

# BIOSTATISTICS (MS)

NYSED: 40032 HEGIS: 0419.00 CIP: 26.1102

## Overview

The Master of Science in Biostatistics program will train students in biostatistical methods for study design, data analysis, and statistical reporting for scientific and lay audiences. This degree will train students in key areas including data management, statistical reasoning, the interpretation of numeric data for scientific inference in studies in medicine and public health, and the ability to collaborate and communicate effectively with scientists and other public health stakeholders across disciplines. Graduates of the program are prepared to work as statisticians in a variety of professional environments including government, academic, healthcare, and industry. In addition, students receive training in preparation for quantitative doctoral programs in public health, such as biostatistics and epidemiology.

Students will have the opportunity to work with faculty on many public health problems. Examples include:

- Problems of randomly timed biomarker measurements in Alzheimer's disease cohort studies.
- Selection bias due to delayed entry to cohort studies.
- N-of-1 study design in Alzheimer's disease.
- Mixed-methods (qualitative/quantitative) community-engaged research focused on rigorous measurement.
- Survey research for community-based interventions and health disparities research.
- Implementation, evaluation, and enhancement of the infrastructure of community-engaged research
- Resolution of high granularity measures of disease incidence and risk from person-generated data (social media, mobile tools, wearables, etc.)
- Statistical (spatiotemporal) and machine learning methods for incorporating unstructured data in population disease modeling
- Zero-inflated count models to understand the changes in count outcomes (e.g. substance use, smoking behaviors, sexual risk-taking) over time.
- Time diary methodology to understand the temporal associations between daily behaviors, perceptions, of individual health.
- Biological biomarkers of stress among young sexual minority men and the links between sexual minority stress and biological markers of stress.

Students are engaged in several active learning opportunities outside of their courses:

- There is a journal club that meets bimonthly in which they select and present papers and lead discussion about the design and analytical issues in the papers.
- There are short-courses in computing and coding, such as in Stata and R.
- There is a consulting laboratory in which students are mentored in providing statistical consulting.

## A STEM-Designated Master's Degree

The Master of Science in Biostatistics program is classified as STEM-eligible (<https://publichealth.nyu.edu/stem/>), allowing international

students on an F-1 visa to apply for two years of additional employment in the United States after graduation if they meet the required criteria.

## Admissions

All applications to MPH or MS programs at NYU GPH must be submitted through SOPHAS (<https://sophas.org/>), the common application for schools and programs of public health. You are required to select a single area of concentration when you apply, and we encourage you to research the different concentrations available to identify one which best aligns with your interests.

In general, the elements of a complete application include:

- SOPHAS application form
- Official transcripts from each institution attended (or an evaluation of your credentials if you graduated from a foreign institution)
- Three letters of recommendation
- Personal statement
- Resume/CV
- English language proficiency exam results for all applicants whose native language is not English and who did not receive the equivalent of a US bachelor's degree at an institution where English is the primary language of instruction.

## Program Requirements

Course	Title	Credits
<b>Required Courses</b>		
GPH-GU 2106	Epidemiology	3
GPH-GU 2995	Biostatistics for Public Health	3
GPH-GU 5170	Introduction to Public Health	0
GPH-GU 2353	Regression I: Linear Regression and Modeling (3).	3
GPH-GU 2354	Regression II: Categorical Data Analysis	3
GPH-GU 2361	Research Methods in Public Health	3
GPH-GU 2450	Intermediate Epidemiology	3
<b>Selective Courses</b>		
For all selective courses below, when you take one as a requirement, the other may be taken as an elective.		
Select one of the following: <sup>1</sup>		3-4
GPH-GU 2286	Introduction to Data Management and Statistical Computing	
GPH-GU 2183 & GPH-GU 2184	Introduction to Statistical Programming in R and Intermediate Statistical Programming in R <sup>2</sup>	
Select one of the following:		3
GPH-GU 2225	Psychometric Measurement and Analysis in Public Health Research and Practice	
GPH-GU 2387	Survey Design, Analysis, and Reporting	
Select one of the following:		3
GPH-GU 2480	Longitudinal Analysis of Public Health Data <sup>3</sup>	
GPH-GU 2368	Applied Survival Analysis	
Select one of the following:		3
GPH-GU 2930	Epidemiological Methods and Design	
GPH-GU 3225	Statistical Inference	
GPH-GU 2363	Causal Inference: Design and Analysis	
APSTA-GE 2012	Causal Inference	

