductory Biology: Biology of Organisms	4	Lecture (3 hours), laboratory (1 credit/3 hours). Concepts and methods in the study of whole organisms. Evolutionary theory; population biology; diversity of animals, fungi, and microorganisms; ecology and behavior; and animal structure and function.
MATH	1231	Single-Variable Calculus I	3	Limits and continuity. Differentiation and integration of algebraic and trigonometric functions with applications.
MATH	1232	Single-Variable Calculus II	3	The calculus of exponential and logarithmic functions. L’Hopital’s rule. Techniques of integration. Infinite series and Taylor series. Polar coordinates. Prerequisite: Math 1231

		<b>THE FOLLOWING PREREQUISITE IS FOR OPTION A ONLY:</b>		
MATH	2233	Multivariable Calculus	3	Partial derivatives and multiple integrals. Vector-valued functions. Topics in vector calculus, including line and surface integrals and the theorems of Gauss, Green, and Stokes. Prerequisite: MATH 1232

### Prerequisite Courses for Admission Consideration (or equivalents to these GW courses)

The courses listed below are additional prerequisite course requirements. Applicants lacking these courses (or equivalents to these GW courses) will be considered for admission but will only be admitted conditionally with the expectation that these courses will be completed within the first semester following matriculation in the program. Credits for these courses do not count toward the 72-credit graduation requirement, nor are grades earned in these additional courses reflected in the overall grade-point average.

MATH	2184	Linear Algebra I	3	Linear equations, matrices, inverses, and determinants. Vector spaces, rank, eigenvalues, and diagonalization. Applications to geometry and ordinary differential equations. Prerequisite: MATH 1231
STAT	2183	Intermediate Statistical Laboratory: Statistical Computing Packages	3	Application of program packages (e.g., SAS, SPSS) to the solution of one-, two- and k-sample parametric and nonparametric statistical problems. Basic concepts in data preparation, modification, analysis and interpretation of results. Prerequisite: an introductory statistics course.
-or-			-or-	
PUBH	6853	Use of Statistical Packages: Data Management and Data Analysis	3	This course familiarizes the student with one of the most widely used database management systems and statistical analysis software packages, the SAS System, operating in a Windows environment. Throughout the course, several database management system techniques and data analytical strategies for the appropriate analysis of datasets obtained from a variety of studies will be presented. Statistical techniques covered include linear regression, analysis of variance, logistic regression, and survival analysis.

**Students without a prior Masters of Public Health degree from an accredited school of public health will be required to successfully pass the zero-credit, online course *Pathways to Public Health (PUBH 6080)* within one year of matriculation. There is no fee for this course.**

### PhD EPIDEMIOLOGY DEGREE REQUIREMENTS

Course Distribution Summary	Credits-Option A	Credits-Option B
Core Courses	37	34
Elective Courses	14 (min) - 23	17 (min) - 26
Consulting Note: May be waived by the Epidemiology Program Director, based on written documentation of prior equivalent course work or relevant work experience.	3	3
Dissertation Research	12 (min) -21	12 (min) -21
<b>Total Required Credits (including up to 24 transfer credits)</b>	<b>72</b>	<b>72</b>
<b>Students have 7 years to complete all degree requirements from matriculation.</b>		

## **The General Examination**

**Part I** is a written comprehensive examination consisting of one examination in the field of biostatistics and three in the field of epidemiology. The epidemiology examinations are based on the course content of PUBH 6247 Epidemiologic Methods 1: Design of Health Studies, PUBH 6252 Epidemiologic Methods 2: Advanced Epidemiological Methods, and PUBH 8419 Measurement in Public Health and is administered by the faculty of the Department of Epidemiology. The biostatistics examination is based on the course content of PUBH 8877 Generalized Linear Models in Biostatistics and is administered by the faculty of the Department of Biostatistics and Bioinformatics. Students are expected to take the comprehensive examination within 24 months from the date of enrollment in the program. In addition, students are required to make up any deficiencies prior to taking the examination, e.g., by enrolling in appropriate master's-level courses as needed. The doctoral comprehensive examination is administered once per year in late August. A student who fails to pass the comprehensive examination may, with the approval of the faculty, repeat all or a portion of the examination. Failure on the second attempt will result in termination from the PhD program.

