BACHELOR OF SCIENCE WITH A MAJOR IN HEALTH DATA SCIENCE, PRE-MEDICAL PROFESSIONS CONCENTRATION

Program Director: Ali Rahnavard

The bachelor's program in health data science offers an interdisciplinary degree that equips students with a comprehensive understanding of using data analytics, statistics, and machine learning to address crucial challenges in public health and biomedicine. This program focuses on managing, analyzing, and interpreting complex health and omics data, alongside providing a strong foundation in public health principles, health policy, and population health. Students gain expertise in applying data science tools and methodologies to real-world issues, including epidemic tracking, molecular epidemiology, health disparities, disease prevention, health promotion, and health services planning. The curriculum integrates modules on epidemiology, biostatistics, health informatics, biology, machine learning, and data ethics. Graduates are well-prepared for diverse career paths in public health departments, healthcare organizations, hospitals, biomedical research institutes, non-profit research institutions, and government agencies. They contribute significantly to data-driven public health initiatives and advancements in biomedicine. Through this program, students engage in real-world health applications and gain an understanding of the risk factors for public health and human diseases such as cancer and how infectious diseases spread and evolve.

Pre-medical Professional Concentration

The pre-medical professional concentration is a specialized program that equips students with the foundational knowledge and skills required for admission into medical school or pursuing a career in healthcare. This concentration focuses on essential subjects like biology, chemistry, physics, and anatomy, while also integrating coursework in health data science, statistics, and research methods. This combination prepares students to engage in cutting-edge research utilizing new health and omics data and technologies, which serve as complementary skills to medicine. Students in this concentration develop a solid understanding of medical concepts and cultivate critical thinking, problem-solving, and communication skills essential for success in the medical field. The program effectively prepares students for the rigorous academic demands of medical school and offers a pathway towards various medical professions, including physicians, surgeons, or healthcare researchers.

ADMISSIONS

Information on the admission process is available from the Office of Undergraduate Admissions website (https://undergraduate.admissions.gwu.edu/). Applications may be submitted via the Common Application (https://go.gwu.edu/commonapp/).

Supporting documents not submitted online should be mailed to:

Office of Undergraduate Admissions
The George Washington University
800 21st Street NW, Suite 100
Washington, DC 20052

Contact for questions:

gwadm@gwu.edu or 202-994-6040

REQUIREMENTS

The following requirements must be fulfilled: 20 credits in general education courses, 56 to 57 credits in health data science core courses, 10 credits in health data science guided elective courses, and 33 to 34 credits in general elective courses.

The pre-medical professions concentration is completed by taking 34 credits in specified courses. These courses are double counted in other categories and are taken as part of, not in addition to, the above requirements.

Code	Title	Credits
Required		
Health data science core courses		
PUBH 4201	Practical Computing	
or CSCI 1011	Introduction to Programming with Java	
or CSCI 1012	Introduction to Programming with Python	
PUBH 4202	Bioinformatics Algorithms and Data Structures	
or CSCI 1112	Algorithms and Data Structures	
PUBH 1142	Introduction to Health Data Science	
PUBH 1242	Health Data Mining (Health Data Mining)	
PUBH 2242	Natural Language Processing for Healthcare (Text Mining/Natural Language Processing)	
PUBH 3242	Health Data Visualization	
MATH 1231	Single-Variable Calculus I	
MATH 1232	Single-Variable Calculus II	
BISC 1111	Introductory Biology: Cells and Molecules	
PUBH 2110	Public Health Biology (PUBH 2110 is 3 credits, BISC 1112 is 4 credits)	
or BISC 1112	Introductory Biology: The Biology of Organisms	
PUBH 2142	Introduction to Biostatistics for Public Health	

STAT 2118	Regression Analysis	
or STAT 2183	Intermediate Statistics Lab/Packages	
STAT 3157	Introduction to Mathematical Statistics I	
PUBH 1010	First-Year Experience in Public Health	
PUBH 1101	Introduction to Public Health and Health Services	
PUBH 3131	Epidemiology	
PUBH 3199	Topics in Public Health (Research Methods; taken for 3 credits)	
PUBH 3136	Health Law	
or PUBH 3151	Current Issues in Bioethics	
PUBH 4199	Independent Study (Capstone Project; taken for 3 credits)	

Pre-medical professions concentration-specific courses

The courses below are required for the concentration. These courses, which total 34 credits, are double counted toward, not in addition to, either the core course or guided elective requirement.

