

Program Director

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Admissions Requirements

Applicants must hold an undergraduate degree from an accredited institution of higher learning. Applicants should have academic backgrounds of excellence, usually with majors, or equivalent, in the fields in which they intend to study for advanced degrees. Normally, a B average (or equivalent) from an accredited college is required. With evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of a B average may be accepted on a conditional basis. Meeting the minimum requirements does not assure acceptance. The departments may, and often do, set higher admission standards. Moreover, the number of spaces available for new graduate students limits the number who can be accepted. Students who apply in their senior year must provide evidence of the completion of their baccalaureate work before registration in Columbian College is permitted. Applicants should be aware that graduate courses taken prior to admission while in non-degree status are not used in assessing admissibility to degree programs and may not be transferable into those programs. The Program-at-a-Glance presents the Ph.D. curriculum for students admitted to the Ph.D. program with no intermediate Master's degree.

If desired, a student may complete the M.S. program prior to admission to the Ph.D. degree program, in which case no more than 24 credit hours from the M.S. degree may be applied to the Ph.D. course work requirements. In this instance the student will be required to take a minimum of 27 additional credit hours of coursework. The distribution of these courses between statistics and public health would depend on the nature of the Master's degree and whether the transferred credit hours would be used to defray statistics or public health course work. Full information is available in the Graduate Admissions Application or see www.gwu.edu/~gradinfo. A detailed description of admissions policies is available at www.gwu.edu/~ccas.

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

The courses listed below (or equivalents) are prerequisites for admission consideration, and **MUST** appear on your transcript. Submit your PhD Epidemiology program admission application only after you have completed all of the following courses:

BISC	013	Introductory Biology: Biology of Organisms	4	Lecture (3 hours), laboratory (1 hour). Concepts and methods in the study of whole organisms. Evolutionary theory; population biology; diversity of plants, animals, fungi, and microorganisms; ecology and behavior; and animal structure and function.
BISC	014	Introductory Biology: Cells and Molecules	4	Lecture (3 hours), laboratory (1 hour). Nutrition and metabolism, cellular physiology, genetics, and molecular biology of plants and animals.
MATH	031	Single-Variable Calculus I	3	Limits and continuity. Differentiation and integration of algebraic and trigonometric functions with applications.
MATH	032	Single-Variable Calculus II	3	The calculus of exponential and logarithmic functions. Techniques of integration. Infinite series and Taylor series. Polar coordinates. Prerequisite: MATH 31
MATH	033	Multivariable Calculus III	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 32

Additional Course Requirements

The courses listed below are “Additional Course Requirements.” Applicants lacking these courses (or equivalents to these GW courses) will be considered for admission, but, if admissible, will be admitted conditionally with the expectation that these courses will be satisfactorily completed within two semesters following matriculation in the program. These credits do not count as credit toward the 72 credit graduation requirement, nor are grades earned in these additional courses reflected in the overall grade point average.

MATH	124	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 031
PubH or	249	Use of Statistical Packages: Data Management and Data Analysis or	3 or	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.
STAT	183	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.

