Milken Institute School of Public Health THE GEORGE WASHINGTON UNIVERSITY	**Department of Biostatistics and Bioinformatics** **Bachelor of Science** **Health Data Science** **Academic Year 2026 – 2027** All curriculum revisions will be updated immediately on the website http://www.publichealth.gwu.edu

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Mission

The mission of the Health Data Sciences (HDS) program is to prepare students for graduate school or employment in the health data science sector. Students will gain analytical skills and experience with designing, conducting, analyzing, and reporting studies utilizing health data. Data will include omics, epidemiological, environmental, biomedical, public health, and demographic data. The HDS program prepares students for immediate: post-graduate employment and/or entry into graduate programs in health data science, biostatistics, bioinformatics, computational biology, or other professional programs, including medical, dental, business (biotech, pharma), and law (biotech, pharma).

Program Overview

Advancements in innovative technologies and collaborations across the globe generate vast amounts of health and related data that enable our understanding of complex systems in human health, nature, behavior, society, and beyond. Exploring health data and finding evidence and patterns provide opportunities to make informed decisions. The HDS curriculum designs a roadmap of skills and training in learning from quantitative and qualitative data, forming questions, generating and evaluating hypotheses, and making inferences.

The major in Health Data Science will provide students with a solid foundation in data science, mathematics, computer science, health, and biology, enhanced by specially designed biostatistics and bioinformatics analytics and ethics courses. A hands-on program will enable students to apply analytic methods to various real-world applications, take the skills learned in the classroom and practice them in real-world problems, preparing them to address new challenges and questions.

Goals

The goals of the Bachelor of Science in Health Data Science are to ensure graduates can:

- Apply interdisciplinary knowledge of biostatistics, bioinformatics, computational biology, and health data science
- Design, conduct, analyze, and report results from experiments and other scientific studies
- Wrangle and manipulate data
- Effectively visualize data
- Analyze and interpret data

- Function effectively on multidisciplinary teams
- Integrate knowledge and experience across disciplines
- Communicate effectively
- Provide programming expertise to solve biomedical problems and answer biological questions

Program Specific Competencies

Upon completion of the Bachelor of Science in Health Data Science, students will possess the following functional competencies:

1. Identify important health-related problems and apply health data science as a method to find solutions [Relevant Courses: PUBH, 1010, 1101, 2110, 1142, 3131, 3151, 2110, 3131]
2. Generate and manage a health data science project as a solution to a health-related problem [Relevant Courses: PUBH 1142, 4202, 3232, 2242, 2103, 3242, 3199]
3. Design, apply, and use data gathering, analytical, and reporting technologies inherent to health data science projects [Relevant Courses: PUBH 3232, 2242, 2142, 3242, 2118, 3199]
4. Generate and interpret the results of health data science analyses [Relevant Courses: PUBH 2142, 2110, 2142, 2242, 3199]
5. Assess the potential impact of policy changes based on health data analytical insights from health and/or biomedical data ecosystems [Relevant Courses: PUBH 1101, 3131, 3242, 1142, 4202, STAT 2118, STAT 2183, STAT 4157, MATH 1231]
6. Develop skill sets as problem solvers and leaders in health data science [Relevant Courses: PUBH 1142, 3232, 2110, 2142, 2242, 2103, 3131, 3242, 4202]
7. Communicate the results of data science projects [Relevant Courses: PUBH 3242, 2142, 1101, 1101, 3131]

Degree Requirements

All students accepted to this major must follow the policies outlined in the GW Bulletin and the GWSPH Student Handbook. This includes, but is not limited to:

- Minimum Grade Point Average (GPA)
- Minimum Course Grades
- Approved Guided Electives
- Maximum Credit Allowances
- University General Education
- Double Majors and Double Degrees
- Double Counting
- Continuous Enrollment
- Maximum Time to Degree
- Required Minimum Degree Credits
- Transfer Credit Policy
- Field Experience, Undergraduate Research, Independent Study, and Study Abroad
- CITI Training
- Integrity Quiz and Plagiarism
- Professional Enhancement (PE) Hours

There are four levels of requirements for this BS degree: University general education requirements, major core requirements, guided electives, and general electives. University general education requirements are taken by all University undergraduate students and form the liberal arts education component of the BS degree. Students with a declared concentration must meet the requirements for the concentration in addition to the four levels of requirements listed above.

Students should review the GW Bulletin to ascertain the prerequisite courses for the major core courses. Notes on policies related to specific courses will be documented in footnotes, but only on the first instance the course appears in this program guide.

Bachelor of Science in Health Data Science -No Concentration- Must Fulfill the Following Degree Requirements	
Requirement	Credits
General Education*	24
Health Data Science Core (see program curriculum)	40
Health Data Science Electives (pre-approved or approved by advisor) – Guided Electives	15
General Electives (to be chosen with advisor)	41
Total	120

Bachelor of Science in Health Data Science - Pre-medical Professional Concentration - Must Fulfill the Following Degree Requirements	
Requirement	Credits
General Education*	24
Health Data Science Core (see program curriculum)	40
Health Data Science Guided Electives (pre-approved or approved by advisor)	3
Concentration	34
General Electives (to be chosen with advisor)	19
Total	120

Students are strongly encouraged to consult the GW Schedule of Classes and meet with their advisor before finalizing their class schedule.