BISC 1112	Introductory Biology: The Biology of Organisms	
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
CHEM 2151	Organic Chemistry I	
or CHEM 2153	Organic Chemistry Laboratory I	
CHEM 2152	Organic Chemistry II	
or CHEM 2154	Organic Chemistry Laboratory II	
BISC 3261	Introductory Medical Biochemistry	
or CHEM 3165	Biochemistry I	
PHYS 1011	General Physics I	
or PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1012	General Physics II	
or PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	
PSYC 1001	General Psychology	
or SOC 1001	Introduction to Sociology	

Electives

43 to 44 credits in elective courses, including 10 credits in health data science guided elective courses (below) and 33 to 34 credits in general elective courses. Most courses offered by GW can be taken as general electives. Students are encouraged to meet with their advisor to help select these courses. No more than 3 credits in Lifestyle, Sport, and Physical Activity (LSPA) courses can be counted toward the 120 credits required for the bachelor's degree. LSPA courses count as general electives.

Health data science guided electives

Code	Title	Credits
Biochemistry		
BIOC 3820	Bioinformatics and Computational Biochemistry	
Biological sciences		
BISC 2207	Genetics	
BISC 2213	Biology of Cancer	
BISC 2214	Developmental Biology	
BISC 2336	Introductory Microbiology	
BISC 2583	Biology of Proteins	
BISC 2585	Biometry	
Biomedical engineering		
BME 3825	Medical Measurement Laboratory	
BME 4482	Medical Measurements	
Computer science		
CSCI 1112	Algorithms and Data Structures	
CSCI 1121	Introduction to C Programming	
CSCI 1132	Data Structures and Software Design	
CSCI 1311	Discrete Structures I	
CSCI 2312	Discrete Structures II	
CSCI 2441	Database Systems and Team Projects	
CSCI 3212	Algorithms	
CSCI 3362	Probability for Computer Science	
CSCI 4341	Continuous Algorithms	
CSCI 4342	Computational Linear Algebra and Applications	

CSCI 4364	Machine Learning
CSCI 4572	Computational Biology
CSCI 4576	Introduction to Biomedical Computing
CSCI 4577	Biomedical Computing

Data science

DATS 2101	Ethical Life in a Digital World
DATS 2102	Data Visualization for Data Science
DATS 2103	Data Mining for Data Science
DATS 2104	Data Warehousing for Data Science

Economics

ECON 2123	Introduction to Econometrics
ECON 3105	Economic Forecasting
ECON 3148	Health Economics

Electrical and eomputer engineering

ECE 1120	C Programming for Electrical and Computer Engineering
ECE 1125	Data Structures and Algorithms for ECE
ECE 3220	Introduction to Digital Signal Processing
ECE 3225	Signal and Image Analysis

Mathematics

MATH 2184	Linear Algebra I
MATH 2233	Multivariable Calculus
MATH 3125	Linear Algebra II
MATH 3342	Ordinary Differential Equations
MATH 3359	Introduction to Mathematical Modeling
MATH 3553	Introduction to Numerical Analysis
MATH 3740	Computational Complexity
MATH 4239	Real Analysis I
MATH 4240	Real Analysis II

Mechanical and aerospace engineering

MAE 1117	Introduction to Engineering Computations

Physics

PHYS 3100	Math Methods for Physics
PHYS 3181	Computational Physics

Public health

PUBH 3201	Introduction to Bioinformatics
PUBH 3202	Introduction to Genomics
PUBH 3995	Undergraduate Research

Statistics

STAT 2123	Introduction to Econometrics
STAT 2183W	Intermediate Statistical Laboratory: Statistical Computing Packages
STAT 3119	Design and Analysis of Experiments
STAT 4158	Introduction to Mathematical Statistics II
STAT 4181	Applied Time Series Analysis
STAT 4188	Nonparametric Statistics Inference
STAT 4189	Mathematical Probability and Applications I
STAT 4190	Mathematical Probability and Applications II
STAT 4197	Fundamentals of SAS Programming for Data Management