

### Program Director

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### Mission Statement

The mission of the Biostatistics Program is to educate graduate students in developing the necessary methodological and quantitative skills to successfully apply statistical methods to the biological, biomedical and health services sciences. In addition to enhance students' capacity to think critically and creatively, we are determined to deepen their commitment to improving the public's health, to engaging in and promoting public service – qualities that are essential for future biostatisticians and public health practitioners.

### Goals

The goals of the Biostatistics Program are to ensure that graduates:

- ◆ Understand and adhere to high scientific standards for research;
- ◆ Understand how to apply statistical methods to biological/biomedical sciences and health services
- ◆ Understand and follow guidelines for ethical treatment of research participants;
- ◆ Communicate research findings to a lay audience; and
- ◆ Respect cultural diversity throughout all of the above.

### Course Requirements

The MPH degree program in biostatistics consists of 45 credits. These credits are based on a series of Core Courses (17 credits) and Program-Specific Courses, and electives (28 credits). It includes a Practicum/Capstone Culminating experience, where students apply their classroom education within a biostatistical or epidemiological organization in a research endeavor.

### Program Prerequisites

All applicants to the MPH Biostatistics degree program must have completed two semesters of college level calculus through Calculus II with a grade of B or better to be considered for admission.

### Program-Specific Competencies

The specialization in Biostatistics focuses on developing students' skills in the statistical analysis and interpretation of health research data. The following competencies were developed in concert with professors of biostatistics courses (at GWU as well as from other CEPH-accredited MPH programs), biostatistics textbooks, conversations with prospective employers likely to hire MPH-biostatistics graduates, and with experience teaching biostatistics courses to MPH students. ASPH Education Committee competencies were also consulted.

Upon completion of the MPH in Biostatistics, students will demonstrate functional competence to:

- Enumerate and apply the underlying principles and methods to design, plan, and conduct public health and biomedical studies including cohort, case control, cross-sectional, and clinical trials. Relevant courses: PubH 209\*, 247, 249, 260, and 266.
- Conduct data analysis and interpret the results from public health and biomedical studies including cohort, case control, cross-sectional, and clinical trials. Relevant courses: PubH 209\*, 247, 249, 258, 260, 266.
- Manipulate various databases from large scale epidemiological studies and clinical trials studies using statistical software, e.g. SAS®. Relevant course: PubH 209\*, 249, 260, 266.
- Use theoretical biostatistical concepts in an applied setting to identify the appropriate data analysis methods for public health and biomedical studies including cohort, case control, cross-sectional, and clinical trials. Relevant courses: PubH 247, 249, 260, 264, 266.
- Synthesize data and relevant literature and interpret findings from statistical analyses in a causal framework, in order to prepare manuscripts and make oral presentations for both professional and lay audiences. Relevant courses: PubH 209\*, 247, 249, 260, 266.
- Work as a member of a multidisciplinary research team and recognize and appropriately respond to ethical issues that arise in research. Relevant courses: PubH 209\*, 247, 258.
- Provide biostatistical advice as a member of a team of researchers engaged in a biomedical or epidemiological research project. Relevant courses: PubH 209\*, 247, 249, 258, 264, 266.
- Apply biomedical and epidemiological concepts in identifying and describing the determinants and the distribution of disease in human populations which is the necessary background for successful participation in studies of health and disease. Relevant courses: PubH 247, 249, 260, 264, 266.
- Identify and assess patterns of emerging diseases to postulate hypotheses and to propose appropriate strategies in order to Quantitatively evaluate the impact of health problems. Relevant courses: PubH 209\*, 247, 249, 258
- Comprehend basic ethical and legal principles pertaining to the collection, maintenance, use and dissemination of biomedical and epidemiologic data. PubH 247, 258, 266

\*Selected biostatistics topics/electives including PubH 262

### **Sample Special Project Topics**

Longitudinal Assessment of Disease Severity Markers in Renal Patients  
 Analysis of USDA Data Trends on Toxic Residues in Animal Food Sources  
 Alternative Methods for Analyzing Knee Surgery Outcome Data  
 Correlates of Cerebral Spinal Fluid Substances in HIV Patients  
 Development of a Prediction Model for Mortality in ICU Patients

**See the Curriculum Sheets that follow.**

School of Public Health and Health Services

Master of Public Health  
Biostatistics Program  
2009-2010  
Program-at-a-Glance