<b>Electives</b>	<b>11-12</b>
Select nine credits in an approved, thematic area	
Select three credits from the list below	
<b>Culminating Experience</b>	
GPH-GU 2686 Thesis I: Practice and Integrative Learning Experiences	2
GPH-GU 2687 Thesis II: Practice and Integrative Learning Experiences	2
<b>Total Credits</b>	<b>46</b>

1

While you must take either GPH-GU 2286 Introduction to Data Management and Statistical Computing or (GPH-GU 2183 Introduction to Statistical Programming in R and GPH-GU 2184 Intermediate Statistical Programming in R) as a requirement, you may take the other as an elective with approval.

2

Please note that students who choose this option will take one less elective credit.

3

While you must take either GPH-GU 2480 Longitudinal Analysis of Public Health Data or GPH-GU 2368 Applied Survival Analysis as a requirement, you may take the other as an elective.

## Electives

MS students are required to select a theme for 9 elective credits. At least two of the courses taken within the theme should be primarily statistical in content, while the third may be focused on a relevant subject matter. The remaining 3 credits may be selected from the electives below (if not included in your 9 thematic credits or as selective requirements), or with approval of the department chair. The thematic area and courses taken are flexible and to be chosen by the student, with approval by the department chair.

### Electives Course List

Course	Title	Credits
GPH-GU 3152/5152	Advanced Agent-Based Modeling	3
DS-GA 1019	Advanced Python for Data Science <sup>4</sup>	3
PHDSW-GS 3070	Advanced Structural Equation Modeling <sup>1</sup>	3
GPH-GU 2355	Analysis of Epidemiologic Data Using SAS (requires approval of the Chair) <sup>4</sup>	3
GPH-GU 2372	Applied Bayesian Analysis in Public Health	3
GPH-GU 2368	Applied Survival Analysis	3
DS-GA 1004	Big Data <sup>4</sup>	3
CUSP-GX 6002		3
GPH-GU 2235	Biostatistical Consulting	3
GPH-GU 2363	Causal Inference: Design and Analysis	3
APSTA-GE 2012	Causal Inference <sup>2</sup>	3
APSTA-GE 2094		3
GPH-GU 2336	Critical Reading of the Biostatistical Literature	3
CUSP-GX 6004		3
APSTA-GE 2331	Data Science for Social Impact	3
ECE-GY 9343	SEL TOP. TELECOM NETWORK <sup>4</sup>	3
GPH-GU 2380/5380	Data-Driven Decision Making in Global Public Health <sup>4</sup>	3