*Students must take one of the approved oral communications courses listed in APPENDIX at the end of the program guide.

Require Core Curriculum

Core Area	Required Core HDS Courses – 40 credits				
	Course number	Course title	Credits	Prerequisites	Semester offered
Programming and Data Processing	PUBH 4201	Practical Computing	3	BISC 1111 or BISC 1112	Fall
	PUBH 4202	Bioinformatics Algorithms and Data Structures	3	PUBH 4201	Spr
Data Science	PUBH 1142	Introduction to Health Data Science	3	none	Fall
	PUBH 3232	Health Data Mining	3	(CSCI 1012, PUBH 4201, or STAT 1129) and (STAT 1051, STAT 1053, STAT 1111, or STAT 1127)	Spr

	PUBH 2242	Natural Language Processing for Healthcare	3	PUBH 1142	Fall
	PUBH 3242	Health Data Visualization	3	PUBH 1142	Spr
Biology	PUBH 2110	Public Health Biology	3	BISC 1005, BISC 1006, BISC1007, BISC 1008, BISC 1111, BISC 1112, or HONR 1033 in a biology topic	Fall, Spr
Probability and Statistics	PUBH 2142	Introductory Biostatistics	3	none	Fall, Spr
	STAT 4157	Introductory Probability (calculus based)	3	MATH 1232	Fall, Spr
	STAT 2183	Regression Analysis or Applied Statistical Methods	3	An introductory statistics course	Fall, Spr, Sum
Public Health	PUBH 1010	First-Year Experience in Public Health	1	none	Fall, Sum
	PUBH 1101	Introduction to Public Health and Health Services	3	none	Fall, Spr, Sum
	PUBH 3131	Epidemiology	3	PUBH 2142, STAT 1051, STAT 1053, STAT 1111, or STAT 1127	Fall, Spr
	PUBH 2140	Foundations of Research Methods	3	none	Fall, Spr
	TOTAL				40 credits

Pre-Medical Professional Concentration

Course Title	Course Number	Credits
Biology 2	BISC 1112	4
General Chemistry 1	CHEM 1111	4
General Chemistry 2	CHEM 1112	4
Organic Chemistry 1	CHEM 2151/2153	4
Organic Chemistry 2	CHEM 2152/2154	4
Introduction to Biochemistry	BISC 3261 or CHEM 3165	3
General physics 1	PHYS 1011 or 1021 or 1025	4
General physics 2	PHYS 1012 or 1022 or 1026	4
Psychology or Sociology	PSYC 1001 or SOC 1001	3
Total		34

Health Data Science Guided Electives

Biochemistry

BIOC 3820	Bioinformatics and Computational Biochemistry	2

Biological Sciences

BISC 1111	Biology: Cells & Molecules	4
BISC 1112	Introductory Biology: The Biology of Organisms	4
BISC 2207	Genetics	3
BISC 2213	Biology of Cancer	3
BISC 2214	Developmental Biology	3
BISC 2336	Introductory Microbiology	3
BISC 2583	Biology of Proteins	3
BISC 2585	Biometry	3
BISC 3261	Introductory Medical Biochemistry	3

Biomedical Engineering

BME 3825	Medical Measurement Laboratory	1
BME 4482	Medical Measurements	3

Computer Science

CSCI 1112	Algorithms and Data Structures	3
CSCI 1121	Introduction to C Programming	3
CSCI 1132	Data Structures and Software Design	3
CSCI 1311	Discrete Structures I	3
CSCI 2312	Discrete Structures II	3
CSCI 2441	Database Systems and Team Projects	3
CSCI 3212	Algorithms	4
CSCI 3362	Probability for Computer Science	3
CSCI 4341	Continuous Algorithms	3
CSCI 4342	Computational Linear Algebra and Applications	3
CSCI 4364	Machine Learning	3
CSCI 4576	Introduction to Biomedical Computing	3
CSCI 4577	Biomedical Computing	3

Data Science

DATS 2101	Ethical Life in a Digital World	3
DATS 2102	Data Visualization for Data Science	3
DATS 2103	Data Mining	
DATS 2104	Data Warehousing for Data Science	3

Economics

ECON 2123	Introduction to Econometrics	3
ECON 3105	Economic Forecasting	3
ECON 3148	Health Economics	3

Electrical and Computer Engineering

ECE 1120	C Programming for Electrical and Computer Engineering	3
ECE 1125	Data Structures and Algorithms for ECE	3
ECE 3220	Introduction to Digital Signal Processing	3
ECE 3225	Signal and Image Analysis	3