*Begin Planning Your Practicum During Year 1*

**Required Core Courses**

Required Core Course		Credits	Semester Offered	Grade
PubH 201	Biological Concepts for Public Health	2	Fall, Spring, Summer I	
PubH 202	Biostatistical Applications for Public Health	3	Fall, Spring, Summer 10 wk	
PubH 203	Principles and Practice of Epidemiology	3	Fall, Spring, Summer 10 wk	
PubH 204	Environmental and Occupational Health in a Sustainable World	2	Fall, Spring, Summer I	
PubH 205	Policy Approaches to Public Health	2	Fall, Spring, Summer 10 wk	
PubH 207	Social and Behavioral Approaches to Public Health	2	Fall, Spring, Summer I	
PubH 208	Management Approaches to Public Health	3	Fall, Spring, Summer 10-wk	
Total	Core Credits	17		

**Required Program-Specific Courses**

Required Program-Specific Course		Credits	Semester Offered	Grade
PubH 247	Design of Health Studies	3	Fall, Spring	
PubH 249	Use of Statistical Packages: Data Management and Data Analysis	3	Fall, Spring	
PubH 252	Advanced Epidemiologic Methods	3	Fall, Spring	
PubH 258	Advanced Topics in Biostatistical Consulting	1	Spring	
PubH 260	Advanced Data Analysis for Public Health	3	Fall, Spring	
PubH 264	Quantitative Methods	3	Spring	
PubH 266	Biostatistical Methods	3	Fall	
<b>Electives</b>	Electives Epi-Biostatistics Courses with Advisor's approval	5	Summer, Fall, Spring	
PubH 214.10	Practicum	2	See advisor	
PubH 215.10	Culminating Experience	2	See Advisor	
Course Distribution		<b>Credits</b>		
Public Health Core Courses		17		
Program-Specific Courses		19		
Electives-Epi-Bio Courses with Advisor's Approval		5		
Practicum		2		
Culminating Experience		2		
<b>Total</b>	<b>Degree Credits</b>	<b>45</b>		

School of Public Health and Health Services

Master of Public Health and Graduate Certificate Program Option

Biostatistics

2009-2010

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

Graduation Requirements

MPH

1. **Graduate Credit Requirement.** 45 graduate credits are required.
2. **Course Requirements.** Successful completion of the Core Courses and the Program-Specific Courses are required.
3. **Grade Point Requirement.** A 3.0 (B average) overall grade point average is required.
4. **Time Limit Requirement.** The degree must be completed within four years.
5. **Transfer Credit Policy.** Up to 12 graduate credits that have not been applied to a previous graduate degree may be transferred to the MPH. Up to 18 credits may be transferred to the MPH from the SPHHS Graduate Certificate. Credits must have been earned from an accredited institution in the last 3 years with a grade point of 3.0 or better.

Graduation Requirements

Graduate Certificate Program

1. Graduate Credit Requirement. 18 graduate credits are required.
2. Graduate Credit Requirement for students enrolled concurrently in a SPHHS Degree Program. 12 credits are required.
3. The Program Director/Advisor must pre-approve all course selections and course sequencing by developing a "program of study" prior to the student's initial registration. Graduate Certificate students meet with their advisor each semester before registration. All changes in this program of study must be pre-approved by the Program Director/Advisor.
4. Course Requirements. Since most graduate certificate students are currently enrolled in an MPH program or have previously earned a graduate degree, most course credits will be selected from the program-specific course list. Under no circumstances may a certificate student enroll in fewer than 9 credits of program-specific courses.
5. Grade Point Requirement. A 3.0 (B average) overall grade point average or better is required.
6. Time Limit Requirement. The certificate must be completed within 2 years.
7. Transfer Credit Policy. The Program Director/Advisor may approve up to 4 graduate credits that have not been applied to a previous graduate degree to be transferred to the graduate certificate. The course(s) must be relevant to the graduate certificate. Credits must have been earned from an accredited institution in the last 3 years with a grade point of 3.0 or better.