Ph.D. Epidemiology Degree Requirements

Course Distribution Summary	Credits
Core Courses <ul style="list-style-type: none"> Public Health (12 Credits) Statistics (15 Credits) 	27
Approved Elective Courses <ul style="list-style-type: none"> Public Health Statistics 	21 (minimum)
Consulting Note: May be waived by the Epidemiology Program Director, based on written documentation of prior equivalent course work or relevant work experience. Waiving part or all of this requirement does not alter the 72 total credit requirement. Waiver of the consulting course increases the total number of electives by the number of consulting credits waived.	3
Dissertation Research	12-21
Total Credits	72
The General Examinations <p>Part I is a <u>written comprehensive examination</u> consisting of one examination in the field of biostatistics and one in the field of epidemiology. The epidemiology examination is based on the course content of PubH 221 Environmental and Occupational Epidemiology and is administered by the faculty of the School of Public Health and Health Services. The biostatistics examination is based on the course content of PubH 265 Design of Medical Studies and PubH 266 Biostatistical Methods and is administered by the faculty of the Department of Statistics. 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. A student who fails to pass the comprehensive examination may, with the approval of the faculty, repeat the examination the following year. Failure on the second attempt will result in termination from the Ph.D. program.</p> <p>Part II, the research proposal, consists of an <u>oral examination</u> based on a written dissertation research proposal. As soon as feasible after successful completion of the comprehensive exam, students are encouraged to identify a dissertation advisor 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 or 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.</p> <p>Upon successful completion of the required course work and both parts of the General Examination, the candidate will generally be recommended to the Associate Dean for Graduate Affairs of The Columbian College of Arts and Sciences (CCAS) for promotion to PhD Candidacy: the dissertation research. A candidate must file an approved dissertation research plan with the CCAS before being admitted to PhD Candidacy. Prior to completion of the General Examination, a student may register for at most 6 credit hours of Dissertation Research (EPID 399).</p> <p>The document <u>Doctoral Dissertation Reference Guide</u> describes the specific requirements for the doctoral dissertation established by the <i>Program Management Committee</i>.</p>	
Professional Enhancement Requirement (Two Days) 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 workshops, seminars, or other relevant professional meetings, which are often held at SPHHS and in the metropolitan Washington, DC area. Examples of conference sponsors include the National Academy for State Health Policy, the Pan American Health Organization, the American Public Health Association, the American College of Healthcare Executives, the Area Health Education Center, the American College of Sports Medicine, and the National Athletic Trainer's Association. Opportunities for professional enhancement are regularly publicized via the SPHHS Listserv and through your department or advisor. It is hoped that PhD students will fulfill one day of this two day requirement by participating in a poster presentation at GWUMC Research Day.	
Students must submit documentation of Professional Enhancement activities to the Office of Student Records. The documentation consists of the Professional Enhancement Form (see www.gwumc.edu/sphhs/sacd/forms.htm), which includes a <u>prior approval signature</u> from the student's advisor, a description of the program agenda, and proof of attendance.	
Remember to submit your documentation before you apply to graduate!	

Curriculum for PHD students with no intermediate master's degree

Required Core Courses (27 Total Credits)

Required Public Health Core Courses (12 Credits)		Credits	Semester Offered	Grade
PubH 201	Biological Concepts for Public Health	2	Summer, Fall, Spring	
PubH 203	Principles and Practice of Epidemiology	3	Fall, Spring	
PubH 221	Environmental and Occupational Epidemiology <i>Basis for PhD General Comprehensive</i>	3	Spring	
PubH 209	Topics	2	Summer, Fall, Spring	
PubH 207	One of the following: Social and Behavioral Science Methods	2	Summer and Spring	
PubH 285	Health Economics and Financing	2	Fall, Spring	
HSML 203	Introduction to Health Management	2	Summer 2, Fall, Spring	
Required Statistics Core Courses (15 Credits)		Credits	Semester Offered	Grade
STAT 201	Mathematical Statistics I	3	Fall, Spring	
STAT 202	Mathematical Statistics II	3	Fall, Spring	
STAT 210	Data Analysis	3	Spring	
PubH 265	Design of Medical Studies <i>Basis for PhD General Comprehensive</i>	3	Spring	
PubH 266	Biostatistical Methods <i>Basis for PhD General Comprehensive</i>	3	Fall	

Approved Elective Courses (21 Credits Minimum)

Approved Public Health Elective Courses		Credits	Semester Offered	Grade
* May be taken for 3 credits by adding PubH 209 Topics by the same name for 1 credit.				
PubH 209	Topics in Epidemiology and Biostatistics	1-2	Summer, Fall, Spring	
PubH 223	Principles of Environmental and Occupational Toxicology	2	Fall	
PubH 224	Problem Solving in Environmental and Occupational Health	2	Summer	
PubH 242*	Clinical Epidemiology and Decision Analysis Doctoral students concurrently take PubH 209 affiliated Topics course for 1 credit (see Advisor)	2	Spring	
PubH 244*	Cancer Epidemiology	2	Spring	
PubH 245*	Infectious Disease Epidemiology	2	Spring	
PubH 246*	Injury Epidemiology and Prevention	2	Spring	
PubH 248	Epidemiologic Methods in Older Populations	2	Fall	
PubH 250	Epidemiology of HIV/AIDS	2	Fall	
PubH 259	Epidemiologic Surveillance in Public Health	2	Spring	
PubH 321	Introduction to Global Health and Development	3	Fall	
PubH 403	Measurement in Public Health and Health Services	3	Spring	
Approved Statistics Elective Courses		Credits	Semester Offered	Grade
STAT 227	Survival Analysis	3	Fall	
STAT 231	Categorical Data Analysis	3	Fall Alternate Years	
STAT 207	Methods of Statistical Computing I	3	Alternate academic years	
STAT 208	Methods of Statistical Computing II	3	Alternate academic years	
STAT 213	Intermediate Probability and Stochastic Processes	3	Alternate academic years	
STAT 215	Applied Multivariate Analysis I	3	Alternate academic years	
STAT 216	Applied Multivariate Analysis II	3	Alternate academic years	