ECE-GY 7123	DEEP LEARNING	3
GPH-GU 2930	Epidemiological Methods and Design	3
GPH-GU 3220	Experimental Study Designs in Epidemiology	3
URPL-GP 2618	Geographic Information Systems and Analysis	3
GPH-GU 2126	Healthcare Claims Data Analysis	3
GPH-GU 2244	Health Care Management Science <sup>4</sup>	3
GPH-GU 2324	Infectious Disease Epidemiology <sup>4</sup>	3
GPH-GU 2184	Intermediate Statistical Programming in R	2
GPH-GU 2152	Introduction to Agent-Based Modeling	3
GPH-GU 2286	Introduction to Data Management and Statistical Computing	3
GPH-GU 2183	Introduction to Statistical Programming in R	2
APSTA-GE 2110	Large Databases in Applied Research	3-4
GPH-GU 2480	Longitudinal Analysis of Public Health Data	3
DS-GA 1003	Machine Learning <sup>3,4</sup>	3
GPH-GU 2338	Machine Learning in Public Health	3
APSTA-GE 2013	Missing Data	2
DS-GA 1011	Natural Language Processing with Representation Learning	3
GPH-GU 2274	Outbreak Epidemiology: Re-emerging and Emerging Infectious Diseases <sup>4</sup>	3
DS-GA 1018	Probabilistic Time Series Analysis	3
DS-GA 1007	Programming for Data Science	3
GPH-GU 2225	Psychometric Measurement and Analysis in Public Health Research and Practice	3
GPH-GU 2022	SAS for Beginners: Data Management and Exploration	1
APSTA-GE 2015	Applied Spatial Statistics	2
GPH-GU 2512	Special Topics: Applied Spatial Statistics for Public Health	1
DS-GA 3001	Special Topics in Data Science <sup>4</sup>	3
GPH-GU 3225	Statistical Inference	3
APSTA-GE 2014	Stats Analysis of Networks	3
PHDSW-GS 3069	Structural Equation Modeling	3
GPH-GU 2387	Survey Design, Analysis, and Reporting	3
DS-GA 1015	Text as Data	3
BI-GY 7633	Transcriptomics	3

1

Pre-req: PHDSW-GS 3069 Structural Equation Modeling

2

Pre-req or co-req: GPH-GU 2354 Regression II: Categorical Data Analysis

3

Must take GPH-GU 2338 Machine Learning in Public Health first.

4

Requires approval of the Chair.

## Sample Plan of Study Full-Time

Course	Title	Credits
<b>1st Semester/Term</b>		
GPH-GU 2106	Epidemiology	3
GPH-GU 2995	Biostatistics for Public Health	3

GPH-GU 2286 or GPH-GU 2183	Introduction to Data Management and Statistical Computing or Introduction to Statistical Programming in R	3
GPH-GU 5170	Introduction to Public Health	0
Elective		3
<b>Credits</b>		<b>12</b>
<b>2nd Semester/Term</b>		
GPH-GU 2184	Intermediate Statistical Programming in R <sup>1</sup>	2
<b>Credits</b>		<b>2</b>
<b>3rd Semester/Term</b>		
GPH-GU 2353	Regression I: Linear Regression and Modeling (3).	3
GPH-GU 2361	Research Methods in Public Health	3
GPH-GU 2450	Intermediate Epidemiology	3
GPH-GU 2184	Intermediate Statistical Programming in R <sup>2</sup>	2
<b>Credits</b>		<b>11</b>
<b>4th Semester/Term</b>		
GPH-GU 2686	Thesis I: Practice and Integrative Learning Experiences	2
GPH-GU 2354	Regression II: Categorical Data Analysis	3
GPH-GU 2930 or GPH-GU 3225 or GPH-GU 2363 or APSTA-GE 2012	Epidemiological Methods and Design or Statistical Inference or Causal Inference: Design and Analysis or Causal Inference	3
GPH-GU 2225 or GPH-GU 2387	Psychometric Measurement and Analysis in Public Health Research and Practice or Survey Design, Analysis, and Reporting	3
<b>Credits</b>		<b>11</b>
<b>5th Semester/Term</b>		
GPH-GU 2687	Thesis II: Practice and Integrative Learning Experiences	2
GPH-GU 2480 or GPH-GU 2368	Longitudinal Analysis of Public Health Data or Applied Survival Analysis	3
Elective		3
Elective		2-3
<b>Credits</b>		<b>10</b>
<b>Total Credits</b>		<b>46</b>

1

Students who did not take GPH-GU 2183 Introduction to Statistical Programming in R do not need to take this course; this course may also be taken in the Spring term for students who took GPH-GU 2183 Introduction to Statistical Programming in R; also note that January courses count towards the Spring course load.

2

Students who are taking GPH-GU 2184 Intermediate Statistical Programming in R do not have to take an elective in this term.