**Part II**, the dissertation proposal defense is an oral examination based on a written dissertation research proposal. Within one year after successful completion of the comprehensive exams (GE Part I), students work with the Program Director to identify a dissertation advisor and committee members from the Department of Epidemiology, and a topic of research. The written dissertation proposal is then submitted to the student's Dissertation Research Committee, and the student will make an oral presentation of his/her proposal to the Committee. The Committee will determine the student's readiness to pursue and successfully complete the proposed research, in addition to the appropriateness of the specific problem for dissertation level research.

Upon successful completion of the required course work, the General Examination (Part I and II), and after IRB review the candidate will be recommended for promotion to PhD **Candidacy**: the dissertation research.

### **Professional Enhancement Requirement (One Day)**

Professional enhancement activities supplement the academic curriculum and help prepare students to participate actively in the professional community. They enhance practical knowledge and awareness of public health issues – either in general or in a student's specific area of study. Students can fulfill this requirement by attending and presenting at workshops, seminars, or professional meetings, some of which are held at Milken Institute SPH and in the metropolitan Washington, DC area. Examples of conference sponsors include the Society for Epidemiologic Research, American College of Epidemiology, National Academy for State Health Policy, the Pan American Health Organization, and the American Public Health Association. Opportunities for professional enhancement are regularly publicized via the Milken Institute SPH and EPI department listservs and through the department or advisor.

***Students must submit documentation of Professional Enhancement activities including proof of attendance before applying for graduation.***

**Required Courses (34-37 Total Credits)**

<b>Required Core Courses</b>		<b>Credits</b>	<b>Semester Offered</b>
PUBH 6003	Principles and Practice of Epidemiology	3	Summer, Fall, Spring
PUBH 6080	Pathways to Public Health*	0	Fall, Spring, Summer
PUBH 6247	Epidemiologic Methods 1: Design of Health Studies <i>Basis for PhD General Comprehensive Exam</i>	3	Fall, Spring
PUBH 6252	Epidemiologic Methods 2: Advanced Epidemiologic Methods <i>Basis for PhD General Comprehensive Exam</i>	3	Fall, Spring
PUBH 6421	Responsible Conduct of Research	1	Fall, Summer
PUBH 8099	PhD Seminar- Cross Cutting Concepts in Public Health	1	Fall
PUBH 8419	Measurement in Public Health and Health Services <i>Basis for PhD General Comprehensive Exam</i>	3	Spring (even years only)
PUBH 8435	PhD Proposal Development	2	Fall, Spring
STAT 6210	Data Analysis	3	Fall, Spring, Summer
PUBH 6866	Principles of Clinical Trials	3	Spring
PUBH 6865	Applied Categorical Data Analysis	3	Spring
PUBH 8877	Generalized Linear Models in Biostatistics <i>Basis for PhD General Comprehensive Exam</i>	3	Fall
<b>OPTION A ONLY:</b>			
STAT 6201	Mathematical Statistics I	3	Fall, Spring
STAT 6202	Mathematical Statistics II	3	Fall, Spring
<b>OPTION B ONLY:</b>			
PUBH 8364	Quantitative Methods	3	Spring
<b>Required Program-Specific Courses* (3 Credits)</b>		<b>Credits</b>	<b>Semester Offered</b>
PUBH 6242 + 8242	Clinical Epidemiology and Public Health: Reading the Research + Doctoral Topics	2+1	Spring
PUBH 6244+ 8244	Cancer Epidemiology + Doctoral Topics	2+1	Spring
PUBH 6245 + 8245	Infectious Disease Epidemiology + Doctoral Topics	2+1	Spring
PUBH 6250+ 8250	Epidemiology of HIV/AIDS +Doctoral Topics	2+1	Fall
PUBH 6259+8259	Epidemiologic Surveillance in Public Health +Doctoral Topics	2+1	Spring
*These courses may be taken for 3 credits by adding a 1-credit PUBH 82xx <i>Doctoral Topics</i> course that goes by the same name as the 2-credit course at the PUBH 62xx level.			
<b>Elective Courses (Minimum 14 Credits)</b>			
<b>Any PUBH or STAT graduate level course (all prerequisites must be met)</b>			
<b>(Other elective courses outside of SPH may be taken with advanced approval)</b>			
<b>Elective Courses –Sample list (not exclusive)</b>		<b>Credits</b>	<b>Semester Offered</b>
PUBH 6299	Topics in Epidemiology	1+	Summer, Fall, Spring
PUBH 6260	Applied Epidemiologic Data Analysis	3	Fall, Spring
PUBH 6262	Introduction to Geographic Information Systems	1	Summer, Fall, Spring
PUBH 6263	Advanced GIS	1	Fall, Spring
PUBH 6268	Advanced SAS	1	Summer
<b>Statistics Elective Courses – Sample OPTION A ONLY</b>		<b>Credits</b>	<b>Semester Offered</b>
STAT 6213	Intermediate Probability and Stochastic Processes	3	Spring, alternate years