STAT 217	Advanced ANOVA I (Design of Experiments)	3	Fall	
STAT 218	Advanced ANOVA II (Linear Models)	3	Spring	
STAT 223	Bayesian Statistics (Theory and Applications)	3	Alternate Springs	
STAT 226	Advanced Biostatistical Methods	3	Spring	
STAT 262	Nonparametric Inference	3	Alternate academic years	
STAT 263	Advanced Statistical Theory I	3	Fall	
STAT 265	Multivariate Analysis	3	Fall	
STAT 273	Stochastic Processes I	3	Alternate academic years	
STAT 274	Stochastic Processes II	3	Alternate academic years	
STAT TBA	Current Topics in Epidemiology and Biostatistics	variable	See Advisor	
Consulting (3 Credits)				
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 212	(Special Project) Consulting Practicum	2	Summer, Fall, Spring	
PubH 258	Advanced Topics in Biostatistical Consulting	1	Spring	
Dissertation Research (12-21 Credits)				
EPID 399	Dissertation Research for PhD Epidemiology Students	Taken in units of 3 credits	Summer, Fall, Spring	

**Columbian College of Arts and Sciences
And
School of Public Health and Health Services**

Ph.D. Epidemiology

2005-2006

Note: All curriculum revisions will be updated immediately on the website <http://www.gwumc.edu>

Public Health Course Descriptions

HSML	203	Introduction to Health Management	2	Introduction to management topics essential for those seeking to serve in mid-level and senior positions at organizations providing and/or assessing health and public health services. The course strives to embed these theories in the context of the case. Summer 2, Fall, Spring
PubH	201	Biological Concepts for Public Health	2	Provides an overview of current knowledge about biological mechanisms of major diseases causing death and disability in the US and globally; understanding and interpreting the reciprocal relationships of genetic, environmental, and behavioral determinants of health and disease in an ecologic context; analyzing, discussing, and communicating biologic principles of disease from a public health perspective. Summer, Fall, Spring
PubH	203	Principles and Practice of Epidemiology	3	General principles, methods, and applications of epidemiology. Outbreak investigations, measures of disease frequency, standardization of disease rates, study design, measures of association, hypothesis testing, bias, effect modification, causal inference, disease screening, and surveillance. Case studies apply these concepts to a variety of infectious, acute, and chronic health conditions affecting the population. Fall, Spring
PubH	207	Social and Behavioral Science Methods	2	This course will present detailed information about theories and constructs of behavior and behavior change among progressively larger and more complex groups from individuals to populations. The goal of the course is to encourage interactive and independent learning in areas of behavioral change, especially in areas pertaining to health that are of both personal and professional interest to course participants. Summer, Spring
PubH	209	Topics	1 to 3	In-depth examination of a particular facet of public health. Topics and prerequisites vary. Summer, Fall, Spring
PubH	210	Independent Study	1-6	Permission of instructor and advisor required. Summer, Fall, Spring
PubH	212	(Special Project) Consulting Practicum	2 to 4	Under faculty supervision, the student undertakes an original project that applies the skills and knowledge gained in the chosen track and/or concentration within the MPH program. Ph.D. Epidemiology students may take 2-credit hours of PubH 212 as consulting practicum to satisfy the statistical consulting requirement of their degree program. Prerequisite: permission of the instructor. Summer, Fall, Spring