Core Courses  
17 Credits

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. Fall, Spring, Summer 1
PubH	202	Biostatistical Applications for Public Health	3	Application of biostatistical principles to critical analysis of retrospective studies, prospective studies, and controlled clinical trials, as well as studies in the health services literature. Selection, basic calculations, and interpretation of statistical methods for detection of significant associations and differences. Fall, Spring, Summer 10 weeks

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, Summer 10 weeks
PubH	204	Environmental and Occupational Health in a Sustainable World	2	Examines the connection between population health and exposures to chemical, physical, and biological agents in the environment. Through the use of problem-solving frameworks, students will become familiar with data sources, methodologies and policy approaches being used to address the public health impacts of environmental and occupational health hazards, including the consequences of climate change, natural resource degradation, and industrial chemicals. The course will integrate key concepts of environmental health with principles of sustainability to illustrate how public policies and practices on the local, national and global level affect population health. Fall, Spring, Summer 1
PubH	205	Policy Approaches to Public Health	2	Introductory multidisciplinary course focusing on the interplay of all aspects of global public health on health policy problems. Students will learn how health policy is made, how health care and public health services are delivered, and how to define and analyze key health policy problems drawing on the perspectives and skills of the public health disciplines. Fall, Spring, Summer 10 weeks
PubH	207	Social and Behavioral Approaches to Public Health	2	This course will emphasize social and behavioral science theories, models, and concepts that can be applied to public health problems and interventions. This course will describe the role of social and community factors, including race/ethnicity and culture, in both the onset and solution of public health problems and describe the inter-relationship between the social and behavioral science. Fall, Spring, Summer 1
PubH	208	Management Approaches to Public Health	3	An advanced multidisciplinary course examining global public health and health delivery issues through the use of a case study approach. Prerequisites: PubH 201.202.203.204.205, 207, Fall, Spring, Summer 10 weeks
<b>Program Specific Courses, Electives, Practicum and Culminating Experience 28 Credits</b>				
PubH	247	Design of Health Studies	3	Epidemiologic concepts and methods applied to specific research questions especially new types of public health problems. Recognition and development of the most appropriate study design for a specific health issue. Ecologic, cross-sectional, case-control, cohort studies and clinical trials. Sampling, measurement, questionnaire design, causality and causal criteria. Development of a research proposal. Prerequisite, PubH 203, Fall, Spring
PubH	249	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. Prerequisite, PubH 202, Fall, Spring
PubH	252	Advanced Epidemiologic Methods	3	Advanced quantitative epidemiologic methods, with a focus on basic data analytic techniques, identifying and evaluating bias and adjusting for confounding. Dose-response, trend analysis, and multiple linear and logistic regression models. Prerequisites: PubH 202.203.247, Fall, Spring

PubH	258	Advanced Topics in Biostatistical Consulting	1	Principles and practice of biostatistical consulting in public health and medical research environments. Spring
PubH	260	Advanced Data Analysis for Public Health	3	Advanced data analysis using the SAS System to expand on the analytic techniques gained in PubH 202 and PubH 249 and to provide students with the applied statistical skills required to analyze various types of public health datasets. Prerequisites: PubH 202, 249, Fall, Spring
PubH	264	Quantitative Methods	3	Introduces basic concepts in mathematical statistics. Topics will include probabilities (unconditional and conditional), density and distribution functions of continuous and discrete random variables, including expected values. Specific distribution functions discussed will be Binomial, Poisson, Hypergeometric, and Gaussian distributions. Additional topics include bivariable distributions, variance-covariance matrix, limiting theory, asymptotic results, and maximum likelihood estimation. Prerequisites: Math 31, 32 and PubH 202, 249. Spring.
PubH	266	Biostatistical Methods	3	This course will present to student biostatistical methods for asymptotically efficient tests. It will also cover estimates of relative risks and odds ratios from prospective and retrospective matched and unmatched studies. Transformation from measures of risks using appropriate scales will also be discussed and its asymptotic properties presented. Among topics to be covered are fixed and random effects models, in contingency tables, power functions, logistic regression, conditional logistic regression, Poisson regression. Maximum likelihood and efficient scores. Prerequisites: Stat 201-2 or PubH 264. Fall
PubH	214. 10	Practicum	1-3	This course provides the opportunity for MPH students to apply the knowledge and skills acquired through their programs of study. A planned, supervised and evaluated practice experience that is relevant to the student's program is an essential component of a public health professional degree program. These opportunities can take place in a variety of agencies or organizations. Each program customizes Practicum requirements to meet students' needs. (Credit/No Credit) Summer, Fall, Spring
PubH	215. 10	Culminating Experience	2-3	A culminating experience is one that requires a student to synthesize and integrate knowledge acquired in coursework and other learning experiences and to apply theory and principles in a situation that approximates some aspect of professional practice. It is through this course that faculty evaluates the extent to which the student has mastered the body of knowledge and can demonstrate proficiency in the required competencies. Each program customizes Culminating Experience requirements to meet students' needs. Summer, Fall, Spring
		Electives	5	Any Epi – Bio course with advisor's approval