Mathematics

MATH 1231	Calculus 1	3
MATH 1232	Calculus 2	3
MATH 2184	Linear Algebra	3
MATH 2233	Multivariable Calculus	3
MATH 3125	Linear Algebra II	3
MATH 3342	Ordinary Differential Equations	3
MATH 3359	Introduction to Mathematical Modeling	3
MATH 3553	Introduction to Numerical Analysis	3
MATH 3740	Computational Complexity	3
MATH 4239	Real Analysis I	3
MATH 4240	Real Analysis II	3

Mechanical and Aerospace Engineering

MAE 1117	Introduction to Engineering Computations	3

Physics

PHYS 3100	Math Methods for Physics	3
PHYS 3181	Computational Physics	3

Chemistry

CHEM 3165	Biochemistry I	3

Public Health

PUBH 3201	Introduction to Bioinformatics	3
PUBH 3202	Introduction to Genomics	3
PUBH 3136 or PUBH 3151	Ethics in Public Health or Health Law	3
PUBH 3995	Undergraduate Research	1-6
PUBH 4199	Independent Study (capstone project)	3

Statistics

STAT 2118	Regression Analysis	3
STAT 2123	Introduction to Econometrics	3
STAT 3119	Analysis of Variance	3
STAT 4158	Introduction to Mathematical Statistics II	3
STAT 4181	Applied Time Series Analysis	3
STAT 4188	Nonparametric Statistics Inference	3

STAT 4189	Mathematical Probability and Applications I	3
STAT 4190	Mathematical Probability and Applications II	3
STAT 4197	Fundamentals of SAS Programming for Data Management	3

Sample Course Schedule for Bachelor of Science in Health Data Science

Fall 1	Credits		Spring 1	Credits
PUBH 1010	1		PUBH 1142	3
PUBH 1101	3		PUBH 2142	3
BISC 1111	4		PUBH 2110	3
MATH 1231	3		MATH 1232	3
UW 1020 - university writing (gen-ed req.)	4		Humanities gen-ed	3
Total	15			16

Fall 2	Credits		Spring 2	Credits
PUBH 4201	3		PUBH 4202	3
PUBH 3131	3		PUBH 3136	3
Social Science gen-ed 1	3		STAT 2183	3
Social Science gen-ed 2	3		elective	3
elective	3		elective	3
Total	15		Total	15

Fall 3	Credits		Spring 3	Credits
PUBH 3232	3		PUBH 3242	3
PUBH 2242	3		STAT 4157	3
elective	3		elective	3
elective	3		elective	3
elective	3		elective	3
Total	15		Total	15

Fall 4	Credits		Spring 4	Credits
PUBH 2140	3		capstone project or undergraduate research course	3
elective	3		elective	3
elective	3		elective	3
elective	3		elective	3
elective	3		elective	3
Total	15		Total	15

Admission

Incoming freshman and external transfer students may apply directly to the major through GW admissions. Internal transfer students accepted into the program matriculate in the semester following admission. We will accept transfers from students with a GPA of 2.5 or higher. Students should use the internal transfer form found on the Registrar's website: https://registrar.gwu.edu/undergraduate-internal-transfer. Students follow the prescribed curriculum effective in the year that they matriculate into the BS in Health Data Science program.

Students are expected to consult with the GWSPH Undergraduate Program Advisor prior to the first term's course registration and in future terms as needed. Students are expected to consult a program advisor in all matters affecting the program of study, such as substitutions or withdrawals.

APPENDIX

Oral communication courses

- AMST 2450 History and Meaning of Higher Education in the United States (effective Fall 2021)
- AMST 2620 Human Mind and Artificial Intelligence (effective Spring 2018)
- ANTH 1004 Language in Culture and Society
- ANTH 3838/ANTH 3838W Theory and Practice in Archaeology
- CHEM 2118W Practicing Science Communications (effective Summer 2020)
- COMM 1040 Public Communication
- COMM 1041 Interpersonal Communication
- EAP 1010 Oral Academic Communication for International Students (effective Fall 2019)
- ENGL 1365 Literature and the Environment (effective Fall 2017)
- GER 2109 Advanced Conversation and Composition (effective Fall 2018)
- GER 2109W Advanced Conversation and Composition (effective Fall 2020)
- GTCH 2003 Step 1 and 2 Hybrid: Inquiry Approaches to Teaching and Lesson Design (new number effective Spring 2021) (formerly known as GTCH 1003) (effective Fall 2019)
- HONR 1034 Honors Seminar: Scientific Reasoning and Discovery (effective Spring 2018)
- ORSC 2000 Sophomore Colloquium: Diversity in Organizations (effective Spring 2018)
- SLHS 4201 Social Communication Development (ends effective Summer 2021)
- SOC 4195 Senior Research Seminar (effective Spring 2020)
- SOC 4195W Senior Research Seminar (effective Fall 2020)
- SPAN 3022 Advanced Oral Proficiency: Environmental and Social Sustainability in Latin America
- WLP 1020 Writing, Literature, and Society (effective Spring 2022)