PubH	221	Environmental and Occupational Epidemiology	3	Epidemiologic methods for the study of environmental and occupational health problems. Epidemiologic exposure assessment methods and methods relevant to cohort, case-control, cross-sectional, and cluster investigation studies. Sources of and evaluation of biases and confounding, as well as survey and questionnaire design. Prerequisites: PubH 203.202, Spring
PubH	223	Principles of Environmental and Occupational Toxicology	2	Introduction to principles of toxicology with emphasis on concepts most relevant in environmental and occupational applications, risk assessment, and risk communication. Prerequisites: Organic Chemistry, Fall
PubH	224	Problem Solving in Environmental and Occupational Health	2	Synthetic, case study approach to environmental and occupational health problems. Integrating health and exposure information. Litigation issues, public health advisories, risk communication, and advanced toxicology. Prerequisites: PubH 204.223.221, Summer
PubH	242	Clinical Epidemiology and Decision Analysis	2 + 1	Quantitative and qualitative approaches to decision making, including risk- benefit analysis, decision analysis, and cost-effective analysis. Applications to technology assessment; development of clinical guidelines. PubH 202.203, Spring Note: Doctoral students concurrently take PubH 209 affiliated Topics course for 1 credit (see Advisor)
PubH	244	Cancer Epidemiology	2	Epidemiology of specific cancers, with an emphasis on molecular and genetic epidemiology. Current research in the field. Prerequisites: PubH 202.203, Spring
PubH	245	Infectious Disease Epidemiology	2	The role and conduct of laboratory and field investigations in the epidemiology of infectious diseases. Prerequisite, PubH 203, Spring
PubH	246	Injury Epidemiology and Prevention	2	Epidemiologic knowledge and prevention strategies for intentional and unintentional injuries, including those occurring in transportation, occupational, home, and recreational environments. Research methods, sources of data, and application to injury prevention. Prerequisite, PubH 203, Spring
PubH	258	Advanced Topics in Biostatistical Consulting	1	Principles and practice of biostatistical consulting in public health and medical research environments. Spring
PubH	285	Health Economics and Financing	3	Covers economic principles as they apply to health services financing and public health policy: provider payment policy and cost containment, supply of health providers and services, individual demand for health care services, and cost-benefit analyses and economic incentives to promote public health goals. Prerequisite: Basic Economics, Fall, Spring
PubH	321	Introduction to Global Health and Development	3	Multidimensional aspects of international health and medical, economic, and socio-cultural aspects of disease. Major causes of mortality and morbidity on a regional basis. Fundamentals of development, issues in family health, ethics, and social change and approaches to the delivery of health care services. Fall
PubH	403	Measurement in Public Health and Health Services Research		In this course students review principles of measurement and assessment as they apply to public health and health services research constructs, review existing state-of –the-art measures of individual and population health status (e.g., morbidity, mortality, functioning and health-related quality of life) and of individual and

				community health behavior, and explore current measurement issues in health research. Prerequisite: PubH 401. 252, Spring
EPID	399	Dissertation Research	1 to 12	Dissertation Research for PhD EPI Students

Statistics Course Descriptions

STAT	201	Mathematical Statistics I	3	Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: MATH 33, 124. Fall, Spring
STAT	202	Mathematical Statistics II	3	Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: MATH 33, 124. Fall, Spring
STAT	207	Methods of Statistical Computing I	3	Error analysis, computational aspects of linear models, sweep operator, random number generation, simulation and resampling. Optimization, numerical integration (Gaussian quadrature, Simpson's rule); EM algorithm. Prerequisite: STAT 118, 157-8; MATH 124; knowledge of a computer programming language. Alternate Academic Years
STAT	208	Methods of Statistical Computing II	3	Numerical linear algebra, matrix decomposition and eigenvalue problems. Smoothing and density estimation. Graphics, interactive and dynamic techniques for data display. Object-oriented programming. Prerequisite: STAT 118, 157-58; MATH 124; and knowledge of a programming language. Alternate Academic Years
STAT	210	Data Analysis	3	Review of statistical principles of data analysis, using computerized statistical procedures. Multiple regression and the general linear model, analysis of contingency tables and categorical data, logistic regression for qualitative responses. Prerequisite: STAT 118, either Stat 183 or demonstrated proficiency in computer programming, and one semester of mathematical statistics (STAT 157 or STAT 201). Spring
STAT	213	Intermediate Probability and Stochastic Processes	3	This is a beginning graduate course on probability theory and stochastic process. The course covers discrete and continuous random variables and their distributions, conditional distributions and conditional expectation, generating functions and their applications, convergence of random variables; and an introduction to the Brownian motion process, the homogeneous and nonhomogeneous Poisson processes and martingales. Prerequisite: STAT 201 and STAT 202. Spring
STAT	215	Applied Multivariate Analysis I	3	Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical and physical sciences. Prerequisite: STAT119, STAT157 and STAT158; MATH 124. Alternate academic years
STAT	216	Applied Multivariate Analysis II	2	Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical and physical sciences. Prerequisite: STAT119, STAT157 and STAT158; MATH 124. Alternate academic years