**NOTE: Always see your advisor for course scheduling and sequencing strategies, but remember that proper course selection, fulfilling requirements, and on-time graduation are your responsibilities.**

The Master of Public Health (MPH) curriculum consists of four types of courses:

- Required Core Courses (PubH 201, 202, 203, 204, 205, 207, and PubH 208)
- Required Program-Specific Courses
- Electives
- Required Practicum and Culminating Experience

The MPH core courses are designed to provide students with a broad public health context as well as a critical foundation for subsequent coursework. Early completion of these core courses ensures that students will have the base of knowledge to successfully complete the program specific courses and to get as much as possible out of them. As such, entering students are expected to enroll in MPH core courses in accordance with the following guidelines:

- We expect MPH students to complete the MPH core courses in their first year following their admission into the program (fall/spring/summer). This does not include PubH 208 (Management Approaches to Public Health), which should be taken in the second half of the program of study, and which requires every other core course as a pre-requisite.
- Further, we expect MPH students to complete the following MPH courses in the first two semesters of study:
  - PubH 201 – Biological Concepts for Public Health
  - PubH 202 – Biostatistics or PubH 203 – Epidemiology
  - PubH 205 – Policy Approaches to Public Health

These guidelines reinforce the principle that core courses should be taken early. However, since the core courses (minus PubH 208) consist of only 15 credits, it is also both feasible and desirable for full-time students (who are taking at least 9 credits per semester) to take an introductory program specific courses in their first year.

In order to help assure that all students complete core courses in the first year of study, SPHHS will offer all MPH core courses during all three semesters (fall, spring, and summer). This will allow students who wish to complete their MPH degree within two years to do so, and will allow every student to make steady progress toward completing the MPH degree. Most of the MPH Biostatistics program specific courses are offered twice in each academic year (fall/spring semesters).

We recognize that there may be exceptional circumstances that make it difficult for a student to complete core courses in the first year as outlined above. Any such student should discuss this situation with his or her academic advisor. If the advisor and student agree that an exception is needed, the student should complete a Graduate Petition Form explaining the circumstances, obtain the academic advisor's signature, and submit the Petition to the SPHHS Office of Student Records, 222 Ross Hall. The Associate Dean for Student and Faculty Development must approve such a petition before a student is permitted to defer any core courses to the second year.

Table 1 (full time students) and Table 2 (part time students) present sample course schedules that students admitted to the MPH program in biostatistics can use as a guideline to structure their program of studies. It is noteworthy that in either sample course schedule a fully 45 credits are required to complete the degree, including core courses (17 credits), program specific courses 20 credits), Epi-Bio electives (5 credits) and the practicum (2 credits) and culminating experience (2 credits).

**GWU School of Public Health and Health Services  
MPH in Biostatistics (45 cr)**

**Sample Schedule for 2-Year Completion (Summer start)**

Semester	Cr	Course #	Course Name	Time
<b>Summer 1<sup>st</sup> year</b> 5 credits	3	PubH 202	Biostatistical Applications for Public Health	Mon 9:00-12 pm/Weds (lab) 9:00-10:30 am 10 wks
	2	PubH 201	Biological Concepts for Public Health	Tues and Thurs 3:45-6 pm (6-wks)
<b>Fall 1<sup>st</sup> year</b> 8 credits	3	PubH 203	Principles and Practice of Epidemiology	Friday 3:10-6:00 pm
	2	PubH 204	Environmental and Occupational Health	Tues 4:10 – 6:00
	3	PubH 249	Use of Stat Packages for Data Analysis	Tues 6:10-9:00 pm
<b>Spring 1<sup>st</sup> year</b> 9 credits	2	PubH 205	Policy Approaches to Public Health	Thurs 6:10 – 8:00 pm
	3	PubH 247	Design of Health Studies	Weds 6:10 – 9:00 pm
	3	PubH 264	Quantitative Methods	Tues 6:10- 9:00 pm
	1	PubH 209	Epi-Bio Course (advisor's approval)	
<b>Summer 2<sup>nd</sup> year</b> 4 credits	2	PubH 207	Social and Behavioral Approaches to Public Health	Summer I – Mon/Weds 3:45 – 6:00 pm
	2	PubH 209	Epi-Bio electives	
<b>Fall 2<sup>nd</sup> year</b> 11 credits	3	PubH 208	Management Approaches in Public Health	Thurs 6:10-9:00 pm
	3	PubH 252	Advanced Epidemiologic Methods	Weds 6:10-9:00 pm
	3	PubH 266	Biostatistical Methods	Tues 6:10-9:00 pm
	2	PubH 211	Practicum	Tues 4:10-6:00 pm
<b>Spring 2<sup>nd</sup> year</b> 8 credits	1	PubH 258	Advanced Topics in Biostatistical Consulting	Mon 4:10-6:00 pm
	3	PubH 260	Advanced Data Analysis for Public Health	Tues 6:10-9:00 pm
	2	PubH 215	Culminating Experience	TBD
	2	PubH 209	Epi-Bio Electives	