## Part-Time

Course	Title	Credits
<b>1st Semester/Term</b>		
GPH-GU 2106	Epidemiology	3
GPH-GU 2995	Biostatistics for Public Health	3
GPH-GU 5170	Introduction to Public Health	0
<b>Credits</b>		<b>6</b>
<b>2nd Semester/Term</b>		
GPH-GU 2353	Regression I: Linear Regression and Modeling (3).	3
GPH-GU 2361	Research Methods in Public Health	3
<b>Credits</b>		<b>6</b>
<b>3rd Semester/Term</b>		
Select one of the following:		2-3
GPH-GU 2286	Introduction to Data Management and Statistical Computing	
GPH-GU 2183	Introduction to Statistical Programming in R <sup>1</sup>	

Elective		3
<b>Credits</b>		<b>6</b>
<b>4th Semester/Term</b>		
GPH-GU 2480 or GPH-GU 2368	Longitudinal Analysis of Public Health Data or Applied Survival Analysis	3
Elective		3
<b>Credits</b>		<b>6</b>
<b>5th Semester/Term</b>		
GPH-GU 2354	Regression II: Categorical Data Analysis	3
GPH-GU 2450	Intermediate Epidemiology	3
<b>Credits</b>		<b>6</b>
<b>6th Semester/Term</b>		
GPH-GU 2387 or GPH-GU 2225	Survey Design, Analysis, and Reporting or Psychometric Measurement and Analysis in Public Health Research and Practice	3
Elective		3
<b>Credits</b>		<b>6</b>
<b>7th Semester/Term</b>		
GPH-GU 2686	Thesis I: Practice and Integrative Learning Experiences	2
GPH-GU 2930 or GPH-GU 3225 or GPH-GU 2363 or APSTA-GE 2012	Epidemiological Methods and Design or Statistical Inference or Causal Inference: Design and Analysis or Causal Inference	3
<b>Credits</b>		<b>5</b>
<b>8th Semester/Term</b>		
GPH-GU 2687	Thesis II: Practice and Integrative Learning Experiences	2
Elective		2-3
<b>Credits</b>		<b>5</b>
<b>Total Credits</b>		<b>46</b>

1

Plus GPH-GU 2184 Intermediate Statistical Programming in R which is offered in January and in the Spring.

## Learning Outcomes

Upon completion of the Biostatistics Master of Science degree, graduates will have the skills and competencies to:

1. Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
2. Harness basic concepts of probability, random variation and commonly used statistical probability distributions.
3. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
4. Implement the appropriate analytic methods for calculating key measures of association.
5. Understand and apply ethical principles to data acquisition, management, storage, sharing, and analysis
6. Interpret results of statistical analyses found in public health research studies.
7. Utilize relevant statistical software for data analysis.

## Policies

### Waiver Exam

The computing requirement for MPH and MS students in Biostatistics is the successful completion of GPH-GU 2183 Introduction to Statistical Programming in R and GPH-GU 2184 Intermediate Statistical Programming in R, or GPH-GU 2286 Introduction to Data Management

and Statistical Computing. This requirement must be completed in the first year of the degree program. Students who feel they know the material in GPH-GU 2183 Introduction to Statistical Programming in R and/or GPH-GU 2184 Intermediate Statistical Programming in R sufficiently well are eligible to take an online exam to waive one or both of the courses. The exam is offered shortly before the start of the Fall semester and students will be emailed with exact dates, along with a form to sign up for the exam. The material covered in these courses is outlined below:

- GPH-GU 2183 Introduction to Statistical Programming in R: R objects, data visualization, data import & export, and data manipulation
- GPH-GU 2184 Intermediate Statistical Programming in R: organizing and modifying data, operating on various data object types, creating functions and iterations for statistical simulations, and writing high-quality reports with R Markdown.

Questions about the exam may be directed to [gph.bsadmin@nyu.edu](mailto:gph.bsadmin@gph.bsadmin@nyu.edu).

## **NYU Policies**

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).

## **School of Global Public Health Policies**

A list of related academic policies can be found on the School of Global Public Health academic policies page (<https://bulletins.nyu.edu/graduate/global-public-health/academic-policies/>).