STAT	217	Advanced ANOVA I (Design of Experiments)	3	Design and analysis of the single- and multiple-factor experiments. Includes block designs, repeated measures, factorial and fractional factorial experiments, response surface experimentation. Prerequisite: STAT 119, STAT 157 and STAT 58; MATH 124. Fall
STAT	218	Advanced ANOVA II (Linear Models)	3	Theory of the general linear parametric model. Includes least squares estimation, multiple comparisons procedures, variance components estimation. Prerequisite: STAT 201 and STAT 202; MATH 124. Spring
STAT	223	Bayesian Statistics (Theory and Applications)	3	An overview of Bayesian statistics, including its foundational issues, decision under uncertainty, linear models, expert opinion, and computational issues. Prerequisite: STAT 201 and STAT 202. Alternate academic years
PubH	265	Design of Medical Studies <i>Basis for PhD General Comprehensive</i>	3	Design of medical investigations, including the randomized clinical trial, observational cohort study, and the retrospective case-control study. Specific methods regarding sample size, power and precision and statistical procedures for randomization and sampling. Ethics of clinical trials and the intention-to-treat principle. Prerequisite: PubH 202, Spring
PubH	266	Biostatistical Methods <i>Basis for PhD General Comprehensive</i>	3	Biostatistical methods for asymptotically efficient tests and estimates of relative risks and odds ratios from prospective and retrospective matched and unmatched studies. Fixed and random effects models. Logistic regression, conditional logistic regression. Poisson regression. Maximum likelihood and efficient scores. Prerequisites: STAT 202 or Instructor's permission, Fall
STAT	226	Advanced Biostatistical Methods	3	Statistical methods for the analysis of longitudinal data: nonparametric, fixed effects, mixed effects, generalized estimating equations. Methods for the analysis of emerging data: group sequential analysis, Brownian motion, Bayesian methods and stochastic curtailment. Other advanced topics of current research in biostatistics. Spring
STAT	227	Survival Analysis	3	Parametric and nonparametric methods for the analysis of events observed in time (survival data), including Kaplan-Meier estimate of survival functions, logrank and generalized Wilcoxon tests, the Cox proportional hazards model and an introduction to counting processes. Prerequisite: Stat 201-2 or permission of instructor. Fall
STAT	231	Categorical Data Analysis	3	A study of the theoretical bases underlying the analysis of categorical data. Measures and tests for association; Mantel-Haenszel procedure; weighted least squares and maximum likelihood estimators in linear models; estimating equations; logistic regression; loglinear models. Prerequisite: STAT 201 and STAT 202. Fall alternate years
STAT	262	Nonparametric Inference	3	Inference when the form of the underlying distribution is unspecified. Prerequisite: STAT 201 and STAT 202. Alternate academic years
STAT	263	Advanced Statistical Theory I	3	Decision theoretic estimation, classical point estimation, hypothesis testing. Prerequisite: STAT 201 and STAT 202. Fall

STAT	265	Multivariate Analysis	3	Multivariate normal distribution. Hotelling's T^2 and generalized T^2_o , Wishart distribution, discrimination and classification. Prerequisite: STAT 201 and STAT 202 and MATH 124. Fall alternate years
STAT	273	Stochastic Processes I	3	Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Alternate years
STAT	274	Stochastic Processes II	3	Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Alternate years
STAT	TBA	Seminar: Current Topics in Epidemiology and Biostatistics	3	Doctoral seminar intended to introduce current topics of controversy in epidemiology and in biostatistics. Some of these topics are the following: statistical issues in meta analyses, intent-to-treat principle in clinical trials, confounding in un-controlled epidemiologic studies, criteria for causation from non-experimental observational studies: causative evidence relating smoking to lung cancer.