5 credits of Epi-Bio –Any 209 courses offered by the Epi-Bio Department. A student can substitute epi-bio electives with one statistics course with approval of the program director.

+ Both the Practicum and the Culminating Experience require substantial lead time to plan. Make sure that you start planning your Practicum the semester before you wish to conduct it. Make sure that you start planning your Culminating Experience approximately 2 semesters before you plan to complete it.

**GWU School of Public Health and Health Services  
MPH in Biostatistics (45 cr)**

**Sample Schedule for 3-Year Completion (Fall start)**

Semester	Cr	Course #	Course Name	Time
<b>Fall 1<sup>st</sup> year</b> 5 credits	2	PubH 201	Biological Concepts for Public Health	Thurs 4:10 – 6:00 pm
	3	PubH 202	Biostatistical Applications for Public Health	Weds 6:10 – 9:00 pm
<b>Spring 1<sup>st</sup> year</b> 7 credit	3	PubH 203	Principles and Practice of Epidemiology	Thurs 3:10 – 6:00 pm
	2	PubH 204	Environmental and Occupational Health	Tues 6:10- 8:00 pm
	2	PubH 205	Policy Approaches to Public Health	Thurs 6:10-8:00 pm
<b>Summer 1<sup>st</sup> year</b> 3 credits	2	PubH 207	Social and Behavioral Approaches to Public Health	Summer I – Mon/Weds 6:10 – 8:25 pm
	1	PubH 209	Epi-Bio Elective	
<b>Fall 2<sup>nd</sup> year</b> 7 credits	3	PubH 247	Design of Health Studies	Thurs 6:10-9:00 pm
	3	PubH 249	Use of Statistical Packages for Data Analysis	Tues 6:10-9:00 pm + 1 hour computer lab
	1	PubH 209	Epi-Bio Elective	
<b>Spring 2<sup>nd</sup> year</b> 7 credits	3	PubH 252	Advanced Epidemiologic Methods	Thurs 3:10-6:00 pm
	3	PubH 264	Quantitative Methods	Tues 6:10-9:00 pm
	1	PubH 209	Epi-Bio Elective	
<b>Summer 2<sup>nd</sup> year</b> 2 credits	2	PubH 209	Epi-Bio Electives	
<b>Fall 3<sup>rd</sup> year</b> 8 credits	3	PubH 208	Management Approaches to Public Health	Thurs 6:10 -9:00 pm
	3	PubH 266	Biostatistical Methods	Tues 6:10-9:00 pm
	2	PubH 214	Practicum	Tues 4:10-6:00 pm
<b>Spring 3<sup>rd</sup> year</b> 6 credits	3	PubH 260	Advanced Data Analysis	Tues 6:00 pm-9:00 pm
	1	PubH 258	Advanced Topics in Biostatistical Consulting	Mon 4:10 pm-6:00 pm
	2	PubH 215	Culminating Experience	TBD

5 credits of Epi-Bio –Any 209 courses offered by the Epi-Bio Department. A student can substitute epi-bio electives with one statistics course with approval of the program director.

+ Both the Practicum and the Culminating Experience require substantial lead time to plan. Make sure that you start planning your Practicum the semester before you wish to conduct it. Make sure that you start planning your Culminating Experience approximately 2 semesters before you plan to complete it.