STAT 6215	Applied Multivariate Analysis I	3	Alternate academic years
STAT 6216	Applied Multivariate Analysis II	3	Alternate academic years
STAT 6217	Design of Experiments	3	Fall, alternate years
STAT 6223	Bayesian Statistics (Theory and Applications)	3	Spring, alternate years
STAT 6227	Survival Analysis	3	Fall
STAT 8226	Advanced Biostatistical Methods	3	Spring
<b>Biostatistics Elective Courses – Sample OPTION A or B</b>		<b>Credits</b>	<b>Semester Offered</b>
PUBH 6862	Applied Linear Regression Analysis for Public Health Research	3	Fall
PUBH 6864	Applied Survival Analysis for Public Health Research	3	Spring
PUBH 6887	Applied Longitudinal Data Analysis for Public Health Research	3	Spring
<b>Consulting (3 Credits)</b>			
Note: May be waived by the Epidemiology Program Director, based on written documentation of prior equivalent course work or relevant work experience. Waiver of the consulting course increases the total number of electives by the number of consulting credits waived.			
PUBH 6869	Principles of Biostatistics Consulting	1	Spring
PUBH 8283	Biostatistics Consulting Practicum	2	Summer, Fall, Spring
<b>Dissertation Research (12-21 Credits)</b>			
PUBH 8999	Dissertation Research for PhD Epidemiology Students	Taken in units of 3 credits	Summer, Fall, Spring

*\*\*Pathways to Public Health (PUBH 6080) may be waived for students who matriculate with a prior Public Health degree from a CEPH accredited institution.*

**Course Descriptions and Registration** information can be found on the website:

<http://publichealth.gwu.edu/academics/>

## **PhD Graduation Requirements**

### **Graduation**

While degrees are awarded at the end of each semester, formal commencement ceremonies occur only in May, including the doctoral hooding ceremony. Students are eligible to participate in graduation activities only after they have completed all degree requirements and have no financial obligations to the University. Students may include PhD designation after their name upon completion of all degree requirements.

### **Graduation Requirements**

1. Credits: Successful completion of 72 credits. This includes documented and approved transferred coursework/credits.
2. Curriculum: Successful completion of program requirements and elective coursework.
3. General examination: Once the course of study is completed, students are required to pass the General examination Part I.
4. Dissertation: 12-21 credits in dissertation research are required. Once the proposal has been successfully defended (General Examination Part II) and the dissertation research credit requirement has been met, the oral defense may be scheduled.
5. Students must complete GE Parts I and II and have the dissertation proposal approved by the IRB to be officially admitted to the candidacy phase.
6. Grade point average: A minimum overall grade-point average of *B* (3.0).
7. Time limit: The degree must be completed within seven years of matriculation.
8. CITI Training requirement: All students are required to complete training regarding human subject protection regulation and the Health Insurance Portability and Accountability Act of 1996 (HIPAA). To fulfill this requirement, you must complete the Collaborative IRB Training Initiative (CITI) Course in The Protection of Human Research Subjects.
9. Integrity Quiz & Plagiarism requirement: All students are required to review the George Washington University Code of Academic Integrity, take the quiz within their first semester of study, and ensure documentation is submitted to the SPH Office of Student Records.
10. Professional Enhancement requirement: Students must attend/participate in 8 hours of epidemiology conferences. To be cleared for graduation, students are required to submit required documentation of applicable Professional Enhancement activities to the SPH Office of Student Records.